Performance Volatility Index for Indian Pharmaceutical Industry

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Abstract

Pharmaceutical industry is one of the important industries to build human capital of a nation, which consists complex matrix of processes, operations and organizations involved in the discovery, development and manufacture of various drugs and medications. A nation with a strong pharmaceutical industry has a healthy and strong population which provides a strong human capital. Indian pharmaceutical industry is an excellent example of a highly growth oriented industry, which is enhancing its value in the process. From being a pure reverse engineering industry focused on the domestic market, the industry is moving towards basic research-driven, export-oriented global presence, providing wide range of value added quality products and services. This industry contributes 1 percent to the country's gross domestic product (GDP) and attracted US$ 1.63 billion (Rs. 72,218.55 million) foreign direct investment (FDI) between April 2000 and November 2009 which is equal to 1.59 percent of total FDI inflow. The domestic investment in the pharmaceutical sector is estimated at US$ 6.31 billion. The turnover of the industry had increased from a mere US$0.3 billion in 1980 to about US$20 billion of which local market is worth of US$11.26 billion and international market is US$ 8.74 billion in 2009. The market accounts for nearly 2% of the global market in terms of value and 10% in terms of volume. The industry grew at a CAGR of 13 per cent from 2002 to 2007. Though the Year 2008 ended with the adverse impact of economic recession in global markets, particularly the advanced markets, the Indian pharmaceutical industry is registered a positive growth of 10.20 percent in 2008. The performance volatility index of Indian pharmaceutical industry stands at 0.96.

Full Paper

The Global economy today seems to be recovering from the most severe crisis since the Great Depression of the 1930s. The economy again surfaced a lot with the subprime mortgage crisis in the US in August 2007 and took the character of a global crisis in September 2008 following the collapse of Lehman Brothers. It is also dubbed as the greatest crisis in the history of financial capitalism because of the way it simultaneously propagated to other countries and collapsed world economic growth rate. The impact of the crisis can be gauged from the sharp upward revisions to the estimates of possible write-downs by banks and other financial institutions from about US$ 500 billion in March 2008 to about US$ 3.5 trillion in October 2009. More than the financial cost, the adverse impact on the real economy has been severe: in 2009, the world GDP is estimated by the IMF to have contracted by 0.8 per cent and the world trade volume is estimated to have declined by 12 per cent. India's GDP growth rate was scaled down from 9 percent to 6.2 percent. This paper will discuss performance volatility index for Pharmaceutical Industry.

AN OVER VIEW OF PHARMACEUTICAL INDUSTRY

Pharmaceutical industry is one of the important industries to build human capital of a nation, which consists complex matrix of processes, operations and organizations involved in the discovery, development and manufacture of various drugs and medications. A nation with a strong pharmaceutical industry has a healthy and strong population which provides a strong human capital. Indian pharmaceutical industry is an excellent example of a highly growth oriented industry, which is enhancing its value in the process. From being a pure reverse engineering industry focused on the domestic market, the industry is moving towards basic research-driven, export-oriented global presence, providing wide range of value added quality products and services. Pharmaceutical industry consists commercial business houses, which may focus either on research, manufacturing, marketing and/or distribution of medicine, drugs, and chemicals mostly in the context of healthcare. The roots of pharmaceutical firms can be traced back to 754 B.C. and were known as 'drugstores' in Arabian countries. Arabian pharmacists opened the first known drugstore in 754 BC in Baghdad. In those times, drugstores were famous in medieval Islamic world, Europe and North America. After discovering insulin and penicillin in the 1920s and 1930s, the drugstores were converted into major pharmaceutical firms. Mass-manufactured and distributed pharmaceutical firms made entry into Switzerland, Germany, Italy, the UK, the US, Belgium and the Netherlands in those times. Towards the end of 1950s, most of the

sophisticated drug manufacturing techniques came into existence as a result of developing systematic scientific approaches, understanding human biology (including DNA). This development made it necessary to enact legislations to test and approve drugs. Prescription and non-prescription drugs became legally distinguished from one another even as the pharmaceutical industry matured.

The global pharmaceutical market reached US$778 billion[1] in the year 2009; however, the growth rate moderated from 6.4% in 2007 to 5.10% in 2008. In 2009 the growth rate was scaled down to 4 percent and it is expected to reach global market to US$ 825 billion in 2010 with 6 percent growth rate (Refer Table 1 and figure 1). The Pharmaceuticals market had to contend with a number of forces including decline in new product approvals and the global economic recession, marked in particular by a sharp downturn in the world's largest economies – the USA and the EU. However, the U.S. government medical reform and growth in the emerging markets will stimulate the pharmaceutical industry.

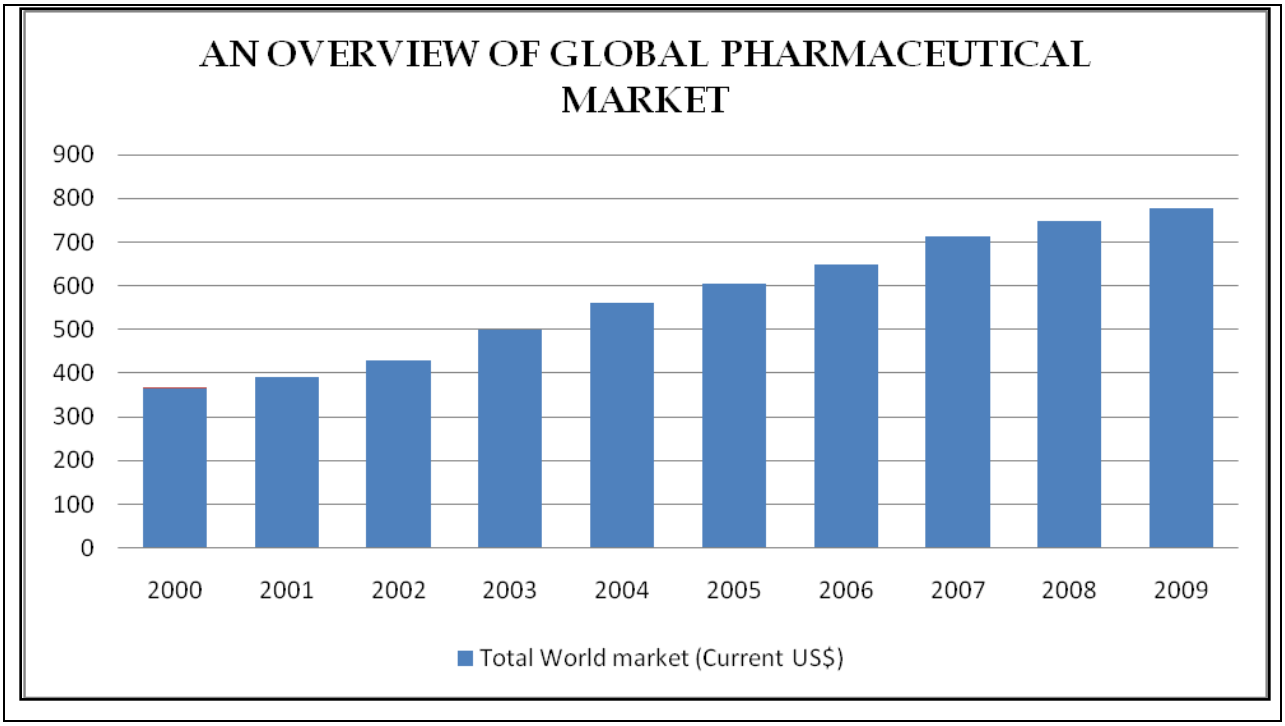
Table 1

GLOBAL PHARMACEUTICAL MARKET SIZE & GROWTH RATES

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total World market (Current US$)	365	392	428	499	560	605	649	712	748	778
Growth Over Previous year (Constant US$ Growth)	11.50%	11.80%	9.50%	10.30%	8.00%	7.30%	7.10%	6.40%	5.10%	4%

Source: IMS Health Market Prognosis (includes IMS Audited and Unaudited markets)

Figure 1



Source: Table 1

INDUSTRY SEGMENTS

Pharmaceutical industry manufactures products that may be broadly classified based on various parameters. The main segments of products of the pharmaceutical industry are formulations (finished dosages) and bulk drugs (Active Pharmaceutical Ingredients).

i. **Bulk Drug:** Bulk drugs are the Active Pharmaceutical Ingredients (APIs) with medicinal properties, which are used for manufacturing formulations. Bulk drugs are Active Pharmaceutical Ingredients (API) or compounds that show specific medicinal properties. Bulk drugs and drug intermediates consist chemicals and solvents; these are the raw materials for the production of drug formulations, which are ultimately sold to the customers. Indian bulk drugs industry registered impressive growth over the past few decades which is very encouraging. India is among the top five bulk drugs producers, producing around 400 different drugs. About 60% of bulk drugs are exported[2] and the balance is sold to domestic formulators.

ii. **Formulation:** Formulations are the end-products of the medicine manufacturing process, and can take the form of tablets, capsules, injectables or syrups, which are ultimately consumed by customers. Formulations constituted nearly 78% (FY08) of the Indian Pharmaceutical industry's sales, and the remaining accounted for bulk drugs. Out of the formulation sales, about 68% are domestic sales and the rest are exports.

INDIAN PHARMACEUTICAL INDUSTRY

Among the emerging countries, India has the largest Pharmaceutical Industry. It provides essential drugs at affordable prices to its vast population, and also provides employment to millions. Indian Pharmaceutical Industry has attained wide-ranging capabilities in the complex field of drug manufacture and technology. From simple painkillers to sophisticated antibiotics and complex cardiac compounds, almost every type of drug is now made indigenously. Pharmaceutical industry first took root in India in 1930 in Calcutta (Kolkata), West Bengal when the Bengal Chemicals and Pharmaceutical Works was set up in government sector. In India, up to 1960s, multinational companies (MNCs) hed a dominant position[3]. These firms imported most of the bulk drugs (the active pharmaceutical ingredients) from their parent companies abroad and sold the end products in the form of tablets and capsules, syrups etc. at prices unaffordable for a majority of the Indian population. This led to a revision of Government of India's (GOI) policy towards this industry. In the early 1960s, the GOI started encouraging the growth of Indian companies that were into manufacturing drugs. With GOI's support and with the Patents Act in 1970, the industry was able to become what it is today[4]. The Patents Act dissipated the dominance of MNCs and the Indian pharmaceutical companies occupied that place. They carved a niche in both the Indian and world markets with their expertise in reverse-engineering and new processes for manufacturing drugs at low costs.

The growth of Indian pharmaceutical Industry may be divided into five phases. The first phase was up to 1970, where foreign companies dominated the market share with very few recognized Indian Companies in existence. The period from 1970-80 comprised the second phase, where drug prices were controlled. The Government of India passed Indian Patent Act, 1970 and domestic pharma companies began to tap the market. The third phase was characterized by pharmaceutical production infrastructure creation, and announcement of export initiatives to domestic pharma companies. The duration of the third phase was from 1980-90. The fourth phase began in 1990 and ended with 2000. During this phase, Indian pharmaceutical companies expanded their businesses in India and outside India very rapidly. In this phase, research orientation production was started. The fifth phase began in the year 2000. Innovation and Research is the chief characteristic of this phase. The Patent Act, 2005 was introduced during this phase, which gave Indian companies the strength to rise to International standards.

At present, the Indian pharmaceutical industry can be broadly segmented to (i) bulk drugs (APIs) and (ii) formulations with very few companies risking investing in primary research aimed at developing and patenting new drugs. The bulk drug business is essentially a commodity business, where as the formulation business is primarily a market driven and brand oriented business. This industry meets about 90% of the country's bulk drug requirement[5].

Growth & Market Size

The Indian Pharmaceutical industry grew from a mere US$0.3 billion turnover in 1980 to about $20 billion[6] of which local market is worth US$11.26 billion and international market is worth US$ 8.74 billion in 2009. It accounts for nearly 2% of the global market[7] in terms of value and 10% in terms of volume. The Indian Pharmaceutical industry is now ranked 3rd in terms of volume of production and fourteenth in terms of value and 13th in terms of domestic consumption. The country ranks fourth in terms of generic production and seventeenth in terms of export value of bulk actives and dosage forms, one reason for lower value share is the lower cost of drugs in India ranging from 5% to 50% less as compared to developed countries. The industry grew at a CAGR of 13 per cent from 2002 to 2007. Though the Year 2008 ended with the adverse impact of economic recession in global markets, particularly the advanced markets, the Indian pharmaceutical industry is registered a positive growth of 10.20 percent in 2008. The industry registered 6.78 per cent growth rate in the year 2009 and India's pharmaceuticals market is expected to grow by about 12-13 per cent in 2010 and will grow at a CAGR of 10% in 2011-15. Rising disposable income and rising health consciousness resulted in a positive impact on the pharmaceutical industry. The industry is likely to become one among the top ten in the market in the next decade. It is also playing a crucial social role by distributing quality medicines to society. The industry is poised to usher in a new era showing a tremendous growth in infrastructure development, technology base creation with wide range of production. The industry is self-sufficient and is a low cost producer of high quality bulk drugs & formulations.

Indian Pharmaceutical Industry employs over 42 lakhs people directly and indirectly. It contributes nearly 1% to the India's GDP[8]. Indian Pharmaceutical Industry meets 40% of the world's bulk drug requirement. The Exports value of bulk actives and dosage makes it to occupy the 17th rank position. Presently, the Indian pharmaceutical industry meets 90% of the country's pharmaceutical needs and imports the remaining 10% drug requirements from other counties. Indian pharma industry exports to more than 200 countries with a sizeable share in the advanced regulated markets of US and Western Europe. Pharmaceutical industry has shown commendable export performance, the trade balance being positive throughout the years. During the period between 2003-04 and 2008-09, the Compounded

Annual Growth Rate (CAGR) of exports was 17.8 per cent (Refer Tables & figure 2 & 5). According to Ministry of Commerce & Industry, domestic investment in the pharmaceutical sector is estimated at US$ 6.31 billion. The Government of India allowed Foreign Direct Investment upto 100 per cent in pharmaceutical industry. This sector was able to attract FDI worth US$ 1.63 billion (Rs. 72,218.55 million) from April 2000 to December 2009[9].

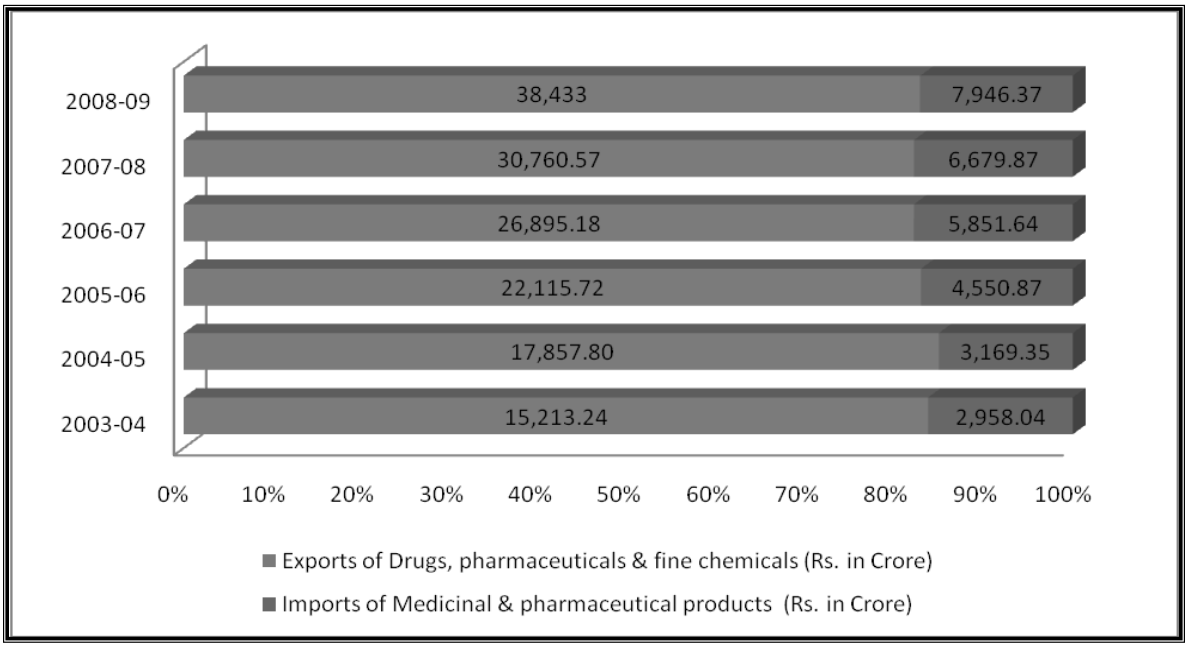
TABLE 2

INDIA'S TRADE IN PHARMACEUTICAL PRODUCTS

Commodity Name	**2003-04**	**2004-05**	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**CAGR (2003-04 to 2007-08)** (%)
Exports of Drugs, pharmaceuticals & fine chemicals (Rs. in Crore)	15,213.24	17,857.80	22,115.72	26,895.18	30,760.57	38,433	17.8
Imports of Medicinal & pharmaceutical products (Rs. in Crore)	2,958.04	3,169.35	4,550.87	5,851.64	6,679.87	7,946.37	18.4
Exports Growth Rate (%)	18.61	17.38	23.84	21.61	14.37	24.94	
Imports Growth Rate (%)	3.24	7.14	43.59	28.58	14.15	18.96	

Source: Directorate General of Commercial Intelligence and Statistics (DGCIS) Kolkata

FIGURE 2, INDIA'S TRADE IN PHARMACEUTICAL PRODUCTS



Source: Table 2

FDI Flow into Pharmaceutical Industry,

Table 3 shows various calculated parameters to calculate performance Index.

Table 3: Performance of Various Indices

Particulars/ Period	2007 (12 Months)	2008 (12 Months)	2009 (12 Months)	2007-2009 (36 Months)
Monthly Average return from pharmaceutical stocks at BSE	1.44% (35.96) [0.832*]	- 2.65% (122.59) [0.829*]	4.67% (42.43) [2.483*]	1.15% (72.40) [0.813*]
Monthly Average return from Sensex (BSE)	3.45% (40.26) [1.884*]	-5.45% (112.23) [-1.785*]	5.49% (101.81) [1.887*]	1.16% (103.15) [0.688*]
Monthly Average FDI Inflow into Pharmaceutical Sector (In US$ Million)	19.02 [1.767*]	21.98 [2.659*]	20.94 [4.159*]	20.65 [4.403*]
Monthly Average FDI Inflow into India (In US$ Million)	1,326.78 [7.930*]	2,752.40 [6.803*]	2,295.24 [12.490*]	2,124.81 [11.572*]
% Allocation to Pharma sector	1.43%	0.80%	0.91%	0.97%

Note : Variance of returns are presented in ( )
't' values are presented in [ ]
** stands to Significant at 0.05 level*
Source: Compiled from the data available from BSE and Ministry of Commerce & Industry.

The calculated beta coefficient of pharmaceutical index is 0.63 which is below one. Less than one beta coefficient elucidate that the volatility in the returns of specific sector are less than the volatility in benchmark returns. It is provided in the table 3. The monthly returns from pharmaceutical pack was 1.44 percent in 2007 where as the monthly sensex return was 3.45 percent in the same period. In 2008 also the pharmaceutical index gave a negative return of 2.65 percent where as sensex gave a negative return of 5.45 percent. It indicates that the pharmaceutical companies cannot give greater returns than market returns in a bull market (refer the returns in 2009) and will not loose more than the market returns in a bear market. The calculated 't' is significant at 5 % level of significance. The investment in pharmaceutical stocks is defensive in nature. It is clear from the Table 3 that the global financial crisis showed a smaller effect on the secondary market returns along with other sectors but that effect is low. The inflow of FDI into Indian pharmaceutical industry did not affected by the financial crisis. The average monthly inflow of FDIs is more during 2008 compared to 2007 and 2009. It was US$ 21.98 million in 2008 and US$ 19.02 million, US$ 20.94 million in 2007 and 2009 respectively. The inflow of FDI in September, 2007 was only US$ 2.47 million, where as it was US$ 135.16 million in December, 2007. The cumulative FDI inflow upto December, 2007 in pharmaceutical sector was US$ 1,165.26 million, occupied 2.58 percent of total FDI inflows into India. The cumulative FDI inflow into pharmaceutical industry was increased to US$ 1,428.96 million by December 2008 and to US$ 1,680.29 million by December 2009. It shows a moving upward trend. The financial crisis showed some what positive effect on some segments of pharmaceutical industry. Particularly, the financial crisis motivated the US government to introduce the health care reforms in US. This step boosts the Indian generic segment.

THE PERFORMANCE VOLATILITY INDEX OF INDIAN PHARMACEUTICAL INDUSTRY

Performance Volatility index is a measure of expectations of investors regarding to volatility in rate of return over the near term. In finance terms volatility stands to the level of risk. It is often described as the "rate and magnitude of changes in returns". The performance volatility index is a good indicator of market conditions. It gives great advantages in terms of investment, trading and hedging of securities in the sector. It helps to build a risk premium rate, as it depicts the collective consensus of various market factors in the investment in a specific sector.

Calculation Methodology

Performance volatility index is a measure, of the difference between the product of weights multiplied by the difference between the standard derivation of the specific sector returns and the standard derivation of benchmark index. Here the performance volatility index is calculated with the following formula.

Performance Volatility Index = $W_1 (\sigma_\partial - \sigma_\ell) - W_2 (\sigma_\pi - \sigma_\Omega)$

Where,

σ_∂ = Standard derivation of benchmark (Sensex) monthly returns

σ_ℓ = Standard deviation of specific (Pharmaceutical) sector monthly returns

σ_π = Standard deviation of monthly increase of total FDI inflow into India

σ_Ω = Standard deviation of monthly increase of FDI inflow into specific sector

W_1 &W_2 = Weights assigned

The factors and the calculated performance volatility index are presented in Table4.

Table 4: Performance Volatility Index

Particulars/ Period	2007 (12 Months)	2008 (12 Months)	2009 (12 Months)	2007-2009 (36 Months)
σ_∂	6.34	10.59	10.09	**10.16**
σ_ℓ	6.00	11.07	6.51	**8.51**
σ_π	1.70	3.13	0.75	**2.23**
σ_Ω	3.61	2.38	1.09	**2.51**
W_1 &W_2	0.5 & 0.5	0.5 & 0.5	0.5 & 0.5	**0.5 & 0.5**
Performance Volatility Index	**1.13**	**-0.61**	**1.96**	**0.96**

Source: Calculated from Appendix

Table 4 depicts the performance volatility index for Indian pharmaceutical industry for 36 months (2007-09) is 0.96. It is less than one. The index for 2008 was negative 0.61. It indicates the positive forward look of investors about the Indian pharmaceutical industry. During this period (2008), the FDI inflow was high inspite of the secondary market returns were negative. As the average market returns were more in 2009 than in 2007, the performance volatility index for 2009 is more than the index of 2007. Over all, it can be concluded that the performance index for Indian pharmaceutical industry is less than one which shows the volatility in the returns are less than the volatility in benchmark returns.

Conclusion

The performance volatility index was at (0.61), which shows the impact of economy on pharmaceutical sector was very low. It does not show any effect on primary investable funds (FDI Inflow).

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