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A Behavioral Model For Stock Prices

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Abstract

Multi-factor models have been popularly used to explain asset market behavior. The Fama and French three-factor model fitted on the sample set of new economy stocks for the study period of late nineties to early 2000s, however, fails to give adequate explanation of the stock market behavior. A behavioral model built on the assumption of bounded rationality and biases in investor behavior seems to offer a better explanation of the stock price behavior.

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INTRODUCTION

Tracing stock price movements is a difficult exercise that involves detailed examination of firm specific and industry specific factors. It is now widely recognized that Sharpe (1964) and Lintner (1965) and Mossin's (1966) Capital Asset Pricing Model (CAPM) and its other variants do not adequately describe the cross section of expected returns. Investors have been found to earn abnormal returns in excess of those predicted by the model. We therefore developed a simple model for stock price movement that incorporates investor behavior pattern. By examining the stock price data of a sample set of technology, media and telecom (TMT) companies, listed in the Bombay Stock Exchange, during the late 90's and early 2000 period we identified inertia in investor behavior as an important factor in generating market fads. The hype associated with all sorts of dot-com and media companies that pushed stock markets worldwide during the later part of nineties and early two thousand poses an interesting question as to whether such boom in technology and media stocks was justified by fundamentals or was it a mere fad? Using the behavioral inertia approach, the present study tries to show that the market was indeed driven by the craze surrounding such stocks.

The paper is divided into three broad sections. In section 1 we introduce asset pricing models. A brief description of Fama and French three factor model is followed by its empirical invalidation using the sample data under consideration. In section 2 the drawbacks of the neoclassical approach -the framework within which most asset pricing models are constructed– is highlighted. A behavioral stock price model that incorporates investor behavior pattern and is less restrictive in assumptions has been proposed. The result of an empirical test of the model is also examined in this section. In section 3 a comparative evaluation of the two models is done by looking at their forecasting power.

1 Asset Pricing Models

The Capital Asset Pricing Model (CAPM) is one of the most extensively studied models both theoretically and empirically for valuation of securities. The CAPM is a theory about the way stocks are priced in relation to their risk. The underlying logic of the theory is that assets with the same risk should earn the same expected returns. The CAPM puts forward the idea that in market equilibrium assets earn premia over the riskless rate that increases with their risk, where the determining influence on risk premia is the covariance between the asset and the so called market portfolio- the 'β' of the asset, rather than the own or intrinsic risk of an asset. Various versions of CAPM are available in the literature which were built by relaxing some of the stringent assumptions of the original model. However, starting in the late 1970s empirical work appeared that challenged even the robust version of the CAPM. Fama and French (1992) made a devastating blow to CAPM when they reported that there seemed to be no connection between beta and returns. Fama and French argued that the higher average return on small stocks and high book-to-market value stocks reflect unidentified state variables that produce undiversifiable risks (covariances) in returns that are not captured by market returns and are priced separately from market betas. Fama and French (1996) therefore formulated an extension of the CAPM model that describes asset return as a function of three different sources of risk. This model explains many of the CAPM average return anomalies. In the three-factor model developed by Fama and French, size and ratio of book value of common equity to market equity (BE/ME) are used as proxy for sensitivity to common risk factors in returns. The model described expected return on a portfolio in excess of the risk-free rate as a function of: (i) excess return on a broad market portfolio $R_m - R_f$; (ii) the difference between the return on a portfolio of small stocks and the return on a portfolio of large stocks (SMB); and (iii) the difference between the return on a portfolio of high BE/ME stocks and the return on a portfolio of low BE/ME stocks (HML). In other words, the expected return on portfolio i is

$$\mathrm{E}(R_i) - R_f = b_i[E(R_M) - R_f] + s_i\, E(SMB) + h_i\, E(HML) \text{........(1)}$$

where $E(R_M) - R_f$, E(SMB), E(HML) are expected premiums and the factor sensitivities and b_i, s_i and h_i are the slopes in the time series regression

$$R_i - R_f = a_i + b_i(R_M - R_f) + s_i\, SMB + h_i\, HML + \varepsilon_i \text{........(2)}$$

The study showed that the three-factor model gives a good description of returns in portfolios formed on earnings/price (EPS/P), cash flow/price and sales growth in addition to explaining returns on portfolios formed on size, BE/ME and industry returns.

1.1 Empirical estimation of Fama and French three-factor model

The study period covered was April 1999 to November 2004. From the TMT stocks underlying the various BSE and NSE indices only 35 companies were found to have a continuous price data and information on economic fundamentals of the company for the period covered under the study. These, therefore, formed the sample for the present study. In general, stock market studies are done using portfolios rather than stock returns. Holding a diversified portfolio is assumed to take care of firm specific risk. In this study portfolios were constructed using various criteria (see Appendix 1). In the Fama and French model firms with high BE/ME value are treated as weak firms experiencing distress. The risk associated with such firms gets priced and is reflected in high returns and positive $\hat{h}_i$. On the other hand, firms with low BE/ME values are strong firms and have negative loading on $\hat{h}_i$. Similarly, small firms have low earnings on assets and are less profitable than big firms. So size is treated as a proxy for risk factor and therefore small firms will have higher expected returns and positive slope on

SMB as against big firms which have lower expected returns and negative slope SMB. After testing for stationarity (see Appendix 2) the model is estimated by running the regression equation (2) and validated by testing for $H_o : a_i = 0$. We estimated this regression for the thirty-six constructed portfolios (see Table 1 and Table 2). A detailed analysis of Table 1 showed that:

1. For the six equal weighted size-BE/ME portfolios, the $H_o : a_i = 0$ is accepted. The null, however, does not hold for value weighted size-BE/ME (except SMBEME) as also for single sort BE/ME (both equal and value weighted) portfolios evaluated at 5% level of significance.
2. As compared to value weighted portfolios, equal weighted portfolios seem to have both better explanatory power, as also greater sensitivity to size and BE/ME factors.
3. Slope on SMB is high and strong in the small category for both equal and value weighted portfolios. In the big group SMB is not only small in magnitude but also insignificant. Also, the slope coefficient is positively related to returns in some categories. Similarly when ranking is on the basis of BE/ME alone, SMB is significant for equal weighted category and not for value weighted category.
4. Loadings on HML on all the portfolios is strongly supported in all except SMBEME (both equal and value weighted) and SHBEME value weighted stocks. In all the regressions low BE/ME stocks have negative coefficients whereas high BE/ME stocks have positive coefficients.
5. The explanatory power of regression is good when the BE/ME criteria is used alone for constructing portfolios. Combined with size the regression works well for small as against big. Equal weighted portfolios seem to do better than value weighted.

Thus, the high R^2 associated with the above regression indicates that there is risk related to size and BE/ME which captures common variation in returns. However, whereas the model picks up the premium associated with small size when in the first place small size is already highlighted, it fails to establish a discount in returns for big sized firms. It however, prices the risk captured by BE/ME factor along the predicted lines of the model. Thus the size premium is weaker and less reliable than the value premium.

EPS/P Criteria The regression estimates of equation (2) using portfolios constructed on the basis of EPS/P ranking also shows poor performance of the multifactor model. In both equal and value weighted double sort category for only 3 out of 6 portfolios, the three-factor model fails to reject the H_o. In the single sort category again for only portfolios LEPS and LEPS weighted the H_o is not rejected again evaluated at 5% level of significance. The slope coefficients on SMB and HML also do not conform to the three-factor model. None of the low EPS/P portfolios have a negative loading on HML. Similarly in the big size-EPS/P category none have significant SMB and only 2 out of 6 big-size portfolios have negative coefficient on SMB. The insipid performance of the model when portfolios are formed using EPS/P criteria indicates that the earnings variable does not adequately capture information regarding returns in stock prices. Further, the weak correlation between BE/ME and EPS/P for sample companies (a meagre 0.19) implies that earnings variable also fails to pick-up the risk associated with high BE/ME firms. Thus, the empirical exercise showed that the model performed somewhat better when portfolios were constructed using BE/ME criteria. This was not surprising considering the fact that the risk mimicking portfolios SMB and HML were themselves formed on the basis of size and BE/ME ranking. They would therefore be able to explain return on other portfolios formed on similar ranking. Thus the validity of the Fama and French model is dependent upon the criteria used for constructing sample portfolios as also the risk mimicking portfolios. A more serious problem facing the Fama and French model is its failure to explain the momentum effect, (which argues that past relative performance predicts future relative performance) of Jegadeesh and Titman (1993).

2 Drawbacks of neoclassical approach

The results of Fama and French model challenge us with a need to develop an alternate model for stock market behavior in the late 1990s and early 2000. The rise in stock prices not justified by fundamentals directs us into the realm of behavioral inertia. The Fama and French model, built in the neo-classical framework, has great theoretical appeal but limited empirical relevance. The neo-classical approach imposes stringent assumption on the behavior of economic agents. The assumption of perfect rationality, for example, has come in for a lot of criticism. It is now recognized that individuals at best have imperfect rationality. With limited time, brainpower and bounded rationality individuals are often not in a position to maximize their objective function and would instead settle for a 'satisfactory' level of the target variable. Moreover even the 'optimum' level so identified may not be chosen for altruistic reasons. With these modified assumptions it is no longer certain that equilibrium values would be achieved. In the capital market, for instance, while the trading by rational traders traces the path towards equilibrium, trading activities of irrational traders pushes the market away from the equilibrium point. The equilibrium prices are a weighted average of the beliefs of rational and irrational traders, and the influence of either group on prices depends upon their risk bearing capacity. Arbitrage will, therefore, not eliminate mispricing. Arbitraging does not work efficiently, since it is hard for an investor to know whether other investors have yet detected and acted upon it.

Persistent mispricing might also occur because some relevant piece of public information is either ignored or misused by everyone leading to market prices being regularly at odds with fundamental values. All individuals have biases especially under conditions when information is slack. While it might be argued that in the modern day computerized world, information is no longer a constraint, the question of quality of information, its proper interpretation and analyses still remains. And since individuals have similar biases, it will be incorrect to assume that errors cancel out in equilibrium and therefore that the estimated values will approximate the true values. Neoclassical economists arguing for the existence of equilibrium had immense faith in human learning capabilities and therefore believed that individuals will not systematically and consistently make the same mistake. However, experimentation literature has shown that there can be a complete lack of learning even in infinite horizons. Since there are some opportunity costs to learning, even a completely 'rational' learner will chose not to experiment and remain in a non-optimal equilibrium if the cost of trying something else is too high. Moreover, the time required to converge to an equilibrium strategy can be extremely long, especially in a situation of changing environment. Thus, markets can be in a situation of perpetual non-convergence.

2.1 Behavioral inertia model for stock prices

Faced with information, time and resource constraints and also a stock price series that exhibits random walk, investors find that the best forecast of the future price is in fact the current price. In an uncertain world, where information is revealed through a sequence of events, the cost of collecting and analyzing information are exorbitant in terms of money, time and expertise. Market participants will therefore find it more 'rational' and practical to change their decisions only slowly even when underlying economic conditions are constantly changing. Thus, they would find greater returns with inaction rather than optimizing action and behavioral inertia plays the important role of imparting stability in individual's behavior. Inertia produces highly auto-correlated time series in which random events have lasting effects.

The behavioral inertia approach has been shown to be a combination of inertia and caprice, i.e. random change (Stanley 2000). Individuals are often overconfident about their abilities and therefore may deviate from the tried and tested path. Such 'irrationality' in behavior creates uncertainity in all economic phenomena. Caprice provides a mechanism of behavioral variation, which promotes advancement of the society. It also exhibits inertia or pattern in variation. Variations that were successful in the most recent past will tend to remain successful in the near future as well, implying positive autocorrelations among the innovations. By explicitly identifying inertia and caprice, the Behavioral Inertia Model proposes a dynamic theory of economic phenomena. The idea that the current price is the best predictor of future price has been quite popular both with lay investors as well as academicians. Proponents of Efficient Market Hypothesis (weak form) treat current price as reflecting all the information that is contained in past prices. They therefore, highlight the futility of forming trading rules based on share price history. Keynes (1936) argued that investors accept current valuations as a correct reflection of the market assessment of future prospects. They downplay the fact that these valuations can be incorrect. Faced with uncertainty regarding factors that might affect stock prices market participants seek safety by conforming to the behavior of the majority on the average. This however, does not rule out the possibility of profit making by predicting changes in the conventional basis of valuation, a short time ahead of the rest of the investor population. Such a possibility generates speculative behavior amongst investors. In the literature on finance it is common to find lagged dependent variables when stock market analysis is in the returns framework (e.g. Fama and French (1988)). There are also studies on asset market that include time dependency in preferences in utility function. These, however, are built in the neoclassical framework and incorporate habit persistence in consumption in the utility function. Constandinides(1988), Detemple(1989), Heaton(1989) and Sunderasan(1989) examined asset pricing on the basis of habit formation. Heaton(1995) used a simulated Method of Moments approach to evaluate a representative consumer asset pricing model and reported evidence for the local substitution of consumption with habit formation occurring over longer periods of time. By incorporating such time non-separability in preferences, the performances of asset pricing models have been found to improve. The behavioral inertia model that we developed is not based on optimizing principles. Ours is a simple approach that allows for biases in individual behavior and treats them as incompletely rational. Therefore, our approach does not entail calculations of rationally expected returns, which in any case cannot be calculated in ex- ante terms. In this study, we developed a behavioral inertia model at the stock level rather than at the portfolio level. This is owing to the fact that investors rarely hold a well diversified portfolio (see Barber and Odean (2000); Polkovinchenko (2003); Goetzmann and Kumar (2004)). Investors' personal characteristics, their stock preferences and their behavioral biases jointly influence their diversification choices (Goetzmann and Kumar (2004), Kumar & Lim (2004)). Huberman(2001) also reported the tendency of household investments to be primarily concentrated in their employer's stocks and in general in stocks of companies registered in their country as against foreign company stocks. These phenomena provide compelling evidence that people invest in the familiar stocks while often ignoring the principles of portfolio theory. Further, by working directly with prices rather than stock returns one can draw unambiguous conclusions. With returns, a choice between equal weighted versus value weighted returns has different implications for the behavior of the stock markets. More importantly, by working with prices rather than returns, we avoid the crucial question of unit of time for returns. Measurement choice between average monthly abnormal returns vis--vis buy and hold abnormal returns has severe effect on the outcome of the study. Choice of a normal period to estimate a stock's expected return is also problematic as stocks can show return continuation in the short run and mean reversion in the long-run.

2.2 The Model

We capture the inertia in stock prices and the market dynamism by formulating an asset pricing model as a function of lagged prices and C_t the caprice element.
Assuming inertial decay

$$\mathrm{P}_t = \alpha_0 \, P_{t-1}^{\alpha_1} \, C_t \ldots\ldots\ldots (3)$$

If caprice also experiences the same type of exponential decay then

$C_t = X_t^{\beta}\, C_{t-1}^{\rho}\, \epsilon_t$........ (4)

where X_t is 1 x k vector of explanatory variables, β is a k x 1 vector of regression coefficients. ρ is the auto-regression coefficient for caprice, a measure of its persistence and ϵ_t is the truly random irreducibly stochastic past. Re-writing the above equations in logarithmic form, we get

$\ln P_t = \ln \alpha_0 + \alpha_1 \ln P_{t-1} + \ln C_t$ .... (5)

$\ln C_t = \beta \ln X_t + \rho \ln C_{t-1} + \ln \varepsilon_t$ ....(6)

and further

$\ln C_{t-1} = \ln P_{t-1} - \ln \alpha_0 - \alpha_1 \ln P_{t-2}$ ....(7)

Thus, for each stock i,

$$\begin{aligned}
\ln P_{it} &= \ln \alpha_{0i} + \alpha_{1i} \ln P_{it-1} + \beta_i \ln X_{it} + \rho_i \left[\ln P_{it-1} - \ln \alpha_{0i} - \alpha_{i1} \ln P_{it-2}\right] + \ln \varepsilon_{it} \\
&\text{or} \\
\ln P_{it} &= \ln \alpha_{0i} + (\alpha_{1i} + \rho_i) \ln P_{it-1} + \beta_i \ln X_{it} - \rho_i \ln \alpha_{0i} - \rho_i\, \alpha_{1i} \ln P_{it-2} + \ln \varepsilon_{it} \\
&\text{or} \\
\ln P_{it} &= (1 - \rho_i) \ln \alpha_{0i} + (\alpha_{1i} + \rho_i) \ln P_{it-1} - \rho_i\, \alpha_{1i} \ln P_{it-2} \\
&+ \beta_{1i} \ln X_{1it} + \beta_{2i} \ln X_{2it} + \beta_{3i} \ln X_{3it} + \beta_{4i} \ln X_{4it} + \ln \varepsilon_{it} \text{ ....} \qquad (8)
\end{aligned}$$

(obtained by decomposing X_{it} into its components) Thus, the testing of the model involves running the following regression

$$\begin{aligned}
\ln P_{it} &= (1 - \rho_i) \ln \alpha_{0i} + (\alpha_{1i} + \rho_i) \ln P_{it-1} - \rho_i\, \alpha_{1i} \ln P_{it-2} \\
&+ \beta_{1i} \ln X_{1it} + \beta_{2i} \ln X_{2it} + \beta_{3i} \ln X_{3it} + \beta_{4i} \ln X_{4it} + \nu_t \text{ ....} \qquad (9)
\end{aligned}$$

$$\text{where } \nu_t = \ln \varepsilon_{it}$$

The presence of inertia is ascertained by testing for the

$H_0 : (\alpha_{1i} + \rho_i) - \rho_i\, \alpha_{1i} = 1$

i.e. sum of AR(autoregressive) coefficients = 1

2.3 Empirical Testing of the Model

In our exercise the explanatory variables included are natural log of book-to-market value (lnB/M), natural log of market value (lnMV) and natural log of beta (lnbeta). Of the 35 stocks 3 stocks namely ASM Tech, BPL and Nelco had negative BE/ME value and were therefore dropped. Many of the stocks reported negative beta values for part of the time period under consideration. Moreover, the coefficient of beta was found to be insignificant in a preliminary exercise of univariate regression using cross-section data. However, considering the fact that for long, beta dominated the risk-return models, we saw it reasonable to continue including beta in the set of explanatory variables. To take care of the problem of finding natural log for negative betas we bifurcated the beta variable into lnβ positive and lnβ negative. For positive beta values natural log is estimated and is recorded as variable lnbeta positive. For such periods with positive beta, the variable lnbeta negative shows the value of zero. Similarly, for negative betas, the ln value of $|\beta|$is estimated (i.e. excluding negative sign) and this is treated as variable lnβ negative. Here the variable lnβ positive has elements zero for the corresponding time period. Out of the thirty-two sample companies thirteen had two beta variables of lnbeta and lnbeta negative. The results of ADF test on all the variables used in the model (given in Appendix 3) show that only for the ln price series the null of Unit root with trend and intercept is not accepted at 5% (though not rejected at 1%) for a small number of companies. The p values of the likelihood ratio test of the coefficient on the one time lag of the dependent variable and the trend being jointly equal to zero shows that for Afte, Crest, DSQ, Eserve, Hinduja, InfoSys, Moser, MTNL, Orient, Penasoft, TataElxsi and Vindhyas the absence of trend is accepted at 1% but not at the 5% level of significance. Similarly, the presence of Unit root with intercept alone is not accepted by lnprice series of Eserve, Hinduja and Moser at 5% level of significance.

For all other series the null hypothesis of Unit root is accepted with trend alone at 5% level of significance.

After ascertaining the independence of the error terms (see Appendix 4) we estimated the model by running the following regression on price series of nineteen companies which had positive beta values throughout the study period.

$$\ln P_t = \beta_0 + \beta_1 \ln P_{t-1} + \beta_2 \ln P_{t-2} + \beta_3 \ln BM + \beta_4 \ln MV + \beta_5 \ln beta + \nu_t$$

For the thirteen companies which had negative betas for part of the sample period the beta dummy of lnbeta negative was included in the above regression. Thus, the following regression was run.

$$\begin{aligned}\ln P_t = \beta_0 + \beta_1 \ln P_{t-1} + \beta_2 \ln P_{t-2} + \beta_3 \ln BM + \beta_4 \ln MV + \beta_5 \ln \mathrm{beta} \\ + \beta_6 \ln \mathrm{betaneg} + \nu_t\end{aligned}$$

The results of the above regression are reported in Table 3. The last column of the Table gives us the 't' values calculated for the null hypothesis of

$$\beta_1 + \beta_2 = 1$$

From Table 3 we see that the one time lagged price for all the series is strongly significant and has a positive feedback effect on the current price level whereas the series lagged by two time periods has a low slope coefficient and is also highly insignificant. Moreover, whether P_{t-2} pushes the current price in the same direction or in the opposite direction is not clear from the mixed results obtained. Again lnBM and lnMV are individually significant only for seven companies, whereas the two beta variables, lnbeta and lnbeta negative are significantly different from zero only for five companies. But taken together, the two economic fundamental variables along with the beta dummies and the two lagged price variables do a very good job in modeling the price behavior. This can be seen from the R^2 statistic reported. In all the 32 cases the 'F' test of all the coefficients being equal to zero is rejected. From the t statistic reported in the last column of Table 3 it is clear that the null of inertia evaluated at 1% level is not accepted in the following series- Bluestar, Finolex, Jain, Mphasis, MTNL, NIIT, Satyam, TataElxsi, Wipro and Zensar. An examination of the company history revealed that this period was marked by issue of ADRs, major national and international collaborations and high rating of their performance by various agencies. These conveyed information on the future prospects of the firm which were orthogonal to those obtained from the past performance of the firm. The market therefore viewed these stocks favorably and their market prices were driven away from their existing valuations. In the behavioral inertia approach no distributional assumptions are made about the error term except them being identically and independently distributed. Therefore, we also evaluated the model using the Wald test, an asymptotic test which does not require the assumption that the error term is normally distributed.

The results of the Wald test reported in Table 4 also confirms the presence of inertia in twenty two of the thirty two sample companies. In fact the null hypothesis was rejected for the same set of companies which failed the t test.

3 Forecasting power of the two models

In the debate on the superiority of rational-behavioral approach researchers in the rational paradigm argue for their approach on the grounds of the testability and predictive power (e.g. Fama (1998); Contantinides (2002)). However, as Brav and Heaton(2002) pointed out, the researchers working within the rational paradigm seem to have abandoned testability and prediction in favor of a scheme of ex-post rationalizations of observed price behavior. Since the rational model has enormous flexibility to generate such rationalization, it is nearly always possible for the rational school to explain seemingly anomalous results even when behavioral explanations enjoy at least equal plausibility.

The crucial difference between the two approaches of rational and behavioral school lies in the type of risk that is quantified to describe the risk-return relationships. While factor loadings are proxies of systematic risk, characteristics tend to measure total risk. As the estimated β's are measured with error and as measures of behavioral characteristics use more up to date information the latter promise to be better proxies of true unobservable betas.

Moreover as suggested by Daniel and Titman(1997), characteristics could have information independent of the covariance structure of returns that helps explain expected portfolio returns. To understand the implications of these two approaches we undertook a comparative evaluation of the multifactor model and the behavioral model. Though the two models differ in terms of the dependent variable, they can still be compared on the basis of their predictive power. A dynamic, in-sample forecast using forecasted values for lagged dependent variables was done for the two models viz, Fama and French model and the behavioral model (see Tables 5 and 6). The Tables report two statistics- Mean Absolute Percentage Error (MAPE) and Theil's inequality coefficient, where,
MAPE is defined as $\frac{1}{T}\sum_{t=1}^{T}\left|\frac{\overset{\wedge}{Y_t}-Y_t}{Y_t}\right|$ and
Theil's inequality coefficient U is given as

$$U = \frac{\sqrt{\frac{1}{T}\sum_{t=1}^{T}\left(\overset{\wedge}{Y_t}-Y_t\right)^2}}{\sqrt{\frac{1}{T}\sum_{t=1}^{T}\overset{\wedge}{Y_t}^{2}}+\sqrt{\frac{1}{T}\sum_{t=1}^{T}Y_t^{2}}}$$

Here, $\overset{\wedge}{Y_t}$ and Y_t are the simulated and the actual values of dependent variables of the two models. These two measures of forecast error are invariant of the scale of the dependent variable. The smaller the value of MAPE, the better is the forecasting ability of the model. The value of U lies between 0 and 1. A value of U=0 implies perfect fit, whereas a value of U=1 indicates that the model has no predictive value. A look at mean absolute percentage error and Theil's inequality shows that the behavioral inertia model gives a better description of price behavior in the Indian stock market. Thus the forecasting exercise clearly suggests the need to incorporate investor's inertia in modeling stock prices.

4 CONCLUSIONS

The focus of this study has been on developing a behavioral model for understanding asset market behavior. Popular stock investment strategies are often fads based on market generated data, especially share price as opposed to accounting data given in the company financial reports. Agents assume the current market valuation to be a reflection of the markets assessment of future prospects. Acting on the belief that prices will be what they were, investors use market valuation to pick stocks. Such behavior is self fulfilling and inertia becomes the basis for the market action.

The behavioral inertia approach involves the use of a simple regression exercise. Complex econometric techniques though highly popular generally do not serve much purpose. Researchers choose estimation techniques by looking at the diagnostic statistics of the model. It is however quite possible that what might apparently seem to be the problem may in fact not be so. For example, significant serial correlation in estimated residuals may be due to the presence of ARCH effect in residuals or the omission of lagged dependent and explanatory variables. Hence a model with autocorrelation in disturbances should be developed only after testing for the above mentioned possibilities. Such prescreening of the model may however change the distributional properties of subsequent statistical analysis, yielding statistics that may have virtually unknown sampling properties.

By assuming inertial decay we derive a log-linear model to describe stock price behavior. The model that we have developed is guided by theory rather than an outcome of sample data. Since no inductive searches for suitable econometric models are made, there is no pre-test bias. Any problem in empirical testing either in the form of misspecified error terms or coefficients with wrong sign is treated as evidence against the theory under examination. This is in contrast to the usual approach of modifying a model to arrive at a better fit to the data in hand. This latter approach is not a desirable method of model building as corrections made by looking at apparent deviations from the assumptions may or may not eliminate the root cause of the problem.

The Fama and French model is tested using portfolios constructed on the basis of BE/ME and EPS/P ranking. The results show poor performance of the model in explaining average returns on the various constructed portfolios. In particular, in the BE/ME ranking the null hypothesis of the three-factor portfolios being minimum variance efficient is accepted only for the six size-BE/ME equal weighted portfolios, and the small and medium BE/ME value weighted portfolios. A similar number of portfolios in the EPS/P ranking also accept the null hypothesis.

The coefficients on SMB and HML also do not unambiguously reflect the pricing of risk associated with small size and high book-to-market value firms.

The alternate model proposed in this paper based on investor behavior pattern seems to offer a better explanation of stock market behavior. The presence of inertia in the stock price series is ascertained by undertaking a ‘t’ test on the coefficients of the two lagged variables adding up to 1. Under the condition when no distributional assumptions are made about the returns series, an asymptotic test like Wald test would be more appropriate. We, therefore, undertook a Wald test of the null hypothesis of presence of inertia. The results of both the ‘t’ test and ‘Wald’ test show that the null is not accepted in 10 out of 32 sample companies, namely, Bluestar, Finolex, Jain, Mphasis, MTNL, NIIT, Satyam, TataElxsi, Wipro and Zensar.

An in-sample forecasting of the two models viz. Fama and French and the behavioral inertia model, formulated using rational and behavioral approaches respectively, also supported our argument for incorporating behavioral biases in investor’s behavior.

Table 1: Regression of excess returns to portfolios formed on the basis of BE/ME criteria on the Fama and French factor portfolios

Portfolio		C	EXRET BSE	SMB	HML	R^2	AdjR^2	F stat	DW stat
LBEME	Coeff	0.0555	1.1438	0.2710	-0.26	0.73	0.72	56.68	1.86
	t-Stat	4.6594	9.7965	3.1045	-6.63				
MBEME	Coeff	0.0564	0.9606	0.6146	0.16	0.52	0.50	22.61	1.77
	t-Stat	2.7744	4.8269	4.1310	2.32				
HBEME	Coeff	0.0636	1.1971	0.6804	0.72	0.91	0.90	204.45	2.07
	t-Stat	5.0202	9.6478	7.3352	17.29				
LBEME wtd	Coeff	0.0410	1.1212	0.1356	-0.11	0.41	0.38	14.68	1.77
	t-Stat	2.1125	5.8917	0.9534	-1.67				
MBEME wtd	Coeff	0.0649	0.6610	0.0684	-0.08	0.14	0.10	3.34	2.24
	t-Stat	2.6656	2.7699	0.3833	-0.99				
HBEME wtd	Coeff	0.0703	1.2469	0.0697	0.26	0.60	0.58	31.15	1.77
	t-Stat	4.3078	7.8026	0.5834	4.82				
SLBEME	Coeff	-0.0001	1.0817	1.0512	-0.38	0.78	0.77	74.25	2.20
	t-Stat	-0.0087	7.3762	9.5893	-7.65				
SMBEME	Coeff	0.0192	1.0582	0.9427	-0.06	0.55	0.53	25.32	1.45
	t-Stat	0.8525	4.8059	5.7271	-0.87				
SHBEME	Coeff	0.0128	1.1199	1.0449	0.95	0.91	0.90	201.72	2.23
	t-Stat	0.7781	6.9225	8.6397	17.34				
BLBEME	Coeff	0.0191	1.1927	-0.1488	-0.23	0.63	0.61	35.00	1.70
	t-Stat	1.3222	8.4063	-1.4029	-4.77				
BMBEME	Coeff	0.0066	0.9127	0.3300	0.28	0.42	0.39	15.14	2.15
	t-Stat	0.2832	4.0196	1.9443	3.71				

Table 1: Contd.

Portfolio		C	EXRET BSE	SMB	HML	R^2	AdjR^2	F stat	DW stat
BHBEME	Coeff	0.0062	1.1544	-0.1425	0.45	0.73	0.72	58.00	1.49
	t-Stat	0.4573	8.7359	-1.4424	10.05				
SHBEME wtd	Coeff	0.0878	2.1221	0.7963	0.04	0.50	0.48	20.96	1.86
SLBEME wtd	Coeff	0.0498	1.1756	0.8519	-0.30	0.63	0.61	35.68	1.58
	t-Stat	2.5320	6.0977	5.9110	-4.60				
SMBEME wtd	Coeff	0.0684	1.1905	1.2132	-0.10	0.39	0.36	13.57	1.59
	t-Stat	1.8289	3.2503	4.4311	-0.77				
	t-Stat	2.4951	6.1575	3.0908	0.33				
SHBEME wtd	Coeff	0.0878	2.1221	0.7963	0.04	0.50	0.48	20.96	1.86
	t-Stat	2.4951	6.1575	3.0908	0.33				
BLBEME wtd	Coeff	0.0802	1.2069	0.0551	-0.35	0.53	0.51	23.91	1.53
	t-Stat	3.9560	6.0745	0.3710	-5.16				
BLBEME wtd	Coeff	0.0802	1.2069	0.0551	-0.35	0.53	0.51	23.91	1.53
	t-Stat	3.9560	6.0745	0.3710	-5.16				
BMBEME wtd	Coeff	0.0652	0.7453	0.0380	-0.12	0.19	0.15	4.85	2.38
	t-Stat	2.7639	3.2247	0.2197	-1.59				
BHBEME wtd	Coeff	0.0578	1.0939	-0.1367	0.17	0.43	0.40	15.97	1.87
	t-Stat	3.3289	6.4316	-1.0751	2.89				

Table 2. Regression of excess Returns on portfolios formed on the basis of EPS/P ranking on the Fama and French factor portfolios.

Portfolio		C	EXRET BSE	SMB	HML	R^2	Adj R^2	F-stat	DW stat
LEPS wtd	Coeff	0.0736	0.2730	0.1258	0.0543	0.02	-0.03	0.33	1.96
	t-Stat	1.6828	0.6395	0.3918	0.3748				
MEPS wtd	Coeff	0.0485	0.2865	-0.0279	0.1105	0.06	0.01	1.26	1.51
	t-Stat	2.1250	1.2859	-0.1668	1.4615				
HEPS wtd	Coeff	0.0829	0.3501	0.0620	0.0873	0.06	0.02	1.34	1.57
	t-Stat	3.3217	1.4357	0.3384	1.0550				
LEPS wtd	Coeff	0.0122	0.9383	0.2144	0.3180	0.29	0.25	8.52	2.01
	t-Stat	0.3984	3.1232	0.9548	3.1392				
MEPS wtd	Coeff	0.0545	0.9919	0.1485	-0.1259	0.43	0.40	15.76	1.68
	t-Stat	3.1735	5.8956	1.1805	-2.2194				
HEPS wtd	Coeff	0.0933	1.1161	0.0294	0.1535	0.39	0.36	13.26	2.00
	t-Stat	4.6012	5.6173	0.1982	2.2907				
SLEPS wtd	Coeff	0.0486	1.0196	1.2416	0.5227	0.75	0.74	64.28	1.49
	t-Stat	2.1241	4.5517	7.4147	6.9213				
SMEPS wtd	Coeff	0.0263	1.2011	0.9372	0.3969	0.67	0.65	41.74	1.54
	t-Stat	1.1154	5.1915	5.4189	5.0881				
SHEPS wtd	Coeff	0.0859	1.3011	0.8716	-0.1362	0.73	0.72	57.76	1.67
	t-Stat	5.4544	8.4333	7.5568	-2.6181				
BLEPS wtd	Coeff	-0.0109	0.6818	0.2634	1.0119	0.65	0.63	38.20	2.10
	t-Stat	-0.3390	2.1573	1.1147	9.4972				
BMEPS wtd	Coeff	0.0750	1.1305	0.1076	-0.2425	0.54	0.52	25.00	1.53
	t-Stat	4.4471	6.8421	0.8709	-4.3538				
BHEPS wtd	Coeff	0.1030	1.2821	-0.2765	0.1500	0.52	0.49	22.43	1.74
	t-Stat	6.2796	7.9792	-2.3019	2.7691				

Table 2: Contd.

Portfolio		C	EXRET BSE	SMB	HML	R^2	Adj R^2	F-stat	DW stat
SLEPS wtd	Coeff	0.0060	0.5673	0.8278	0.1017	0.24	0.20	6.62	2.11
	t-Stat	0.1659	1.6125	3.1472	0.8574				
SMEPS wtd	Coeff	-0.0050	0.8191	1.2366	1.4376	0.72	0.71	55.08	1.82
	t-Stat	-0.1161	1.9308	3.8993	10.0511				
SHEPS wtd	Coeff	0.0907	1.3309	0.8133	-0.1057	0.60	0.58	31.44	1.97
	t-Stat	4.3305	6.4830	5.2996	-1.5269				
BLEPS wtd	Coeff	0.0021	0.7540	0.1721	0.3583	0.20	0.16	5.17	2.08
	t-Stat	0.0560	2.0285	0.6194	2.8596				
BMEPS wtd	Coeff	0.0546	0.9849	0.1213	-0.1455	0.42	0.39	14.91	1.65
	t-Stat	3.0844	5.6746	0.9350	-2.4857				
BHEPS wtd	Coeff	0.0901	0.9918	-0.2230	0.1205	0.41	0.38	14.65	2.48
	t-Stat	5.7240	6.4305	-1.9338	2.3178				

Table 3. Regression of $\ln P_t$ on $\ln P_{t-1}$, $\ln P_{t-2}$, $\ln BM$, $\ln MV$, $\ln \beta$ and $\ln \beta$negative

		C	$\ln P_{t-1}$	$\ln P_{t-2}$	$\ln BM$	$\ln MV$	$\ln \beta$	$\ln \beta$ Negative
Coeff	ACE	1.8420	0.8945	-0.0383	-0.1636	-0.1028	0.1121	0.0000
S.E		1.2940	0.1297	0.1416	0.0905	0.0810	0.0947	0.0000
t-Stat		1.4230	6.8988	-0.2708	-1.8073	-1.2702	1.1836	0.0000
Prob.		0.1600	0.0000	0.7875	0.0757	0.2089	0.2412	0.0000
		R-sq = 0.897341 **AdjR-sq** = 0.888786 **DW** = 2.032666 **Prob(F)** = 0 **t** = -1.663						
Coeff	AFTE	3.0324	0.8964	-0.0345	-0.1410	-0.1182	0.2196	0.0000
S.E		4.1628	0.1312	0.1433	0.0823	0.1713	0.5980	0.0000
t-Stat		0.7284	6.8352	-0.2407	-1.7135	-0.6900	0.3672	0.0000
Prob.		0.4692	0.0000	0.8106	0.0918	0.4928	0.7147	0.0000
		R-sq = 0.849264 **AdjR-sq** = 0.836702 **DW** = 1.915063 **Prob(F)** = 0 t = -1.98						
Coeff	BLUESTAR	-13.7697	0.8489	-0.1148	0.5275	0.7692	0.2452	0.1216
S.E		3.9782	0.1312	0.1224	0.1324	0.2170	0.0693	0.0373
t-Stat		-3.4613	6.4712	-0.9377	3.9830	3.5440	3.5352	3.2578
Prob.		0.0010	0.0000	0.3522	0.0002	0.0008	0.0008	0.0019
		R-sq =0.920026 **AdjR-sq** = 0.911893 **DW** = 2.032666 Prob(F) = 0 **t** = -3.49						
Coeff	CMC	-0.0966	0.9879	-0.2086	0.0498	0.0676	-0.0379	0.0000
S.E		2.3038	0.1237	0.1321	0.0744	0.1196	0.0354	0.0000
t-Stat		-0.0419	7.9829	-1.5792	0.6698	0.5654	-1.0714	0.0000
Prob.		0.9667	0.0000	0.1195	0.5055	0.5739	0.2883	0.0000
		R-sq = 0.767065 **AdjR-sq** = 0.747653 **DW** = 1.992401 **Prob(F)** = 0 **t** = -2.35						
Coeff	COSMO	1.6672	0.5711	0.2725	-0.1187	-0.0414	-0.1666	0.0770
S.E		2.0388	0.1227	0.1321	0.1476	0.1018	0.1122	0.0439
t-Stat		0.8177	4.6535	2.0635	-0.8040	-0.4064	-1.4847	1.7568
Prob.		0.4168	0.0000	0.0435	0.4247	0.6859	0.1429	0.0841
		R-sq = 0.884129 **AdjR-sq** = 0.872346 **DW** = 2.053098 **Prob(F)** = 0 **t** = -1.61						
Coeff	CREST	10.6456	0.9274	-0.0607	-0.5491	-0.5031	0.1067	0.0000
S.E		3.3939	0.1264	0.1347	0.1934	0.1635	0.0868	0.0000
t-Stat		3.1367	7.3374	-0.4510	-2.8396	-3.0761	1.2297	0.0000
Prob.		0.0026	0.0000	0.6536	0.0062	0.0032	0.2236	0.0000
		R-sq = 0.910739 **AdjR-sq** = 0.903301 **DW** = 2.096961 **Prob(F)** = 0 **t** = -1.99						

Table 3. Contd.

		C	$\ln P_{t-1}$	$\ln P_{t-2}$	$\ln BM$	$\ln MV$	$\ln \beta$	$\ln \beta$ Negative
Coeff	CYBERSYS	-0.0126	0.9641	0.0101	-0.0026	-0.0038	0.1257	0.0000
S.E		0.6056	0.1277	0.1355	0.0988	0.0295	0.1393	0.0000
t-Stat		-0.0209	7.5490	0.0746	-0.0266	-0.1305	0.9028	0.0000
Prob.		0.9834	0.0000	0.9408	0.9789	0.8966	0.3702	0.0000
		R-sq = 0.950369 **AdjR-sq** = 0.946233 **DW** = 1.960987 **Prob(F)** = 0 **t** = -0.45						
Coeff	DSQ	7.2462	0.8419	-0.0449	-0.3656	-0.2533	-0.9163	0.0000
S.E		2.8389	0.1280	0.1472	0.1305	0.1214	0.3472	0.0000
t-Stat		2.5525	6.5755	-0.3051	-2.8022	-2.0871	-2.6390	0.0000
Prob.		0.0133	0.0000	0.7613	0.0068	0.0411	0.0106	0.0000
		R-sq = 0.964638 **AdjR-sq** = 0.961691 **DW** = 2.024837 **Prob(F)** = 0 **t** = -2.14						
Coeff	ESERVE	-24.6422	0.7094	0.1346	0.8987	1.2783	0.9219	3.6217
S.E		89.5153	0.1260	0.1303	3.0048	4.4734	3.0649	11.9790
t-Stat		-0.2753	5.6297	1.0328	0.2991	0.2858	0.3008	0.3023
Prob.		0.7841	0.0000	0.3059	0.7659	0.7761	0.7646	0.7635
		R-sq = 0.744673 **AdjR-sq** = 0.718707 **DW** = 2.00396 **Prob(F)** = 0 **t** = -2.00						
Coeff	FINOLEX	-16.1226	0.5453	0.1806	0.9429	0.7748	-0.1734	-0.1731
S.E		11.0004	0.1225	0.1217	0.4899	0.4941	0.0817	0.0496
t-Stat		-1.4656	4.4526	1.4832	1.9247	1.5680	-2.1235	-3.4861
Prob.		0.1481	0.0000	0.1433	0.0591	0.1222	0.0379	0.0009
		R-sq = 0.918078 **AdjR-sq** = 0.909747 **DW** = 2.105351 **Prob(F)** = 0 **t** = -3.27						
Coeff	HCL	47.1060	0.7081	0.1682	-1.9989	-2.1246	-0.0051	-0.3191
S.E		63.5441	0.1288	0.1264	2.6236	2.8765	0.6754	0.1115
t-Stat		0.7413	5.4964	1.3300	-0.7619	-0.7386	-0.0076	-2.8616
Prob.		0.4614	0.0000	0.1886	0.4492	0.4631	0.9940	0.0058
		R-sq = 0.941186 **AdjR-sq** = 0.935205 **DW** = 2.109003 **Prob(F)** = 0 **t** = -1.97						
Coeff	HINDUJA	-2.3139	1.1041	-0.0711	0.3663	0.1018	-0.0037	0.0000
S.E		3.3113	0.1192	0.1426	0.2244	0.1525	0.0142	0.0000
t-Stat		-0.6988	9.2590	-0.4987	1.6326	0.6672	-0.2606	0.0000
Prob.		0.4874	0.0000	0.6198	0.1078	0.5072	0.7953	0.0000
		R-sq = 0.919182 **AdjR-sq** =0.912448 **DW** = 1.916596 **Prob(F)** = 0 **t** = 0.501						

Table 3. Contd.

		C	$\ln P_{t-1}$	$\ln P_{t-2}$	$\ln BM$	$\ln MV$	$\ln \beta$	$\ln \beta$ Negative
Coeff	INFOSYS	1.4784	0.7773	-0.0043	-0.1270	0.0027	0.1151	0.0000
S.E		0.8466	0.1296	0.1347	0.0858	0.0238	0.0895	0.0000
t-Stat		1.7462	5.9957	-0.0322	-1.4809	0.1138	1.2857	0.0000
Prob.		0.0859	0.0000	0.9744	0.1439	0.9098	0.2035	0.0000
		R-sq = 0.745948 **AdjR-sq** = 0.724777 **DW** = 1.977954 **Prob(F)** = 0 **t** = -2.46						
Coeff	JAIN	9.0544	0.8429	-0.0659	-0.8248	-0.4300	-0.2054	0.6225
S.E		17.8614	0.1252	0.1217	1.1730	0.9210	0.3371	0.4103
t-Stat		0.5069	6.7308	-0.5418	-0.7031	-0.4669	-0.6093	1.5171
Prob.		0.6141	0.0000	0.5900	0.4847	0.6423	0.5447	0.1346
		R-sq = 0.888267 **AdjR-sq** = 0.876904 **DW** = 1.962494 **Prob(F)** = 0 **t** = -3.28						
Coeff	MASTEK	2.2929	0.9542	0.0070	-0.0867	-0.1060	0.1076	0.0000
S.E		2.3421	0.1285	0.1367	0.1135	0.1082	0.2299	0.0000
t-Stat		0.9790	7.4288	0.0510	-0.7638	-0.9791	0.4682	0.0000
Prob.		0.3315	0.0000	0.9595	0.4480	0.3315	0.6414	0.0000
		R-sq = 0.923703 **AdjR-sq** = 0.917345 **DW** = 1.915473 **Prob(F)** = 0 **t** = -0.74						
Coeff	MOSER	1.2697	0.7552	0.0491	0.0044	-0.0071	0.0154	-0.0662
S.E		0.9839	0.1282	0.1286	0.1335	0.0440	0.1054	0.0886
t-Stat		1.2905	5.8909	0.3814	0.0329	-0.1605	0.1461	-0.7472
Prob.		0.2019	0.0000	0.7043	0.9738	0.8730	0.8844	0.4579
		R-sq = 0.772889 **AdjR-sq** = 0.749793 **DW** = 2.057018 **Prob(F)** = 0 **t** = -2.48						
Coeff	MPHASIS	5.8226	0.8672	-0.1516	-0.0467	-0.1757	-0.6700	0.0258
S.E		2.3446	0.1321	0.1284	0.0407	0.0874	0.3900	0.0206
t-Stat		2.4834	6.5665	-1.1801	-1.1499	-2.0103	-1.7178	1.2520
Prob.		0.0159	0.0000	0.2427	0.2548	0.0490	0.0911	0.2155
		R-sq = 0.822951 **AdjR-sq** = 0.804946 **DW** = 1.904903 **Prob(F)** = 0 **t** = -2.82						
Coeff	MTNL	30.4114	0.5738	-0.0237	-0.9100	-1.1147	0.0738	0.1072
S.E		8.6277	0.1239	0.1223	0.2506	0.3309	0.0694	0.0684
t-Stat		3.5248	4.6331	-0.1940	-3.6309	-3.3691	1.0624	1.5673
Prob.		0.0008	0.0000	0.8469	0.0006	0.0013	0.2924	0.1224
		R-sq = 0.797689 **AdjR-sq** = 0.777115 **DW** = 2.02991 **Prob(F)** = 0 **t** = -4.29						

Table 3. Contd.

		C	$\ln P_{t-1}$	$\ln P_{t-2}$	$\ln BM$	$\ln MV$	$\ln \beta$	$\ln \beta$ Negative
Coeff	NIIT	37.7572	0.7398	-0.0706	-0.2841	-1.4403	0.1576	0.2572
S.E		17.3706	0.1260	0.1439	0.1369	0.6851	0.1647	0.1361
t-Stat		2.1736	5.8692	-0.4907	-2.0754	-2.1022	0.9572	1.8900
Prob.		0.0338	0.0000	0.6255	0.0423	0.0398	0.3424	0.0637
		R-sq = 0.94485 **AdjR-sq** = 0.939241 **DW** = 2.061302 **Prob(F)** = 0 **t** = -2.88						
Coeff	ORIENT	1.5824	0.9117	-0.0911	-0.1604	-0.0478	0.1549	0.0000
S.E		5.0381	0.1274	0.1390	0.2847	0.2450	0.1144	0.0000
t-Stat		0.3141	7.1576	-0.6551	-0.5635	-0.1951	1.3535	0.0000
Prob.		0.7546	0.0000	0.5149	0.5752	0.8460	0.1810	0.0000
		R-sq =0.842621 **AdjR-sq** = 0.829506 **DW** = 2.041689 **Prob(F)** = 0 **t** = -2.12						
Coeff	PENTA MEDIA	80.8495	0.8670	-0.0305	-3.8814	-3.4607	-0.3694	0.0000
S.E		74.0574	0.1301	0.1436	3.4967	3.2023	0.3318	0.0000
t-Stat		1.0917	6.6667	-0.2126	-1.1100	-1.0807	-1.1131	0.0000
Prob.		0.2793	0.0000	0.8323	0.2714	0.2841	0.2701	0.0000
		R-sq = 0.889507 AdjR-sq = 0.880299 **DW** = 1.973686 **Prob(F)** = 0 **t** = -1.81						
Coeff	PENTA SOFT	42.5597	0.9719	-0.1393	-1.9722	-1.8103	0.1548	0.0000
S.E		17.6679	0.1320	0.1393	0.7937	0.7539	0.0864	0.0000
t-Stat		2.4089	7.3608	-0.9998	-2.4848	-2.4011	1.7904	0.0000
Prob.		0.0191	0.0000	0.3214	0.0158	0.0195	0.0784	0.0000
		R-sq = 0.973311 **AdjR-sq** = 0.971087 **DW** = 1.9787 **Prob(F)** = 0 **t** = -2.46						
Coeff	SATYAM	11.2988	0.8385	-0.0095	-0.2587	-0.4213	-0.2877	0.0000
S.E		3.0198	0.1246	0.1238	0.0820	0.1132	0.1812	0.0000
t-Stat		3.7416	6.7269	-0.0765	-3.1557	-3.7213	-1.5879	0.0000
Prob.		0.0004	0.0000	0.9393	0.0025	0.0004	0.1176	0.0000
		R-sq = 0.932581 **AdjR-sq** = 0.932581 **DW** = 2.043714 **Prob(F)** = 0 **t** = -2.79						

Table 3. Contd.

		C	$\ln P_{t-1}$	$\ln P_{t-2}$	$\ln BM$	$\ln MV$	$\ln\beta$	$\ln\beta$ Negative
Coeff	TATA ELXSI	3.1207	0.7807	-0.0338	-0.2088	-0.1057	-0.4263	0.0000
S.E		16.5873	0.1248	0.1245	0.8106	0.8370	0.1444	0.0000
t-Stat		0.1881	6.2572	-0.2719	-0.2576	-0.1262	-2.9523	0.0000
Prob.		0.8514	0.0000	0.7867	0.7976	0.9000	0.0045	0.0000
		R-sq = 0.954265 **AdjR-sq** = 0.950454 **DW** = 2.110483 **Prob(F)** = 0 **t** = -3.30						
Coeff	TRIGYN	5.1014	0.8659	-0.0216	-0.4772	-0.2191	0.6190	-0.4417
S.E		1.4058	0.1226	0.1272	0.1286	0.0710	0.1904	0.1558
t-Stat		3.6288	7.0651	-0.1695	-3.7108	-3.0853	3.2506	-2.8347
Prob.		0.0006	0.0000	0.8659	0.0005	0.0031	0.0019	0.0063
		R-sq = 0.925827 **AdjR-sq** = 0.918284 **DW** = 1.862401 **Prob(F)** = 0 **t** = -2.01						
Coeff	VINDHYA	10.2134	0.7560	0.1513	-0.5290	-0.4552	-0.0021	0.0000
S.E		16.0776	0.1258	0.1404	0.7364	0.7422	0.0158	0.0000
t-Stat		0.6353	6.0078	1.0776	-0.7183	-0.6133	-0.1335	0.0000
Prob.		0.5277	0.0000	0.2855	0.4754	0.5420	0.8943	0.0000
		R-sq = 0.950218 **AdjR-sq** = 0.946069 **DW** = 1.998641 **Prob(F)** = 0 **t** = -1.14						
Coeff	VISUAL SOFT	-0.0865	1.0204	0.0027	0.0601	0.0001	-0.0317	0.0000
S.E		0.2200	0.1178	0.1310	0.0379	0.0000	0.0672	0.0000
t-Stat		-0.3931	8.6597	0.0203	1.5870	3.5622	-0.4727	0.0000
Prob.		0.6957	0.0000	0.9839	0.1178	0.0007	0.6381	0.0000
		R-sq = 0.966808 **AdjR-sq** = 0.964042 **DW** = 2.098287 **Prob(F)** = 0 **t** = -1.94						
Coeff	VSNL	0.4430	0.8740	0.0380	-0.0182	0.0002	-0.0757	0.0000
S.E		0.2729	0.1240	0.1238	0.0452	0.0001	0.0397	0.0000
t-Stat		1.6236	7.0269	0.3069	-0.4020	3.1263	-1.9084	0.0000
Prob.		0.1097	0.0000	0.7600	0.6891	0.0027	0.0611	0.0000
		R-sq = 0.948448 **AdjR-sq** = 0.944152 **DW** = 2.055311 **Prob(F)** = 0 **t** = -2.51						

Table 3. Contd.

		C	$\ln P_{t-1}$	$\ln P_{t-2}$	$\ln BM$	$\ln MV$	$\ln \beta$	$\ln \beta$ Negative
Coeff	WIPRO	0.8487	0.7051	-0.0615	-0.3749	-0.0029	-13.0883	-0.2825
S.E		1.1064	0.1265	0.1186	0.0966	0.0370	3.9657	0.0665
t-Stat		0.7671	5.5733	-0.5184	-3.8824	-0.0775	-3.3004	-4.2493
Prob.		0.4461	0.0000	0.6061	0.0003	0.9385	0.0016	0.0001
		R-sq = 0.939486 **AdjR-sq** = 0.933332 **DW** = 2.176874 **Prob(F)** = 0 **t** = -4.29						
Coeff	ZEE	178.2118	0.9230	-0.0969	-7.2948	-7.2614	0.0566	25.5415
S.E		83.2149	0.1304	0.1319	3.4017	3.3991	0.1358	12.9240
t-Stat		2.1416	7.0809	-0.7345	-2.1444	-2.1362	0.4169	1.9763
Prob.		0.0364	0.0000	0.4655	0.0361	0.0368	0.6783	0.0528
		R-sq = 0.876331 **AdjR-sq** = 0.863754 **DW** = 2.090802 **Prob(F)** = 0 **t** = -2.34						
Coeff	ZENITH	-51.1420	0.8431	-0.0389	2.5478	2.6038	0.1519	0.0000
S.E		19.6560	0.1306	0.1297	0.9720	0.9964	0.0738	0.0000
t-Stat		-2.6019	6.4546	-0.2996	2.6213	2.6132	2.0580	0.0000
Prob.		0.0117	0.0000	0.7655	0.0111	0.0113	0.0439	0.0000
		R-sq = 0.892003 **AdjR-sq** = 0.883003 **DW** = 2.004182 **Prob(F)** = 0 **t** = -2.54						
Coeff	ZENSAR	2.8891	0.7915	-0.0622	-0.0985	-0.0702	-0.5501	0.0000
S.E		4.0439	0.1268	0.1214	0.1805	0.2002	0.1680	0.0000
t-Stat		0.7144	6.2398	-0.5124	-0.5457	-0.3508	-3.2743	0.0000
Prob.		0.4777	0.0000	0.6103	0.5873	0.7270	0.0018	0.0000
		R-sq = 0.94899 **AdjR-sq** = 0.944739 **DW** = 1.821649 **Prob(F)** = 0 **t** = -3.64						

5% critical values for t (59) / t (60) are -2 and +2
1% critical values for t (59) / t (60) are -2.66 and +2.66

Table 4. Wald test of the behavioral inertia model

	ACE	AFTE	BLUESTAR	CMC	COSMO
χ^2	2.7656	3.9371	12.19114	5.534355	2.61965
Prob	0.096308	0.04723	0.00048	0.018647	0.105548
	CREST	CYBERSYS	DSQ	ESERVE	FINOLEX
χ^2	3.971055	0.209232	4.582247	4.009459	10.69559
Prob	0.046289	0.64737	0.032305	0.045246	0.001074
	HCL	HINDUJA	INFOSYS	JAIN	MASTEK
χ^2	3.887571	0.251322	6.0695	10.78742	0.559443
Prob	0.048645	0.616146	0.013754	0.001022	0.454485
	MOSER	MPHASIS	MTNL	NIIT	ORIENT
χ^2	6.188097	7.99686	18.47962	8.347959	4.504282
Prob	0.012861	0.004686	0.000017	0.003861	0.03381
	PENTAMEDIA	PENTASOFT	SATYAM	TATA ELXSI	TRIGYN
χ^2	3.280081	6.073744	7.786176	10.93433	4.051178
Prob	0.070125	0.013721	0.005265	0.000944	0.044141
	VINDHYA	VISUALSOFT	VSNL	WIPRO	ZEE
χ^2	1.305545	3.78141	6.341178	18.41242	5.486939
Prob	0.253203	0.051825	0.011797	0.000018	0.019159
	ZENITH	ZENSAR			
χ^2	6.467986	13.26933			
Prob	0.010983	0.00027			

Table 5. A dynamic, in-sample forecast of the Fama and French model

Portfolio Categories	MAPE	Theil Ineq.
LOWBEME	138.61230	0.27766
MEDBEME	633.50490	0.37418
HIGHBEME	110.68240	0.14634
LOWBEME WTD	120.65740	0.46656
MEDBEME WTD	50602.81000	0.62968
HIGHBEME WTD	137.85130	0.34005
SLBEME	115.53700	0.25119
SMBEME	240.65210	0.38177
SHBEME	123.29400	0.15290
BLBEME	604.46320	0.33056
BMBEME	186.91980	0.46158
BHBEME	148.67420	0.27699
SLBEME WTD	125.88630	0.33182
SMBEME WTD	883.25380	0.45227
SHBEME WTD	559.14610	0.40340
BLBEME WTD	279.61330	0.39057
BMBEME WTD	130.95460	0.59913
BHBEMEWTD	176.90670	0.44515
LOWEPSP	204.18430	0.75572
MEDEPSP	126.53040	0.68885
HIGHEPSP	1193.70700	0.59581
LOWEPSP WTD	262.18720	0.54730
MEDEPSP WTD	288.08350	0.44783
HIGHEPSP WTD	318.04350	0.43200
SLEPS	161.78540	0.24796
SMEPS	198.74750	0.30957
SHEPS	1611.16400	0.25454
BLEPS	851.02960	0.32803
BMEPS	114.43930	0.37947
BHEPS	176.69860	0.37231
SLEPS WTD	196.07230	0.57486
SMEPS WTD	370.36140	0.27703
SHEPS WTD	11746.85000	0.32650
BLEPSWTD	168.74200	0.61953
BMEPS WTD	272.36520	0.45763
BHEPS WTD	201.83590	0.41984

MAPE : : Mean Absolute Percentage Error

Table 6. A dynamic, in-sample forecast of the behavioral inertia model

SERIES	MAPE	Theil Ineq.
ACE	12.076810	0.072841
AFTE	10.351700	0.058233
BLUESTAR	6.355607	0.041740
CMC	4.027271	0.025801
COSMO	7.548486	0.053670
CREST	8.273919	0.050925
CYBERSYS	17.258890	0.118091
DSQ	16.755490	0.087276
ESERVE	3.856250	0.024414
FINOLEX	3.501098	0.021038
HCL	8.263292	0.054045
HINDUJA	41.784530	0.207320
INFOSYS	3.752003	0.023913
JAIN	16.952510	0.084641
MASTEK	26.575910	0.137682
MOSER	4.223986	0.024622
MPHASIS	6.284171	0.039356
MTNL	2.243619	0.013973
NIIT	5.640259	0.034547
ORIENT	10.913490	0.070138
PENTAMEDIA	10.780920	0.062769
PENTASOFT	9.949859	0.053656
SATYAM	4.756940	0.029230
TATA ELXSI	21.060570	0.082944
TRIGYN	13.279920	0.093213
VINDHYA	6.733216	0.037949
VISUALSOFT	58.854880	0.285069
VSNL	7.072514	0.044740
WIPRO	12.358880	0.064224
ZEE	15.381320	0.076916
ZENITH	15.311590	0.075450
ZENSAR	13.624820	0.073154

APPENDIX 1 Constructed Portfolios

In this study portfolios were constructed using various criteria. Stocks were ranked on the basis of size, book-to-market value (BE/ME) and EPS/P and grouped to form portfolios. Over time as the order of rank changed, the composition of portfolio also changed. Both equal weighted and value weighted portfolios were constructed with the value weights being equal to the ratio of equity value of the firm to the aggregate total equity of all the sample firms. With BE/ME and EPS/P ranking sub-group of low, medium and high consisting of 12, 11, and 12 stocks were formed. Stocks were also classified into two groups of small and big. This classification along with BE/ME and EPS/P ranking gave us the size-BE/ME and size-EPS/P sorted portfolios. The first six portfolios correspond to equal weighted and value weighted portfolios formed by using BE/ME criteria. The next twelve are equal and value weighted portfolios constructed using the size-BE/ME criteria. Similarly, the single sort EPS/P criteria generates a set of six portfolios formed using equal weights and value weights and the double sort size-EPS/P criteria produces two sets of equal weighted and value weighted portfolios each consisting of six sorts. Thus the various portfolios are-

List of Portfolios.

Portfolio	**Description**
LBEME	Low BE/ME Portfolio
MBEME	Medium BE/ME Portfolio
HBEME	High BE/ME Portfolio
LBEMEWTD	Low BE/ME Value Wtd Portfolio
MBEMEWTD	Medium BE/ME Value Wtd Portfolio
HBEMEWTD	High BE/ME Value Wtd Portfolio
SLBEME	Small and Low BE/ME Portfolio
SMBEME	Small and Medium BE/ME Portfolio
SHBEME	Small and High BE/ME Portfolio
BLBEME	Big and Low BE/ME Portfolio
BMBEME	Big and Medium BE/ME Portfolio
BHBEME	Big and High BE/ME Portfolio
SLBEMEWTD	Small and Low BE/ME Value Wtd Portfolio
SMBEMEWTD	Small and Medium BE/ME Value Wtd Portfolio
SHBEMEWTD	Small and High BE/ME Value Wtd Portfolio
BLBEMEWTD	Big and Low BE/ME Value Wtd Portfolio
BMBEMEWTD	Big and Medium BE/ME Value Wtd Portfolio
BHBEMEWTD	Big and High BE/ME Value Wtd Portfolio

List of Portfolios : Contd

Portfolio	**Description**
LEPSP	Low EPS/P Portfolio
MEPSP	Medium EPS/P Portfolio
HEPSP	High EPS/P Portfolio
LEPSPWTD	Low EPS/P Value Wtd Portfolio
MEPSPWTD	Medium EPS/P Value Wtd Portfolio
HEPSPWTD	High EPS/P Value Wtd Portfolio
SLEPS	Small and Low EPS/P Portfolio
SMEPS	Small and Medium EPS/P Portfolio
SHEPS	Small and High EPS/P Portfolio
BLEPS	Big and Low EPS/P Portfolio
BMEPS	Big and Medium EPS/P Portfolio
BHEPS	Big and High EPS/P Portfolio
SLEPSWTD	Small and Low EPS/P Value Wtd Portfolio
SMEPSWTD	Small and Medium EPS/P Value Wtd Portfolio
SHEPSWTD	Small and High EPS/P Value Wtd Portfolio
BLEPSWTD	Big and Low EPS/P Value Wtd Portfolio
BMEPSWTD	Big and Medium EPS/P Value Wtd Portfolio
BHEPSWTD	Big and High EPS/P Value Wtd Portfolio

APPENDIX 2 Unit Root Test on Returns on Various Portfolios.

Portfolio categories	ADF Test Statistic		Portfolio categories	ADF Test Statistic
LBEME	-4.39274		LEPSP	-4.50817
MBEME	-4.01194		MEPSP	-3.55762
HBEME	-4.59867		HEPSP	-3.7389
LBEME WTD	-5.18031		LEPSP WTD	-3.7908
MBEME WTD	-3.89775		MEPSP WTD	-4.24905
HBEME WTD	-4.4449		HEPSP WTD	-5.35248
SLBEME	-3.58284		SLEPS	-4.1587
SMBEME	-3.66651		SMEPS	-4.56958
SHBEME	-4.8988		SHEPS	-3.90226
BLBEME	-3.68762		BLEPS	-4.64291
BMBEME	-4.39183		BMEPS	-3.90823
BHBEME	-3.62454		BHEPS	-4.11845
SLBEME WTD	-4.26832		SLEPS WTD	-4.45268
SMBEME WTD	-3.84653		SMEPS WTD	-5.02462
SHBEME WTD	-4.66814		SHEPS WTD	-4.15495
BLBEME WTD	-3.95087		BLEPS WTD	-4.02282
BMBEME WTD	-3.69531		BMEPS WTD	-4.17855
BHBEME WTD	-3.52882		BHEPS WTD	-4.30645
			SMB	-4.72802
			HML	-4.97865
			EX RET BSE	-4.02755

1% Critical Value *	-4.1059
5% Critical Value	-3.4801
10% Critical Value	-3.1675

APPENDIX 3 : Unit Root Test on Behavioral Model Variables
A: Unit root test on lnPt series.

	Trend and intercept			Intercept	First Difference
Company Name	ADF Test Statistic	LR statistic	p value	ADF Test Statistic	ADF Test Statistic
ACE	-1.65260	3.01103	0.22190	-1.36177	-4.45132
AFTE	-3.30391	11.79965	0.01011	-2.16278	-3.63110
BLUESTAR	-1.29002	2.97545	0.22589	-0.49399	-3.94376
CMC	-2.22767	5.38762	0.06762	-1.70677	-5.83399
COSMO	-1.81554	5.29531	0.07082	-2.18307	-4.86096
CREST	-2.60502	6.99037	0.03034	-1.61098	-3.87510
CYBERSYS	-1.41327	2.80383	0.24613	-1.31309	-4.65562
DSQ	-2.38188	6.02015	0.04929	-0.51687	-4.46176
ESERVE	-3.55981	15.04889	0.02134	-3.05534	-4.26175
FINOLEX	-1.51209	4.62226	0.09915	-2.05328	-4.59224
HCL	-0.70040	3.50963	0.17294	-0.86471	-3.60139
HINDUJA	-3.28890	11.42558	0.03148	-3.07396	-3.94296
INFOSYS	-2.99447	10.61218	0.02434	-1.64174	-4.65933
JAIN	-1.66241	3.11550	0.21061	-1.53597	-4.47584
MASTEK	-2.01687	4.45127	0.10800	-1.24104	-4.49361

Contd. A: Unit root test on lnPt series.

	Trend and intercept			Intercept	First Difference
Company Name	ADF Test Statistic	LR statistic	p value	ADF Test Statistic	ADF Test Statistic
MOSER	-3.58313	14.18448	0.01774	-3.05630	-4.26908
MPHASIS	-2.14019	4.79180	0.09109	-2.10937	-4.97569
MTNL	-2.73524	7.81744	0.02007	-2.09223	-6.78012
NIIT	-1.46158	2.51490	0.28438	-1.27396	-4.66568
ORIENT	-2.71885	7.61819	0.02217	-1.60495	-4.39461
PENTAMEDIA	-1.55242	3.73631	0.15441	-1.89891	-5.10155
PENTASOFT	-2.51994	6.53922	0.03802	-0.69573	-5.02415
SATYAM	-1.88054	4.20752	0.12200	-1.88117	-4.32108
TATAELXSI	-3.19582	11.00724	0.03724	-0.31814	-4.75306
TRIGYN	-1.69345	3.30000	0.19205	-1.61317	-4.01304
VINDHYA	-3.51537	12.24155	0.02929	-0.95324	-5.23041
VISUALSOFT	-1.87475	3.84356	0.14635	-1.17511	-3.64867
VSNL	-2.00977	4.26034	0.11882	-1.15712	-4.29305
WIPRO	-2.02116	4.49261	0.10579	-1.30433	-5.17209
ZEE	-1.87954	4.59670	0.10042	-1.71294	-4.70897

Contd. A: Unit root test on lnPt series.

	Trend and intercept			Intercept	First Difference
Company Name	ADF Test Statistic	LR statistic	p value	ADF Test Statistic	ADF Test Statistic
ZENITH	-1.65304	3.09658	0.21261	-1.14573	-5.29169
ZENSAR	-1.85018	4.18838	0.12317	-1.55714	-4.28964

B: Unit root test on lnBM series

	Trend and intercept			Intercept	First Difference
Company Name	ADF Test Statistic	LR statistic	p value	ADF Test Statistic	ADF Test Statistic
ACE	-1.69359	3.35276	0.18705	-1.57227	-4.53970
AFTE	-2.46875	6.42389	0.04028	-1.56533	-4.45216
BLUESTAR	-1.69387	3.44662	0.17848	-1.70587	-4.48791
CMC	-1.89377	4.46987	0.10700	-1.92264	-4.56365
COSMO	-2.31826	5.63905	0.05963	-1.74690	-4.52998
CREST	-2.41144	6.06931	0.04809	-1.25576	-4.48453
CYBERSYS	-2.45441	6.24075	0.04414	-1.09700	-4.53345
DSQ	-2.73121	7.62910	0.02205	-0.79174	-4.70001
ESERVE	-2.35138	6.58005	0.03725	-0.84192	-4.48074
FINOLEX	-2.77535	8.07589	0.01763	-1.08523	-4.95558
HCL	-1.98408	4.34250	0.11404	-1.34830	-4.60665
HINDUJA	-2.40410	6.46972	0.03937	-2.27267	-4.51057
INFOSYS	-1.99117	4.18449	0.12341	-1.27988	-4.50575
JAIN	-1.61597	3.03424	0.21934	-1.43957	-4.49499
MASTEK	-2.52801	6.89768	0.03178	-0.90305	-4.56252
MOSER	-1.58385	2.96977	0.22653	-1.43327	-4.45668

Contd. B: Unit root test on lnBM series

	Trend and intercept			Intercept	First Difference
Company Name	ADF Test Statistic	LR statistic	p value	ADF Test Statistic	ADF Test Statistic
MPHASIS	-1.39026	4.30145	0.11640	-1.65237	-4.44764
MTNL	-2.60752	6.99881	0.03022	-0.92930	-4.60236
NIIT	-1.43463	2.83058	0.24286	-1.36106	-4.67975
ORIENT	-2.46106	6.27813	0.04332	-1.48221	-4.47746
PENTAMEDIA	-1.45388	2.89420	0.23525	-1.62594	-4.43765
PENTASOFT	-2.05325	4.41817	0.10980	-1.16089	-4.49689
SATYAM	-2.23658	5.21641	0.07367	-1.25882	-4.48835
TATAELXSI	-2.11472	5.03950	0.08048	-0.64671	-4.61062
TRIGYN	-1.94517	4.22251	0.12109	-2.02192	-4.44561
VINDHYA	-2.65490	7.29549	0.02605	-1.03260	-4.78718
VISUALSOFT	-2.53894	6.98864	0.03037	-0.85833	-4.51874
VSNL	-2.32218	6.08525	0.04771	-1.60426	-4.43571
WIPRO	-2.78966	7.94784	0.01880	-0.69646	-4.80392
ZEE	-1.43791	3.22202	0.19969	-1.42894	-4.47237
ZENITH	-1.77276	3.40941	0.18183	-1.77333	-4.44255
ZENSAR	-2.73857	7.66177	0.02169	-0.86790	-4.73398

C: Unit root test on lnMV series.

	Trend and intercept			Intercept	First Difference
Company Name	ADF Test Statistic	LR statistic	p value	ADF Test Statistic	ADF Test Statistic
ACE	-2.36305	5.78711	0.05538	-1.05200	-4.58942
AFTE	-2.44668	6.56535	0.03753	-2.39192	-4.43803
BLUESTAR	-1.78896	3.66209	0.16025	-1.82017	-4.43471
CMC	-1.93344	4.36729	0.11263	-1.90081	-4.43807
COSMO	-2.31318	5.66261	0.05894	-1.38163	-4.58803
CREST	-2.49494	6.70790	0.03495	-1.37317	-4.45677
CYBERSYS	-2.11083	4.70272	0.09524	-1.75451	-4.44177
DSQ	-2.51793	6.67853	0.03546	-0.69785	-4.60052
ESERVE	-2.12859	6.03391	0.04895	-2.42819	-4.50805
FINOLEX	-2.97142	9.08200	0.01066	-0.95382	-5.02213
HCL	-1.91776	4.07852	0.13013	-1.40748	-4.56803
HINDUJA	-2.34031	6.40378	0.04069	-2.15568	-4.56581
INFOSYS	-1.83477	3.57577	0.16731	-1.44491	-4.45680
JAIN	-1.60634	2.95557	0.22814	-1.59142	-4.48169
MASTEK	-2.52703	6.89845	0.03177	-1.10495	-4.49163
MOSER	-2.29033	5.51792	0.06336	-1.38008	-4.66497

Contd. C: Unit root test on lnMV series

	Trend and intercept			Intercept	First Difference
Company Name	ADF Test Statistic	LR statistic	p value	ADF Test Statistic	ADF Test Statistic
MPHASIS	-1.63825	3.17826	0.20410	-1.25233	-4.47385
MTNL	-2.57356	6.95845	0.03083	-1.11632	-4.50294
NIIT	-1.69817	4.00601	0.13493	-1.33388	-4.44734
ORIENT	-2.50661	6.61590	0.03659	-1.34249	-4.46998
PENTAMEDIA	-1.44896	2.87831	0.23713	-1.63038	-4.43866
PENTASOFT	-2.04630	4.39523	0.11107	-1.23992	-4.47348
SATYAM	-2.37427	6.03959	0.04881	-1.72643	-4.43776
TATAELXSI	-2.04978	4.85137	0.08842	-0.67812	-4.58112
TRIGYN	-2.13890	4.78138	0.09157	-1.34824	-4.47360
VINDHYA	-2.76691	7.82651	0.01998	-0.92836	-4.77324
VISUALSOFT	-2.48565	6.84418	0.03264	-1.01998	-4.48183
VSNL	-2.34276	6.10152	0.04732	-1.56124	-4.43741
WIPRO	-2.04509	6.00026	0.04978	-1.74205	-4.43578
ZEE	-1.44698	3.15735	0.20625	-1.42122	-4.47290
ZENITH	-1.69795	3.21729	0.20016	-1.68868	-4.44177
ZENSAR	-2.56653	6.93208	0.03124	-0.81016	-4.63077

D: Unit root test on lnBeta series.

	Trend and intercept			Intercept	First Difference
Company Name	ADF Test Statistic	LR statistic	p value	ADF Test Statistic	ADF Test Statistic
ACE	-2.11284	4.70030	0.09536	-1.67338	-4.55389
AFTE	-2.38496	6.30071	0.04284	-2.47489	-4.45580
BLUESTAR	-1.98758	4.14948	0.12559	-1.93059	-4.46930
CMC	-2.00279	4.89370	0.08657	-1.09400	-4.47875
COSMO	-2.07642	5.08610	0.07863	-1.98368	-4.44652
CREST	-1.77724	3.77483	0.15146	-0.76894	-4.55766
CYBERSYS	-2.08732	4.56002	0.10228	-2.02711	-4.43495
DSQ	-1.93612	4.00997	0.13466	-1.52708	-4.47052
ESERVE	-1.83253	5.33535	0.06941	-2.25853	-4.52630
FINOLEX	-2.27136	5.76365	0.05603	-1.60670	-4.43536
HCL	-1.92159	3.96533	0.13770	-1.01602	-4.57807
HINDUJA	-1.83675	3.62973	0.16286	-1.28300	-4.52444
INFOSYS	-1.87919	3.73295	0.15467	-1.72998	-4.47579
JAIN	-2.01351	4.42086	0.10965	-0.67929	-4.67184
MASTEK	-1.92160	4.24993	0.11944	-1.99547	-4.44256
MOSER	-1.81387	5.77913	0.05560	-1.83557	-4.44790

Contd. D: Unit root test on lnBeta series.

	Trend and intercept			Intercept	First Difference
Company Name	ADF Test Statistic	LR statistic	p value	ADF Test Statistic	ADF Test Statistic
MPHASIS	-1.85829	4.04470	0.13234	-1.89884	-4.43766
MTNL	-2.42502	6.13622	0.04651	-1.95760	-4.45237
NIIT	-2.04686	4.56539	0.10201	-0.84458	-4.60406
ORIENT	-2.33023	5.96121	0.05076	-2.31915	-4.50024
PENTAMEDIA	-2.17161	5.49386	0.06413	-1.65162	-4.63400
PENTASOFT	-2.25219	6.01159	0.04950	-2.12984	-4.43507
SATYAM	-1.94196	3.96829	0.13750	-1.95294	-4.43946
TATAELXSI	-1.82140	3.55780	0.16882	-1.09463	-4.56911
TRIGYN	-1.94429	4.19842	0.12255	-1.15255	-4.48242
VINDHYA	-1.78388	3.92688	0.14038	-0.69949	-4.55546
VISUALSOFT	-1.74860	3.27673	0.19430	-1.72157	-4.43471
VSNL	-2.34514	6.22010	0.04460	-2.30598	-4.52773
WIPRO	-1.90340	4.41190	0.11015	-0.58659	-4.58258
ZEE	-1.65334	3.72324	0.15542	-1.15884	-4.46276
ZENITH	-1.47025	4.16833	0.12441	-1.88091	-4.82715
ZENSAR	-1.33018	3.28186	0.19380	-1.77565	-4.51317

E: Unit root test on lnBeta negative series.

	Trend and intercept			Intercept	First Difference
Company Name	ADF Test Statistic	LR statistic	p value	ADF Test Statistic	ADF Test Statistic
BLUESTAR	-1.576960	2.942952	.229586	-1.60524	-4.4406
COSMO	-2.31972	5.79885	0.05506	-1.90693	-4.43471
ESERVE	-2.14250	4.88978	0.08674	-0.62444	-4.66881
FINOLEX	-1.98384	5.82460	0.05435	-2.36461	-4.58258
HCL	-1.90340	4.41190	0.11015	-0.58659	-4.58258
JAIN	-1.76113	3.34507	0.18777	-1.74990	-4.43471
MOSER	-1.83529	3.76599	0.15213	-1.90693	-4.43471
MPHASIS	-2.29146	5.64263	0.05953	-1.93064	-4.43479
MTNL	-1.83529	3.76599	0.15213	-1.90693	-4.43471
NIIT	-1.83529	3.76599	0.15213	-1.90693	-4.43471
TRIGYN	-1.83529	3.76599	0.15213	-1.90693	-4.43471
WIPRO	-2.00838	4.43144	0.10908	-1.56294	-4.44202
ZEE	-1.98384	5.82460	0.05435	-2.36461	-4.58258

ADF Critical values for the regression with trend and intercept, intercept (level), and intercept (first difference)

Critical Value*	Trend and intercept	Intercept	First Difference
1%	-4.1035	-3.5328	-3.5345
5%	-3.4790	-2.9062	-2.9069
10%	-3.1669	-2.5903	-2.5907

APPENDIX 4 Breusch-Godfrey Serial Correlation Test.

Company	LM Statistic	Prob		Company	LM Statistic	Prob.
ACE	2.02398	0.363496		MOSER	3.42704	0.18023
AFTE	2.5602	0.278009		MPHASIS	2.7392	0.254206
BLUESTAR	3.28626	0.193374		MTNL	0.23296	0.890049
CMC	0.6762	0.713122		NIIT	4.44429	0.108377
COSMO	0.9238	0.630086		ORIENT	0.83439	0.65889
CREST	3.72375	0.155381		PENTAMEDIA	0.71662	0.69886
CYBERSYS	3.273	0.19466		PENTASOFT	2.52272	0.28327
DSQ	1.19743	0.549519		TATAELXSI	2.8151	0.24474
ESERVE	3.31789	0.19034		VINDHYA	0.83592	0.65839
FINOLEX	2.9755	0.22588		VISUALSOFT	2.99735	0.22343
HCL	2.1522	0.340922		VSNL	2.48095	0.28925
HINDUJA	0.7686	0.680927		WIPRO	1.99236	0.36929
INFOSYS	0.46836	0.791218		ZEE	3.2119	0.2007
JAIN	0.26538	0.875737		ZENITH	0.26152	0.87743
MASTEK	2.97329	0.22613		ZENSAR	1.80806	0.40494

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