Are the New Economy Stocks Independent of the Economy: A Comparison of USA and India

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Abstract

With the information and communication technology revolution, the global economy is transforming from a low productive, manufacture based 'old' economy to a knowledge based, service oriented and highly productive 'new' economy. In this new era, composition of stock market has changed significantly with the new economy sector adding values to the stock markets. This article inquires whether this is the initiation of a new era of changed stock price behaviour at least in the context of the new economy stocks that characterizes all the financial markets experiencing e-revolution irrespective of their level of development. It confirms a special characteristic of new economy stocks that holds across countries.

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I. Introduction

The information and communication technology revolution that is sweeping through the world in recent years is said to be transforming the global economy from a low productive, manufacture based one to a knowledge based, service oriented, highly productive, globalized economy with long run growth potential, where productivity growth can be attributed not to the traditional sources but to the irreversible advancement in knowledge: a change that is being described as a transformation to a 'new' economy from an old one.

With the advent of e-revolution, the composition of stock market has changed significantly in countries that experienced e-revolution. The new economy sector, constituting of computer software and hardware firms, firms providing software and hardware services, telecommunication firms, media and entertainment firms, has come to dominate and to add values to these nations' stock market. There has been a consensus that the significant stock value increments in those countries are driven by the growth rate of the emerging new economy sector. Resultantly, this new situation has produced a new set of question.

In this new economy, does a ‘new mechanism’ now rule so far as stock market is concerned? Is this really the initiation of a new era of changed stock price behaviour at least in the context of the new economy stocks that characterizes all the financial markets that experienced e-revolution irrespective of their level of development? While these are questions that require a comprehensive review of our understanding of stock market, we, in this article, inquire on the specific issue of whether the new economy stocks irrespective of the level of financial development across countries are showing similar pattern. This will confirm a special characteristic of new economy stocks that holds across countries.

The study selects two countries namely India and USA that experienced e-revolution and having different levels of development of stock markets. While the US financial market is one of most developed markets in the world in terms of activity, efficiency and growth, the Indian stock market remains a relatively less developed financial market. Both the two economies are related substantially in terms of business transactions at least in the context of the emerging new economy sector. The

study explores the trends in movements of the new economy stocks in the two countries and seeks to delineate common trends, if any, in the new economy stock price movement in the two countries. The presence of common trend will confirm the special character of the new economy stocks irrespective of the level of development of the financial markets.

The study selects 1998-2003 as the period of study. This was the period when new economy stocks were gaining significance in the global economy and were having profound impact on the very nature of the stock market and its workings. We conclude in our study that the movements in the new economy stock prices were quite similar in the two countries. To trace trends in new economy stock price movement, thirty-seven new economy stocks have been selected for each country. Stocks have been selected from BSE TMT index (for India) [that is the Technology-Media-Telecommunication Index available in Bombay Stock Exchange] and from NASDAQ 100 (for USA) on basis of availability of data for the entire study period. Price data (on monthly and yearly basis) and financial data (on yearly basis) have been compiled from official website of Bombay Stock Exchange and American Stock Exchange. A large volume of financial data has been compiled from official website of these new economy firms.

The trajectory of the paper is the following. Section I inquires whether new economy sector has come to constitute a significant sector in the stock markets of the two nations. Section II explores the factors determining the new economy stock prices in the two stock markets. This is analyzed in three ways. First, we employ a time series analysis, second, a cross section analysis and, third, a panel data estimation technique. We summarize the results and make a comparative analysis of the trends in new economy stock price movements in the two economies. We conclude in favor of a presence of bubble. Section III attempts to explore the factors leading to the formation of such bubble.

II. New Economy Sector in the Stock Market

One possible technique to emphasize importance of new economy sector in the stock market in recent years could be to pinpoint relative importance of different important sectors in influencing activities or movement in stock market. To be precise, the inquiry could be boiled down to an investigation of whether and to what extent market returns are influenced by sectoral returns. The return of the sector that

explains significantly variations in market return might be identified as a significant sector.

The study works with some stock market indices. For India, BSE 200 index is taken as the market proxy. Few sectoral indices, namely BSE Information Technology Sector index (BSE IT), BSE Fast Moving Consumer Goods Sector index (BSE FMCG), BSE Capital Goods Sector Index (BSE CG), BSE Public Sector Unit Index (BSE PSU) and BSE Healthcare Sector Index (BSE HC) are chosen to represent different important sectors. For USA, Nasdaq 100 is chosen as the market proxy, and NASDAQ Bank Index, NASDAQ Biotechnology Index, NASDAQ Computer Index, NASDAQ Industrial Index, NASDAQ Telecommunications Index and NASDAQ Other Finance Index are chosen to represent different important sectors in US stock market. These indices constituted of a limited number of important stocks serve the purpose of quantifying the price movements and reflect the sensitivity of the market in an effective manner.

The study computes individual sector returns along with market returns using monthly stock prices. Returns are defined as:

$$\text{Re t} = \frac{\Pi_{\tau} - \Pi_{\tau-1}}{\Pi_{\tau-1}}$$

Π_t and Π_{t-1} are prices in period t and t -1 respectively. Theoretically, such returns include change in price as well as in dividends. Due to non availability of monthly data on dividends returns include only prices.

Relative importance of sectors could be checked by regressing market return on sectoral returns. But, to form a statistically adequate model the return series should first be checked for stationarity. If all the series contain unit root, the multiple regression of one random walk on others is subject to the spurious regression phenomenon. The model will be characterized by an extremely high value of R^2 even when the explanatory power of the model is low and conventional t tests will tend to indicate a relationship between the variables when none is present.

The results of applying Dickey-Fuller (DF) and augmented Dickey-Fuller (ADF) (whenever necessary) tests to the return data using the package Microfit (Version Windows 4.0) are presented in Appendix A (table A.1 and table A.2 for India, table A.4 and table A.5 for USA).

The study reveals all return series (both in India and in USA) to contain unit roots and to be stationary in their first difference thus invalidating estimation using Ordinary Least Square. This, however, does not imply that the two series are not

related. Many time-series are non-stationary but 'move together' over time. They might be cointegrated, that is, there might exist some influence on the series, which imply that the two series are bound by some relationship in the long run. A cointegrating relationship is also seen as a long term or equilibrium phenomenon. Cointegrated variables may deviate from their relationships in the short run, but their association would return in the long run. In this framework, for any sector to be significant in the stock market, one should not expect sectoral returns to 'move out of line' with market return in the long run, thus implying that individual sectoral returns and market return must be cointegrated.

Testing for cointegrating relationship between market return and individual sector returns has been done using Microfit for Windows (version 4.0). As revealed from earlier tests all the return series are integrated of order one. In the testing procedure, one sector is chosen at a time and whether the return of the chosen sector is co-integrated with market return is tested using Johansen estimate of the co-integrating vector. Selecting number of cointegrating factor to be two and using estimation option for trended variable, with an assumed trend in the data generating process, we obtain the statistics reported in Appendix A (table A.3 for India, table A.6 for USA).

In both the countries, return of the IT sector is strongly cointegrated with that of the market return just as in the case of other sectors suggesting a long run relationship between IT sector return and market return. In short run, there may appear a lack of association between them, but their association would return in the long run. This establishes the emerging new economy sector as an important sector in the stock markets of both the countries along with the other established sectors.

It now remains to explore the trend in the movements of the new economy stocks in the two markets. A look at the new economy stock price movement in the two markets reveals a common trend. Year 1998 was the period when new economy stocks were gaining importance. Stock prices experienced a meteoric rise in 1999 and 2000 followed by a crash. 2001 was a period of downward revision in stock prices that continued in 2002 and 2003. These similarities in price movement invoke further inquiry regarding factors influencing new economy stock prices in the two markets.

III. Factors Determining New Economy Stock Prices

This section investigates the factors behind formation of new economy stock prices in the two markets. In an optimal stock market, fundamentals determine stock

prices, that is, any change in stock prices can be significantly explained by financial and economic variables. In case of fundamental determined stock prices, investors receive optimal returns in the form of risk free returns plus a risk premium. The deviation between actual stock price and true stock price are random. In certain instances however, speculative factors determine stock prices driving actual prices far away from the true price. This hints formation of 'bubble'.

Time series analysis:

Dwyer and Hafer (1990) provide the theoretical basis of the model with fundamentals and bubbles. In their model, prices are fundamentally determined if dividend payments can explain the changes in stock prices. To be precise, value of stocks should be equal to the present value of expected future dividends. With constant expected growth rate in dividends proportional change in stock prices will be constant. Hence, price fluctuations will be random.

Blanchard and Watson (1982) explain the method of detecting the presence of bubble. In any period, actual price deviates from the fundamental price by the bubble. In absence of bubbles, fundamentals determine prices. However, with bubbles, proportional change in stock prices could be explained by two terms - proportional change in fundamental price and proportional change in bubbles. With bubble, proportional change in stock prices will be an increasing function of time and predictable. This can be tested by regressing proportional change in stock prices on time. One can construct different models to perform this regression analysis.

Burman (1999) developed a simple model (A) that could be estimated to detect presence of bubble.

$$\ln P_t = a + b.t + c.t^2 + e_t \ldots\ldots\ldots\ldots..(1)$$

Where $E(e_t) = 0$ for all t

$E(e_t e_{t-1}) = 0$ and $E(e_t^2) = \sigma^2$ for all t.

(1) could be useful for our purpose. The company balance sheets and profit and loss accounts provide financial data on annual basis. Regression analysis based on this data set following Dwyer and Hafer (1990) method, would lead to unsatisfactory estimated results due to low degrees of freedom. Stock price data however are available on daily, monthly and yearly basis. With this data set, (1) is useful, where proportional changes in stock prices could be regressed over time to detect the role of bubble in price formation. In this model if stock prices are

fundamental determined, coefficients of t and t^2 should not be statistically significant, implying that change in stock price cannot be predicted except for a constant growth.

Model (1) is estimated by ordinary least square method using data on new economy firms, selected earlier. Detailed results are shown in Appendix B.

The results reveal significant role of bubble in new economy stock price determination, in the two countries. In both the economies, prices of new economy stocks are significantly influenced by time and variation in stock prices could be explained solely by variation in time. This is evident from high values of R^2 and adjusted R^2 and from significant t values for estimated regression coefficient of time and $(time)^2$. The results are summarized in appendix B (table B.1 for India, table B.2 for the USA). Thus, it is bubble, not fundamental, that determines new economy stock prices. The contribution of bubble however varies across firms. Contribution of bubble is mild ($R^2<0.5$) for only a few firms in both the economies. In most of the cases R^2 lies within the range of 0.8 to 0.96. However, a difference is to be noted. The t values (Appendix B), obtained for estimated regression coefficients for time and time squared, are all positive in case of USA. But, in India some of these are positive and some are negative. All the t values are however statistically significant. Thus while prices are bubble determined, it is not possible to trace any trend in context of India. In USA however, prices are increasing functions of time and hence are predictable.

The presence of bubble, as detected by the time-series analysis, might induce us to conclude that the new economy stocks have in general been bubble-determined with the stock markets grossly overestimating the stocks.

However, we should conclude cautiously. Over a short period as that covered in this study, bubbles rather than fundamentals are likely to dominate. The test however cannot be extended to long run due to insufficiency of relevant data. Moreover, the study follows the approach of Blanchard and Watson (1982), where existence of bubble makes proportional changes in stock prices an increasing function of time. This study uses Burman's (1999) model where proportional changes in stock prices depend on only two factors, t and $t^{2.}$ Estimated results depend crucially on the specification of the model. A different model specification might alter study results significantly. Since the time series analysis does not provide us with non-trivial results, it would be better to detect the role of fundamental variables in determining stock prices. Scope of any detailed time-series analysis is however limited owing to non-availability of sufficient data. Alternatively, we might resort to cross section

analysis testing whether, at a particular point of time, new economy stock prices are determined by fundamental economic and financial variables. This is dealt with in the following subsection.

Cross Section Analysis

The cross section analysis inquires whether at every year of the study period price formation is based on fundamental economic and financial variables. Of the different fundamental variables portraying the true health of companies, the study selects only four. These are (i) dividend per share (DPS) reflecting the liquidity position, investment and growth opportunities of the firm; (ii) net worth per share (NWS) or capital accumulated per share reflecting firm's ability or need to raise financial capital; (iii) net profit per share (NPS) portraying the health of the company and (iv) debt-equity ratio (D/E) measuring the risk associated with the company. If price formation is based on these four fundamental variables then prices can be said to have moved according to fundamentals.

Proportional change in stock prices is regressed on these four fundamental variables namely DPS, NPS, NWS and D/E using a simple regression equation like (2). For fundamental determined stock prices, coefficients of DPS, NWS, NPS and D/E ratio should be statistically significant.

$$\ln P_i = \text{Constant} + a.(DPS)_i + b.(NWS)_i + c.(NPS)_i + d.(D/E)_i + u_i \quad \ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Where $E(e_i) = 0$ for all i

$E(e_i e_j) = 0$ for i not equal to j and $E(e_i^2) = \sigma^2$ for all i.

There is no problem of multi collinearity in the data. (2) has been estimated using data on selected new economy stocks separately for the two countries and for all the six years at four different points namely at opening price, at closing price, at high price and at low price. If at any stage of regression, t ratio for estimated regression coefficient for any of the fundamental variables has been found less than unity in absolute term, regression has been rerun with the particular variable dropped. This is to improve the adjusted R^2 of the model. The final estimated equation incorporates only those fundamental variables whose estimated regression coefficients possess t ratios that exceed unity in absolute term. Adjusted R^2 in the final regression equation shows the maximum extent to which fundamental variables could explain variations in new economy stock prices. The results obtained for successive years are then

compared to trace out the trend in price formation over the period of study. Study results are shown in Appendix C.

Results of the study highlight that the stock market boom of 1998-2000 was indeed not being driven by fundamentals in both the markets. The explanatory power of the fundamental variables, as is explained by values of R^2 and adjusted R^2, remained low during 1998. It dwindled to a minimum during 1999 and the first half of 2000. Explanatory power started improving since late 2001 and reached a moderate level during 2002-2003. The inefficacy of fundamental variables in explaining variation in stock prices is further revealed by insignificant t values for the estimated regression coefficients of fundamental variables. Even with an improvement in the explanatory power of fundamental variables in recent year, role of individual fundamental variables, except for NPS and NWS, has not become significant.

Both the time series and cross section analysis pointed towards bubble determined new economy stock price in the context of India as well as USA. There are however, certain limitations of time series and cross section analysis. Resorting to panel data estimation that takes into account both the time and spatial dimension of data set could enrich any empirical analysis in ways that could not be attained using pure time series or pure cross section data. With its wide spectrum, it provides more information, more variability and efficiency, less collinearity among variables, and more degrees of freedom. Moreover, dynamics of change with short time series and phenomena such as economies of scale or technical change could be better analyzed using panel data.

Panel data analysis

With data on variables on N cross sectional units for T periods, the relationship among variables using the pooled data set might be represented as:

$$y(i,t) = a + b.x(i,t) + e(i,t) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

y(i,t) denotes the dependent variable, i denote cross section identifier and t the time identifier. x(i,t) is the vector of explanatory variables for the *i*th firm in the *t*th time period. x's are non-stochastic and e(i,t) follows the classical assumptions.

Data on stock price and financial variables for selected new economy firms (Indian and US) for the six-year period 1998-2003, have been used to construct balanced panels of 222 observations for each country. The panel is estimated for each country separately at four price points, namely at open price, high price, low price and close

price with NPS, DPS, NWS and DE as explanatory variables, using the econometric package LIMDEP. In order to decide which model suits the data best, five models are defined.

1. $y(i,t) = a + e(i,t)$ (no group effects or xs)
2. $y(i,t) = a(i) + e(i,t)$ (group dummies only)
3. $y(i,t) = a + b.x(i,t) + e(i,t)$ (regressors only, the classical model)
4. The full 'one-way' model
   I. The one way FEM (with xs & group effects) described as:
   $y(i,t) = a(i) + b.x(i,t) + e(i,t)$, $i = 1,2,\ldots.N$; $t = 1,2,\ldots T$, $e(i,t)$ is a classical disturbance with $E[e(i,t)] = 0$ and Var. $[e(i,t)] = \sigma^2(e)$
   II. The Random effect model described as:
   $y(i,t) = a_i + b.x(i,t) + e(i,t)$; $a_i = a + u_i$ $\quad i = 1,2,\ldots\ldots\ldots\ldots\ldots..N$
   or, $y(i,t) = a + b.x(i,t) + u_i + e(i,t)$
   or, $y(i,t) = a + b.\ x(i,t) + W_{i,t}$
   a_i is assumed to be a random variable with mean 'a'. u_i is a random error term with usual assumptions. This cross-sectional specific error term is uncorrelated with the errors of the variables. The random effects model is a generalized regression model with the assumptions $E[u_i]=0$, $Var.[u_i]=\sigma^2(u)$, $Cov[e_{it}, u_i]= 0$, $Var.[e_{it} + u_i]=\sigma^2 = \sigma^2(e) + \sigma^2(u)$, $Corr[e_{it} + u_i , e_{it} + u_i]= r = \sigma^2(u)/\sigma^2$
5. The full 'two-way' model
   I. The two way FEM (with x's, group effects & time effects) described as:
   $y(i,t) = a_0 + a(i) + g(t) + b.\ x(i,t) + e(i,t)$, $i = 1,2,\ldots.N$; $t = 1,2,\ldots T$, $e(i,t)$ is a classical disturbance with $E[e(i,t)] = 0$ and Var. $[e(i,t)] = \sigma^2(e)$. The problem of multi collinearity - the time and group dummy variables both sum to one - is avoided by imposing the restriction

$$\sum_{i=1,N} a(i) = \sum_{t=1,T} g(t) = 0$$

   II. The two-way random effect model or Error Components Models with group and time effect described as:

$$y(i,t) = a + b.\ x(i,t) + u_i + v\ (i,t)$$

$$v(i,t) = e(i,t) + u(i) + w(t)$$

with the usual assumptions u(i)~N[0, σ^2(u)], e(i,t)~N[0, σ^2(e)], w(t)~N[0, σ^2(w)]. The individual error terms are not correlated with each other and are not auto correlated across both cross section and time series units. The cross-section specific error affects only the observations in that panel. The time-specific error component is peculiar to all observations for that time period t. The third e_{it} affects only the particular observation.

Chi-squared statistics based on the likelihood functions and F statistics based on the sums of squares are used to choose among models (1) to (5). Breusch and Pagan's Lagrange multiplier statistic is used for testing FEM/REM against CLRM. Hausman's chi-squared statistic is used for testing the REM against FEM.

Panel data findings are listed in appendix D (table D.I.1 – table D.I.6 for India, table D.II.1 – table D.II.3 for USA). While investigating the nature of price formation for new economy stocks, the study considers two financial markets. The basis characteristics of the two markets differ substantially. The US stock market is one of the most integrated and developed markets with considerable depth. The Indian stock market on the contrary is not so developed and lags substantially in terms of depth even in the era of financial liberalization. In both the markets, as suggest the results of the study, new economy firms do possess some 'individuality' that is each firm has a special characteristic of its own. This is evident from the Lagrange Multiplier Test by which FEM/REM is favoured over classical linear regression model at all price points. The nature of 'individuality' however differs in the two markets. In Indian context, the two way model with explanatory variables as well as group effect and time effect (model 5) is superior to other models at all price points. This is suggested by likelihood ratio test and F test. Further, the Hausman statistic suggests superiority of FEM over REM at all the four price points. The presence of significant 'group effect' and 'time effect' confirms that firms are distinct in the sense that factors influencing price formation mechanism of one firm seems to be unique for that firm and the factors change significantly over time. In US stock market, the situation is different. Although FEM/REM is favoured over classical linear regression model at all price points, REM is superior to FEM. Firms do have 'individuality' but the differences are random. They are, as if, random drawing from a much larger population. There seems to exist, some general rule or general set of factors that influence price formation mechanism of the sector. Within the sector, price formation mechanism of one firm differs from that of others, but the difference is purely

random. This difference in stock price behaviour might reflect the differences in depth and nature of the two markets. In a developed stock market, investors are supposed to be better informed due to availability of better signal sent by the market. In a not so developed market, it might be difficult for the investors to frame any general rule regarding price formation mechanism of firms.

Panel data estimation reveals another significant result. Whatever be the degree and extent of development, efficiency and depth of the stock market, new economy stock prices have never been fundamental determined. The presence of non-economic factors in price formation mechanism is asserted by the insignificant role of fundamental variables in stock price determination in both the markets. It is speculation and herd behavior which could explain new economy stock price movement over the period of study. Nature and extent of speculation however might differ across the markets. Now it remains to be seen what possibly led to the formation of bubble in case of the new economy stock prices? Does the formation of bubble have to do with a change in the very mechanism through which the stock market behavior is understood to be operating?

IV. Bubbles in New Economy Stock Prices: A Possible Explanation

A typical bubble begins with a 'precipitating factor' such as development of something that seems unique to the investors. Then follows an 'amplification mechanism', generally in the form of assertions from media, reinforcing the view (Farlow, 2002). The resulting stock price increase generates optimism pushing up prices further. As the bubble takes its course, investors, being more convinced about the dawn of a 'new era' where traditional methods of stock valuation do not apply, try to justify even the most unusual valuations.

The global new economy stock price boom during 1998-2000 was driven mostly by the enthusiasm for the new economy created by the assertions of the emerging 'new economy paradigm'. The paradigm claims the new technology and globalization to have ushered in a new economic era of faster, stable and inflation free growth and hence stronger profit. The old pattern of boom and slump is claimed to disappear leading to a transformation of the markets. Most of the future growth potential was expected to be in the new economy reducing economic significance of the other sectors. Ultimately, as claimed by the paradigm, the new economy will penetrate other sectors of the economy.

One possible explanation for the formation of bubble in new economy stock prices during 1998-2000 could be that the optimism fed by the assertions of new economy paradigm changed the nature and composition of investment in stock market. In a stock market, there are two types of investors: the momentum investors and the value investors. Momentum investors buy stocks with the sole purpose of making profit by selling the stocks, quickly to other investors, at a higher price. The only consideration for them is not the net present value of the stock but the changes in stock prices. The 'value investors', in expectation of high future dividends, identify and invest in companies whose worth is not yet reflected in the share prices and thus, pick up only 'value stocks' with positive net present value where prices are related to underlying fundamentals. The isolation of new economy sector as the 'sector of the future' and the resulting perceived growth opportunity of new economy stocks allowed them to sell at high prices. The initial increase generated expectations of further increase and attracted new buyers – normally speculators or what we might call *momentum* investors. Replacement of value investment by momentum investment hastened speculating activities pushing up prices much above the earning capacity.

The fact that the bubble was almost entirely in the new economy stocks in both the countries under consideration confirms the presence of momentum investment in the new economy sector. The stock price behaviour during 1999-2000 was different from the bubble preceding the 1929 crash, or the "Nifty Fifty" bubble of the 1970s. In both the cases, almost all the stocks were over-valued.

Traditional asset price theory suggests that the presence of even a few 'rational' agents betting against the bubble might stop it in its track (Farlow, 2002). This corrective mechanism however did not trigger in case of new economy stocks and the 'rational' value investors found it difficult to regain dominance over the momentum investors. In general, it is difficult for the corrective behaviour to set in. Betting against a bubble before it corrects itself is risky unless the rational investors could coordinate in sufficient numbers against it. However, a growing bubble creates returns to those who stay in; the greater the returns, the larger the number who need to coordinate against it to correct it. “Rational” behaviour does not naturally come to dominate the population.

Similar was the case with new economy stocks. The strong line of defense of the new economy paradigm could have made it difficult for the 'value' investment to

regain dominance over the momentum investment and for the corrective mechanism against bubble to set in. The assertions were manifold, such as:

- New technology is expected to bring about significant improvement in the real economy and the resultant productivity increase could justify the valuations of new economy stocks. The assertion that the new technology is boosting growth and the bubble, if present in the market, will never burst, was the catchword of the new economy paradigm.
- New economy stocks are 'growth' stocks that cannot be evaluated by standard tests. Such stocks are often sold at multiples as their prices move with 'perceived' growth opportunity. Technology firms with diverse growth opportunity choose low, often zero debt equity ratio and normally pay out nothing as dividend to ensure investment in positive NPV projects. Thus, technology stock prices might not react to change in leverage or in dividend policies.
- For long duration assets such as equity, it is inappropriate to judge bubble on basis of immediate price action because PDV of a stock depends crucially on long term cash flows. While evaluating the rationality of price of any 'long-lived asset', the time horizon must be sufficiently extended to include long-term cash flows in stock price evaluation. New economy stock prices might rise sufficiently in future to justify the high prices in late 1999 or in early 2000 (Siegel, 2000).

The increased optimism and inflow of momentum investment pushed up prices to levels that even the most zealous supporter of new economy paradigm found hard to rationalize. The bubble burst when the optimism of the short-term, momentum investors was reversed.

The traditional models of asset price determination based on rationality assumption thus cannot explain movement in the new economy stock prices. The study further predicts that even if growth stocks dominate in the new era, bubble might still develop. Any over-estimation of the growth opportunity might again invite momentum investment inviting another stock market slide. Moreover, this razor edge stability in the stock market in the new economy could have significant psychological impact on the real economy producing profound disequilibrium. The formation of bubble in one part of the economy distorts the flow of funds through out the economy making the flow of funds biased to that sector. The bursting of bubble could produce growing pessimism in the economy constraining real economy activities and the severity of the disequilibrium would hinge upon the strength of nexus between

financial sector and the real sector. However, this issue is not addressed in our study. Our study has pointed to a new era of functional instability, or rather razor-edge stability, embedded in the stock market. New models need to be developed in order to explain the causes of functional instability and to gauge the impact of this instability on underlying real economy.

Reference

1. Blanchard, Oliver and Watson, Mark. (1982) “Bubbles, Rational Expectations and Financial Markets”, *in* Crisis in the Economic and Financial Structure, Lexington Books, MA,.
2. Burman R.B. (1999) "What Determines the Prices of Indian Stocks: Fundamentals or Bubbles", Research Papers in Applied Finance, ICFAI Journal of Applied Finance (1995-99), ICFAI.
3. Dwyer, G.P. and Hafer, R.W. (1990) "Do Fundamentals, Bubbles, or Neither Determine Stock Prices? Some International Evidence", The Stock Market: Bubbles, Volatility and Chaos (edited by authors), Kluwer Academic Press, Boston.
4. Farlow, Andrew., (2002) The UK House Price Bubble, http:\\www.bubbles.com, 27 November, 2002.
5. Siegel J. J., (2002), "What is an Asset Price Bubble? An Operational Definition", Journal of Economic Literature, September 19 issue.

Website

1. http:\\www.bseindia.com
2. http:\\www.indiainfoline.com
3. http:\\www.capitalmarket.com
4. http:\\www.nasdaq.com
5. http:\\www.bubbles.com

Appendix A:

Table: A.1(Case for India)

Unit Root Test (56 observations: 1999M3 to 2003M10)

Variables		Test Statistic
Return BSE 200 index	ADF(12)	-1.5821
Return BSE IT index	ADF(9)	-2.3853
Return BSE PSU index	ADF(12)	-2.2506
Return BSE CG index	ADF(12)	-2.2216
Return BSE HC index	ADF(12)	-0.96546
Return BSE FMCG index	ADF(10)	-1.8668

95% Critical Value for the Dickey-Fuller Statistic = -3.5162

Table: A.2 (Case for India)

Unit root test (55 observations: 1999M4 to 2003M10)

Variables in first difference		Test Statistic
Return BSE 200 index	DF	-10.4685
Return BSE IT index	ADF(12)	-3.6114
Return BSE PSU index	ADF(9)	-3.6506
Return BSE CG index	DF	-10.0711
Return BSE HC index	DF	-20.6903
Return BSE FMCG index	DF	-10.8190

95% Critical Value for the Dickey-Fuller Statistic = -3.5189

Table: A.3 Johansen Tests for Co-integration (Case for India)

(With unrestricted intercept and unrestricted trend in the VAR)
(54 observations: 1999M5 to 2003M10)

List of variables included in the cointegrating vector	Trace		Maximum eigenvalue	
	r = 0	r <=1	r = 0	r <=1
Return BSE 200, Return BSE IT	35.17*	15.72*	19.45*	15.72*
Return BSE 200, Return BSE PSU	36.91*	18.11*	18.81*	18.11*
Return BSE 200, Return BSE CG	44.02*	17.03*	26.99*	17.03*
Return BSE 200, Return BSE FMCG	60.86*	18.83*	42.02*	18.83*
Return BSE 200, BSE Return HC	48.84*	19.96*	28.88*	19.96*

The columns labeled r = 0 test a null hypothesis of no cointegration, while the r <= 1 columns test a null of at most one cointegrating vector. * denotes rejection of the null at 5% level of significance.

Table A.4 (Case for USA)

Unit Root Test (71 observations: 1998M2 to 2003M12)

Variables		Test Statistic
Return Nasdaq 100 Index	ADF(10)	-1.7156
Return Nasdaq Bank Index	ADF(6)	-2.5217
Return Nasdaq Biotech Index	ADF(11)	-1.6897
Return Nasdaq Computer Index	ADF(10)	-1.7439
Return Nasdaq Financial Index	ADF(6)	-2.7318
Return Nasdaq Industrial Index	ADF(12)	-3.1351
Return Nasdaq Telecom Index	ADF(10)	-1.5384

95% Critical Value for the Dickey-Fuller Statistic = -3.4889

Table A.5 (Case for USA)

Unit root test (70 observations : 1998M3 to 2003M12)

Variables in first difference	Test Statistic	
Return Nasdaq 100 Index	DF	-12.6636
Return Nasdaq Bank Index	DF	-12.6330
Return Nasdaq Biotech Index	ADF(1)	-7.5822
Return Nasdaq Computer Index	ADF(10)	-1.7439
Return Nasdaq Financial Index	ADF(4)	-3.5624
Return Nasdaq Industrial Index	DF	-16.5731
Return Nasdaq Telecom Index	DF	-15.5358

95% Critical Value for the Dickey-Fuller Statistic = -3.4889

Table A.6 Johansen Tests for Co-integration (Case for USA)

With unrestricted intercept and unrestricted trend in the VAR
(69 observations:1998M4 to 2003M12)

List of variables included in the cointegrating vector	Trace		Maximum eigenvalue	
	r = 0	r <=1	r = 0	r <=1
Return Nasdaq 100, Return Bank	54.61*	18.79*	35.80*	18.79*
Return Nasdaq 100, Return Biotech	70.76*	22.89*	47.86*	22.89*
Return Nasdaq 100, Return Computer	79.28*	27.62*	51.66*	27.62*
Return Nasdaq 100, Return Financial	49.20*	12.11*	37.09*	12.11*
Return Nasdaq 100, Return Industrial	91.26*	25.35*	65.91*	25.35*
Return Nasdaq 100, Return Telecom	57.47*	26.85*	30.63*	26.85*

The columns labeled r = 0 test a null hypothesis of no cointegration, while the r <= 1 columns test a null of at most one cointegrating vector. * denotes rejection of the null at 5% level of significance.

Appendix B: Table B.1 Results of Time series Analysis (Case for India)

Company	t values			R^2	Company	t values			R^2
	Const.	Time	$Time^2$			Const.	Time	$Time^2$	
Aptech	63.6	-4.03	-6.95	0.60	MTNL	90.7	-3.52	-2.70	0.39
Aftek	44.8	5.06	-9.94	0.73	NIIT	139.4	-1.88	-11.72	0.77
BSEL	48.9	-11.66	-9.8	0.87	Penta G	60.6	-15.4	-6.60	0.91
CMC	59.6	-2.94	2.24	0.49	Penta Soft	60.6	-15.4	-6.60	0.91
Compucom	46.9	-11.21	0.96*	0.88	Polaris	51.2	-5.87	-1.89*	0.63
Crest com	44.8	5.06	-9.94	0.73	Psi Data	70.2	2.52	-10.71	0.76
Cybertech	34.3	-18.06	2.79	0.94	Ramco	59.1	-9.06	2.00*	0.87
DSQ	44.4	-6.83	-7.42	0.76	Ram Info	48.6	-0.8*	-13.13	0.79
Digital Glob	67.5	3.49	-6.67	0.65	Rolta	63.1	9.27	-10.82	0.83
Finolex	74.9	2.85	-4.64	0.49	Satyam	64.7	0.31*	-10.43	0.72
Geom Soft	48.6	-11.13	4.58	0.88	Silverline	37.3	-8.67	-4.15	0.83
Him F Com	40.6	-9.25	-5.80	0.83	Sonata	37.3	-8.90	-7.91	0.83
Hugh soft	60.7	-11.61	-3.54	0.88	Tata Info	104.1	-2.52	-5.44	0.59
Hugh Tele	57.3	-3.11	-0.23*	0.37	Tata Elxsi	80.5	7.71	-8.90	0.77
ITI	22.7	-5.00	-2.04*	0.66	Trigyn Tech	42.7	-3.07	-4.71	0.42
Infosys	140.2	10.13	-7.90	0.80	Usha Beltron	15.8	-7.40	2.90	0.88

Mastek	50.0	1.60*	-10.09	0.71	VSNL	73.6	-3.38	-5.72	0.51
Moser Baer	45.9	0.69*	-1.92*	0.11	Wipro	62.3	-3.53	-2.32	0.39
					ZEE	66.3	-3.27	-11.87	0.78

Table B.2 Results of Time series Analysis: Case for USA

	t values					t values			
Company	Const	Time	$Time^2$	R^2	Company	Const.	Time	$Time^2$	R^2
Adobe	8.24	4.90	-3.15	0.60	Interactive	46.55	1.68*	-3.67	0.62
Amazon	9.00	12.6	-11.5	0.79	Level 3 C	4.73	16.24	-14.45	0.87
Amgen	72.5	5.00	-12.3	0.96	Linear	42.85	4.38	-8.198	0.86
Apple	18.0	5.47	-6.01	0.46	Maxim	34.40	20.90	-24.6	0.33
Applied	22.5	4.87	-7.36	0.76	Mercury	17.74	4.29	-6.97	0.77
ATY Tech	14.4	2.85	-2.1	0.26	Microchip	28.47	0.83*	-3.36	0.71
BEA	10.0	1.2*	-3.10	0.58	Microsoft	41.39	14.12	-6.50	0.40
Broadcom	14.0	6.80	-8.39	0.69	Network	9.20	7.10	-8.63	0.69
Check Point	16.8	1.5*	-4.93	0.82	Nextel	11.44	7.74	-8.41	0.62
Cisco	19.1	10.6	-11.9	0.78	Nov	27.61	1.03*	-3.69	0.73
Comcast	41.3	1.42	-1.2*	0.08	Oracle	15.07	3.36	-6.04	0.76
Compuware	12.4	3.58	-1.7*	0.59	People Soft	30.13	-6.81	6.89	0.51
Dell	28.3	8.78	-9.06	0.65	Qualcom	17.30	3.95	-7.14	0.82
e Bay	13.7	5.47	-7.75	0.74	Scandisk	6.90	5.03	-6.45	0.60
Echostar	18.1	5.64	-9.72	0.88	Sebl	14.10	3.58	-6.04	0.73
Electronics	43.9	-4.1	1.18*	0.77	Sun Micro	14.60	9.05	-11.41	0.81
Flex	27.0	4.30	-8.60	0.88	Veritas	15.90	4.03	-6.28	0.71
Intel	30.0	6.70	-7.96	0.64	Yahoo	5.921	13.02	-12.58	0.79

Appendix C: Results of Cross section Analysis: India versus USA

'*' denotes significance at 5%level of significance for all tables

1998		t values of estimated regression coefficients				
		NPS	DPS	NWS	DE	2^2
Open price	India	Dropped	1.7	1.3	Dropped	0.16
	USA	2.42*	-1.85	1.78	Dropped	0.21
High Price	India	1.27	dropped	1.59	Dropped	0.10
	USA	1.12	-1.78	1.46	Dropped	0.04
Low Price	India	Dropped	1.57	1.42	Dropped	0.14
	USA	3.2*	-1.36	Dropped	Dropped	0.22
Close Price	India	1.32	dropped	1.47	Dropped	0.09
	USA	1.91	-1.29	dropped	Dropped	0.06

1999		t values for estimated regression coefficients				
		NPS	DPS	NWS	DE	Adj.R^2
Open price	India	Dropped	1.20	1.52	Dropped	0.06
	USA	1.08	-1.35	Dropped	1.12	0.02
High Price	India	Dropped	1.38	1.52	1.03	0.05
	USA	1.35	-1.74	1.06	1.20	0.05
Low Price	India	Dropped	1.17	1.61	Dropped	0.07
	USA	1.91	Dropped	Dropped	1.00	0.08
Close Price	India	Dropped	1.17	1.81	1.23	0.07
	USA	1.19	-2.12*	1.26	1.02	0.08

2000		t values for estimated regression coefficients				
		NPS	DPS	NWS	DE	Adj.R^2
Open price	India	1.7	1.19	-1.86	Dropped	0.06
	USA	-1.40	Dropped	Dropped	Dropped	0.002
High Price	India	1.49	1.07	-1.47	Dropped	0.008
	USA	-1.00	Dropped	Dropped	Dropped	-0.01
Low Price	India	1.65	1.58	-1.3	Dropped	0.06
	USA	Dropped	1.29	1.18	Dropped	0.03
Close Price	India	1.58	1.61	-1.19	Dropped	0.06
	USA	0.49	Dropped	Dropped	Dropped	-0.02

2001		t values for estimated regression coefficients				
		NPS	DPS	NWS	DE	Adj.R^2
Open price	India	1.59	1.02	Dropped	Dropped	0.06
	USA	Dropped	0.60	Dropped	Dropped	-0.02
High Price	India	2.39*	Dropped	-1.19	Dropped	0.10
	USA	Dropped	0.46	Dropped	Dropped	-0.02
Low Price	India	2.38*	1.48	Dropped	-1.78	0.22
	USA	2.83*	1.14	2.07*	Dropped	0.41
Close Price	India	3.21*	1.31	Dropped	-1.8	0.30
	USA	Dropped	2.31*	Dropped	3.14*	0.31

2002		t values for estimated regression coefficients				
		NPS	DPS	NWS	DE	Adj.R^2
Open price	India	4.45*	-3.51*	-4.62*	Dropped	0.46
	USA	Dropped	Dropped	1.36	2.25*	0.13
High Price	India	4.02*	-3.01*	-4.16*	Dropped	0.39
	USA	Dropped	Dropped	1.55	2.35*	0.15
Low Price	India	4.22*	-3.04*	-4.33*	Dropped	0.38
	USA	Dropped	Dropped	2.36	1.70	0.16
Close Price	India	3.93*	-3.02*	-4.03*	Dropped	0.33
	USA	Dropped	Dropped	1.73	1.62	0.10

2003		t values for estimated regression coefficients				
		NPS	DPS	NWS	DE	Adj.R^2
Open price	India	3.71*	-1.17	2.6*	Dropped	0.26
	USA	3.76*	Dropped	Dropped	-1.42	0.33
High Price	India	3.36*	Dropped	2.07*	Dropped	0.25
	USA	2.75*	Dropped	Dropped	-1.90	0.26
Low Price	India	3.75*	Dropped	2.53*	Dropped	0.28
	USA	4.01*	Dropped	Dropped	-1.35	0.35
Close Price	India	3.52*	-1.05	2.31*	Dropped	0.26
	USA	2.42	Dropped	Dropped	-2.19	0.25

Appendix D

Table D.I.1. Panel Data Estimation Results (Case for India)

Observations: 222 Parameters: 47 Degree of freedom: 175

Table: D.I.1	Open price	High price	Low price	Close price
R-squared	0.77	0.83	0.84	0.87
Adjusted R^2	0.71	0.78	0.79	0.84
Model test: F[46,175](prob)	12.84(0.00)	17.96(0.0)	19.35(0.0)	26.03(0.00)
Log-L	-282.89	-246.03	-246.69	-220.23
Restricted(b=0) Log-L	- 447.35	-440.24	-447.81	-449.47
LogAm PrCrt	0.141	-0.191	-0.185	-0.424
Akaike Info. Crt.	2.972	2.640	2.646	2.407
Estd. Autocorrelation of e(i, t)	- 0.036	0.115	0.178	0.039

Table D.I.2: t ratios for explanatory variables (Case for India)

Variable	DPS	NWS	NPS	DE	Constant
Open price	0.43	0.07	-0.63	-1.03	52.48
High price	-0.13	1.61	-0.43	-0.42	67.36
Low price	-0.21	1.7	-0.49	-0.49	54.28
Close price	-0.45	1.5	-0.27	-0.56	67.55

Table D.I.3: Test Statistics for the Classical Model (Case for India)

	Likelihood Ratio Test (Prob. Values)				F Tests (Prob. Values)			
	Open price	High price	Low price	Close price	Open price	High price	Low price	Close price
(2) Vs (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(3) Vs (1)	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00
(4) Vs (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(4) Vs (2)	0.01	0.00	0.06	0.01	0.02	0.00	0.12	0.02
(4) Vs (3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(5) Vs (4)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(5) Vs (3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table D.I.4: Test Statistics for the Classical Model (Case for India)

	LM statistic	Hausman Statistic
Open price	185.84 (2 df, prob value = 0.00)	24.60 (4df, prob value = 0.00)
High price	240.32 (2 df, prob value= 0.00)	14.74 (4df, prob value = 0.00)
Low price	223.02 (2 df, Prob value = 0.00)	12.75 (4df, prob value = 0.01)
Close price	278.83 (2 df, prob value = 0.00)	23.51 (4df, prob value = 0.00)

(High values of LM favor FEM/REM over CR model, High values of H favor FEM)

Table D.I.5. Estimated Fixed Effects (Case for India)

	t ratios							
	Intercept dummies				Differential dummies (Infosys base)			
	Prices							
Group	Open	High	Low	Close	Open	High	Low	Close
Ace	-4.63	-4.24	-5.16	-4.6	18.43	18.01	22.30	20.38
Aptech	0.13	-1.62	-0.11	2.23	10.98	13.92	14.42	9.70
Amex	0.08	1.01	1.03	-2.5	11.03	9.77	12.59	17.09
Atcom	-1.46	-1.34	-3.42	-2.74	13.35	13.36	19.48	17.37
Compucom	-0.78	-1.47	-0.51	-1.34	12.39	13.68	15.01	15.28
Crest Comm	-1.07	-0.55	-1.22	-0.62	12.89	12.26	16.17	14.19
Data pro	-4.80	-4.78	-7.74	-6.38	18.70	18.88	26.39	23.21
data soft	-5.33	-4.5	-6.94	-5.79	19.54	18.42	25.11	22.26
Digital Eqp	2.48	2.71	3.97	3.39	7.25	7.10	7.97	7.84
Finolex	0.80	0.32	1.56	0.66	9.74	10.70	11.55	11.94
Frontier	-8.03	-8.25	-10.35	-8.97	23.85	24.38	30.54	27.30
Infosys	7.01	7.14	8.94	8.28	0.00	0.00	0.00	0.00
Infotech	1.51	2.39	1.97	2.23	8.80	7.62	11.14	9.68
KLG Sys	-1.43	-0.61	-0.92	-0.31	13.43	12.33	15.67	13.66
Maars	-1.34	-1.41	-1.14	-1.08	13.29	13.59	16.01	14.89
Mastek	2.95	3.19	3.02	3.27	6.54	6.37	9.49	8.06
Mphasis	2.11	2.11	2.90	3.24	7.50	7.70	9.23	7.66
MTNL	0.75	0.06	1.66	0.61	10.00	11.30	11.65	12.25
NIIT	3.78	3.6	4.76	4.1	5.27	5.75	6.79	6.79
Odyssey	-3.91	-2.5	-3.62	-2.65	17.32	15.29	19.91	17.33
Onward	-0.36	-0.44	-1.15	-0.74	11.78	12.09	16.07	14.38
Orient	-1.00	-0.49	-1.28	-0.66	12.77	12.15	16.26	14.23
Pentamedia	1.41	0.97	0.58	-0.3	8.97	9.87	13.33	13.67
PSI Data	1.88	1.5	1.50	1.35	8.19	9.00	11.84	11.04
Ram Info	-2.78	-3.56	-4.66	-3.99	15.53	16.96	21.54	19.45
Rolta	-0.45	0.23	0.08	0.23	11.87	11.01	14.10	12.81
Satyam	1.96	3.19	3.43	3.15	8.11	6.40	8.87	8.27
SSI	1.04	-0.15	1.09	1.48	9.04	11.19	11.90	10.27
Sri Adhikari	0.50	-0.64	1.23	-0.21	10.40	12.39	12.31	13.53
Tata Elxsi	-0.68	-0.67	-0.31	-0.17	12.26	12.43	14.72	13.45
Tata Info	1.36	2.32	3.31	2.69	9.07	7.78	9.09	9.01
Trigyn	1.66	1.26	0.42	0.25	8.58	9.43	13.60	12.81
TVS	-0.02	-1.06	-1.59	-1.09	11.08	12.92	16.59	14.76
VSNL	1.08	2.11	2.98	2.28	8.51	6.98	8.16	8.37
Wipro	5.10	4.96	7.03	5.68	3.01	3.44	2.99	4.10
Zee	2.14	1.73	2.13	1.9	7.47	8.33	10.47	9.84
Zenith	-1.56	-2.32	-3.40	-2.84	13.59	14.98	19.52	17.60

Table D.I.6. Estimated Fixed Effects (case for India)

	t ratios							
	Intercept dummies				Differential dummies (1998 base)			
	Prices							
Year	Open	High	Low	Close	Open	High	Low	Close
1998	-3.25	-1.09	-1.81	0.44	0.00	0.00	0.00	0.00
1999	1.54	5.35	3.36	8.78	-20.37	-27.28	-21.92	-35.30
2000	7.10	6.79	5.43	2.23	-44.01	-33.55	-30.78	-7.67
2001	0.30	-2.86	-2.65	-5.05	-15.19	7.35	3.38	23.09
2002	-2.22	-3.21	-4.06	-3.62	-4.05	9.25	9.89	17.39
2003	-3.37	-4.88	-0.25	-2.69	0.84	16.41	-6.48	13.36

II. Panel Data Estimation Results (Case for USA)

Table D.II.1: Test Statistics for the Classical Model (Case for USA)

	LM statistic	Hausman Statistic
Open price	185.84 (2 df, prob value = 0.00)	4.60 (4df, prob value = 0.29)
High price	186.99 (2 df, prob value= 0.00)	5.12 (4df, prob value = 0.28)
Low price	175.14 (2 df, Prob value = 0.00)	5.48 (4df, prob value = 0.24)
Close price	186.87 (2 df, prob value = 0.00)	0.76 (4df, prob value = 0.94)

Table D.II.2: b/St.Error for fundamental variables (Case for USA)

Variable	DPS	NWS	NPS	DE	Constant
Open price	0.25	0.47	0.16	-1.26	52.48
High price	0.44	1.59	1.38	-0.49	18.04
Low price	0.26	1.75	1.89	0.79	24.72
Close price	0.61	0.88	1.79	0.66	22.62

Table D.II.3: GLS Estimates (Case for USA)

	Open Price	High Price	Low Price	Close Price
Var[e]	0.954350D+00	0.601005D+00	0.294059D+00	0.318146D+00
Var[u]	0.218723D+01	0.665011D-01	0.143090D+00	0.927872D-01
Var[w]	0.295443D+01	0.148965D+01	0.780311D+00	0.934508D+00
Sum of Sq	0.722685D+03	0 .179577D+03	0.111723D+03	0.109950D+03
R-squared	0.569545D-01	0.143353D-01	0.132259D+00	0.461992D-01