ASIAN ACADEMY *of* MANAGEMENT JOURNAL *of* ACCOUNTING *and* FINANCE

AAMJAF, Vol. 5, No. 1, 31–65, 2009

THE BEHAVIOUR OF PRICE MULTIPLES IN INDIA (1990–2007)

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ABSTRACT

In this paper, we examine the behaviour of price multiples in India from 1990–2007. The distributions of price multiples tend to be normal over our study period, thus making the mean and standard deviation of these multiples relevant parameters for equity analysis in the Indian context. Further, sectors with high price multiples exhibit greater volatility in these multiples. This may result in greater price forecast errors for these sectors. We also find a very weak relationship between price multiples and their fundamental determinants. The cross-sectional linear models do not seem to be good descriptors of price multiples. However, price-to-book value (P/BV) and price-to-sales (P/S) ratios do reflect corporate fundamentals in the case of the Bombay Stock Exchange Sensitive Index, which tracks 30 stocks that are large in size and account for a major part of trading activity. In contrast, the fundamental determinants do not seem to drive price-to-earnings (P/E) and price-to-cash flow (P/CF) ratios, even for our limited universe of index stocks. This may be owing to the fact that earnings multiples are more driven by sentiments due to the actions of noise traders than by fundamentals, which influence the behaviour of value traders. Further, earnings are a bottom line number and thus are severely affected by accounting biases and judgments. The price multiples also seem to be sensitive to market conditions and therefore are generally greater in upturns, with the exception of infrastructure-related sectors. Our results are relevant for market stakeholders, who use price-multiple information for strategy building and policy decision making.

Keywords: price earnings ratio, price to book value ratio, relative valuation, price multiples, discounted cash flows

INTRODUCTION

India initiated its capital market reforms in the early 1990s; this time is also known as the Liberalisation, Privatisation, and Globalisation era. A major step was to provide statutory status to the Securities Exchange Board of India (SEBI), the capital market regulator in India, in 1992. This was followed by the adoption of screen-based trading with the setting up of the National Stock Exchange (NSE)[1] in 1993 and the subsequent dematerialisation of securities in 1996. The Indian equity market has also seen some structural changes in the past decade, with the introduction of financial derivatives in 2000, the shift to rolling settlement (T + 2) in 2001 and the establishment of national commodity exchanges, to name a few. The equity market now has fairly well functioning components, composed of the pre-Initial Public Offer (IPO) market (involving venture funds and private equity funds), the IPO market (electronic auctions), the secondary market (nationwide electronic trading) and market participants (households, mutual funds, insurance companies and Foreign Institutional Investors (FIIs). The presence of market participants has shown tremendous growth, with an increase of just 18 FIIs registered with SEBI in 1993 to 1319 in 2008, 35 venture capital funds in 2000 to 106 by the end of 2008 and just 12 mutual funds in 1994 to 40 in 2008. They have also shown enormous potential in terms of trade activity, with FIIs cumulative net investment increasing from a mere USD4 million in 1992–1993 to USD68 billion in 2007–2008. Similarly, net purchases by mutual funds increased from a mere USD460 million in 2000–2001 to USD18.39 billion in 2007–2008. In the same manner, the global listing of Indian securities has also shown unparallel growth, with the American Depository Receipts (ADRs)/Global Depository Receipts (GDRs) issues increasing from USD240 million in 1992–1993 to approximately USD8.8 billion in 2007–2008 and external commercial borrowings (ECBs) from USD358 million in 1992–1993 to about USD22 billion in 2007–2008.

However, the year 2008 was a gloomy year, with the global economy facing one of the largest banking crises. The Indian equity markets also experienced an almost 40% correction during that year. The price-earnings ratio (P/E) of the BSE Sensex[2] also fell in line with the market, from around 28 in January to about 12 by the end of the year. In 2008, FIIs pulled an estimated USD13 billion out from the Indian market, the first net outflow in 11 years and the greatest in 15 years. However, with oil prices and all other commodity prices witnessing sharp corrections coupled with a significant drop in inflation, there are sufficient triggers to support a positive growth outlook. Additionally, the prompt and effective intervention by the Reserve Bank of India (RBI), the central bank of India, through aggressive rate cuts and liquidity infusion will surely provide impetus to growth in 2009. After remaining net sellers through the past few

months, FIIs are turning positive on India, buying shares worth approximately USD357 million in December.

The steep market decline has created opportunities for buying many growth companies trading at single-digit P/E ratios and below their net asset values. The long-term outlook remains positive for the Indian market, though in the short term, it may show extreme volatility on account of apprehensions over slowing growth, selling by foreign funds and investment opportunities in other asset classes such as commodities. Despite concerns about the persistent damage to investor confidence, the Indian market is not expensive and presents a rare investment opportunity on account of attractive valuations, strong fundamentals of the economy and a relatively better growth outlook.

With such a vibrant opportunity present in the equity market, there is a grave need to place emphasis on the valuation techniques used to evaluate common stocks. At firms within the investment community, be they equity research firms, venture capitalists, trading firms, investment banks, and hedge funds, etc., relative valuation is the most acceptable technique for valuing stocks, apart from fundamental valuation. Relative valuation estimates the value of an asset by looking at the pricing of 'comparable' assets relative to a common variable such as earnings, cash flows, book value or sales. It is the most popular technique of valuing an asset for a few reasons. First, a valuation based upon a multiple for comparable firms can be quickly estimated with far fewer assumptions and in a speedy manner compared to fundamental analysis. Second, a relative valuation is simpler to understand and easier to present to clients and customers. Values in relative valuations can be standardised relative to earnings firms generate, to the book value or replacement value of the firms themselves, to the revenues that firms generate or to measure a firm's cash flows.

Some of the important multiples in relative valuations are earnings multiples, which can be estimated using current earnings per share, yielding a current P/E, earnings over the last four quarters, resulting in a trailing P/E, or expected earnings per share in the next year, providing a forward P/E. The ratio of price to book value (P/BV) or to the replacement value, which is the accounting estimate of book value, is determined by accounting rules and is heavily influenced by the original price paid for any assets and any accounting adjustments (such as depreciation) made since. For those who believe that book value is not a good measure of the true value of assets, an alternative is to use the replacement cost of the assets; the ratio of the market value of a firm to its replacement cost is called Tobin's Q. Another important price multiple used in the industry a revenue-based multiple that is the ratio of the market value of an asset to the revenue it generates. For equity investors, this ratio is the price-to-sales ratio (P/S), where the market value per share is divided by the revenues

generated per share. Some equity researchers emphasise price-to-cash flow (P/CF) ratios instead of traditional P/E ratios, as the later is impacted by the accounting treatment of certain items in a firm's financial statements.

A lot of empirical work has been conducted for matured market related to the robustness of value drivers in deriving equity prices. Beaver, Lambert and Morse (1980) produced one of the earliest works on value drivers. The study derives a relationship between price changes and earnings changes by expanding the information upon which earnings expectations are conditioned to include data other than prior earnings history. Similarly, Ou and Penman (1989) show that the information in prices that leads to future earnings is contained in financial statements. Skogsvik and Skogsvik (2001) investigate P/E ratio valuation as a relative valuation approach. More specifically, they investigate how similar the company being valued and its peer companies must be in order for a relative P/E ratio valuation model to work. Liu, Nissim and Thomas (2002a) examine the valuation performance of a comprehensive list of value drivers to find out which value driver best explains stock prices. They extend their work in 2005 to compare cash flow-based valuations with earnings multiples.

A small body of literature on price multiples is also available in the Indian context. Gupta, Jain and Gupta (1998) provide an empirical perspective on P/E ratios. The focus of the research is on the market's average P/E ratio and its use as an important market signal. It also advocates a new approach to evaluating the appropriate P/E ratio as part of the investment analysis of individual companies. They also examine the short-term volatility of the market's P/E ratio, reflecting the possible irrationality of the market from time to time. The research is concerned with drawing implications of findings for regulatory policy and market reform. Gill (2003) demonstrates empirically that stock market valuations are no longer driven solely by traditional investment principles. Thus, there seems to be a major research gap on the subject for the Indian environment. Most of the work done by Indian researchers relates to P/E ratios while no concrete research has been done on other value drivers, such as book value, sales and cash flows, in India. Furthermore, there is no empirical evidence on the relationship between price multiples and their fundamental determinants. The present study attempts to fill the research gap on the subject and to contribute to the body of literature relating to equity valuation.

The study has the following objectives: (1) To understand the time series behaviour of price multiples, (2) To evaluate the relationship between price multiples and their determinants, and (3) To examine whether price multiples are sensitive to market conditions, e.g., they tend to be higher during market upturns compared to market downturns.

The study is organised into six sections including the present one. The second section provides a brief review of the literature. The next section describes the data and their sources. The time-series behaviour of price multiples is discussed in the fourth section. Then, we provide the relationship between price multiples and their fundamental determinants as well as evidence regarding the sensitivity of these multiples to market conditions. Summary and concluding remarks are contained in the last section.

REVIEW OF LITERATURE

There is a large body of literature in textbooks (e.g., Copeland, Koller & Murrin 1994; Damodaran, 1996; Palepu, Healey & Bernard, 2000) discussing price multiples. Interestingly, there is few research papers published on the subject. While international papers have concentrated on all multiples, work in the Indian context has been confined to P/E ratios.

One of the earliest international works on value drivers was done by Beaver, Lambert and Morse (1980). In their analysis, price is used as a surrogate for additional information available to market participants using the stochastic process of accounting earnings. This relationship provides an interpretation of the contemporaneous association between price changes and earnings changes, as previously observed by Ball and Brown (1968), and Beaver, Clarke and Wright (1979), among others. It also provides a basis for inferring from prices the earnings process and expected future earnings as perceived by market participants. Similarly, Ou and Penman (1989) note that information in prices that leads to future earnings is contained in financial statements. The study compares the ability of prices and appropriate financial statement variables to predict future earnings. In addition to comparing the ability of the P/E ratio and accounting numbers to predict earnings, it also compares the ability to predict stock returns. The study observes that information in prices that leads to future earnings is contained in financial statements. It demonstrates that certain numbers presented in the income statement, balance sheet, and cash flows can be summarised into one measure that predicts future earnings and also filters out transitory components of current earnings. Skogsvik and Skogsvik (2001) investigate P/E ratio valuation as a relative valuation approach. The analysis shows that the P/E ratio is a function of four company characteristics: expected book return on owner's equity, growth in owner's equity, the company dividend payout ratio and the cost of equity capital. It also finds that the P/E ratio of the peer company is unlikely to be correct in determining the value of the concerned company when there are differences in the expected book return relative to owner's equity. Finally, it suggests that the peer company should really be similar to the company being valued with regard to the investment risk, the choice of

accounting principles, the expected future book return on owner's equity and the future growth in owner's equity. Liu, Nissim and Thomas (2002a; 2002b) examine the valuation performance of a comprehensive list of value drivers to determine which value driver best explains stock prices. They find that multiples derived from forward earnings explain stock prices remarkably well, as the pricing errors were within 15% of stock prices for about half of their sample. In terms of relative performance, the following general rankings are observed consistently each year: forward earnings measures are followed by historical earnings measures, cash flow measures and the book value of equity are tied for third, and sales performed the worst. They also observe that performance declines when they consider more complex measures of intrinsic value based on shortcut residual income models. They also note that contrary to the popular view that different industries have different "best" multiples; these overall rankings are observed consistently for almost all industries examined. In addition, they find that performance improves when multiples are computed using the harmonic mean relative to the mean or median ratio of price to value drivers of comparable firms. Liu, Nissim and Thomas (September, 2002b) extend their previous work over different countries. In this study, they examine the ability of industry multiples to approximate observed stock prices in 10 countries. The value drivers examined are reported and forecasted numbers for earnings, dividends, cash flows and sales. The results are almost similar to their previous work. The latest work, also by Liu, Nissim and Thomas (2007), features an exploration in which they try to determine whether valuations based on cash flow multiples are better than earnings multiples. They observe that despite intuitive claims that operating cash flows are better than earnings as a summary measure of value, stock prices are better explained by reported earnings than by reported operating cash flows.

Baker and Ruback (1999) analyse industry multiples for the S&P 500 for the year 1995. This paper focuses on two implementation challenges when using valuation multiples: how to estimate the industry multiple and how to choose a measure of financial performance as a basis of substitutability. They use Gibbs sampling to estimate simultaneously the error specification and small sample minimum variance multiples for 22 industries. In addition, they consider the performance of four common multiples: the simple mean, the harmonic mean, the value-weighted mean, and the median. They find that harmonic mean is a close approximation to the Gibbs minimum variance estimates. They conclude that it is always better to use the harmonic mean to estimate the industry multiple because the harmonic mean is mathematically always less than the simple mean. The results imply that using the simple mean industry multiple will overestimate value. They argue that the basis of substitutability should be selected by choosing the measure that minimises the spread across multiples within an industry. To study alternative bases of substitutability, they examine the harmonic mean multiple based on EBIT, EBITDA, and revenue. They show that the basis varies

across industries. One explanation is that the basis of substitutability that provides the most precise estimate of value varies by industry because the underlying value drivers differ across industries.

Huang, Tsai and Chen (2007) re-examine the P/E anomaly by decomposing P/E ratios into a fundamental component and a residual component, which enables them to capture factors that potentially provide better measures of investor overreaction. They attempt to analyse whether performance reversal in P/E ratios and stock returns is due to predictable time-varying firm and economic fundamentals or to investor over-optimism (pessimism). The sample consists of publicly listed firms listed on the New York Stock Exchange (NYSE) between 1982 and 2002. They find that both firm-specific and macroeconomic factors determine P/E multiples. Analysts' long-term growth rate forecast, dividend payout ratio, and firm size are all positively associated with P/E ratios, while financial risk and aggregate bond yields are negatively associated with P/E ratios. They also discover strong evidence of performance reversals for the top-P/E and bottom-P/E portfolios in the years subsequent to the portfolio formation year, with the strongest reversal occurring in the first post-formation year. Finally, they observe that extreme portfolios constructed based upon residual P/E ratios exhibit performance reversals only for portfolios constructed using top residual P/E ratios, which supports the over-optimism hypothesis of the P/E anomaly. Conversely, the bottom residual P/E portfolios show no sign of performance reversals, indicating the lack of over-pessimism. Thus, it can be explained by changing firm and economic fundamentals and not investor overreaction.

Da and Schaumburg (1996) document that within industries, relative valuations implicit in analyst target prices do provide investors with valuable information but that the implied absolute valuations themselves are much less informative. Their findings apply to the sample of S&P 500 stocks and do not rely on trading at the exact time of announcement. Using a large database of target price announcements from 1997–2004, they construct a simple strategy based on target-price-implied relative valuations and show that the resulting abnormal return is both economically and statistically significant and is not easily explained by transaction costs alone.

Some work on price multiples has also been done for India, but it has been restricted to P/E ratios. Gupta, Jain and Gupta (1998) study P/E ratios of the Indian Stock Market and Indian companies. The analysis provides an empirical perspective on P/E ratios. The focus of the study is on the market's average P/E ratio and its use as an important market signal. It also advocates a new approach to evaluating the appropriate P/E ratio as part of the investment analysis of individual companies. They also examine the short-term volatility of the market's P/E ratio, reflecting the possible occasional irrationality of the market. Through

their analysis, they find that the 1980s witnessed a long-term revaluation of the Indian stock market as a whole. The market's average P/E ratio doubled between 1980 and 1986, which reflected a significant shift in household investors' asset preference for equities. They also observe that the market's P/E ratio is an extremely useful indicator of the market's mood and state, and note that from a practical angle there are four states of the stock market, with each state associated with a certain level of the market's average P/E ratio. The states are: a dangerously high average P/E ratio, which is a symptom of a market bubble; a high market P/E ratio, where extreme caution is needed in entering into the market; a reasonable market P/E ratio, which prevails in developed and efficient markets; an abnormally low market P/E ratio, which offers a rare opportunity to buy stock at advantageous prices. The study also analyses short-term movements of the market's average P/E ratio and concludes that the Indian market was experiencing a "bubble market" and was not a market governed essentially by economic fundamentals. The research indicates that the market's unhealthy functioning should be a matter of concern for policy makers and that greater reliance ought to be placed on markets. The study shows erratic behaviour in the Indian market's average P/E ratio, which fluctuated between a high level of 40 in 1991 to 10.5 in 1996. The market's erratic behaviour was also indicated by the share price fluctuations, whose high to low ratio on average was as high as 2.5:1. They examine that the primary determinant of the return earned from equity investment is the change in P/E ratio rather than earnings per share (EPS) growth. Lastly, the study indicates that despite the creation of the Over-the-counter Exchange of India (OTCEI), no satisfactory trading arrangements for small company shares have been made in India, which is an important area of concern for policy makers. Gill (2003) demonstrates empirically that the stock market valuations are no longer driven solely by traditional investment principles. It tests three propositions:

1. The low P/E ratio companies give superior returns.
2. The average P/E ratio for an industry gives an indication of the overall expectation for that particular segment.
3. The P/E to growth in earnings (PEG) ratio is technically superior to the standard P/E ratio.

She finds that the low P/E ratio as an indicator does not hold anymore and that there is nothing reflecting a long-term investment strategy. She observes that there is an acceptable P/E range for different industries; here it is not only the past record of the P/E ratio but also the average P/E ratio for the industry that should be examined. Lastly, she observes that the use of the P/E ratio along with the EPS growth rate could produce the more useful PEG ratio, which is a sound indicator of a company's potential value.

DATA

The time-series behaviour of price multiples has been studied in 17 out of 20 major sectors. The sector classification of the Bombay Stock Exchange 500 (BSE 500)[3] index has been used for this purpose. Three sectors namely, Diversified, Miscellaneous and, Media and Publishing are excluded from our work; the exclusion of the first two owes to the nature of these sectors as they are difficult to benchmark, and the third is excluded because it had few listed companies with infrequent trading records. For each sector, yearly data of around 8–12 large cap[4] companies are selected for a period of 18 years with positive price multiples for each company. The period covered under the study is from 1990 to 2007. We cover 162 companies, which account for a major component of the total market capitalisation as well as trading activity in India. The data details are provided in Exhibit A. Hence, the sample size is representative of market performance. The data composed of yearly multiples, viz., P/E, P/BV, P/CF and P/S, have been taken from Capitaline Plus[5]. These price multiples are adjusted for capitalisation changes such as stock splits, stock dividends and right issues. The definitions of these price multiples are given in Exhibit B. All of the companies with financial years[6] ending in March are considered. The price multiples have been capped between 0 and 100 to avoid extremely large as well as negative values. We also examine the time-series behaviour of price multiples for the overall market by creating an equally weighted market proxy from the sample companies. The proxies for the market price multiples are estimated by taking the average of these multiples across sample companies on a year-to-year basis.

Exhibit A: Details of Sample Sectors

Sample No.	Sector	No. of companies
1	Agriculture	11
2	Capital goods	12
3	Chemical and petrochemical	11
4	Consumer durables	4
5	Finance	12
6	Fast-moving consumer goods (FMCG)	12
7	Healthcare	12
8	Housing-related	12
9	Information technology (IT)	11
10	Metal, metal products and mining	12
11	Oil and gas	12
12	Power	6
13	Telecom	4
14	Textile	8
15	Tourism	4
16	Transport equipment	12
17	Transport services	7

Exhibit B: Definitions of Price Multiples

Price multiples	Definitions
P/E	Price/EPS, where Price = closing price EPS = net profit – preference dividend – dividend tax/number of shares
P/BV	Price/ BV, where Price = closing price BV = net worth/number of shares and Net worth = equity + reserves and surplus
P/S	Price/Sales, where Price = Closing price Sales = Gross sales
P/CF	Price/Cash Earnings Per Share, where Price = Closing price CF = (net profit – preference dividend – dividend tax + depreciation)/paid up equity * face value

We next analyse the relationship between price multiples and their determinants using only 14 out of the 17 sectors (covering 148 out of 162 companies). The three omitted sectors are Tourism, Consumer durable and Telecom, as the lack of a sufficient number of companies in these sectors will create problems while estimating cross-sectional regressions. The yearly data on accounting and financial variables act as fundamental determinants (or can be used to construct such determinants) of price multiples and include market capitalisation, dividend payout, EPS, return on equity and net profit margin. These have also been taken from Capitaline Plus. EPS numbers are used to calculate growth rates as well as risk measures.

TIME-SERIES BEHAVIOUR OF PRICE MULTIPLES

We perform a test of normality on historical distributions of four price multiples, i.e., P/E, P/CF, P/BV and P/S for 17 prominent sectors over an 18-year period. We employ a One-Sample Kolmogorov-Smirnov test (K-S test) for this purpose, using a 5% level of significance. The One-Sample K-S test procedure compares the observed cumulative distribution function for a variable with a specified theoretical distribution, which may be normal, uniform, Poisson, or exponential.

The Kolmogorov-Smirnov Z is computed from the largest difference (in absolute value) between the observed and theoretical cumulative distribution functions. This goodness-of-fit test calculates whether the observations could reasonably have come from the specified distribution.

The mean K-S statistic and p-value are calculated for each sector by taking an average of these values for all of the sample companies in a given sector. The estimation is done for the total period (1990–2007) and three sub-periods, namely, sub-period 1 (1990–1995), sub-period 2 (1996–2001) and sub-period 3 (2002–2007). These results are shown in Table 1. Non-normality is rejected in case of all the sectors for the total period as well as for the three sub-periods for all price multiples. In fact, only 10, 16, 13 and 21 out of 162 companies show a p-value lower than 5% for P/E, P/CF, P/BV and P/S, respectively. Further, none of the sample companies exhibit non-normality for sub-period data. Given the possible non-stationary of distribution parameters over a longer time period one shall rely more on sub-period findings.

Our sample results suggest that price multiples in India can be characterised by two parameters, i.e., its mean ratio and its time-series volatility measured by standard deviation. The mean price multiple and the standard deviation for a given sector are estimated by taking an average of these parameters for the sample companies in each sector, which are shown in Table 2.

Mean P/E ratios for all of the sectors except Tourism, Housing-related and Consumer Durables have shown a common pattern of decline from sub-period 1 to sub-period 3. A similar trend was observed for the other three price multiples, with the exception of Housing-related in P/CF, IT in P/BV, and Housing-related and Transport equipment for P/S. In sub-period 2, the mean P/E fell sharply for all of the sectors, as this was the bearish phase of the market. The P/E of the Agriculture sector saw a steep fall, wherein the mean P/E ratios fell from 21 to 5.5 in sub-period 2. We also find that the mean of other price multiples fell in the same period except in IT where it had increased sharply. This was a period when the worldwide IT sector was going through a boom phase.

The P/E, P/CF, P/BV and P/S ratios of three sectors, viz., Consumer durable, Tourism and Housing-related increased in sub-period 3 in comparison to sub-period 1. The reason for the contradictory behaviour of these three sectors compared to the rest of the sample could be their strong growth potential in these three sectors, their lower sectoral risk and/or the high volatility of sectoral multiples. It can be seen from Table 2 that the mean standard deviations of price multiples in these three sectors have increased over time due to investors possibly having demanded high multiples.

Table 1
Test of normality for price multiple distributions

Panel A: P/E Ratio

Sector	1990–2007		1990–1995		1996–2001		2002–2007	
	Kolmogorov-Smirnov Z	p-value	Kolmogorov-Smirnov Z	p-value	Kolmogorov-Smirnov Z	p-value	Kolmogorov-Smirnov Z	p-value
Agriculture	**1.056**	0.344	**0.631**	0.775	**0.539**	0.897	**0.590**	0.804
Capital goods	**1.008**	0.378	**0.556**	0.827	**0.652**	0.747	**0.607**	0.806
Chemical and petrochemical	**0.950**	0.419	**0.565**	0.810	**0.570**	0.821	**0.608**	0.815
Consumer durables	**0.863**	0.483	**0.727**	0.666	**0.616**	0.839	**0.585**	0.872
Finance	**0.921**	0.454	**0.594**	0.770	**0.577**	0.863	**0.534**	0.921
FMCG	**0.764**	0.614	**0.565**	0.838	**0.586**	0.829	**0.625**	0.781
Healthcare	**0.776**	0.590	**0.497**	0.898	**0.624**	0.767	**0.583**	0.835
Housing-related	**0.948**	0.389	**0.568**	0.867	**0.606**	0.785	**0.541**	0.892
Information technology	**0.978**	0.355	**0.529**	0.863	**0.526**	0.864	**0.623**	0.774
Metal, metal products and mining	**0.881**	0.478	**0.521**	0.890	**0.613**	0.791	**0.571**	0.850
Oil and gas	**0.936**	0.413	**0.693**	0.682	**0.589**	0.850	**0.675**	0.713
Power	**1.007**	0.419	**0.547**	0.815	**0.678**	0.705	**0.586**	0.855
Telecom	**0.803**	0.595	**0.448**	0.970	**0.737**	0.649	**0.593**	0.820
Textile	**0.836**	0.511	**0.491**	0.914	**0.747**	0.630	**0.534**	0.885
Tourism	**0.972**	0.379	**0.656**	0.754	**0.649**	0.778	**0.534**	0.864
Transport equipment	**0.895**	0.453	**0.572**	0.852	**0.627**	0.792	**0.617**	0.771
Transport services	**0.829**	0.541	**0.589**	0.797	**0.761**	0.626	**0.661**	0.748

(continued on next page)

Table 1 *(continued)*

Panel B: P/CF Ratio

Sector	1990–2007		1990–1995		1996–2001		2002–2007	
	Kolmogorov-Smirnov Z	p-value	Kolmogorov-Smirnov Z	p-value	Kolmogorov-Smirnov Z	p-value	Kolmogorov-Smirnov Z	p-value
Agriculture	**1.196**	0.264	**0.595**	0.799	**0.635**	0.793	**0.538**	0.890
Capital goods	**1.005**	0.397	**0.574**	0.802	**0.588**	0.835	**0.607**	0.813
Chemical and petrochemical	**0.865**	0.478	**0.581**	0.810	**0.469**	0.951	**0.639**	0.766
Consumer durables	**0.917**	0.420	**0.576**	0.875	**0.523**	0.916	**0.571**	0.861
Finance	**0.922**	0.433	**0.589**	0.780	**0.553**	0.864	**0.541**	0.910
FMCG	**0.835**	0.532	**0.583**	0.828	**0.591**	0.818	**0.628**	0.793
Healthcare	**0.957**	0.465	**0.539**	0.864	**0.646**	0.748	**0.549**	0.884
Housing-related	**0.988**	0.352	**0.557**	0.881	**0.670**	0.701	**0.602**	0.838
Information technology	**0.985**	0.368	**0.508**	0.912	**0.612**	0.772	**0.547**	0.873
Metal, metal products and mining	**0.885**	0.469	**0.571**	0.820	**0.623**	0.804	**0.500**	0.923
Oil and gas	**0.904**	0.476	**0.629**	0.766	**0.604**	0.824	**0.567**	0.850
Power	**0.880**	0.542	**0.564**	0.802	**0.570**	0.877	**0.518**	0.931
Telecom	**0.850**	0.530	**0.441**	0.976	**0.700**	0.712	**0.613**	0.834
Textile	**0.837**	0.562	**0.551**	0.878	**0.608**	0.838	**0.582**	0.846
Tourism	**0.740**	0.676	**0.687**	0.695	**0.636**	0.804	**0.440**	0.986
Transport equipment	**0.712**	0.684	**0.561**	0.859	**0.565**	0.871	**0.504**	0.909
Transport services	**0.881**	0.473	**0.634**	0.741	**0.645**	0.776	**0.553**	0.895

(continued on next page)

Table 1 *(continued)*

Panel C: P/ BV Ratio

Sector	1990–2007		1990–1995		1996–2001		2002–2007	
	Kolmogorov-Smirnov Z	p-value	Kolmogorov-Smirnov Z	p-value	Kolmogorov-Smirnov Z	p-value	Kolmogorov-Smirnov Z	p-value
Agriculture	**0.983**	0.375	**0.655**	0.721	**0.560**	0.871	**0.579**	0.849
Capital goods	**1.182**	0.253	**0.644**	0.713	**0.661**	0.730	**0.592**	0.853
Chemical and petrochemical	**0.895**	0.461	**0.588**	0.813	**0.544**	0.873	**0.582**	0.839
Consumer durables	**0.946**	0.389	**0.588**	0.851	**0.529**	0.889	**0.644**	0.790
Finance	**0.859**	0.517	**0.623**	0.746	**0.579**	0.868	**0.544**	0.890
FMCG	**0.940**	0.454	**0.599**	0.774	**0.579**	0.847	**0.612**	0.802
Healthcare	**0.992**	0.367	**0.590**	0.785	**0.675**	0.723	**0.504**	0.938
Housing-related	**1.016**	0.375	**0.652**	0.755	**0.685**	0.698	**0.593**	0.830
Information technology	**1.113**	0.283	**0.556**	0.862	**0.641**	0.754	**0.576**	0.855
Metal, metal products and mining	**0.922**	0.398	**0.585**	0.775	**0.696**	0.736	**0.589**	0.850
Oil and gas	**0.905**	0.477	**0.667**	0.700	**0.610**	0.819	**0.543**	0.908
Power	**0.961**	0.413	**0.550**	0.811	**0.606**	0.825	**0.549**	0.897
Telecom	**1.021**	0.261	**0.556**	0.820	**0.645**	0.713	**0.642**	0.793
Textile	**0.986**	0.321	**0.619**	0.775	**0.720**	0.664	**0.545**	0.882
Tourism	**0.666**	0.749	**0.497**	0.958	**0.587**	0.875	**0.505**	0.956
Transport equipment	**0.704**	0.712	**0.632**	0.770	**0.521**	0.924	**0.517**	0.926
Transport services	**0.993**	0.317	**0.556**	0.832	**0.686**	0.720	**0.498**	0.943

(continued on next page)

Table 1 *(continued)*

Panel D: P/ S Ratio

Sector	1990–2007		1990–1995		1996–2001		2002–2007	
	Kolmogorov-Smirnov Z	p-value	Kolmogorov-Smirnov Z	p-value	Kolmogorov-Smirnov Z	p-value	Kolmogorov-Smirnov Z	p-value
Agriculture	**1.208**	0.277	**0.584**	0.807	**0.652**	0.762	**0.551**	0.880
Capital goods	**1.173**	0.240	**0.636**	0.710	**0.647**	0.765	**0.629**	0.796
Chemical and petrochemical	**0.916**	0.439	**0.559**	0.852	**0.484**	0.949	**0.593**	0.810
Consumer durables	**0.927**	0.374	**0.541**	0.921	**0.664**	0.757	**0.628**	0.819
Finance	**0.848**	0.548	**0.589**	0.793	**0.557**	0.876	**0.555**	0.895
FMCG	**0.911**	0.431	**0.516**	0.893	**0.679**	0.707	**0.625**	0.805
Healthcare	**0.987**	0.369	**0.564**	0.818	**0.697**	0.684	**0.495**	0.948
Housing-related	**1.114**	0.314	**8.773**	0.833	**0.668**	0.718	**0.637**	0.777
Information technology	**0.999**	0.347	**0.590**	0.816	**0.661**	0.713	**0.571**	0.868
Metal, metal products and mining	**0.832**	0.536	**0.565**	0.817	**0.588**	0.858	**0.513**	0.926
Oil and gas	**0.899**	0.468	**0.632**	0.788	**0.612**	0.815	**0.504**	0.937
Power	**0.967**	0.398	**0.564**	0.794	**0.632**	0.767	**0.529**	0.908
Telecom	**0.796**	0.644	**0.407**	0.991	**0.713**	0.705	**0.453**	0.984
Textile	**0.843**	0.501	**0.553**	0.867	**0.654**	0.759	**0.531**	0.894
Tourism	**0.798**	0.566	**0.593**	0.834	**0.550**	0.912	**0.538**	0.926
Transport equipment	**0.747**	0.674	**0.585**	0.850	**0.593**	0.830	**0.468**	0.964
Transport services	**0.829**	0.510	**0.530**	0.854	**0.659**	0.761	**0.538**	0.892

Table 2
Descriptive statistics for price multiples

Panel A: P/E Ratio

Sample No.	Sector	1990–2007		1990–1995		1996–2001		2002–2007	
		Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
1	**Agriculture**	10.780	11.256	20.977	21.823	5.437	2.459	9.118	4.433
2	**Capital goods**	16.765	16.162	26.638	21.470	12.480	10.411	15.296	9.123
3	**Chemical and petrochemical**	16.392	14.398	20.613	12.289	14.564	10.862	13.994	9.573
4	**Consumer durables**	15.340	9.841	16.740	7.754	10.471	4.373	21.436	12.145
5	**Finance**	15.786	13.469	25.274	23.885	10.466	5.395	17.894	10.218
6	**FMCG**	22.025	14.630	33.681	22.836	21.594	10.988	18.033	10.137
7	**Healthcare**	19.979	15.236	24.811	21.897	16.622	10.632	22.099	12.230
8	**Housing-related**	17.674	16.008	19.488	11.612	11.595	7.421	22.485	17.111
9	**Information technology**	30.031	23.268	36.892	17.093	35.319	29.093	25.753	12.356
10	**Metal, metal products and mining**	12.894	11.817	19.059	16.036	10.952	7.981	9.580	4.772
11	**Oil and gas**	17.492	15.735	17.492	15.735	11.966	9.388	16.213	15.607
12	**Power**	12.549	12.309	17.648	14.950	11.347	10.647	11.513	5.275
13	**Telecom**	15.579	12.941	23.745	13.030	14.643	13.214	12.441	6.663
14	**Textile**	13.382	10.255	15.791	6.633	11.675	10.722	13.801	9.520
15	**Tourism**	24.731	20.341	27.288	16.912	12.591	4.445	35.466	22.311
16	**Transport equipment**	18.412	12.859	25.072	16.032	14.764	6.829	16.766	7.748
17	**Transport services**	8.176	7.120	9.310	4.671	6.277	5.035	8.508	6.528

(continued on next page)

Table 2 *(continued)*

Panel B: P/CF Ratio

Sample No.	Sector	1990–2007		1990–1995		1996–2001		2002–2007	
		Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
1	**Agriculture**	7.580	10.703	16.249	18.465	3.132	1.165	5.011	3.221
2	**Capital goods**	10.436	11.266	16.783	16.134	5.364	3.031	10.876	7.839
3	**Chemical and petrochemical**	10.291	7.241	13.537	6.855	7.499	3.069	9.940	6.715
4	**Consumer durables**	9.264	6.107	11.472	4.912	6.452	2.476	11.598	8.086
5	**Finance**	13.332	12.121	21.174	21.059	8.337	4.310	15.645	9.497
6	**FMCG**	17.749	11.849	25.033	15.793	17.604	9.073	14.453	8.167
7	**Healthcare**	16.708	17.138	20.074	18.776	16.725	16.701	16.233	8.173
8	**Housing-related**	9.234	9.130	9.397	4.896	5.491	2.468	12.042	11.007
9	**Information technology**	20.588	16.704	17.244	7.575	27.044	26.292	17.541	4.990
10	**Metal, metal products and mining**	7.819	6.150	11.107	6.862	6.155	4.271	6.962	3.625
11	**Oil and gas**	10.837	8.540	21.604	10.786	7.270	5.024	8.218	5.135
12	**Power**	6.506	6.239	12.261	10.928	4.558	2.422	6.201	3.714
13	**Telecom**	11.797	11.010	17.932	9.872	12.449	12.623	7.460	3.669
14	**Textile**	7.165	5.266	9.710	4.330	4.103	1.973	8.218	5.958
15	**Tourism**	15.301	10.895	21.312	15.846	9.211	2.885	16.231	6.309
16	**Transport equipment**	10.294	5.843	13.566	7.207	7.769	2.817	10.294	4.493
17	**Transport services**	4.385	3.288	6.197	3.564	3.443	2.153	4.057	2.146

(continued on next page)

Table 2 *(continued)*

Panel C: P/BV Ratio

Sample No.	Sector	1990–2007		1990–1995		1996–2001		2002–2007	
		Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
1	**Agriculture**	1.562	1.570	2.695	1.970	0.880	0.634	1.341	0.922
2	**Capital goods**	3.119	4.879	5.885	7.024	1.056	0.740	3.221	2.844
3	**Chemical and petrochemical**	3.298	3.924	7.849	7.591	1.746	0.697	2.855	1.783
4	**Consumer durables**	2.634	2.362	3.025	2.472	1.525	0.747	3.650	3.207
5	**Finance**	2.215	1.774	4.014	3.579	1.444	0.619	2.408	1.269
6	**FMCG**	6.086	5.991	9.042	4.699	4.259	1.860	6.470	6.258
7	**Healthcare**	4.457	4.891	6.222	8.975	3.504	2.835	4.172	2.051
8	**Housing-related**	2.374	2.740	3.203	2.059	0.935	0.568	3.105	3.172
9	**Information technology**	7.343	8.604	4.437	2.072	11.920	13.325	4.999	1.529
10	**Metal, metal products and mining**	1.758	1.550	2.805	1.799	0.902	0.513	1.835	1.113
11	**Oil and gas**	2.459	2.148	4.816	3.182	1.408	0.715	2.227	1.456
12	**Power**	1.458	1.491	3.513	2.749	0.909	0.441	1.266	0.743
13	**Telecom**	2.421	2.543	5.813	3.032	2.193	1.954	1.076	0.706
14	**Textile**	1.694	1.567	3.161	1.968	0.790	0.481	1.429	1.007
15	**Tourism**	3.313	2.555	5.629	3.072	2.192	1.468	2.422	1.621
16	**Transport equipment**	3.400	1.991	4.309	1.959	2.440	1.164	3.614	1.634
17	**Transport services**	1.719	1.724	2.399	1.499	1.126	0.809	1.906	1.454

(continued on next page)

Table 2 *(continued)*

Panel D: P/S Ratio

Sample No.	Sector	1990–2007		1990–1995		1996–2001		2002–2007	
		Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
1	**Agriculture**	0.786	1.136	1.901	1.854	0.308	0.150	0.507	0.344
2	**Capital goods**	1.660	3.275	3.824	5.585	0.475	0.268	1.376	1.264
3	**Chemical and petrochemical**	1.099	1.264	2.382	2.339	0.582	0.221	1.035	0.681
4	**Consumer durables**	0.662	0.604	1.435	0.430	0.560	0.316	0.549	0.459
5	**Finance**	3.816	4.243	6.891	6.484	1.840	0.898	5.177	3.811
6	**FMCG**	1.579	1.124	2.066	0.940	1.168	0.501	1.726	1.115
7	**Healthcare**	2.510	2.492	3.173	4.284	1.963	1.419	2.871	1.438
8	**Housing-related**	1.537	2.996	1.021	0.606	0.454	0.271	2.937	4.400
9	**Information technology**	5.111	5.749	4.457	2.184	7.639	9.196	3.893	1.004
10	**Metal, metal products and mining**	1.164	0.913	1.478	0.812	0.854	0.425	1.271	0.770
11	**Oil and gas**	2.267	3.456	1.926	1.535	2.578	3.880	1.588	1.027
12	**Power**	1.410	1.325	2.181	1.799	1.093	0.673	1.453	0.835
13	**Telecom**	2.047	1.880	2.862	1.265	2.422	2.524	1.245	0.574
14	**Textile**	1.163	0.864	1.489	0.834	0.691	0.382	1.355	0.989
15	**Tourism**	3.422	1.926	4.230	2.321	2.847	1.276	3.260	1.785
16	**Transport equipment**	0.980	0.587	1.108	0.567	0.761	0.329	1.141	0.511
17	**Transport services**	1.674	1.787	2.823	1.271	0.887	0.563	2.088	1.982

We next analyse the relationship between mean price multiples and the mean standard deviation of these multiples using the Spearman Rank correlation coefficient for all of the sample periods as depicted in Table 3. We find that sectors that have high mean price multiples also have high standard deviations. This suggests that sectors with high price multiples also tend to exhibit higher volatility in these multiples. Thus, while forecasting price multiples, high-price-multiple sectors may generally have greater price forecast errors, which is confirmed by Sehgal and Pandey (2009) in the Indian context.

Table 3
Correlation between mean and standard deviation for sectoral data

Period/ multiples	P/E	P/CF	P/BV	P/S
1990–2007	0.846	0.819	0.868	0.843
1990–1995	0.782	0.767	0.846	0.853
1996–2001	0.706	0.875	0.880	0.958
2002–2007	0.897	0.757	0.887	0.882

DETERMINANTS OF PRICE MULTIPLES

Model Specification and Estimation

In this section, we study the relationship between price multiples and their fundamental determinants. Using the discounted cash flow (DCF) approach, the equity value should be a function of three variables-its capacity to generate cash flows for equity holders, its expected growth in these cash flows, and the uncertainty associated with these cash flows. To understand the relationship between price multiples and their determinants, we use a simple discounted cash flow model provided by Gordon (1962) which is a stable growth dividend discount model. The value of equity is:

$$\text{Value of equity} = Po = \text{DPS}_1/k_e - g, \quad (1)$$

where DPS_1 is the expected dividend next year, k_e is the cost of equity and g is the expected stable growth rate.

Dividing both side of equation (1) by the current earnings, we obtain the discounted cash flow equation, specifying the price-to-equity ratio for a stable-growth firm:

$$\text{Po/EPS}_0 = \text{P/E} = \text{Payout ratio}*(1 + g)/k_e - g. \quad (2)$$

Equation (2) can be rearranged as:

$$\text{Po} = \text{EPS}_0 * \text{Payout ratio}*(1 + g)/k_e - g. \quad (3)$$

Dividing equation (3) by cashflows on both sides, we can estimate the price-to-cash flow ratio as:

$$\text{Po/CFo} = \text{PC/F} = (\text{EPS}_0/\text{CFo})*\text{Payout ratio}*(1 + g)/k_e - g. \quad (4)$$

Similarly, dividing equation (3) by book value, we get the price-to-book value equation:

$$\text{Po/BVo} = \text{PB/V} = \text{ROE}*\text{Payout ratio}*(1 + g)/k_e - g, \quad (5)$$

where ROE is return on equity.

Finally, we estimate the price-to-sales ratio by dividing equation (3) by net sales on both sides:

$$\text{Po/Sales} = \text{P/S} = (\text{NPM})*\text{Payout ratio}*(1 + g)/k_e - g, \quad (6)$$

where NPM is net profit margin.

We can see that P/E is a function of growth, risk and payout ratio, while P/CF, P/BV and P/S require EPS/CF, ROE, and NPM as additional variables, respectively. Theoretically, dividend payout and growth rate should be positively correlated with P/E (as well as P/CF, P/BV and P/S), while higher risk should lead to lower price multiples. In addition, higher EPS/CF, ROE and NPM should positively impact P/CF, P/BV and P/S ratios in the given order. In our analysis, we have added the natural logarithm of size as an additional determinant for all four price multiples.

We employ multiple regression analysis for our purpose as shown below:

$$\text{P/E} = a + b_1 \text{ payout} + b_2 \text{ growth} + b_3 \text{ risk} + b_4 \text{ size} + e_i, \quad (7)$$

$$\text{P/CF} = a + b_1 (\text{EPS/CF}) + b_2 \text{ payout} + b_3 \text{ growth} + b_4 \text{ risk} + b_5 \text{ size} + e_i, \quad (8)$$

$$\text{P/BV} = a + b_1 \text{ ROE} + b_2 \text{ payout} + b_3 \text{ growth} + b_4 \text{ risk} + b_5 \text{ size} + e_i, \quad (9)$$

$$\text{P/Sales} = a + b_1 \text{ NPM} + b_2 \text{ payout} + b_3 \text{ growth} + b_4 \text{ risk} + b_5 \text{ size} + e_i, \quad (10)$$

where the growth rate was calculated as the compounded annual growth rate of EPS over the sample period, risk in our study was defined as the standard deviation of the EPS of individual companies for the period under study, and the market capitalisation of individual companies was taken as a proxy for size. We define size as market capitalisation (price times the number of shares outstanding). As in previous research, the size variable shall act as a proxy for all other information variables that we explicitly fail to incorporate, given the framework of Gordon Model and the fact that there is a pronounced size effect in emerging markets including India (Fama-French, 1998; Sehgal & Tripathy, 2003).

We run both sector regressions as well as market regressions only for the total period to test a long-term structural relationship between price multiples and their determinants. We take the simple average of price multiples and their determinants for each company over the sample and use them for estimating the regressions. We perform cross correlations (using Pearson's Correlation Coefficient) between the fundamental determinants to detect any multi-collinearity. We employ transformed variables in our main regressions (equations 7, 8, 9 and 10) wherever we find significant overlapping (at a 5% level of significance) between the explanatory variables. We generate transformed variables by running auxiliary regressions between the overlapping variables, say, X and X1, and use the error distribution of the regression as an independent variable, replacing X1 in our main regressions.

It is interesting to note that in India, the BSE Sensex 30 companies represent a major part of the investment analyst universe. These companies account for 48% of total market capitalisation and about 74% of the trading activity on the BSE. They also evoke large institutional interest and represent about 25% of FII purchases and sales portfolios. These securities also regularly appear on mutual funds' top 25 asset allocation lists. Given the institutional interest supported by large trading volumes, these companies experience better price discovery, and their price multiples are hence expected to exhibit a stronger relationship with their fundamental determinants. We re-estimate the market regressions for only Sensex companies to verify our beliefs.

Finally, we try to understand how sensitive the price multiples are to market conditions, i.e., whether these price multiples tend to shift up (down) during market upturns (downturns). We run a simple regression of price multiples on a dummy variable in the form

$$Pt = Y_0 + Y_1 Dt, \qquad (11)$$

where Pt = Price Multiples, Dt is equal to 1 if there is a market upturn and is equal to 0 otherwise.

While 'upturn' is defined as the year in which the average market return (BSE Sensex) is greater than the average annual market return over the total period, other years shall qualify as downturn periods. The slope (Y_1) of the regression shows the difference between price multiples for the upturn and downturn periods.

Empirical Results

We find that relationships between price multiples and their determinants are relatively stronger over the total period, as shown in Table 4, in comparison to sub-periods (results not shown in the paper). Our results suggest that such relationships should be estimated and interpreted for long time periods. Using sector regressions involving P/E and its determinants, we find that adjusted R^2 is greater than 30% for only 7 out of 14 sample sectors. Moreover, the determinants do not seem to exhibit hypothesised relationship with P/E, as reflected by the sign as well as the significance of their t-statistics. The results for the P/CF ratio are slightly better than those for the P/E ratios. We cover only 13 sectors for other price multiples. The Power sector is excluded, owing to the insufficiency of data for the sample companies. The results for P/BV and P/S are much stronger. In the case of P/BV, the adjusted R^2 of all the sectors except Finance was more than 30%, while in the case of P/S, only the Agriculture sector had an adjusted R^2 of less than 30%. The theoretical relationship between P/CF, P/BV, P/S and their determinants continue to be questionable as in the case of the P/E ratio. Our results can be mainly attributed to an empirically weak relationship between price multiples and their fundamental determinants. They may also partially be caused by micro-numerosity (low degrees of freedom), owing to the limited number of companies in our sector regressions.

We next aggregate data for all sample sectors and run a market regression. The market regression results suggest that there is some relationship between P/BV and its determinants (as shown by an adjusted R^2 greater than 30%). Similar results for P/E P/CF and P/S are very weak, thus suggesting that fundamental models may not be a good way to predict these price multiples. Our results can possibly be attributed to the fact that the Indian stock market has limited width, with only the top 30–40 companies tracked by analysts and regularly traded by institutional investors. We also report market regression results separately estimated only for BSE Sensex stocks. Our findings confirm that both the P/BV as well as the P/S ratios shows a much stronger relationship with their fundamental determinants in the case of large, well-established companies. It is well known that market analysts tend to use both of these ratios

Table 4
Relationship between price multiples and their determinants for the total period (1990–2007)

Panel A: P/E Ratio

Sector\Market	Intercept	Dividend payout (%)	EPS (%)	EPS (S.D.)	MCAP (log)	Adjusted R^2
Power (Coefficient)	8.176	0.187	0.000	–0.148	0.153	0.358
t-Stat	8.145	2.901	65.535	–1.808	0.748	
Agriculture (Coefficient)	4.931	–0.148	–0.331	0.199	1.966	0.198
t-Stat	0.883	–2.455	–2.190	1.324	1.720	
Capital Goods (Coefficient)	6.918	–0.008	–0.304	–0.003	2.046	0.025
t-Stat	0.987	–0.207	–1.460	–0.121	1.535	
Chemical (Coefficient)	–12.291	–0.061	0.043	0.113	5.303	0.625
t-Stat	–1.630	–1.413	0.577	1.621	3.938	
Finance (Coefficient)	31.913	–0.236	0.126	0.352	–2.068	0.038
t-Stat	3.048	–1.141	1.238	1.301	–1.387	
FMCG (Coefficient)	21.008	–0.001	0.070	–0.376	–0.856	–0.355
t-Stat	1.901	–0.640	0.218	–0.547	–0.357	
Health (Coefficient)	11.408	0.112	–0.141	0.029	0.565	0.176
t-Stat	1.963	1.302	–0.888	0.476	0.799	
Housing (Coefficient)	15.319	–0.576	0.643	0.117	2.896	0.501
t-Stat	1.685	–2.903	2.199	2.180	1.666	
IT (Coefficient)	68.924	0.211	–0.390	–1.097	–5.410	0.215
t-Stat	1.160	1.342	–0.550	–1.794	–0.599	
Metal (Coefficient)	4.906	0.000	0.102	0.027	1.101	–0.222
t-Stat	0.705	0.005	0.558	0.490	1.150	

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Table 4 *(continued)*

Sector\Market	Intercept	Dividend payout (%)	EPS (%)	EPS (S.D.)	MCAP (log)	Adjusted R^2
Oil (Coefficient)	47.898	0.004	–0.055	–0.001	–3.991	–0.023
t-Stat	2.490	0.031	–0.182	–0.082	–1.300	
Textile (Coefficient)	–11.781	0.091	–0.026	–0.097	4.204	0.722
t-Stat	–1.936	0.746	–0.135	–0.102	2.509	
Transport Equipment (Coefficient)	8.819	0.000	–0.075	–0.237	2.025	0.095
t-Stat	0.955	0.012	–0.441	–0.523	1.471	
Transport Services (Coefficient)	2.356	0.144	0.311	0.187	–0.219	0.846
t-Stat	0.835	3.387	4.355	4.119	–0.471	
Market (Coefficient)	11.370	0.029	0.012	–0.006	0.713	0.034
t-Stat	4.004	1.730	0.220	–1.157	1.483	
BSE Sensex (Coefficient)	13.246	0.043	0.131	0.072	–0.240	0.099
t-Stat	1.339	2.364	1.324	1.412	–0.202	

(continued on next page)

Table 4 *(continued)*

Panel B: P/CF Ratio

Sector\Market	Intercept	Dividend payout (%)	EPS (%)	EPS (S.D.)	MCAP (log)	Adjusted R^2
Power (Coefficient)	6.182	–0.062	–0.132	0.056	0.734	–1.747
t-Stat	0.703	–1.139	–1.028	0.400	0.757	–0.113
Agriculture (Coefficient)	5.395	0.005	–0.168	–0.004	1.147	–1.642
t-Stat	0.718	0.235	–1.475	–0.261	1.576	–0.151
Capital Goods (Coefficient)	2.622	0.007	-0.018	–0.039	0.439	–6.170
t-Stat	1.709	0.772	–1.575	–3.711	2.122	–3.791
Chemical (Coefficient)	–702.183	2043.929	0.131	0.377	–2.019	16.768
t-Stat	–0.685	0.715	1.470	1.398	–1.399	0.715
Finance (Coefficient)	5.439	0.000	–0.062	–0.371	–0.149	23.101
t-Stat	0.229	–0.153	–0.184	–0.507	–0.060	0.539
FMCG (Coefficient)	21.902	0.246	–0.207	0.058	0.625	–30.263
t-Stat	2.591	4.610	–1.991	1.557	1.327	–2.297
Health (Coefficient)	7.637	–0.242	0.289	0.054	0.747	5.770
t-Stat	1.200	–2.076	1.865	1.886	0.803	0.737
Housing (Coefficient)	–3.074	0.127	–0.250	–0.593	–1.215	–9.281
t-Stat	–0.046	1.635	–0.659	–1.902	–0.278	–0.528
IT (Coefficient)	1.388	0.011	0.091	0.035	0.268	–0.090
t-Stat	0.261	0.176	0.640	0.890	0.385	–0.973
Metal (Coefficient)	6.182	–0.062	–0.132	0.056	0.734	–1.747
t-Stat	0.703	–1.139	–1.028	0.400	0.757	–0.113

(continued on next page)

Table 4 *(continued)*

Sector\Market	Intercept	Dividend payout (%)	EPS (%)	EPS (S.D.)	MCAP (log)	Adjusted R^2
Oil (Coefficient)	7.711	0.064	0.206	0.006	–4.011	52.490
t-Stat	0.394	0.639	0.556	0.563	–1.751	1.670
Textile (Coefficient)	5.407	0.258	–0.087	–0.365	0.911	–13.494
t-Stat	1.434	4.641	–1.334	–1.146	1.524	–2.607
Transport Equipment (Coefficient)	–1.173	0.009	–0.024	–0.119	1.703	2.943
t-Stat	–0.181	0.698	–0.265	–0.515	2.432	0.302
Transport Services (Coefficient)	–0.728	0.096	–0.026	0.100	0.293	6.159
t-Stat	–0.421	3.707	–0.824	5.173	1.360	1.055
Market (Coefficient)	–0.898	0.030	0.003	–0.004	0.569	12.633
t-Stat	–0.291	2.226	0.060	–0.996	1.526	2.858
BSE Sensex (Coefficient)	–2.138	0.034	0.151	0.068	–0.193	16.598
t-Stat	–0.193	2.220	1.936	1.682	–0.205	1.499

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Table 4 *(continued)*

Panel C: P/BV Ratio

Sector\Market	Intercept	Dividend payout (%)	EPS (%)	EPS (S.D.)	MCAP (log)	Adjusted R^2
Power (Coefficient)	23.263	–0.088	–0.292	0.068	0.223	–0.622
t-Stat	4.860	–2.777	–4.014	0.880	0.336	–4.613
Agriculture (Coefficient)	0.143	0.003	–0.031	0.012	0.128	0.078
t-Stat	0.058	0.451	–0.721	2.195	0.434	1.006
Capital Goods (Coefficient)	–0.404	0.090	–0.139	–0.136	1.324	–0.373
t-Stat	–0.074	1.850	–2.448	–2.794	1.449	–2.460
Chemical (Coefficient)	3.431	–0.046	0.028	0.080	–0.265	0.038
t-Stat	1.983	–1.587	2.021	2.003	–1.256	0.457
Finance (Coefficient)	3.699	0.000	–0.018	–0.102	0.212	0.137
t-Stat	0.619	–0.150	–0.116	–0.322	0.166	0.597
FMCG (Coefficient)	3.917	0.023	–0.134	0.029	0.445	–0.099
t-Stat	1.556	1.242	–3.405	2.218	2.346	–1.023
Health (Coefficient)	0.859	–0.042	0.050	0.013	0.263	0.050
t-Stat	0.559	–1.799	1.476	2.094	1.149	1.259
Housing (Coefficient)	8.687	0.072	–0.036	–0.297	0.233	–0.147
t-Stat	0.653	1.974	–0.250	–2.270	0.124	–0.912
IT (Coefficient)	–0.536	0.013	0.015	0.002	0.112	0.055
t-Stat	–0.453	1.383	0.593	0.318	0.838	1.183
Metal (Coefficient)	23.263	–0.088	–0.292	0.068	0.223	–0.622
t-Stat	4.860	–2.777	–4.014	0.880	0.336	–4.613

(continued on next page)

Table 4 *(continued)*

Sector\Market	Intercept	Dividend payout (%)	EPS (%)	EPS (S.D.)	MCAP (log)	Adjusted R^2
Oil (Coefficient)	3.759	0.012	0.021	0.001	–0.563	0.116
t-Stat	2.801	1.287	1.132	0.916	–2.918	2.968
Textile (Coefficient)	–0.749	0.054	–0.002	–0.094	0.280	0.011
t-Stat	–0.885	4.617	–0.139	–1.110	1.511	0.725
Transport Equipment (Coefficient)	–7.258	–0.013	0.023	–0.124	1.007	0.279
t-Stat	–2.698	–1.994	0.789	–1.884	3.157	4.584
Transport Services (Coefficient)	1.164	0.091	–0.024	0.022	–0.047	–0.137
t-Stat	0.263	0.842	–0.322	0.937	–0.136	–0.434
Market (Coefficient)	–0.998	0.016	–0.013	–0.002	0.199	0.116
t-Stat	–1.089	3.202	–0.891	–1.291	1.579	4.238
BSE Sensex (Coefficient)	–3.389	0.008	0.018	0.023	0.009	0.266
t-Stat	–0.794	0.862	0.524	1.261	0.021	2.930

(continued on next page)

Table 4 *(continued)*

Panel D: P/S Ratio

Sector\Market	Intercept	Dividend payout (%)	EPS (%)	EPS (S.D.)	MCAP (log)	Adjusted R^2
Power (Coefficient)	0.485	–0.004	0.000	–0.028	0.127	–0.012
t-Stat	0.519	–0.371	–0.017	–0.962	0.653	–0.143
Agriculture (Coefficient)	–0.172	0.001	–0.006	0.002	0.070	0.115
t-Stat	–0.387	0.350	–0.445	1.006	0.880	17.718
Capital Goods (Coefficient)	–0.840	–0.006	–0.003	–0.018	0.413	–0.011
t-Stat	–1.060	–1.228	–0.354	–2.352	2.841	–5.793
Chemical (Coefficient)	17.703	–0.074	0.025	0.104	–1.806	0.154
t-Stat	7.334	–1.268	1.069	1.477	–5.312	3.432
Finance (Coefficient)	2.081	0.000	–0.011	–0.059	–0.130	–0.050
t-Stat	1.127	–0.643	–0.320	–0.765	–0.321	–0.280
FMCG (Coefficient)	–0.529	–0.003	–0.048	0.011	0.000	0.283
t-Stat	–0.704	–0.266	–2.909	1.747	65.535	4.427
Health (Coefficient)	7.898	–0.108	0.171	0.028	–0.855	0.083
t-Stat	3.742	–1.633	2.545	2.180	–2.078	0.399
Housing (Coefficient)	4.491	0.044	–0.023	–0.140	–0.397	0.137
t-Stat	0.958	3.532	–0.407	–2.859	–0.549	5.143
IT (Coefficient)	–1.032	0.011	–0.016	0.019	0.198	–0.001
t-Stat	–1.881	2.225	–1.085	1.940	2.540	–0.818
Metal (Coefficient)	0.485	–0.004	0.000	–0.028	0.127	–0.012
t-Stat	0.519	–0.371	–0.017	–0.962	0.653	–0.143

(continued on next page)

Table 4 *(continued)*

Sector\Market	Intercept	Dividend payout (%)	EPS (%)	EPS (S.D.)	MCAP (log)	Adjusted R^2
Oil (Coefficient)	2.196	0.017	0.021	0.000	–0.329	0.046
t-Stat	1.772	2.140	1.185	0.087	–1.794	12.616
Textile (Coefficient)	–1.574	0.088	0.017	–0.212	0.351	0.095
t-Stat	–3.145	7.984	1.159	–2.655	2.988	4.796
Transport Equipment (Coefficient)	–0.711	0.000	–0.004	–0.014	0.124	0.160
t-Stat	–0.841	0.250	–0.337	–0.411	1.236	2.858
Transport Services (Coefficient)	–1.137	0.019	0.013	0.022	0.076	0.066
t-Stat	–6.162	10.589	4.130	11.196	3.688	7.140
Market (Coefficient)	1.032	0.012	0.025	–0.001	0.003	0.010
t-Stat	1.437	3.002	1.800	–0.725	0.025	3.309
BSE Sensex (Coefficient)	–0.694	0.014	0.033	0.022	–0.124	0.141
t-Stat	–0.238	3.187	1.354	1.754	–0.386	4.924

for corporate valuations (including those for mergers and acquisition deals). However, the P/E and P/CF do not reflect the fundamentals, even for our limited universe (BSE Sensex Stocks). This may imply that earnings multiples are likely more driven by sentiments, due to the actions of noise traders[9], than by fundamentals, which influence the behaviour of value traders. Further, earnings are bottom-line numbers and are impacted by accounting policies and judgment. Cash earnings tend to provide comparatively better results than accounting earnings, probably owing to a greater consistency in their estimation.

We also examine whether price multiples are sensitive to market conditions. Our dummy variable regression results are shown in Table 5. On a one-tail basis (at 10% level of significance), 11 or more out of the 14 sectors tend to exhibit higher price multiples during market upturns. The power sector is an exception, for which none the price multiples seems to shift with market conditions. Interestingly, the three sectors with non-sensitive P/E ratios, i.e., power, transport services and housing, deal with infrastructure.

Table 5
Sensitivity of price multiples to market conditions for total period (1990–2007)

Sectors	P/E	P/CF	P/BV	P/S
Power (Coefficient)	1.339	1.211	0.577	–0.102
t-Stat	0.373	0.413	0.802	(0.185)
Agriculture (Coefficient)	11.345	10.306	1.594	1.071
t-Stat	2.326	2.610	2.662	2.370
Capital Goods (Coefficient)	10.151	10.755	4.891	3.456
t-Stat	1.591	2.049	1.894	1.602
Chemical (Coefficient)	8.695	4.713	2.837	0.789
t-Stat	2.218	1.822	2.020	1.695
Finance (Coefficient)	15.063	13.233	2.502	5.056
t-Stat	1.999	1.905	2.029	1.900
FMCG (Coefficient)	8.369	6.735	2.731	0.679
t-Stat	1.669	1.466	1.304	1.738
Health (Coefficient)	8.709	5.381	4.026	1.586
t-Stat	1.718	1.043	1.738	1.501
Housing (Coefficient)	4.070	4.802	1.513	0.041
t-Stat	0.826	1.386	1.391	0.028
IT (Coefficient)	16.927	9.219	3.434	3.007
t-Stat	2.324	1.370	0.917	1.280
Metal (Coefficient)	12.006	6.099	2.511	0.835
t-Stat	2.608	1.865	2.171	1.774
Oil (Coefficient)	13.770	10.891	2.543	0.568
t-Stat	1.532	1.931	1.735	0.378
Textile (Coefficient)	5.077	3.875	1.529	0.642
t-Stat	1.519	1.793	2.248	1.766
Transport Equipment (Coefficient)	7.251	4.445	1.567	0.360
t-Stat	1.767	2.040	2.538	2.047
Transport Services (Coefficient)	1.134	2.053	1.117	1.078
t-Stat	0.647	1.477	1.951	1.675

CONCLUSION

In this paper, we analyse the time-series behaviour of price multiples in India from 1990–2007. The price multiple distributions tend to be normal over our study period, thus making the mean and standard deviation of these multiples relevant parameters for equity analysis in the Indian context. The mean price multiple for a company can be compared to the mean sector multiple to detect any under or overvaluation of a sample stock. We also find that sectors with higher price multiples exhibit greater volatility in these multiples. This may result in higher price forecast errors for high-price multiple sectors, as is shown by Sehgal and Pandey (2009).

Next, we tested the relationship between price multiples and their fundamental determinants. Using both sector regressions as well as a market regression (involving 148 companies), we find that fundamentals-based models are not good descriptors of price multiples except in the case of P/BV ratio where our results are somewhat encouraging. Further, such relationships are better estimated over a longer time period, such as 15 or more years. We re-estimate our regressions only for the BSE Sensex 30 stocks, on the premise that fundamental relationships should hold better for large and heavily traded companies. We find that while P/BV and P/S ratios reasonably reflect the corporate fundamentals, the earnings multiples continue to bear a very weak relationship with them. This may be due to the fact that earnings multiples are more driven by sentiments due to the actions of noise traders than by fundamentals, which influence the behaviour of value traders. Furthermore, earnings are being bottom line numbers and suffer from accounting biases in judgments.

The price multiples also tend to be higher during market upturns, with the exception of a few infrastructure-related sectors. In conclusion, we suggest that linear cross-sectional fundamental models may not be a good way to predict price multiples in India. It could be that price multiples exhibit a non-linear relationship with corporate fundamentals. Alternatively, a time-series analysis of price multiples may provide better estimates of future price multiples. However, these issues need to be empirically examined in future work. Our findings are extremely relevant for portfolio managers, investment analysts as well as institutional and individual players who regularly use information about price multiples to detect any misvaluation and develop trading strategies thereon. It is also pertinent for financial regulators who use price multiples to gauge the level of a market as well as investor sentiment and realign their policy interventions. Our results contribute to emerging market literature in the field of equity valuation and have implications for portfolio analysis and management in the Indian context. For a global investing purpose, it will be interesting to compare our results with those for other world markets, especially emerging economies.

NOTES

1. National Stock Exchange of India (NSE) is India's largest stock exchange in terms of transactions. Located in Mumbai, NSE was promoted by leading financial institutions at the behest of the Government of India and was incorporated in November 1992 as a tax-paying company. The exchange's products include equities, exchange-traded funds, stock futures, index futures, interest rate futures and options.
2. The Bombay Stock Exchange Sensitive Index (BSE Sensex) is a value-weighted index composed of 30 stocks starting in April 1984. It consists of the 30 largest and most actively traded stocks that are representative of their various sectors on the Bombay Stock Exchange. These companies account for around one-fifth of the market capitalisation of the BSE.
3. The Bombay Stock Exchange Limited constructed a new index, christened BSE-500, consisting of 500 scrips with effect from 9 August 1999. The BSE-500 index represents nearly 93% of the total market capitalisation on the BSE. BSE-500 covers all 20 major industries of the economy. In line with other BSE indices, effective 16 August 2005, the calculation methodology was shifted to the free-float methodology.
4. In the Indian context, large-cap is a term used by the investment community to refer to companies with a market capitalisation value of more than USD5 billion. Large cap is an abbreviation of the term "large market capitalisation". Market capitalisation is calculated by multiplying the number of a company's shares outstanding by its stock price per share.
5. Capitaline Plus provides fundamental and market data on more than 20,000 Indian listed and unlisted companies, classified under more than 300 industries, along with powerful analytic tools. Extensive data and analysis on every company profile, directors, more than 10-year financials (P&L, balance sheet, cash flow, consolidated financial data, segment data, forex data, R&D data, ratios, etc.), quarterly results, ownership patterns, finished products, raw materials, share price data, a directors' report, management discussion, notes to one's account, business news, corporate events, etc.
6. Financial year is a period used for calculating annual (yearly) financial statements in businesses and other organisations. In many jurisdictions, regulatory laws regarding accounting and taxation require such a reports once per twelve months, but they do not require that the period reported on constitutes a calendar year (i.e., January through December). Fiscal years vary between businesses and countries. In India the government's financial year runs from 1 April to 31 March.
7. We ignore negative price multiples in our research. This may bias our price multiple distributions to be positively skewed. Further, the upper cap on price multiples might have limited the outliers in our observed sample.
8. These are investors who use corporate fundamentals to estimate investment values. They generally indulge in medium to long-term investment decisions.
9. They ignore corporate fundamentals and instead concentrate on past price and volume patterns. They generally indulge in short-term investment decisions, which may be speculative in nature.

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