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Financial Perspective of Mergers and Acquisitions: A Study from Indian Pharmaceutical Sector

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Abstract

It is an attempt to analyze the financial effectiveness of acquisition decisions in Indian pharmaceutical sector during 2002-2004. The performance impact of acquisition decisions on acquirer firms is viewed from shareholders' as well as firms' perspective. Event-study approach is used to analyze accumulation of shareholders'-wealth, considering -60 +60 days event-window and a clean period of 200 days. For the longterm performance impact, comparative analysis for three-yearly pre and post-period performance is attempted considering profitability, liquidity, solvency and growth parameters. Relative efficiency of the sample firms to utilize the pooled resources is further attempted, using data envelopment analysis (DEA), to ascertain whether acquisition decisions uniformly affect all acquirers or the effect differs from firm to firm. Findings appear to be on expected lines. Abnormal returns are observed around announcement date with no negative impact on profitability, liquidity, solvency, efficiency and growth parameters in the long run.

***Keywords** : acquisition performance, abnormal wealth, event-study, long-term financial performance, data envelopment analysis, relative efficiency.*

Introduction

Mergers and acquisitions, in present business environment, are vital corporate strategies for rapid growth and development. The phenomenon of corporate restructuring via mergers and acquisitions began in the western countries of Europe and America, with the emergence of first mergers wave (1897-1904) in US. Following the wave of globalization, liberalization and deregulation, the phenomenon soon gained the global status. In post-90's, substantial changes were observed in the mergers and acquisitions scenario worldwide; annual growth rate of 20.8% during 1985-1999 (in total recorded mergers deals value) rises to 35.7% from 1992-1999 (Pryor 2001). In 2004, thirty thousand acquisitions (valuing $1900 billion exceeding the GDP of several large countries) were completed globally, equivalent to one transaction every 18 minutes (Cartwright and Schoenberg, 2006).

In India, mergers and acquisitions gained prominence during post-reforms era (Khanna, 1998; Basant, 2000; Pavaskar, 2001; Mantravadi and Reddy, 2007; Kumar and Rajib, 2007; Ramakrishanan, 2008). Following the post-reforms era, the spate in mergers and acquisitions activities has been observed almost across all the sectors.

Indian pharmaceutical sector, owing to favourable regulatory environment, easy availability of resources, strong fundamental talent pool, have always remained a favourable destination for mergers and acquisitions activities, both for buyers and sellers. According to CMIE database PROWESS, out of 591 companies, 200 have undergone restructuring via mergers and acquisitions from 1995-2007. With a notable growth-rate of 8 per cent, India ranks third among the global producers in pharmaceuticals contributing 10 per cent in global production and fourteenth in terms of value (1.5 per cent in global share). According to the Mackinsey and Company's report pharmaceutical industry in India is expected to touch USD 40 billion by 2015 just double of its present value (USD 20 billion).

In spite of the uprising trend in mergers and acquisitions in Indian pharmaceutical sectors, during the last two decades, research work on post-acquisition performance concerning Indian pharmaceutical sector seems to be inadequate. With the favourable regulations, government initiative to provide access of life-saving drugs to its inhabitants, rising demand for innovative drugs by affluent class of consumers, low manufacturing cost and availability of talent pool, the future prospect of mergers and acquisitions in this sectors seems to be quite bright. With the hopeful expectations for mergers and acquisitions activities in coming years, a comprehensive study providing an insight of post-acquisition performance merits consideration.

Albeit the rising trend, the performance-outcome of mergers and acquisitions decisions, particularly from acquirer firms perspective is not very promising (Scherer, 1988; Agrawal et al., 1992; Hubbard, 1999; Bruner, 2004, Cartwright and Schoenberg, 2006). In the backdrop of the inconsistent findings of performance studies, this study is an attempt to analyze the performance impact of acquisition from acquirer firms' perspective. Unlike the earlier studies, where either short-term or long-term performance is the prime focus, present study aims at analyzing the financial viability (long-term and short-term) of acquisitions decisions. The shareholders' wealth is taken as a criterion to assess the short-term perspective and for long-term financial aspects of mergers and acquisitions, profitability, solvency, liquidity and growth parameters are analyzed. Further, relative efficiency of firms to utilize available resources is also attempted to find out the efficient and inefficient acquirers.

Observing the rising trend in the Indian pharmaceutical sector during mid-2002 which was in sharp contrast with decline worldwide (Mazumdar, Rajeev and Ray, 2009), the study focuses on the mergers and acquisitions of Indian pharmaceutical sector during 2002-2004. The acquirer firms' perspective is the prime focus of the study. Out of total 128 acquisitions, which took place during 2002-2004 in this sector (both organized and unorganized), after excluding incomplete deals, the firms that ceased to exist during analysis period, foreign companies and the firms for which the data were unavailable, the sample size was limited to 19 firms.

The study is based on secondary data sources. Databases, namely, CMIE's PROWESS, Reserve Bank of India's (RBI) publications, National Stock Exchange of India (NSE), and Bombay Stock Exchange (BSE), newspaper clippings and websites of concerned companies have been referred to access the required information.

Findings show that, on an average, there is no negative impact of acquisitions on the performance of acquirer firms, in terms of either short-term wealth accumulation or long-term financial health. Along with financial parameters, trends of relative efficiency scores also appear to be positive for the majority of acquirers.

The structure of study is outlined as follows: first, post-acquisition impacts from shareholders' perspective are attempted using event-study methodology. The second section deals with long-term impact of acquisition (based on sound financial health parameters, namely, profitability, liquidity, solvency and growth). In the third section, relative efficiency of acquirer firms (to utilize total assets to maximize multiple outputs, namely, operating profits, sales, return on assets, return on capital employed) under consideration is attempted using data envelopment analysis followed by, output based sensitivity analysis. The study is concluded with discussion of important observations, limitations and future scope of study.

Review of Literature

History of mergers and acquisitions began in western economies of Europe and America, but, following the wave of liberalization and global competitiveness, the phenomenon soon attained a global status. Since, its emergence, the area is attracting focus of both financial and strategic researchers. Being a long-term investment decision, performance aspect of mergers and acquisitions is among keen interest areas for financial researchers leading to the accumulation of vast literature in the form of event and accounting studies.

Mergers and acquisitions are strategic decisions, expected to affect the shareholders' wealth on announcement. The value-maximisation hypotheses (Seth 1990) associate synergies with mergers and acquisitions decisions. As such long-term as well as short-term financial implications are expected from mergers and acquisitions.

Long-term impact on firm's financial performance is attempted in literature based on profitability, liquidity, solvency, growth and other parameters. For short-term implications, traditional event-study methodology (Brown and Warner, 1980; 1985) is widely used by analysts to assess the market perceptions regarding prospects of mergers and acquisitions decisions in terms of announcement impact (Moeller, 2003; Kale and Singh, 2005; Anand and Singh, 2008; Mangold and Kerstin, 2008; Sharma, 2010). In spite of a large number of studies pertaining to different time-periods, economies, industries examining the abnormal risk-adjusted return, using the same (event-study) approach, an assorted view of post-merger performance is reflected (Kumar and Panneerselvam, 2009). In literature the evidences of abnormal returns accruing to acquirer firms' shareholders are not much compared to target shareholders (Datta et al., 1992; Cornett and Tehranian, 1992; Houston et al., 2001; Agrawal et al., 2002; King et al., 2004; Moeller et al., 2004; Georgen and Renneboog, 2004). Meta-analysis, based on 41-accounting studies, carried out by Datta et al. (1992) followed by another meta-analysis of King et al., (2004), based on 93 studies including both accounting and event studies, reflect the same view that performance outcomes from mergers and acquisitions are not very promising. On an average, mergers and acquisitions are beneficial from the target-firms' point of view, with no significant gain to bidder firm. In fact, modest negative returns are evident from the study of King et al., (2004).

Besides the majority of literature supporting negative acquirer returns, studies revealing positive returns associated with mergers and acquisitions also exist. Positive returns, both for acquirer (1.843 per cent) and target (18.42 per cent), are reported in -1 day window in airline mergers and acquisitions during 1985-1988 (Singal, 1996). The study by Schwert (1996), reported positive abnormal gains of 23.4 per cent from -42 days to +126 days in mergers and tender offers during 1975-1991. Burton et al. (1999) reported abnormal return of 1.6 per cent in UK joint venture during the period 1989-1991. The study by Eckbo et al. (2000), reported significant positive cumulative average abnormal returns of 1.71 per cent to bidder in domestic Canadian takeover deals. In another study (Mulherin, 2000), significant cumulative average abnormal returns of 0.85 per cent over a two day announcement period in takeovers during 1962 and 1997 were reported. Positive cumulative average abnormal returns of 1.77 per cent are reported by Fuller et al. (2002) in a study of 3135 mergers and acquisition during 1990-2000 in UK in 2 days window. On analyzed acquirer returns in 214 bank mergers during 1985-1998 in -10+1 day window Amihud et al. (2002) reported positive acquirer returns of around 0.98 per cent. In the study by Martynova and Renneboog (2006), significant abnormal return of 12.5 per cent in European takeover during 1993 and 2001 involving, 28 European countries is evident. A significant abnormal return of 0.6 per cent for UK bidder in acquisitions during 1984-1988 appeared from the study by Conn et al. (2005) reported. Jensen (2006) on examining approximately 50 largest US takeovers divulges a huge benefit of around $535 billion to event firms' shareholders.

In Indian context, Pandey (2001) documents a significant announcement return of 10 per cent associated with takeovers for a target firm's shareholders. Anand and Singh (2008) analyzed the announcement impact of mergers and acquisitions, for bidder, in private sector banks in India during 1999-2005, considering a window period 40 days. Findings are again reported to be significantly positive. Zhu and Malhotra (2008) on analyzing the returns in 5 days window for Indian acquirers acquiring US firms during 1999-2005 reported positive returns for three days.

Long-term impact of mergers and acquisitions decisions on the performance of merging entities is attempted by majority of researchers using accounting-study approach. The same non-convergence on post-mergers scenario of merging entities is evident from event studies. According to some studies, mergers and acquisitions are value-creating strategies (Lev and Mandelkar, 1972; Healy and Palepu, 1992; Swaminathan, 2002; Timothy et al., 2003; Beena, 2004; Kumar and Rajib, 2007; Vanitha and Selvam, 2007; Kumar and Bansal, 2008; Selvam et al., 2009; Kumar and Panneerselvam, 2009, Ravichandran, 2009; Ramakrishna, 2010; Kaur and Kaur, 2010). There are some studies which emphasize on mergers and acquisitions as a large failure (Scherer, 1988; Agrawal et al., 1992; Hubbard, 1999; Kuipers et al., 2002; Martinez-Jerez, 2002; Akbulut and Matsusaka, 2003 Bruner, 2004; Mantravadi and Reddy, 2007; Tambi, 2005); Kumar, 2009; Mishra and Chandra, 2010. Evidences of mixed implications, i.e., positive impact on some parameters and negative on others are also there, for example, Singh and Mogla's (2008) five year comparative analysis of 56 mergers in India during 1994 -2005 states decline in profitability with positive implications on size and leverage.

On an average, in literature, mergers and acquisitions decisions are regarded as failure but, overwhelming response of corporates towards these decisions worldwide reveals that mergers and acquisitions cannot be unproductive. Under the influence of the 'theory of market for corporate control', where the possibilities of inefficient management to be replaced by efficient management are very high, immature behaviour (of indulging in futile decisions of mergers and acquisitions) on the part of decision-makers cannot be expected. Such an inconsistency in performance outcome even after 30 years (commencing from 1980's) of research constitutes a rationale for more elaborate studies on the subject. The study is a modest attempt to fill certain gaps identified from performance literature.

On an average performance literature reflects high uncertainty in performance outcome from acquirer firm's perspective constituting rationale for more elaborate analysis of acquirer perspective. To address these gaps financial impact of mergers and acquisitions decisions on acquirer firms in Indian pharmaceutical sector during 2002-2004 is attempted (both from firms' and shareholders' perspective). The objective of the study is to get an insight into the effectiveness of these decisions in terms of enhancing shareholders' wealth (in short-term) and improvement of firm's long-term financial performance (profitability, liquidity, solvency and growth). Along with performance analysis the relative efficiency of sample firms is also attempted using data envelopment analysis (DEA) to get an insight into the relatively efficient and inefficient firms and uniformity of acquisition impact on acquirers.

Financial Impact of Mergers and Acquisitions: Shareholders' Perspective

Mergers and acquisitions are strategic corporate events. The announcement of these events is usually expected to bring the accumulation of shareholders' wealth in the form of cumulative abnormal returns. The fluctuations in the share-prices of merging entities driven by the expectations regarding underlying potential of these deals lead to these abnormal returns.

Impact of mergers and acquisitions on shareholders' wealth is attempted in literature empirically using, event-study methodology. Event Study Methodology (Brown and Warner, 1980; 1985) is a well-accepted tool used for analyzing the abnormal returns accruing on announcement of specific events; it is based on the 'efficient market hypothesis' that, market discounts are publicly available. Using the same traditional approach, the shareholders' perspective is attempted. To evaluate the returns associated with acquisition announcement, impact of acquisition is attempted for a window of 120 days (-60, + 60 days) and a clean period of 200 days.

Event Date, Event Window, Clean Period

Event in the present context is used for acquisition; event date 'Zero Date' is taken as first date of media announcement when, acquisition information is made public.

Window period is usually a period when the maximum influence of event information is experienced by share-prices in the market and clean period is a period whose returns are assumed to be unaffected by announcement information.

For the more convincing outcomes, a relatively larger window of -60, +60 days, as compared to earlier studies, is used to observe the consistency of the returns. To trap even a minute impact of announcement different windows, -1 to +1, -2 to +2, -3 to +3, -4 to +4, -5 to +5, -6 to +6, -7 to +7, -8 to +8, -9 to +9, -10 to +10, -20 to +20, -30 to +30, -40 to +40, -50 to + 50, -60 to +60 days, are used.

Collection of Data

Event information (insert Table 1 here) is gathered from CMIE's database PROWESS; and further cross-verification is attempted using newspaper clippings and websites of concerned companies. For information regarding daily share-prices National Stock Exchange of India (NSE) and Bombay Stock Exchange (BSE) websites are considered. S&P CNX 500 returns are referred to for market returns.

Table 1: Select firms studied from Indian pharmaceutical sector which have undergone acquisition during 2002-2004

	Acquirer Firm	Event Date	Target Firm
1	A B L Biotechnologies Ltd.	17-Mar-04	Shantha Marine Biotechnologies Pvt Ltd
2	Alchemist Ltd.	25-May-04	Valiant Healthcare Limited
3	Apollo Hospitals Enterprise Ltd.	15-May-02	Duncan Gleneagles Hospitals Ltd.
4	Aurobindo Pharma Ltd.	18-Nov-02	Ranit Pharma and Calc Pharma
5	Cadila Healthcare Ltd.	01-Apr-02	Banyan Chemicals
6	Dr Reddy's Laboratories Ltd	02-Jul-03	Zenovus Biotech Ltd.
7	Elder Health Care Ltd.	24-Sep-02	Elder Pharmaceuticals Ltd
8	GlaxoSmithKline Pharmaceuticals Ltd	13-Jun-04	Burroughs Wellcome India Ltd (BWIL)
9	Sun Pharmaceuticals Ltd	25-May-02	MJ Pharmaceuticals Ltd
10	Glenmark Pharmaceuticals	18-Nov-02	Mfg facility of GlaxoSmithkline at Ankleshwar in Gujarat
11	Jubilant Organosys Ltd	01-Sep-02	Active pharmaceuticals ingredients (API) facility of Max India
12	Morepen Laboratories Ltd.	07-Jun-02	Lifespring.
13	Orchid Chemicals & Pharmaceuticals Ltd.	17-Dec-02	Mova Consultants Pvt. Ltd.
14	Pfizer	08-Jul-02	Pharmacia Healthcare Corp
15	Piramal Healthcare Ltd.	26-Nov-03	Global Bulk Drugs and Fine Chemicals Pvt Ltd
16	Ranbaxy Laboratories Ltd.	18-Jun-01	Fortis Health care
17	Wockhardt Ltd.	08-Jul-03	CP Pharmaceuticals Ltd
18	Ciba India Ltd.	18-Aug-03	Diamon Dye-Chem Ltd (DDL).
19	Matrix Laboratories Ltd.	16-Apr-02	Medicorp Technologies India Ltd

Computation of Abnormal Returns During Event Window

Abnormal return as the name suggests is an excess of actual return over expected return. Any abnormal return accruing to shareholders during the event-window (-60 +60 days) is taken as a criterion to access the short-term implications of mergers and acquisitions decisions or wealth creation on acquisition announcement.

Abnormal return is computed using traditional market model approach. Based on market model equation, alpha+ beta (r m) + ei, expected returns are computed. Abnormal returns are computed as the excess of actual returns, [(p1-p0)/p0*100], over expected returns. Computation steps are delineated as flow-chart.

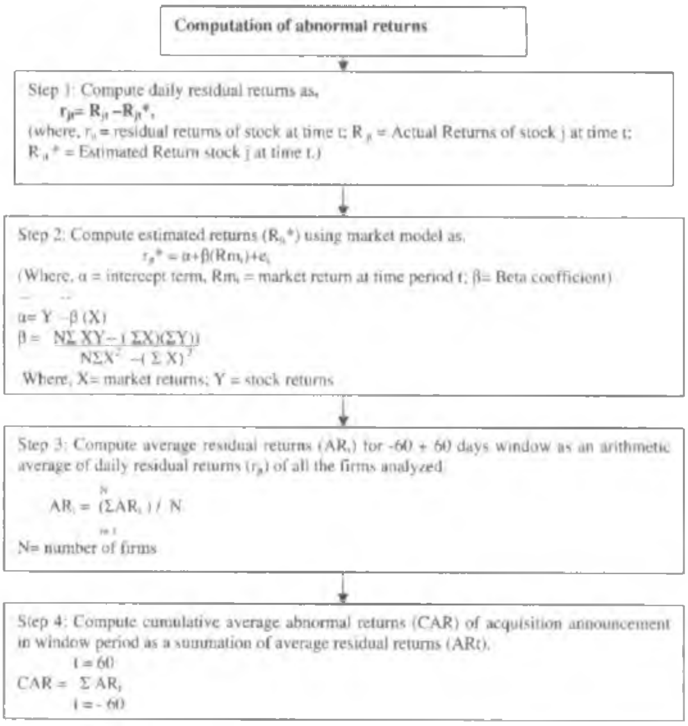

Figure 1: Computation steps used for calculating abnormal returns of acquirer sample firms during event window of -60 + 60 days

Statistical Validation of Findings

To ensure the validity the findings were statistically tested. The null hypothesis that there are no abnormal returns associated with acquisition announcement is statistically confirmed using t-statistics (t-value > 1.64 < 1.96, signifies, 10 per cent significant level; t-value > 1.96 < 2.58, imply, 5 per cent significant level; t-value >2.58, means returns are significant at 1 per cent level). Steps used for t-test are enumerated below.

Step 1: t-statistics of residual return = rjt / SD (rj)

Where, SD (rj) is the standard error of residual returns of firms for the clean period.

Step 2: t-statistics for average abnormal return = ARt / SD (AR)

Where, SD (AR) is the standard deviation of average abnormal returns of the firms during the clean period.

Step 3: t-statistic for cumulative abnormal return (CAR) = CAR / SD (AR) vt

Where, t = respective window period.

Impact of acquisition on shareholders' wealth of acquirer firms analyzed

The abnormal returns from acquisitions are observed on three criteria, namely, residual returns, average abnormal returns and cumulative abnormal returns. On statistically testing the null hypothesis, no significant difference in the residual returns of event and clean period has been observed (insert Table 2). The residual returns during event-window are found to be statistically insignificant, with an exception to Ranbaxy Pharmaceuticals, where, significant fall has been observed. There seems to be no significant difference in the clean period returns during pre - and post-acquisition period.

Table 2: Findings of t-test for residual returns on acquisition announcement for select sample firms from Indian pharmaceutical sector during 2002-2004

	Sample Firms	Mean	SD	t-statistics	Significance Level
1	Morepen	-0.4	4.07	-0.1	NS
2	Alchemist	0.23	4 89	0.05	NS
3	Orchid	-0.28	2.35	-0.12	NS
4	Pfizer	0 09	2.37	0.04	NS
5	Piramal	-0.03	1.72	-0.02	NS
6	Sun Pharmaceuticals	-0.15	2.23	-0.07	NS
7	Apollo Hospitals	-0.7	3.92	-0.18	NS
8	Aurobindo	0.14	2.08	0.07	NS
9	Cadila Healthcare	0.07	2.47	0.03	NS
10	Dr Reddy Lab	-0.2	1.8	-0.11	NS
11	Elder pharmaceutical	0.09	3.18	0.03	NS
12	GlaxoSmithKline	-0.16	1.94	-0.08	NS
13	Glenmark	0.01	3.14	0	NS
14	Jubilant Organoys	-0.41	2.86	-0.14	NS
15	Wockhardt	0.32	1.46	0.22	NS
16	Ranbaxy	-5.53	1.52	-3.64	S***
17	ABL Biotechnologies Ltd	-1.99	7.74	-0.26	NS

Table 3: Findings of t-test of cumulative abnormal return subsequent to acquisition announcement of select firms from Indian pharmaceutical sector which have undergone acquisition during year 2002-2004

Event window	CAR	SD (AR)	t-statistics	Statistical significance
-60	-0.05	0.82169	-0.01	NS
-50	-4.03	0.82169	-0.7	NS
-40	-7.87	0 82169	-1.52	NS
-30	-12.17	0.82169	-2.71	S***
-20	-15.39	0.82169	-4.2	S***
-10	-17 42	0.82169	-6.72	S***
5	-19.54	0.82169	-10.66	S***
-4	-18.59	0.82169	-11.33	S***
-3	-18 61	0 82169	-13 1	S***
-2	-18 45	0.82169	-15.91	S***
-1	0.4	0.82169	0.49	NS
0	-0 88			
1	-0 32	0.82169	-0.39	NS
2	-0.07	0 82169	-0.06	NS
3	-0.91	0.82169	-0.64	NS
4	-1.78	0.82169	-1.09	NS
5	-1.98	0.82169	-1.08	NS
10	-4.62	0.82169	-1.78	S*
20	-10.65	0.82169	-2.9	S***
30	-13.76	0.82169	-3.06	S***
40	-17.6	0.82169	-3.39	S***
50	-24.69	0.82169	-4.26	S***
60	-32.18	0.82169	-5.07	S***

The trends of cumulative abnormal returns during event window (Figures 2 and 3) reveal the accumulation of wealth around 'zero date'. For sample firms the wealth accumulation is observed for a very short span, from -5 to +5 days with maximum accumulation on -1 st day. Continuous fall in cumulative abnormal returns appearing from -60 th to -20 th day window, suddenly decelerate; and on 5th day, the declining trend reversed; on -1st day, frequent rise in returns is observed; rising trends remain continuous up to +10 days but, at a very slow pace subsequently, followed by a significant decline. On an average, the improvement in cumulative abnormal returns for sample firms accrued from -5+5 days; before -5 th day window, cumulative wealth was declining and from -5 th day onward, it switched in reverse direction, leading to maximum wealth-accumulation on -1st day window; the rising tendency remains up to +2nd day and again declining trends revert.

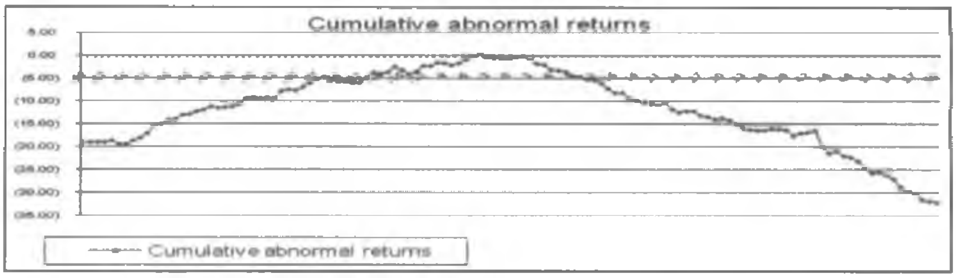

Figure 2: Cumulative abnormal returns in -60 to + 60 days window of acquisition announcement in Indian pharmaceutical sector during year 2002-2004.

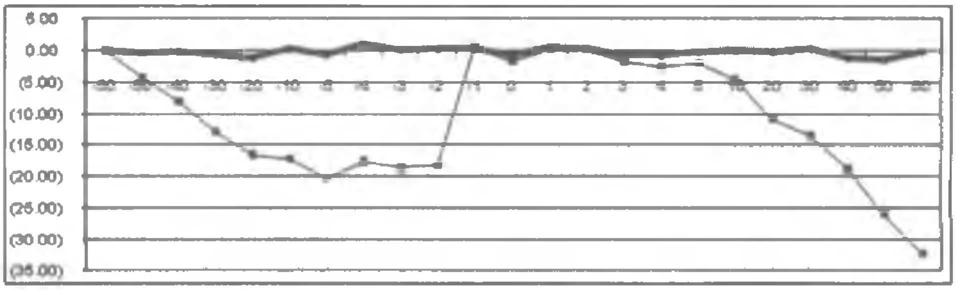

Figure 3: Cumulative and average residual returns in different windows (1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60) of acquisition announcement in Indian pharmaceutical sector during year 2002-2004

A few days' wealth is not enough to judge the well-being of shareholders. Only speculative investors are interested in short-term wealth; genuine shareholders' interest lies in long-term interest of the company as such, it would be better to analyze, post-merger scenario of merging entities, in respect of profitability, liquidity, solvency and other growth parameters in long-run.

To get a clearer and more realistic view of the company's health, long-term perspective, considering sound-health parameters, namely, profitability, liquidity, solvency and growth is attempted.

Financial Impact of Mergers and Acquisitions: Firm's Perspective

Announcement impacts are temporary effects of mergers and acquisitions that last for a very short span, hardly a week (as observed from event analysis). Thus, abnormal returns merely cannot be a sound basis for predicting the effectiveness of acquisition decisions. Share-price fluctuations reflect investors' expectations regarding the prospects of acquisition decisions; further, possibilities of speculators' influence on the share-prices cannot be ignored. Firm's perspective in long period can acquaint a more realistic view of mergers and acquisitions' effectiveness. Sound financial health parameters, namely, profitability, liquidity solvency, growth rate, etc. along with, enlightening the long-term prospects, can also provide an insight into the authenticity of share-price fluctuations.

For a more rigorous view of the effectiveness of mergers and acquisitions, three-yearly comparative analysis of pre and post-acquisition performance is further attempted. Using ratio analysis, the impact of acquisition on all possible parameters of sound financial health, namely, profitability, liquidity and solvency is attempted.

Profitability Analysis

Profitability is a conventional test of operating and economic efficiency. It is an indicator of financial soundness. Profitability connotes an ability of a firm to earn adequate returns. For the management, it is a test of efficiency; for the owners, it is an indicator of adequate returns; for the creditors, it is a cushion of safety; and for the employees, it is a margin of secured employment. Inadequate profits can endanger the survival of a firm in the long run. According to Grant Thorton Survey (2006), profitability is among the main objectives for mergers and acquisitions activities of Indian corporate. Mergers and acquisitions decisions to be successful, should not have any adverse affect on the profit earning capacity of the merging entities.

Profits of post-acquisition period needed to be adequate to justify the returns on equity as well as pooled resources. Profitability analysis is attempted on sales as well as on investment basis to get an insight into the actual profitability position of acquiring firm in post-acquisition period, the adequacy of profits to justify the returns to equity shareholders, the profitability of operations and the extent the resources are gainfully employed.

Profitability of operations is attempted using profit margins, namely, gross-profit, operating-profit, and net-profit. Gross profit margin indicates a safety cushion available to a business concern to adequately meet its operating expenses. It is a margin available to a firm after meeting the cost of goods sold. Increase in gross-profit margin signifies increase in sale or sales price or reduction in the cost of goods sold. Operating profit margin or earnings before interest and taxes (EBIT) is the residual left after meeting the cost of goods sold and operating expenses (administrative, selling and distribution expenses). Net profit margin or earnings after taxes (EAT)) as the name suggests indicate a margin available after meeting all kinds of costs and expenses (including, interest and taxes).

Adequate margins signify adequate returns to business firm to meet operating expenses. Adequate net profits symbolize not only the managerial efficiency to operate successfully but also signify the adequate incentive for owners (in the form of profit) for lending their capital and bearing risk.

Mergers and acquisitions decisions bring the resources of merging entities together. Therefore, it would be quite useful to enquire as to whether these resources are effectively employed or not. Profitability on investments, namely, assets, shareholders' equity and capital employed is attempted using returns on assets (ROA), returns on capital employed (ROCE) and returns on equity (ROE) ratios. For more precise view of returns from assets and capital employed, effects of taxes are precluded from earnings after taxes; interest charges are added back to avoid underestimation of returns as, borrowed capital is also a part of total assets and capital employed. Pre-tax profit inclusive of interest is likely, to be more reliable indicator of returns on assets and capital employed.

Along with profitability parameters, liquidity and solvency positions are equally responsible for a long-term success of a firm. Liquidity and solvency positions indicate availability of funds to meet the business operations.

Liquidity Analysis

Liquidity is an ability of a firm to meet its short-term obligations as and when due. A sound liquidity position is a perquisite for the very existence of a firm. Liquid funds are non-earning assets too. Therefore, efficient management of these funds is necessary. Liquidity analysis is attempted using well-accepted liquidity parameters, namely, current ratio, acid-test ratio, inventory turnover ratio, debtors turnover ratio and creditors turnover ratio.

Solvency Analysis

Solvency is an ability of a firm to meet its long-term obligations (regular interest charges and principal instalments). Solvency is an important parameter for outsiders (lenders, suppliers, taxation authorities, rating agencies, etc) to judge the financial soundness of a firm. Solvency position of an acquirer firm is attempted using debt-equity ratio based on long-term debt as well as total external liabilities (i.e. total debt + current liabilities + deferred tax liabilities) and proprietary ratio.

Growth-Parameters

Impact of acquisitions decision on firms' growth is attempted using net-worth. Net-worth signifies owners' fund (share-capital+ reserves and surplus). In fact, net worth is a better indicator for wealth-accumulation on acquisitions compared to short-term abnormal returns which just signify the speculative gains of few days. Profitability, liquidity and solvency positions of a firm act as the drivers for firms' growth; actual measure of a firm's growth is net-worth.

Methodology

Profitability, liquidity, solvency and growth parameters are computed for the entire set of acquirers for three years before acquisition and for years after acquisition. Average performance for pre as well as post-acquisition is compared using paired sample t-test to find the statistically significant changes in the financial performance of acquirer firms for the acquisitions performed during 2002-2004. Value of t-statistics $>1.64 < 1.96$, signifies, 10 per cent significant level; t-value $> 1.96 < 2.58$, imply, 5 per cent significant level; t-value >2.58, means returns are significant at 1 per cent level.

Impact of acquisition on long-term performance of acquirer firms analyzed

On an average, long-term perspective of acquirer firms as per the observations of comparative analysis of profitability, liquidity, solvency and growth parameters of pre and post-acquisitions period seem to be satisfactory with no negativity on the performance of acquirers in post-acquisition scenario. On statistically testing the null hypothesis, on an average no significant changes are observed in profitability, solvency, liquidity and growth parameters of acquirer firms in post-acquisition period. However, a significant decline is observed in assets turnover ratio signifying the inefficient utilization of pooled resources of acquisitions. If taken positively this decline seems to be a plus point indicating enhanced profit-earning capacity of the firm. With a proper management of assets, there seems to be a possibility of further improvement in the earnings without any additional resources.

Overall profitability, liquidity as well as solvency position of acquirer firms seems to be quite satisfactory consequent to acquisition. Yet there seems to be no significant improvement in the profitability parameters, in post-acquisition period, but the fact cannot be ignored that the pre-acquisition period was revealing loss figures. As regards liquidity position parameters, namely, current ratio and acid-test ratio were formerly nearer to adequate. The efficiency ratios, namely, debtors' turnover, creditors' turnover and inventory turnover between 2-3 months are almost nearer to acceptable standard and any further increase in these parameters will signify the inefficient management of liquid assets. Liquidity position of post-acquisition period further seems to be supplemented by a significant decline observed in creditors, turnover ratio, which may be due to the enhanced credit-worthiness of the firms. Likewise, solvency parameter of debt-equity ratio between 65-70 per cent is also satisfactory. The proprietary ratio is also on safer side reflecting a back up of more than 50 per cent provided by owners' fund thus, signifying a safe cushion for the outsiders. The sound appearing profitability, liquidity and solvency parameters seem to be the reasons for a significant improvement observed in the net-worth for the majority of the acquirers.

Table 4: Impact of acquisition on long-term financial performance of select acquirer firms which have undergone acquisition during 2002-2004

	Pre-Acquisition (3-years Average)	Post-Acquisition (3-years Average)	T-value	Significance
Profitability Analysis				
Gross Profit Margin	-14.58	52.97	1.03	Ns
Operating Profit	-114.67	11.1	0.97	Ns
Net Profit Margin	-135.73	5.94	0.99	Ns
Return on Assets	9.87	8.68	-0.43	Ns
Return on Capital Employed	17.88	13.72	-0.97	Ns
Return on Equity	8.67	10.43	0.29	Ns
Assets Turnover	1.07	0.9	-1.8	S*
Earning Power	6.3	6.71	0.15	Ns
Liquidity Analysis				
Current Ratio	2.88	3.01	0.55	Ns

Acid Test Ratio	2.81	2.95	0.6	Ns
Debtors Turnover Ratio	5.09	4.9	-0.36	Ns
Creditors Turnover Ratio	5.51	4.38	-2.73	S***
Inventory Turnover Ratio	3.8	4.36	0.59	Ns
Solvency Analysis				
Debt Equity (long-term debt)	0.65	0.69	0.25	Ns
Debt Equity (Total debt)	1.35	1.62	1.03	Ns
Proprietary Ratio	0.56	0.51	-1.26	Ns
Net Worth	320.81	618.83	3.24	S***

For a more apparent view, firm-wise analysis is also attempted (Appendix A). Results are again alike with no significant changes in profitability, liquidity and solvency parameters for majority of acquirers.

As per the findings of ratio analysis there has been a significant decline in the assets turnover ratio of acquiring firms in post-acquisition period indicating inefficient utilization of the pooled resources. Efficiency is an important measure of performance (Rao and Miller, 2004; Phusavat and Photoraon, 2006). It is important for managers, investors (Galagedera and Silvapulle, 2002) as well as for customers (Anderson et al., 1998). In order to gain better insight into the efficiency of acquirers in post-acquisition period the relative efficiency scores are analyzed using data envelopment analysis (Chames, Cooper and Rhode, 1978).

Impact of Acquisitions on Acquirer Firms' Efficiency: An Application of Data Envelopment Analysis

Data Envelopment Analysis (DEA) (Charnes, Cooper and Rhodes, 1978) is a popular tool amongst researchers for analyzing relative efficiency. It is a linear programming approach used to determine relative efficiency of a group of firms known as decision making units (DMUs) based on multiple inputs and outputs. Efficiency in DEA means capability of a firm confirmed by optimally weighing the inputs and outputs. Based on efficiency scores, firms are categorized as efficient and inefficient. An envelope, known as efficient frontier is developed with efficient firms (with efficiency score of 1.0) lying on the frontier and the firms with efficiency score less than one, below the frontier.

Farrel's (1957) linear programming model of analyzing technical efficiency is generalized as CCR model (Charnes, Cooper and Rhodes, 1978) to analyze multiple inputs and outputs at a time. The model was further modified as BCC model (Banker, Chames and Cooper, 1984) to accord with the reality of variable returns to scale (Ravichandran et al., 2009).

Due to certain distinctive features DEA is considered as a better tool for measuring performance as compared to traditional methodologies of ratios. DEA can be used either as an alternative to ratio analysis or as a complement (Halkos and Dimitrios, 2004). One of the most important features of DEA is the ability to compare several parameters simultaneously and to come up with a scalar measure of overall performance. Secondly, DEA provides the relative efficiency of each of the firms in a given set of firms; efficiency score of each decision-making unit (DMU) is the ratio of weighted sum of inputs to a weighted sum of outputs. Thirdly, ratios analysis is based on the assumption of constant return to scale (Smith 1990), but, BCC model

Banker, Chames and Cooper, 1984) of DEA is based on variable returns to scale.

The application of DEA is available in various fields, such as, education (Vassilogulou and Giokas, 1990), banking sector (Zenios et al. 1999; Rouatt, 2003), retail sector (Mishra, 2009), pharmacy sector (Naarsimha, 2003; Mostafa 2007; Debnath and Shankar, 2008) and others. In recent years DEA is also applied to analyze the impact of mergers and acquisitions on financial sectors (Bisceglio, 1995; Benjamin Liu and David Tripe, 2002; Carletti, Hartmann and Spagnolo, 2007; Felsenfeld, 2008). In the Indian context, Ravichandran et al. (2009) applied DEA to analyse the impact of mergers and acquisitions on efficiency of Indian banks. Yet, the application of DEA to analyze the impact of mergers and acquisitions in non-financial sectors is not so popular.

In order to get more robust view of acquirers' efficiency to utilize the pooled resources the relative efficiency of acquirer firms is attempted using total assets as input and sales and three dimensions of profitability, namely, operating profits, return on assets and return on capital employed as outputs.

Selection of Inputs, Outputs, and Sample Size

Selection of inputs and outputs and sample size is very crucial in DEA. The inputs and the outputs are required to be in accordance with the type of efficiency needed to be assessed (Sherman and Rupert, 2006). In DEA's literature different approaches are there for the determination of input-output mix such as, production approach, the intermediation approach, the operating approach, the asset approach and the user cost approach (Das and Ghosh, 2006; Favero and Papi, 1995). As mergers and acquisitions bring the resources of acquirers and target firms together; in the present study the impact of acquisitions on acquirer firms' efficiency is attempted considering, total assets as inputs and sales, operating profitability, return on assets and returns on capital employed as outputs.

In DEA's literature a rough rule of thumb is that the number of DMUs should be at least thrice the sum of inputs and outputs (Raab and Lichty, 2002); however, in some studies DMU's size as twice of summation of inputs and outputs is also considered (Golany and Roll, 1989; Debnath and Shankar, 2008). Due to the inability of data envelopment analysis to consider negative values, out of 19 firms considered for wealth analysis and long-term performance analysis 13 firms with positive inputs and outputs data are considered for efficiency analysis. This sample size of 13 firms satisfies the second rule of thumb. For more robust findings along with DEA sensitivity analysis is also attempted by excluding one output at a time. Sensitivity analysis is fulfilling the primary condition of sample size. Thus, it can be presumed that findings will not be much affected by sample size.

Methodology

Efficiency analysis is attempted at two stages; first, relative efficiency scores for acquirer firms are analyzed using total assets as input and sales, operating profits, return on assets and capital employed as outputs. Further, efficiency scores are cross verified using sensitivity analysis. Sensitivity analysis is attempted in different manners in the DEA literature (Mishra 2009); either by reducing or adding DMUs to the set or changing outputs or inputs. In the present context, sensitivity analysis is attempted by changing number of outputs; relative efficiency scores using, sales as inputs and total assets as outputs and operating profits as output and sales as input are also attempted to trace the most affected parameter consequent to acquisition decision.

Relative efficiency is computed using data envelopment application programme (DEAP software) developed by Tim Coelli from Central of Efficiency Productivity Analysis (CEPA). Efficiency computed (in the present context) is output oriented efficiency based on the assumption of variable returns to scale.

Impact of Acquisition on the Relative Efficiency of Acquirer Firms

The relative efficiency scores for the acquirer firms analyzed using DEA (considering, total assets as input and sales, operating profit/ EBIT, ROA and ROCE as inputs) seem to be improving with an increasing trend observed in the numbers of the efficient firms as well as in the mean relative efficiency scores in post-acquisition period (Tables 6 and 7). Mean relative efficiency score which appears to be 0.868 in pre-acquisition periods is 0.962 in post-acquisition period (Table 6). In pre-acquisition period there were four efficient acquirers and in the third year the relative efficiency of eight out of thirteen firms appears to be 1; for three acquirers scores are above 0.9; and for remaining two firms efficiency score is above 0.75 (Table 5).

On an average the efficiency of acquirer firms seems to have improved consequent to acquisition decision with consistent improvement observed in the relative efficiency scores for the majority of the acquirers from pre - to post-acquisition period. The firms which were formerly efficient in pre-acquisition period appear to be efficient in post-acquisition period too. For instance, relative efficiency scores for both Ciba India Ltd. and Ranbaxy Laboratories appear to be 1 throughout the analysis period. In the case of Sun Pharma after a temporary decline in the first year efficiency score again rises to 1. Consistent improvement in the efficiency is visible in the case of Orchid Chemicals with a remarkable leap from the score of 0.645 (in the pre-acquisition period) to 1 in the third year; for Apollo, Alchemist, and Jubiliant observations are similar. Declining trends are observed only in the case of Wockhardt and Aurobindo Pharma Ltd.

Table 5: Relative efficiency scores of acquirer firms during pre and post-acquisition period as per data envelopment analysis

Acquirer firms	Pre-acquisition period	Year 1	Year 2	Year 3
Ranbaxy Laboratories Ltd.	1	1	1	1
Ciba India Ltd.	1	1	1	1
Matrix Laboratories Ltd.	0.898	1	1	1
GlaxoSmithKline Consumer Healthcare Ltd.	0.987	1	0.975	1
Piramal Healthcare Ltd	0.988	0.919	1	1
Sun Pharmaceutical Industries	1	0.789	0.93	1
Glenmark Pharmaceuticals Ltd.	0.795	0.661	1	1
Orchid Chemicals & Pharmaceuticals Ltd.	0.645	0.513	0.847	1
Apollo Hospitals Enterprise Ltd.	0.694	0.676	0.81	0.981
Alchemist Ltd.	0.657	1	1	0.953
Jubilant Organosys Ltd.	0.699	0.892	0.972	0.944
Wockhardt Ltd.	0.922	0.889	0.75	0.861
Aurobindo Pharma Ltd.	1	0.794	0.675	0.767

Table 6 : Relative mean efficiency scores for acquirer firms during pre and post-acquisition period

Inputs and outputs	Pre-acquisition period	Year 1	Year 2	Year 3
Total assets as input; sales, operating profits, ROA and ROCE as outputs	0.868	0.856	0.92	0.962
Excluding operating profits as output	0.815	0.824	0.897	0.95
Excluding sales as output	0.625	0.616	0.773	0.827
Excluding ROCE as output	0.868	0.856	0.905	0.937
Excluding ROA as output	0.877	0.856	0.904	0.945
Total assets as input and sales as output	0.69	0.767	0.774	0.812
Total sales as input and operating profits as output	0.609	0.593	0.676	0.644

Table 7: Number of efficient acquirers during pre-and post-acquisition period

Inputs and outputs	Pre-acquisition period	Year 1	Year 2	Year 3
Total assets as input; sales, operating profits, ROA and ROCE as outputs	4	5	6	8
Excluding operating profits as output	4	5	6	8
Excluding sales as output	2	2	5	6
Excluding ROCE as output	4	5	5	7
Excluding ROA as output	5	5	6	7
Total assets as input and sales as output	3	4	4	3
Total sales as input and operating profits as output	2	2	2	2

To analyze the causes of efficiency, sensitivity analysis is attempted by excluding one output parameter at a time. Findings of sensitivity analysis also seem to be on positive line. Increasing trends similar to the DEA relative efficiency scores are observed in relative mean efficiency scores as well in the numbers of efficient acquirers using different combinations of inputs and outputs (Table 7).

As per the findings of sensitivity analysis, for relatively less efficient acquirers, efficiency seems to be on the improving side. Significant improvements are observed mainly on the parameters which appeared relatively inefficient during pre-acquisition period (Table 8). For instance, both Ranbaxy and Sun Pharma are revealing underutilization of assets and in the case of Ranbaxy relative efficiency score on considering sales as output and total assets as input appears to be extremely low (0.004). But, in post-acquisition scenario, score for both of them is one. Similarly, for other acquirers also, improvement in relatively weak appearing efficiency score has been observed in post-acquisition period.

Concluding Observations

On analysing the impact of acquisition on acquirer firms in Indian pharmaceutical sector during the years 2002-2004 acquirer firms' perspective seems to be quite positive. On an average no negative impact of acquisition is observed on the performance of acquirer firms either in terms of short-term wealth accumulation or in terms of long-term financial health.

In short-term, wealth accumulation is observed for few days around announcement window. Profitability, liquidity and solvency parameters for the majority of the acquirers were already healthier (Table 4 and Appendix A). Thus, the scope of improvement was very little. In the long-run significant improvement in the net-worth for the majority of acquirers is observed indicating the positive impact on financial performance.

Along with financial parameters, trends of relative efficiency scores also appear to be positive for the majority of acquirers. So far as the assets utilization is concerned, majority of acquirers seem to be relatively efficient. For some acquirers improvement is observed in sales over total assets (for instance, Sun Pharma) and for some acquirers improvement in operating profitability is there, as in the case of Matrix (Table 8). As per Du Pont analysis also, the performance can be improved either in terms of maximization of sales over total assets or by enhancing profitability on sales. For, the acquirers which appear as, relatively less efficient on financial parameters may be efficient on some other basis. Possibilities of intents other than improvement in financial performance may be there as has been pointed out by strategic researchers (Brouthers et al., 1998). Likewise, are invisible factors need to be identified, as observed in earlier studies (Brothers et al., 1998; King et al., 2004).

Table 8: Significant changes in relative efficiency scores of acquirer firms subsequent to acquisition

Relative efficiency status for efficient firms during pre-acquisition period

Acquirers with 1 relative efficiency score at least once	DEA analysis	Sensitivity analysis					
	All	Ex. EBIT	Ex. Sales	Ex. ROCE	Ex. ROA	Sales/ Total assets	EBIT/ Sales
Ranbaxy Laboratories Ltd.	1	1	1	1	1	0.004	1
Sun Pharmaceutical Industries	1	1	1	1	1	0.781	1
Ciba India Ltd.	1	1	0.282	1	1	1	0.149
Aurobindo Pharma Ltd.	1	1	0.672	1	1	1	0.499
Matrix Laboratories Ltd.	0.898	0.898	0.5	0.898	1	1	0.149
Relative efficiency status for effient firms during third year of acquisition							
Ranbaxy Labnratories Ltd.	1	1	1	1	1	1	0.665
Sun Pharmaceutical Industries	1	1	0.401	1	1	1	1
Ciba India Ltd.	1	1	1	1	1	1	0.226
Matrix Laboratories Ltd.	1	1	1	1	1	0.646	1
Alchemist Ltd.	0.953	0.953	1	0.905	0.861	0.791	0.395
Glaxosmithkline Consumer Healthcare Ltd.	1	1	0.781	1	1	1	0.719
Glenmark Pharmaceuticals Ltd.	1	1	1	0.725	1	0.518	0.706
Orchid Chemicals & Pharmaceuticals Ltd.	1	1	1	1	0.876	0.487	0.842
Aurobindo Pharma Ltd.	0.767	0.767	0.474	0.767	0.767	0.767	0.395

As per the observation of the study, acquisition seems to be an effective strategy used for the betterment of the performance of the firms. For financially sound firms, it seems to be a useful strategy for maintaining the existing performance and for average performers for the betterment of the relatively weak parameters, thus, supporting them to become more efficient.

Limitation of Research and Future Research Scope

The major limitation of the present study is that it is limited to two years only. Secondly, it is solely based on financial parameters. With more elaborate study, including large sample size, longer time-span and financial as well as non-financial parameters, a more robust insight into post-acquisition performance is likely to be facilitated.

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APPENDIX A :

Impact of acquisition on long-term performance of acquiring firms

Gross Profit Margin	Pre-Acquisition (3-years Avg)	Post-Acquisition (3-years Avg)	t-statistics	Significance
Ranbaxy Laboratories Ltd.	48.62	59.82	10.1	S***
Aurobindo Pharma Ltd.	30.44	33.24	3.13	S***
Elder Healthcare	46.29	38 12	-4.73	S***
Ciba India Ltd	19.03	21.22	2.75	S***
Matrix Laboratories Ltd.	27.03	50.26	2.22	S**
Jubilant Organosys Ltd.	43.57	41.64	-1.96	S*
A B L Biotechnologies Ltd.	-1165.75	86.9	0.98	Ns
Cadila Pharmaceuticals Ltd.	52.66	55.57	0.98	Ns
Dr. Reddy's Laboratories Ltd.	68.42	65.19	-0.91	Ns
Wockhardt Ltd.	52.65	55 66	1.23	Ns
Pfizer Ltd.	67.02	69.56	1.08	Ns
Orchid Chemicals & Pharmaceuticals Ltd.	45.64	48.93	0.99	Ns
Morepen Laboratories Ltd.	41.82	31.04	-1.23	Ns
Glenmark Pharmaceuticals Ltd.	61.51	68.77	0.19	Ns
GlaxoSmithKline Consumer Healthcare Ltd.	67.03	67.29	0.23	Ns
Alchemist Ltd.	12.63	10.76	-0.79	Ns
Apollo Hospitals Enterprise Ltd.	96.14	96 24	0.2	Ns
Sun Pharmaceutical Industries	52.46	49.35	-0.16	Ns
Piramal Healthcare Ltd	55.68	56.86	1.53	NS

Operating Profit	Pre-Acquisition (3-years Avg)	Post-Acquisition (3-years Avg)	T-value	Significance
Morepen Laboratories Ltd.	25.96	-43.08	-10.38	S***
Jubilant Organosys Ltd.	7.41	10.15	4.63	S***
Ranbaxy Laboratories Ltd.	10.77	18.44	4.68	S***
Ciba India Ltd.	3.33	5.64	2.84	S***
Glenmark Pharmaceuticals Ltd.	12.24	16.21	2.26	S**
Matrix Laboratories Ltd.	1.78	24.07	2.48	S**
Aurobindo Pharma Ltd.	12.02	9.05	-1.81	S*
Alchemist Ltd.	8.53	5.82	-1.87	S*
A B L Biotechnologies Ltd.	-2405.82	41.28	1.03	NS
Cadila Pharmaceuticals Ltd.	6.84	6.91	0.05	NS
Dr. Reddy's Laboratories Ltd.	25.55	10.8	-1.49	NS
Wockhardt Ltd.	16.79	19.03	0.69	NS
Pfizer Ltd.	11.13	13.32	0.56	NS
Orchid Chemicals & Pharmaceuticals Ltd.	14.85	15.15	0.08	NS
GlaxoSmithKline Consumer Healthcare Ltd.	10.68	13.11	0.57	NS
Apollo Hospitals Enterprise Ltd.	14.49	14.15	-0.78	NS
Elder Healthcare	8.13	3.63	-1.5	NS
Sun Pharmaceutical Industries	24.11	16.9	-1.24	NS
Piramal Healthcare Ltd	12.55	10.3	-1.58	NS

Net Profit Margin	Pre-Acquisition (3-years Avg)	Post-Acquisition (3-years Avg)	t-value	Significance
Morepen Laboratories Ltd.	10.07	-43.27	-5.34	S***
Jubilant Organosys Ltd.	-0.49	5.11	5.98	S***
Ranbaxy Laboratories Ltd.	5.39	14.86	4.95	S***
Aurobindo Pharma Ltd.	6.72	4.16	-2.91	S***
Apollo Hospitals Enterprise Ltd.	6	7.77	3.25	S***
Ciba India Ltd.	0.54	3.05	2.64	S***
Glenmark Pharmaceuticals Ltd.	6.33	9.69	2.37	S**
Matrix Laboratories Ltd.	-2.14	18.14	2.28	S**
A B L Biotechnologies Ltd.	-2689.28	36.4	1.03	NS
Cadila Pharmaceuticals Ltd.	2.35	0.97	-0.99	NS
Dr. Reddy's Laboratories Ltd.	21.81	8.1	-1.54	NS
Wockhardt Ltd.	12.86	13.4	0.13	NS
Pfizer Ltd.	4.91	4.38	-0.17	NS
Orchid Chemicals & Pharmaceuticals Ltd.	3.87	3.49	-0.11	NS
Glaxosmithkline Consumer Healthcare Ltd	4.74	7.35	0.9	NS
Alchemist Ltd.	-0.45	3.74	0.57	NS
Elder Healthcare	0.65	-3.83	-1.29	NS
Sun Pharmaceutical Industries	20.87	13.5	-1.46	NS
Piramal Healthcare	6.32	5.91	-0.17	NS

Return on Assets	Pre-Acquisition (3-years Avg)	Post-Acquisition (3-years Avg)	t-value	Significance
Morepen Laboratories Ltd.	11.27	-8.47	-3.18	S***
Ranbaxy Laboratories Ltd.	6.85	17.2	3.25	S***
Aurobindo Pharma Ltd.	18.26	5.49	-4.65	S***
Elder Healthcare	9.39	0.88	-1.99	S**
Sun Pharmaceutical Industries	27.17	10.31	-2.33	S**
Ciba India Ltd.	3.18	5.81	1.7	S*
A B L Biotechnologies Ltd.	-2.39	31.01	1.46	NS
Cadila Pharmaceuticals Ltd.	2.61	1.2	-1.14	NS
Dr. Reddy'S Laboratories Ltd.	22.01	6.98	-1.43	NS
Wockhardt Ltd.	14.59	7.72	-1.13	NS
Pfizer Ltd.	8 03	4.77	-1.23	NS
Orchid Chemicals & Pharmaceuticals Ltd.	14.23	14.67	0.11	NS
Jubilant Organosys Ltd.	7.65	8.21	0.62	NS
Glenmark Pharmaceuticals Ltd.	11.21	10.17	-0.39	NS
Glaxosmithkline Consumer Healthcare Ltd.	7.73	8.31	0.14	NS
Alchemist Ltd.	5.16	5.87	1.2	NS
Apollo Hospitals Enterprise Ltd.	9.21	9.43	0.16	NS
Matrix Laboratories Ltd.	4.2	19.12	0.99	NS
Piramal Healthcare Ltd	7.09'	6.17	-0.35	NS

Return on Equity	Pre-Acquisition (3-years Avg)	Post-Acquisition (3-years Avg)	t-value	Significance
Jubilant Organosys Ltd.	-2.17	14.16	3.85	S***
Ranbaxy Laboratories Ltd.	5.51	24.37	4.69	S***
Aurobindo Pharma Ltd.	22.5	7.06	-4.32	S***
Glenmark Pharmaceuticals Ltd.	10.45	17.49	2.59	S**
Apollo Hospitals Enterprise Ltd.	7.52	12.99	2	S**
Sun Pharmaceutical Industries	27.66	13.3	-2.67	S**
Dr. Reddy'S Laboratories Ltd.	25.72	7.8	-1.65	S*
Morepen Laboratories Ltd.	9 16	-52.4	-1.69	S*
A B L Biotechnologies Ltd.	-6.31	61.99	1.52	NS
Cadila Pharmaceuticals Ltd.	11.4	4.85	-1.3	NS
Wockhardt Ltd.	25.95	17.01	-1.24	NS
Pfizer Ltd.	11.2	8.72	-0.39	NS
Orchid Chemicals & Pharmaceuticals Ltd.	3.56	4.79	0.39	NS
GlaxoSmithKline Consumer Healthcare Ltd.	9.84	16.58	1	NS
Alchemist Ltd.	-1.58	6.24	0.46	NS
Elder Healthcare	2.2	-18.62	-1.14	NS
Ciba India Ltd.	1.7	8.79	1.93	NS
Matrix Laboratories Ltd.	-15.09	32.73	0.83	NS
Piramal Healthcare	15.57	10.36	-0.94	NS

Assets Turnover	**Pre-Acquisition (3-years Avg)**	**Post-Acquisition (3-years Avg)**	**t-value**	**Significance**
Cadila Pharmaceuticals Ltd.	1.1	1	-3.83	S***
Pfizer Ltd.	1.58	0.95	-3.59	S***
Glenmark Pharmaceuticals Ltd.	1.26	0.79	-3.39	S***
Glaxosmithkline Consumer Healthcare Ltd.	1.33	1.09	-6.11	S***
Ranbaxy Laboratories Ltd.	0.68	1.11	3.49	S***
Aurobindo Pharma Ltd.	1.69	0.74	-6.62	S***
Alchemist Ltd.	0.61	1.2	7.16	S***
A B L Biotechnologies Ltd.	0.19	0.77	2.31	S**
Wockhardt Ltd.	1.09	0.56	-2.13	S**
Orchid Chemicals & Pharmaceuticals Ltd.	0.5	0.47	-2.48	S**
Morepen Laboratories Ltd.	0.48	0.21	-2.5	S**
Sun Pharmaceutical Industries	1.21	0.71	-2.58	S**
Matrix Laboratories Ltd.	1.61	0.92	-1.81	S*
Dr. Reddy'S Laboratories Ltd.	1.01	0.69	-1.56	NS
Jubilant Organosys Ltd.	1.04	1.11	0.7	NS
Apollo Hospitals Enterprise Ltd.	0.79	0.92	1.57	NS
Elder Healthcare	1.2	1.08	-0.77	NS
Ciba India Ltd.	1.82	1.69	-1.19	NS
Piramal Healthcare	1.13	1.05	-0.49	NS

Earning Power	**Pre-acquisition (3-years Avg)**	**Post-Acquisition (3-years Avg)**	**t-value**	**Significance**
Jubilant Organosys Ltd.	-0.47	5.64	7.83	S***
Ranbaxy Laboratories Ltd.	3.72	16.77	4.08	S***
Aurobindo Pharma Ltd.	11.77	3.38	-4.01	S***
Apollo Hospitals Enterprise Ltd.	4.76	7.21	2.33	S**
Sun Pharmaceutical Industries	25.5	10.25	-2.07	S**
Ciba India Ltd.	0.89	5.35	2.35	S**
Morepen Laboratories Ltd.	4.93	-11.19	-1.75	S*
A B L Biotechnologies Ltd.	-3.61	28.56	1.33	NS
Cadila Pharmaceuticals Ltd.	2.61	1.2	-1.14	NS
Dr. Reddy'S Laboratories Ltd.	22.01	6.98	-1.43	NS
Wockhardt Ltd.	14.59	7.72	-1.13	NS
Pfizer Ltd.	7.9	4.76	-1.17	NS
Orchid Chemicals & Pharmaceuticals Ltd.	1.94	1.62	-0.2	NS
Glenmark Pharmaceuticals Ltd.	7.56	7.8	0.18	NS
Glaxosmithkline Consumer Healthcare Ltd.	6.54	7.95	0.38	NS
Alchemist Ltd.	0.96	4.56	0.97	NS
Elder Healthcare	1.49	-4.52	-1.44	NS
Matrix Laboratories Ltd.	-0.49	17.25	1.2	NS
Piramal Healthcare	7.09	6.17	-0.35	NS

(ii) Impact on liquidity of acquiring firms

Current Ratio	Pre-Acquisition (3-years Avg)	Post-Acquisition (3-years Avg)	t-value	Significance
A B L Biotechnologies Ltd.	0.48	2.35	13.34	S***
Dr. Reddy'S Laboratories Ltd.	4.3	3.73	-2.82	S***
Wockhardt Ltd.	2.2	4.21	13.89	S***
Orchid Chemicals & Pharmaceuticals Ltd.	4.72	3.28	-5.03	S***
Glaxosmithkline Consumer Healthcare Ltd.	1.79	1.22	-3.12	S***
Ranbaxy Laboratories Ltd.	2.91	1.98	-6.26	S***
Aurobindo Pharma Ltd.	3.53	4.94	7.89	S***
Alchemist Ltd.	1.33	2.7	2.92	S***
Piramal Healthcare	2.35	2.08	-3.18	S***
Ciba India Ltd.	2.2	1.94	-2.31	S**
Jubilant Organosys Ltd.	2.96	2.21	-1.88	S*
Cadila Pharmaceuticals Ltd.	2.06	2.12	0.17	NS
Pfizer Ltd.	2.18	1.79	-1.37	NS
Morepen Laboratories Ltd.	6.55	6.34	-0.4	NS
Glenmark Pharmaceuticals Ltd.	3.95	6.18	0.97	NS
Apollo Hospitals Enterprise Ltd.	1.93	1.86	-1.16	NS
Elder Healthcare	2.74	2.23	-1.37	NS
Sun Pharmaceutical Industries	3.6	3.11	-0.31	NS
Matrix Laboratories Ltd.	1.69	1.82	0.49	NS

Acid Test Ratio	Pre-Acquisition (3-years Avg)	Post-Acquisition (3-years Avg)	t-value	Significance
A B L Biotechnologies Ltd.	0.33	1.92	11.26	S***
Wockhardt Ltd.	1.56	3.65	13.37	S***
Orchid Chemicals & Pharmaceuticals Ltd.	2.74	1.48	-3.91	S***
Glaxosmithkline Consumer Healthcare Ltd.	1.31	0.28	-7.1	S***
Ranbaxy Laboratories Ltd.	1.92	1.15	-7.61	S***
Aurobindo Pharma Ltd.	2.46	3.47	4.16	S***
Elder Healthcare	1.52	1.06	-3.05	S***
Apollo Hospitals Enterprise Ltd.	1.37	1.26	-2.12	S**
Jubilant Organosys Ltd.	1.73	1.32	-1.84	S*
Alchemist Ltd.	1.17	2.28	1.89	S*
Matrix Laboratories Ltd.	0.58	0.94	1.66	S*
Piramal Healthcare	1.48	1.17	-1.83	S*
Cadila Pharmaceuticals Ltd.	1.11	0.96	-0.86	NS
Dr. Reddy'S Laboratories Ltd.	3.23	2.93	-1.5	NS
Pfizer Ltd.	1.55	1.09	-1.06	NS
Morepen Laboratories Ltd.	4.91	5.19	0.9	NS
Glenmark Pharmaceuticals Ltd.	3	4.9	0.88	NS
Sun Pharmaceutical Industries	2.6	2.11	-0.31	NS
Ciba India Ltd	1.26	1.24	-0.25	NS

Debtors Turnover Ratio	Pre-Acquisition (3-years Avg)	Post-Acquisition (3-years Avg)	t-value	Significance
Cadila Pharmaceuticals Ltd.	4.72	3.98	-5.33	S***
Morepen Laboratories Ltd.	2.74	0.97	-4.09	S***
Glenmark Pharmaceuticals Ltd.	4.59	2.44	-4.05	S***
Glaxosmithkline Consumer Healthcare Ltd.	8.77	17.04	9.76	S***
Ranbaxy Laboratories Ltd.	2.09	3.46	3.12	S***
Aurobindo Pharma Ltd.	3.96	2.43	-3.81	S***
Sun Pharmaceutical Industries	6.64	5.77	-2.6	S***
Ciba India Ltd	5.05	4.44	-2.7	S***
Matrix Laboratories Ltd.	8.65	4.33	-2.57	S**
A B L Biotechnologies Ltd.	5.62	3.6	-0.43	NS
Dr. Reddy'S Laboratories Ltd.	3.54	3.56	0.02	NS
Wockhardt Ltd.	4.64	3.94	-0.91	NS
Pfizer Ltd.	4.87	5.54	0.98	NS
Orchid Chemicals & Pharmaceuticals Ltd	3.01	3.41	0.89	NS
Jubilant Organosys Ltd.	4.66	5.15	0.82	NS
Alchemist Ltd.	7.75	8.14	1.03	NS
Apollo Hospitals Enterprise Ltd.	5.46	4.84	-1.19	NS
Elder Healthcare	4.61	4.7	0.11	NS
Piramal Healthcare	5.39	5.28	-0.22	NS

Creditors Turnover Ratio	Pre-Acquisition (3-years Avg)	Post-Acquisition (3-years Avg)	t-value	Significance
A B L Biotechnologies Ltd.	0.45	1.09	3.06	S***
Wockhardt Ltd.	4.91	3.23	-4.02	S***
Jubilant Organosys Ltd.	5.43	4.21	-5.66	S***
Aurobindo Pharma Ltd.	3.09	4.98	4.34	S***
Ciba India Ltd.	7.9	5.85	-7.36	S***
Matrix Laboratories Ltd.	3.99	3.25	-3.72	S***
Orchid Chemicals & Pharmaceuticals Ltd.	4.6	2.52	-2.89	S**
Glaxosmithkline Consumer Healthcare Ltd.	1.72	2.35	2.04	S**
Dr. Reddy'S Laboratories Ltd.	3.77	1.96	-2.25	S*
Cadila Pharmaceuticals Ltd.	2.69	2.55	-0.4	NS
Pfizer Ltd.	2.16	1.69	-1.53	NS
Morepen Laboratories Ltd.	10.33	4.39	-1.17	NS
Glenmark Pharmaceuticals Ltd.	5.81	3.22	-1.54	NS
Ranbaxy Laboratories Ltd.	3.68	3.25	-1.07	NS
Alchemist Ltd.	24.19	22.27	-0.34	NS
Piramal Healthcare	3.51	3.31	-0.49	NS
Apollo Hospitals Enterprise Ltd.				
Elder Healthcare				
Sun Pharmaceutical Industries				

Inventory Turnover Ratio	Pre-Acquisition (3-years Avg)	Post-Acquisition (3-years Avg)	t-value	Significance
Orchid Chemicals & Pharmaceuticals Ltd.	1.82	1.18	-22.87	S***
Jubilant Organosys Ltd.	3.62	4.3	2.98	S***
Glaxosmithkline Consumer Healthcare Ltd.	3.59	2.99	-5.74	S***
Aurobindo Pharma Ltd.	5.22	3.09	-12.81	S***
Glenmark Pharmaceuticals Ltd.	3.57	1.71	-1.86	S*
Elder Healthcare	1.41	1.66	1.91	S*
Matrix Laboratories Ltd.	2.87	2.38	-1.69	S*
A B L Biotechnologies Ltd.	0.59	0.96	0.29	NS
Cadila Pharmaceuticals Ltd.	2.56	2.56	-0.05	NS
Dr. Reddy'S Laboratories Ltd.	2.68	2.35	-0.77	NS
Wockhardt Ltd.	3.91	3.39	-0.95	NS
Pfizer Ltd.	2.63	2.55	-0.18	NS
Morepen Laboratories Ltd.	3.33	2.35	-0.68	NS
Ranbaxy Laboratories Ltd.	2.14	2.22	0.27	NS
Alchemist Ltd.	20.16	37.44	0.82	NS
Apollo Hospitals Enterprise Ltd	0.66	0.63	-0.64	NS
Sun Pharmaceutical Industries	2.57	2.77	0.47	NS
Ciba India Ltd.	5.85	5.49	-0.86	NS
Piramal Healthcare	3.07	2.82	-0.85	NS

(iii)Impact on solvency of acquirer firms

Debt Equity (long-term debt)	Pre-Acquisition (3-years Avg)	Post-Acquisition (3-years Avg)	t-value	Significance
A B L Biotechnologies Ltd.	0.25	0.48	5.69	S***
Wockhardt Ltd.	0.29	1.01	11.18	S***
Morepen Laboratories Ltd.	0.9	2.55	6.49	S***
Elder Healthcare	1.01	1.87	4.16	S***
Matrix Laboratories Ltd.	0.85	0.2	-12.36	S***
Glenmark Pharmaceuticals Ltd.	0.3	1.11	2.76	S**
Ciba India Ltd.	0.29	0.03	-2.61	S**
Piramal Healthcare Ltd	0.43	0.11	-2.12	S**
Cadila Pharmaceuticals Ltd.	1.57	1.65	0.38	NS
Dr. Reddy'S Laboratories Ltd.	0.09	0.07	-0.53	NS
Orchid Chemicals & Pharmaceuticals Ltd.	0.96	0.99	0.11	NS
Jubilant Organosys Ltd.	1.91	1	-1.58	NS
Ranbaxy Laboratories Ltd.	0.08	0	-1.3	NS
Aurobindo Pharma Ltd.	0.67	0.61	-1.06	NS
Alchemist Ltd.	2.13	0.33	-1.53	NS
Apollo Hospitals Enterprise Ltd.	0.49	0.36	-0.63	NS
Sun Pharmaceutical Industries	0.09	0.79	1.55	NS
Pfizer Ltd.	0	0		
Glaxosmithkline Consumer Healthcare Ltd.	0.06	0		

Debt Equity (Total debt)	Pre-Acquisition (3-years Avg)	Post-Acquisition (3-years Avg)	t-value	Significance
A B L Biotechnologies Ltd.	0.71	1.72	6.2	S***
Wockhardt Ltd.	0.72	1.46	8.9	S***
Morepen Laboratories Ltd.	1.28	4.22	6.23	S***
Glenmark Pharmaceuticals Ltd.	0.7	1.88	4.7	S***
Glaxosmithkline Consumer Healthcare Ltd.	0.52	1.3	10.77	S***
Aurobindo Pharma Ltd	1.27	1.46	3.48	S***
Ciba India Ltd.	1.09	0.61	-2.84	S***
Matrix Laboratories Ltd.	2.59	1.11	-23.54	S***
Orchid Chemicals & Pharmaceuticals Ltd.	1.33	2.37	1.77	S*
Elder Healthcare	1.78	3.28	1.78	S*
Cadila Pharmaceuticals Ltd.	3.46	3.63	0.47	NS
Dr. Reddy'S Laboratories Ltd.	0.49	0.5	0.04	NS
Pfizer Ltd.	0.55	1.2	1.63	NS
Jubilant Organosys Ltd.	3.15	1.96	-1.34	NS
Ranbaxy Laboratories Ltd.	0.52	0.6	1.28	NS
Alchemist Ltd.	2.87	0.6	-1.48	NS
Apollo Hospitals Enterprise Ltd.	0.91	0.92	0.04	NS
Sun Pharmaceutical Industries	0.37	1.11	1.54	NS
Piramal Healthcare Ltd	1.37	0.91	-0.71	NS

Proprietary Ratio	Pre-Acquisition (3-years Avg)	Post-Acquisition (3-years Avg)	t-value	Significance
A B L Biotechnologies Ltd.	0.59	0.37	-5.29	S***
Morepen Laboratories Ltd.	0.52	0.2	-4.55	S***
Glenmark Pharmaceuticals Ltd.	0.82	0.44	-2.74	S***
Glaxosmithkline Consumer Healthcare Ltd.	0.67	0.48	-7.24	S***
Aurobindo Pharma Ltd.	0.51	0.45	-7.85	S***
Elder Healthcare	0.51	0.35	-14.71	S***
Matrix Laboratories Ltd.	0.32	0.64	4.31	S***
Ciba India Ltd.	0.52	0.64	2.22	S**
Pfizer Ltd.	0.72	0.55	-1.66	S*
Orchid Chemicals & Pharmaceuticals Ltd.	0.48	0.33	-1.85	S*
Cadila Pharmaceuticals Ltd.	0.23	0.24	0.62	NS
Dr. Reddy'S Laboratories Ltd.	0.84	0.76	-0.54	NS
Jubilant Organosys Ltd.	0.26	0.42	1.56	NS
Ranbaxy Laboratories Ltd.	0.67	0.68	0.3	NS
Alchemist Ltd.	0.45	0.72	0.84	NS
Apollo Hospitals Enterprise Ltd.	0.64	0.6	-0.19	NS
Sun Pharmaceutical Industries	0.91	0.72	-1.04	NS
Wockhardt Ltd.	0.54	0.46	-0.77	NS
Piramal Healthcare	0.47	0.59	0.82	NS

(V) Impact of acquisition on net worth of acquiring firms

	Pre-Acquisition (3-years Avg)	Post-Acquisition (3-years Avg)	t-value	Significance
A B L Biotechnologies Ltd.	2.73	9.51	2.93	S***
Cadila Pharmaceuticals Ltd.	83.13	130.55	3.95	S***
Dr. Reddy'S Laboratories Ltd.	1272.73	2903.2	3.19	S***
Wockhardt Ltd.	321.37	794.12	7.18	S***
Pfizer Ltd.	262.11	476.98	3.06	S***
Morepen Laboratories Ltd.	438.74	262.11	-5.93	S***
Glenmark Pharmaceuticals Ltd.	121.44	280.17	8.87	S***
Ranbaxy Laboratories Ltd.	1493.81	2234.92	5.39	S***
Aurobindo Pharma Ltd.	285.9	816.81	54.69	S***
Ciba India Ltd.	141.38	225.2	4.27	S***
Matrix Laboratories Ltd.	14.42	557.22	2.73	S***
Piramal Health Care	357.82	857.17	-2.75	S***
Jubilant Organosys Ltd.	140.27	510.62	2.01	S**
Glaxosmithkline Consumer Healthcare Ltd.	472.25	554.73	2.25	S**
Alchemist Ltd.	50.59	168.81	2.79	S**
Orchid Chemicals & Pharmaceuticals Ltd.	367.08	558.41	1.44	NS
Apollo Hospitals Enterprise Ltd.	262.61	409.65	1.09	NS
Elder Healthcare	6.61	6.55	-0.08	NS
Sun Pharmaceutical Industries	0.37	1.11	1.54	NS

Appendix B: Efficiency scores of acquirer firms as per sensitivity analysis

(i) Relative efficiency scores for acquirer sample firms excluding operating profits as output

Acquirer firms	Pre-acquisition period	Year 1	Year 2	Year 3
Ciba India Ltd.	1	1	1	1
Matrix Laboratories Ltd.	0.898	1	1	1
Ranbaxy Laboratories Ltd.	1	1	1	1
GlaxoSmithKline Consumer Healthcare Ltd.	0.987	1	0.949	1
Piramal Healthcare Ltd	0.966	0.919	1	1
Glenmark Pharmaceuticals Ltd	0.732	0.64	1	1
Sun Pharmaceutical Industries	1	0.695	0.837	1
Orchid Chemicals & Pharmaceuticals Ltd.	0.577	0.508	0.847	1
Alchemist Ltd.	0.397	1	1	0.953
Apollo Hospitals Enterprise Ltd.	0.498	0.627	0.81	0.945
Jubilant Organosys Ltd.	0.694	0.892	0.972	0.944
Aurobindo Pharma Ltd.	1	0.786	0.675	0.767
Wockhardt Ltd.	0.85	0.648	0.574	0.746

(ii) Relative efficiency scores for acquirer firms excluding sales as output

Acquirer firms	Pre-acquisition period	Year 1	Year 2	Year 3
Alchemist Ltd.	0.651	1	1	1
Matrix Laboratories Ltd.	0.5	1	1	1
Ranbaxy Laboratories Ltd.	1	0.732	1	1
Ciba India Ltd.	0.282	0.565	1	1
Glenmark Pharmaceuticals Ltd.	0.742	0.562	1	1
Orchid Chemicals & Pharmaceuticals Ltd.	0.616	0.466	0.847	1
Apollo Hospitals Enterprise Ltd.	0.693	0.535	0.708	0.912
Wockhardt Ltd.	0.696	0.85	0.731	0.781
GlaxoSmithKline Consumer Healthcare Ltd.	0.443	0.393	0.571	0.781
Piramal Healthcare Ltd	0.521	0.297	0.516	0.776
Jubilant Organosys Ltd.	0.307	0.384	0.508	0.626
Aurobindo Pharma Ltd.	0.672	0.47	0.248	0.474
Sun Pharmaceutical Industries	1	0.749	0.918	0.401

iii) Relative efficiency scores of acquirer firms excluding returns on capital employed (ROCE)

Acquirer firms	Pre-acquisition period	Year 1	Year 2	Year 3
Ciba India Ltd.	1	1	1	1
Matrix Laboratories Ltd.	0.898	1	1	1
Ranbaxy Laboratories Ltd.	1	1	1	1
GlaxoSmithKline Consumer Healthcare Ltd.	0.987	1	0.975	1
Piramal Healthcare Ltd	0.988	0.919	1	1
Sun Pharmaceutical Industries	1	0.789	0.93	1
Orchid Chemicals & Pharmaceuticals Ltd.	0.645	0.513	0.847	1
Apollo Hospitals Enterprise Ltd	0.694	0.676	0.81	0.981
Jubilant Organosys Ltd.	0.699	0.892	0.972	0.944
Alchemist Ltd.	0.657	1	1	0.905
Wockhardt Ltd.	0.922	0.889	0.75	0.861
Aurobindo Pharma Ltd.	1	0.794	0.675	0.767
Glenmark Pharmaceuticals Ltd.	0.795	0.661	0.809	0.725

(iv) Relative efficiency scores of acquirer firms excluding return on assets (ROA)

Acquirer firms	Pre-acquisition period	Year 1	Year 2	Year 3
Ciba India Ltd.	1	1	1	1
Matrix Laboratories Ltd.	1	1	1	1
Ranbaxy Laboratories Ltd.	1	1	1	1
GlaxoSmithKline Consumer Healthcare Ltd.	0.987	1	0.975	1
Piramal Healthcare Ltd	0.988	0.919	1	1
Sun Pharmaceutical Industries	1	0.789	0.93	1
Glenmark Pharmaceuticals Ltd.	0.803	0.661	1	1
Apollo Hospitals Enterprise Ltd.	0.695	0.676	0.804	0.982
Jubilant Organosys Ltd.	0.699	0.886	0.964	0.931
Orchid Chemicals & Pharmaceuticals Ltd	0 645	0.513	0.648	0.876
Alchemist Ltd.	0.663	1	1	0.861
Wockhardt Ltd.	0.922	0.889	0.75	0.861
Aurobindo Pharma Ltd.	1	0.794	0.675	0.767

(v) Relative efficiency scores of acquirers in using total assets as input and sales as output

Acquirer firms	Pre-acquisition period	Year 1	Year 2	Year 3
Ciba India Ltd.	1	1	1	1
Ranbaxy Laboratories Ltd.	0.004	1	1	1
GlaxoSmithkline Consumer Healthcare Ltd.	0.987	1	0.923	1
Piramal Healthcare Ltd	0.966	0.919	1	1
Sun Pharmaceutical Industries	0.781	0.631	0.682	1
Jubilant Organosys Ltd.	0.694	0.868	0.953	0.931
Apollo Hospitals Enterprise Ltd.	0.411	0.576	0.636	0.799
Alchemist Ltd.	0.322	1	1	0.791
Aurobindo Pharma Ltd.	1	0.777	0.675	0.767
Matrix Laboratories Ltd.	1	0.713	0.71	0.646
Wockhardt Ltd.	0.82	0.49	0.536	0.61
Glenmark Pharmaceuticals Ltd.	0.572	0 54	0.541	0.518
Orchid Chemicals & Pharmaceuticals Ltd.	0.415	0.462	0.412	0.487

(vi) Relative efficiency of acquirer considering sales as input and operating profits as output

Acquirer firms	Pre-acquisition period	Year 1	Year 2	Year 3
Matrix Laboratories Ltd.	0.149	1	1	1
Sun Pharmaceutical Industries	1	0.749	0.918	1
Orchid Chemicals & Pharmaceuticals Ltd.	0.748	0.466	0.636	0.842
Wockhardt Ltd.	0.696	0.85	0.731	0.776
GlaxoSmithKline Consumer Healthcare Ltd.	0.443	0.393	0.571	0.719
Glenmark Pharmaceuticals Ltd.	0.792	0.624	0.845	0.706
Ranbaxy Laboratories Ltd.	1	0.732	0.901	0.665
Apollo Hospitals Enterprise Ltd.	0.882	0.535	0.751	0.622
Piramal Healthcare Ltd	0.521	0.297	0.458	0.571
Jubilant Organosys Ltd.	0.307	0.384	0.443	0.449
Alchemist Ltd.	0.726	1	1	0.395
Aurobindo Pharma Ltd.	0.499	0.47	0.243	0.395
Ciba India Ltd.	0.149	0.211	0.296	0.226

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