Efficiency Analysis of Pharmaceutical Companies in Pakistan: A Case Study of Ten Famous Companies

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ABSTRACT

Pharmaceutical companies contribute a remarkable amount to the Gross Domestic Product (GDP), employment, and poverty reduction. Pakistan has a very dynamic and reforming Pharmaceutical Industry. Around 759 pharmaceutical companies are operating in Pakistan. However, the study selected 10 leading pharmaceutical companies as a sample. Data Envelopment Analysis (DEA) was applied to analyse the efficiency of Pharmaceutical companies in selecting Total Assets, Liabilities, Equity, Salaries, Wages and other benefits, Sales, Earning Per Share (EPS), Dividend Per Share (DPS), and Return on Equity (ROE). The study ranked the pharmaceutical companies about the optimum utilization of input resources and to maximize the output that provides a guideline to other pharmaceutical companies to increase their revenues by improving their resource utilization following the leading companies' models. Moreover, adopting the same strategy in figuring out ways to increase their efficiencies. This increase in efficiency will make the entire industry better off. It will also increase the GDP of the country.

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1.   Introduction

A pharmaceutical company is a commercial company licensed to conduct research, development, marketing, or distribution of the most common drugs in the healthcare field. These companies are subject to various laws and regulations regarding patents, testing, and marketing of medicines. Pharmaceutical companies discover, develop, and manufacture drugs by public and private organizations that sell, distribute, import, or sell their drugs in the market (Fine et al., 2000). The pharmaceutical sector in Pakistan is very dynamic and reforming. Around 759 pharmaceutical companies are operating in Pakistan, among them twenty-five pharmaceutical firms are operated by multinational companies. Pakistan's pharmaceutical sector covers approximately 70% demands of the country for medicines.

As far as the stock market is concerned, the local pharmaceutical market is divided equally among the national and multinational firms (Junaidi, 2015). In the past ten years, the national pharmaceutical sector has shown tremendous growth. In the past few years, the pharmaceutical industry has invested heavily in self-improvement, and now, most industries follow the manufacturing practices of domestic and international guidelines. Currently, pharmaceutical firms can produce a variety of products, from simple pills to complex biotechnology and value-added general-purpose compounds (Haq, 2014). According to Intercontinental Medical statistics, the size of Pakistan's pharmaceutical industry was 3.1 billion US dollars in monetary value, and the total size of the international pharmaceutical market was

estimated to exceed One trillion US dollars. Pakistan's market has almost 0.5% of the International market (PPMA, 2017).

2. Impact of Pharmaceutical Companies on the Economy

Pharmaceutical companies contribute a remarkable amount to the gross domestic product (GDP) as indicated by a survey of healthcare. This sector imparts 1.6 billion US dollars to the Gross Domestic Product (GDP). Due to its impressive involvement in the Gross Domestic Product (GDP), the government has placed significant effort towards the development of the pharmaceutical industry. For the manufacturing of medicines, Pakistan is considered as 8th biggest manufacturer of pharmaceuticals across the world. The pharmaceutical sector of Pakistan is developing exceptionally. The pharmaceutical companies generate employment and reduce poverty by empowering the citizen and increasing their access to necessities of life.

This sector contributes to the generation of wealth by mobilizing substantial investments from both individuals and businesses. These firms foster research and development (R&D) through the creation of highly specialized employment opportunities, which also advance scientific expertise. Moreover, it extends principles of ethical business practices and social responsibility within the country through activities such as donations, awareness campaigns, and a diverse range of initiatives aimed at enhancing the capabilities of healthcare institutions.

2.1. Merck Pharmaceutical

A German enterprise established in 1668 by the Merck family named "MERCK", when Friedrich Jacob Merck, a German pharmacist, acquired a medical store in Darmstadt. During the nineteenth century, the Merck company transitioned from a pharmacy to a significant player in the pharmaceutical industry, pioneering the production of morphine (Voinea & Van Kranenburg, 2017). Merck Pharmaceuticals is now a global corporation with a substantial $39.7 billion in revenue, ranking as the fifth-largest pharmaceutical company worldwide in 2018. Merck Pharma has been active in Pakistan for four decades, having its manufacturing facility located in Quetta and its headquarters situated in Karachi.

In addition, it operates a distribution center in Lahore. The Quetta manufacturing plant is responsible for the production and packaging of various pharmaceutical products, including tablets, capsules, syrups, ampoules, and ointments. Three major market segments are the focus of the company; cardio metabolic care and oncology, nutrition and infection, and fertility and neuro care (Hayat et al., 2012).

2.2. ABBOT Laboratories

Abbott Laboratories is an American international health device and health care organization associated with headquarters in Abbott Park, US. The organization was founded in 1888 by ''Dr. Wallace Calvin Abbott''. Today, it sells clinical equipment, branded generic drugs, and nutritional products. Abbott started its operations in Pakistan and got a marketing affiliation in 1948. This organization had consistent coverage that comprised a workforce of over 1500 employees. Now two manufacturing plants are in Karachi to produce pharmaceutical products.

2.3. Glaxo Smith Kline (GSK)

GSK is another global pharmaceutical company that commenced its operations in Pakistan on January 1st, 2002, and has since become the leading pharmaceutical company in Pakistan, commanding a significant market share of 57.66 billion. It is headquartered in Brentford, England. It was established in the year 2000 through the merger of Glaxo Welcome and SmithKline Beecham. GSK, at the time, ranked as the sixth-largest pharmaceutical company worldwide.

2.4. AGP Pharmaceuticals

AGP started its business tasks in 1989 as a free drug-producing organization in Karachi, Pakistan. It is consistently developed through assembling and promoting items under authorizing courses of action with numerous organizations worldwide. Furthermore, through assembling and advertising its brands. AGP introduced "MY-Hep" for Hepacivirus in 2016. Further, the Drug Administration of Pakistan approved the prices of malignant tumor treatment drugs, which can provide a moderate alternative treatment for other diseases and has become a prescription drug for considering the high incidence of breast cancer in Pakistan(AGP).

2.5. Novartis Pharmaceutical

Novartis Pharma was introduced in December 1996 by Alexander Clavell and Johann Rudolf. Novartis Pharmaceutical has focused on three divisions with imaginative force and global scales like Pharmaceuticals for eye care and generics. The volume of Novartis Pharma is US $34.9 billion. It is one of the leading pharmaceutical organizations in Switzerland. Novartis was in the top ten pharma list in 2020 (Duxbury & Tuck, 2008).

2.6. Highnoon Laboratories

Highnoon Laboratories were founded in 1984 and it was listed as a private limited company in 1995. Its head office is located in Lahore. Highnoon captured the cardio, gastro, and diabetic segment and retained its profits through these segments (Highnoon).

2.7. ICI pharmaceutical

ICI's corporate headquarters are situated in Karachi, recognized as a chemical enterprise operating in Pakistan that was established in 1944. The company specializes in the production of pharmaceutical goods, soda ash, and agricultural compounds. ICI Pakistan holds a conspicuous position as one of the leading publicly traded companies on the Pakistan Stock Exchange, boasting a paid-up share capital of Rs 1.39 billion. The organization maintains a workforce of approximately 1,295 permanent employees, supplemented by a similar number of individuals engaged in contractual roles to support its operations

2.8. Macter Pharmaceuticals

Macter International Limited is among the most Pharmaceutical organizations in Pakistan. Macter, is a public limited organization that has a remarkable 30-year history in the production of medicine formulations. The vital action of the organization is to create and market drug items. The organization appreciates a true standing of import and is among the top 5 producers by volume. Macter has a solid corporate administration structure and frameworks. Macter International Limited was founded in Pakistan in 1992 as a private limited organization and was changed into a public limited organization in 2011. The central action of the organization is to make and market drug items (Macter).

2.9. Eli Lilly Pharmaceuticals

Eli Lilly is an American drug organization settled in Indiana-polis, with workplaces in 18 countries. Its products are sold in around 125 countries. The organization was established in 1876. This organization was founded by an American chemist ''Col Eli lily''. Eli Lilly Pakistan (Pvt) Ltd. is recorded in Pharmaceutical Companies and is situated in Karachi Pakistan. It has been operating in Pakistan for several years (Blake, 2013). Though many other pharmaceutical companies present a huge share in the stock market of Pakistan, due to the limitations of time and cost only the 10 most famous and biggest companies have been selected as a samples to find out the Performance Ranking of these companies based on input and output variables.

3. Methodology

DEA (Data Envelopment Analysis) is considered a powerful method in the literature (Shewell & Migiro, 2016). Data envelopment analysis is a mathematical approach to using linear programming strategies for transforming inputs into outputs with the motive of comparing the overall performance of similar companies and products. The relative performance or the performance rating is the ratio of the full-weighted output to the full-weighted input. DEA makes use of linear programming to estimate relative performance. In other words, Data Envelopment Analysis (DEA) determines how efficient a DMU is in constructing a certain level of output, based on the amount of input it uses, compared to related DMUs (Mardani, 2017).

3.1. Variables used in the study

This study used secondary data and collected it from annual reports of pharmaceutical companies operating in Pakistan and took the variables to measure the efficiency of the companies by the comparison of their input and output variables. Input variables (total assets, liabilities, equity, taxation, Salaries, wages, and other benefits) and output variables (Sales, EPS, DPS, and ROE) to measure the performance of the companies.

3.2. Definition of Variables

3.2.1. Assets

Assets are resources with economic value owned or controlled by a person, organization, or country, and are expected to bring future benefits. Assets are reported on an organization's balance sheet and are purchased or made to expand an organization's value or benefit the organization's operations. A common asset classified includes cash and its reciprocals, such as Accounts Receivables, Prepaid expenses, Inventories, Properties, and Equipment. There are two types of assets, tangible and intangible assets. Tangible assets are Physical assets and intangible assets have no physical existence like licenses, goodwill, and trademarks. We used tangible assets as input for our study because assets are generally input by which we generate outputs.

3.2.2. Liabilities

Liabilities are defined as legal and financial debts or obligations incurred by the company during its operations. Liabilities have two types, long-term liabilities, and short-term liabilities. The liabilities which are recovered within one year are known as short-term liabilities. Loans are classified by liabilities, accounts payable, Unearned Income, mortgages, accrued expenses, deferred premiums, and earned premiums are example liabilities. Liabilities are usually input.

3.2.3. Equity

In the domain of trading, equity refers to stocks. In the fields of accounting and corporate financing, equity, or shareholders' equity, denotes the capital contributed by owners or the difference between an organization's total assets and its total liabilities. The accounting equation compactly expresses this as 'Equity = Assets - Liabilities.' Equity is considered an essential input because it represents the entire investment that enables a business to generate sales and profits.

3.2.4. Taxation

The government's practice of collecting funds from citizens to finance public services provided by the government is Taxation. Taxation involves the collection of money from individuals based on their income and property holdings. Taxes are included as an input in this study.

3.2.5. Compensation Packages (Salaries, Wages, and Other Benefits)

Compensation owed to employees for the work or services they perform on behalf of their employer is referred to be Salary. Wages and salaries typically exclude additional non-cash benefits employees may receive, such as flights or tuition payments, among others. We have considered salaries, wages, and other benefits as inputs in our study because they represent a component of the cost of production.

3.2.6. Sales

The volume of goods or services sold during a specific period is comprehended as Sales. It happens when a seller or service provider completes a transaction with a buyer through a purchase, occupation, requisition, or direct interaction at the point of sale. Sales establish the primary outputs of any company.

3.2.7. Earnings per Share (EPS)

A numerical indicator that quantifies the profit attributed to each outstanding share of a publicly listed company is Earnings per Share (EPS), typically calculated on a quarterly or annual basis. EPS is computed by dividing the company's quarterly or annual earnings by the number of outstanding shares. Earnings per Share stand for an output, signifying the income earned by a shareholder over a specified period.

3.2.8. Dividend per Share

The total amount of dividends declared and distributed by a company for each common share issued is known as Dividend per Share. This value is determined by dividing the cumulative dividends, including any interim dividends, paid out by the company during a specific time frame by the total number of outstanding common shares. We consider the Dividend per Share as an output in our study.

3.2.9. Return on Equity (ROE)

Return on Equity (ROE) serves as a profitability metric that assesses how efficiently a company generates profit with each dollar of shareholder equity. The ROE formula is expressed as ROE = net income/shareholder equity. ROE is also commonly referred to as return on equity. We incorporate Return on Equity as an output variable in our study.

Table 1: Sources of data on variables

Description	Source	Units
Total Assets	https://investors.merck.com/financials/annual-reports-and-proxy/default.aspx	$
Total Liabilities		$
Total Equity	https://www.pk.abbott/investor/investor-information.html	$
Taxation	https://pk.gsk.com/en-gb/investors/annual-reports/	Rs
Salaries, Wages& other benefits	http://agp.com.pk/financial-statements/ https://www.novartis.com/sites/www.novartis.com/files/novartis-annual-report-2018-en.pdf	$
Total Sales & Revenues		Rs
Earnings Per Share	https://www.novartis.com/sites/www.novartis.com/files/novartis-annual-report-2017-en.pdf	$
Dividend Per Share		Rs
Return on Equity	https://macter.com/financial-reports/	$
Net profit margin	http://www.annualreports.com/Company/sanofi https://www.ici.com.pk/investor-relations/financial-reports/ http://www.highnoon-labs.com/pdfcat/annual-report/	$

3.3. Data Collection Procedure

The data is collected through the use of auxiliary sources. The principal data is collected from audited annual reports issued by pharmaceutical companies in Pakistan (2020 and 2021). Because the data was only available for these most recent years. The annual reports are collected from the company's website. The references are given in the table 4.0.

4. Results and Discussion

Table 2 shows that one firm was efficient in 2020 while maximizing revenue. This is Highnoon, (Highnoon) maintained its efficiency in maximizing revenue, showing the firm's strong managerial commitment towards efficient utilization of resources. However, in 2021, Merck, Abbot, GSK, AGP, Novartis and Macter, ICI, and Lilly improved on their revenue maximization efficiency; implying that nine of the firms regained their efficiency in 2021 which they had not shown in 2020.

Table 2: DEA Results for Revenue as Output

Firms	2020		2021	
	Rank	Theta	Rank	Theta
Merck	4	0.075938	1	1
Abbot	8	0.011884	1	1
GSK	6	0.014818	1	1
AGP	2	0.126471	1	1
Novartis	3	0.088858	1	1
MACTER	9	0.003564	1	1
SANOFI	7	0.013087	10	0.14
ICI	5	0.048191	1	1
HIGHNOON	1	1	1	1
Lilly	10	0.00069	1	1

Source: Author's Compilation

Figure 1: Revenue Efficiency among Ten Manufacturing Firms
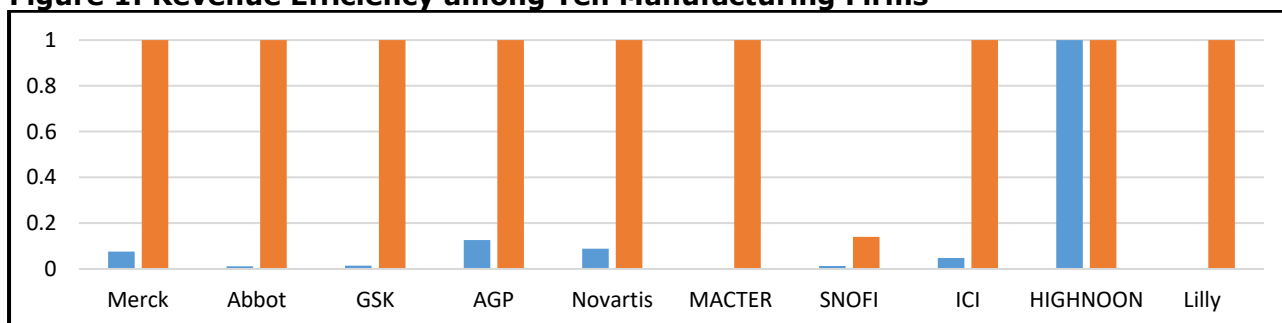

Source: Author's Compilation

Table 3 revealed that while maximizing earnings per share of shareholders, nine of the firms were efficient in both years. These are Merck, Abbot, GSK, AGP, Novartis, Macter, ICI, Highnoon, and Lilly. Sanofi was not efficient in both years while trying to maximize its earnings per share.

Table 3: DEA Results for Earnings per Share as Output

Firms	2020		2021	
	Rank	Theta	Rank	Theta
Merck	1	1	1	1
Abbot	1	1	1	1
GSK	1	1	1	1
AGP	1	1	1	1
Novartis	1	1	1	1
MACTER	1	1	1	1
SANOFI	10	0.02	10	0.08
ICI	1	1	1	1
HIGHNOON	1	1	1	1
Lilly	1	1	1	1

Source: Author's Compilation

Figure 2: Earnings per Share Efficiency among Ten Manufacturing Firms
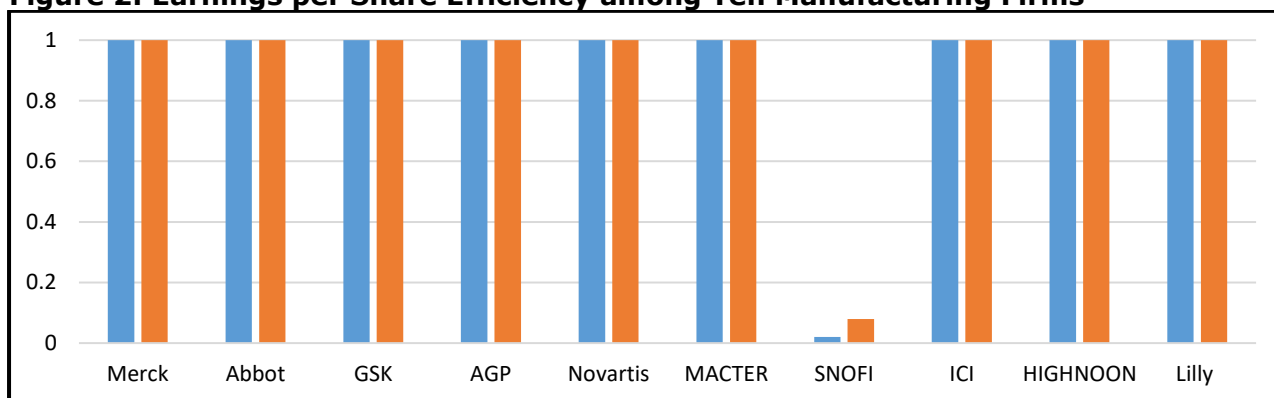
In table 4, there is evidence that ICI and Highnoon were efficient in 2020 while trying to maximize their dividend per share. Eight firms were not efficient during this period. In 2021, many of the firms improved on their dividend per share maximization efficiency, as seven more firms improved their efficiency along with ICI and Highnoon firms that maintained their efficient operations in 2021.

Table 4: DEA Results for Dividend Per Share as Output

Firms	2020		2021	
	Rank	Theta	Rank	Theta
Merck	4	0.182251	1	1
Abbot	7	0.005942	1	1
GSK	6	0.012701	1	1
AGP	5	0.113244	1	1
Novartis	3	0.182942	1	1
MACTER	8	0.003354	1	1
SANOFI	9	0.000582	10	0.11
ICI	1	1	1	1
HIGHNOON	1	1	1	1
Lilly	10	0.000224	1	1

Source: Author's Compilation

Table 5 depicted that nine of the firms were efficient in maximizing returns on equity in 2020. These are Merck, Abbot, GSK, AGP, Novartis, Macter, ICI, Highnoon, and Lilly. Likewise, these nine firms sustained their efficient operations in maximizing their returns on equity. Further results from the table show that Sanofi was not efficient during the years.

**Figure 3: Dividend per Share Efficiency among Ten Manufacturing Firms**
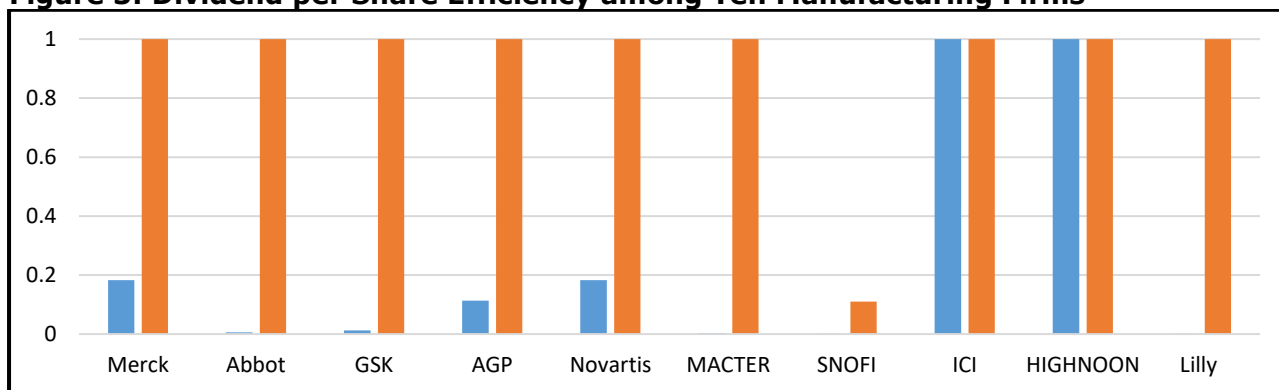
Source: Author's Compilation

Table 5: DEA Results for Return on Equity

Firms	2020		2021	
	Rank	**Theta**	**Rank**	**Theta**
Merck	1	1	1	1
Abbot	1	1	1	1
GSK	1	1	1	1
AGP	1	1	1	1
Novartis	1	1	1	1
MACTER	1	1	1	1
SANOFI	10	0.22	10	0.41
ICI	1	1	1	1
HIGHNOON	1	1	1	1
Lilly	1	1	1	1

Source: Author's Compilation

Figure 4: Returns on Equity Efficiency among Ten Manufacturing Firms
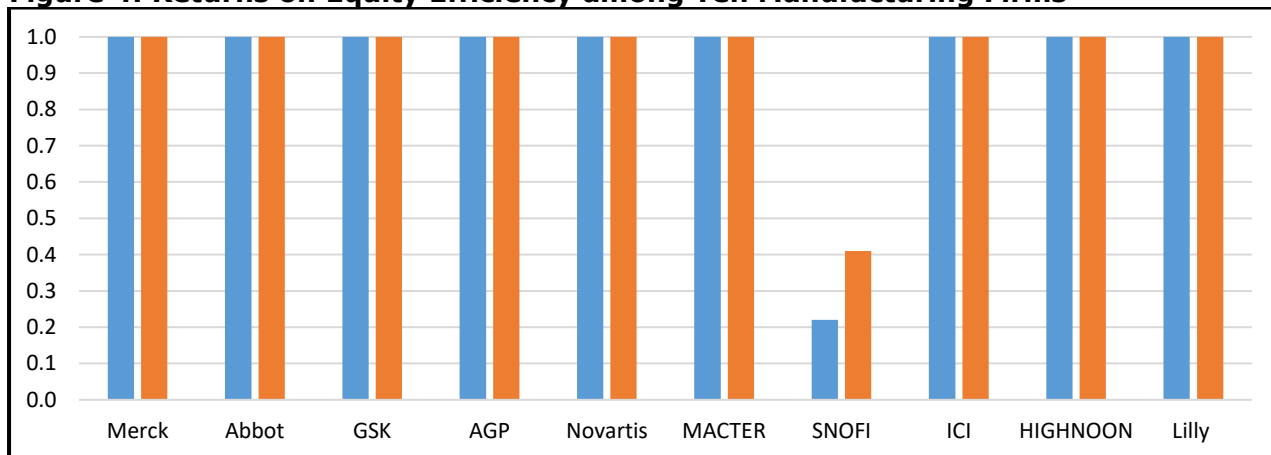
5. Conclusion

The objective of the study was to evaluate the pharmaceutical industry's most famous companies working in Pakistan about their performance in 2020 and 2021. These two years were important due to the outbreak of the Covid-19 pandemic and its aftermath on the business world. Furthermore, it was also assumed that the Pharma and food industries were taking benefit of the situation and earning extraordinary profits. Hence, to find the answer to these assumptions study analyzed the industry and evaluated its performance by Data Envelopment Analysis based on input and variables selection: total assets, liabilities, equity, taxation, Salaries, wages, and other benefits.

The study found the efficiency of pharmaceutical companies, 9 out of 10 companies were efficient in both years. Only Sanofi did not meet the efficiency parameters. The efficient pharmaceutical companies were Merck, Abbot, Highnoon, Glaxo Kilven Smith, ICI, AGP, Lilly Lilly, Novartis, Macter, and Merck. This indicates Pakistan's pharmaceutical industry is growing exceptionally. There are several segments of pharmaceuticals including Oncology, Cardiometabolic, Neuro, and nutrition. Novartis has its place in oncology. Novartis is the leader of the oncology segment and generates 60% of its revenues from this segment.

On the other hand, Abbot, Macter, G.S.K, and AGP are competing in the Cardiometabolic and nutrition segment and generate their maximum revenues from these segments. Each company has its specific target market and segment which is the reason behind most of the industries are efficient in our study. Only Sanofi is evaluated to be inefficient because of its infant emergence in 2004. The study indicated that a company's standing in the market for a long can sustain its performance, the sudden change or volatility of the market did not or less affect performance/efficiency.

Reference

AGP. AGP Pharmaceutical. Retrieved from http://agp.com.pk/company-profile/

Blake, H. (2013). *A history of… Eli Lilly & Co.* Retrieved from https://pharmaphorum.com/views-and-analysis/a-history-of-eli-lilly-co/

Duxbury, P., & Tuck, E. (2008). Pharmaceutical patents need a new lease of life. *No. 185 Managing Intell. Prop.*, 42.

Fine, J.-D., Eady, R. A., Bauer, E. A., Briggaman, R. A., Bruckner-Tuderman, L., Christiano, A., . . . McGrath, J. (2000). Revised classification system for inherited epidermolysis bullosa: Report of the Second International Consensus Meeting on diagnosis and classification of epidermolysis bullosa. *Journal of the American Academy of Dermatology, 42*(6), 1051-1066. doi:https://doi.org/10.1067/mjd.2000.106369

Haq, S. (2014). Industry woes: Drug shortage feared as consignments stuck at ports.

Hayat, S., Hayat, Q., Alyemeni, M. N., Wani, A. S., Pichtel, J., & Ahmad, A. (2012). Role of proline under changing environments: a review. *Plant signaling & behavior, 7*(11), 1456-1466. doi:https://doi.org/10.4161/psb.21949

Highnoon.

Junaidi, I. (2015). No law to stop pharma companies from importing raw materials.

Macter.

Mardani, A., Zavadskas, E. K., Streimikiene, D., Jusoh, A., Khoshnoudi, M. J. R., & Reviews, S. E. . (2017). A comprehensive review of data envelopment analysis (DEA) approach in energy efficiency. *70*, 1298-1322.

PPMA. (2017).

Shewell, P., & Migiro, S. (2016). Data envelopment analysis in performance measurement: A critical analysis of the literature. *Problems and Perspectives in Management*(14, Iss. 3 (contin. 3)), 705-713.

Voinea, C. L., & Van Kranenburg, H. (2017). *Nonmarket strategic management*: Taylor & Francis.