

An Equity Research for Investment on Pharmaceutical Companies Based on Ratio Analysis

Jiayi Cai, Longyue Hong, Nuofan Hu, and Yun Liu

Abstract—Contemporarily, human beings live in an uneasy time with global economic and financial unrest, especially stirred by the COVID-19. Health and wellness are more important than ever; hence pharmaceutical companies have become an attractive investment target. We selected key statistics from the balance sheet, income statement, and cash flow statement to evaluate and compare major pharmaceutical companies' valuation, growth, profitability, and payout, based on the DDM model. These companies include GlaxoSmithKline Plc, Johnson & Johnson, AstraZeneca Plc, MERCK & Co, Amgen Inc, Bristol Myers Squibb Co, Pfizer Inc, and Novo Nordisk A/S. According to the calculation of ratios and the comparison of growth rates and profitability to other selected pharmaceutical companies, GlaxoSmithKline is the best investment target among the eight companies in the comparison list. Specifically, GlaxoSmithKline has both P/E and EV/Sales ratios ranked the lowest in 2020; both average sales growth and average EPS growth rates are ranked at 2nd, average EBITDA growth ranked at 5th for the financial year 2020. The GP/A ratio for GlaxoSmithKline is above the list's average. In a broad sense, there is still an opportunity for growth in medical company equities as the epidemic continues. In particular, we need to choose a firm that has a stable and sustainable growth rate, advanced medical technology, and a suitable and mature system. Our pharmaceutical equity research can lend more insight to other researchers or investors interested in healthcare stocks.

Index Terms—Pharmaceutical companies, equity research, GSK, valuation.

I. INTRODUCTION

GlaxoSmithKline (GSK) is a British multinational pharmaceutical company that produces vaccines, medicines, health products, etc., based in London, England. It is the 7th largest pharmaceutical company in the world [1]. GSK's products are composed of pharmaceuticals, vaccines, and consumer healthcare. Its Pharmaceuticals business has a broad portfolio of innovative and established medicines in respiratory, HIV, immuno-inflammation, and oncology. The company is strengthening its R&D pipeline by focusing on immunology, human genetics, and advanced technologies. It is the world's largest vaccines company by revenue, delivering vaccines that help protect people at all stages of life [2]-[7].

The article focuses on what pharmaceutical companies are

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worth investing in due to the epidemic, the current macroeconomic and world economic development situation as a result of the COVID-19 strike, and the aging baby boomer generation's growing demand for pharmaceuticals.

A previous cross-sectional study indicated that Large pharmaceutical companies were more profitable than other large companies [8]. Additionally, the equity research on GSK's strategy and the forecast suggested that GSK's stock is undervalued and worth buying with an expected return of 23.0% [9].

GlaxoSmithKline's ratio indicators are improving in relation to the boom in the pharmaceutical industry caused by COVID-19. Still, the majority of GSK's income is from various vaccines that the company already provides [10]-[15], net profit and revenue are growing steadily among all types of drugs. Current research investment is effective, and several collaborations are underway to develop adjuvanted COVID-19 vaccines, which creates GSK a promising future.

With these second-hand analyses as support, our research primarily focused on four evaluation aspects inspired by the DDM model. Specifically, we employed P/E and EV/Sales ratio for valuation; for growth potential, we employed Sales, EBITDA, and EPS growth rate; for profitability, we used GP/A ratio; regarding payout, we used payout dividend yield.

The rest of the paper is organized as follows: the Section II will discuss the data origination and the methods utilized to evaluate GSK. Subsequently, the results will be presented for GSK's ratios, growth rates, and payout in Section III. In Section IV, we will compare GSK to its competitors from Valuation, Growth, Profitability, and Payout perspectives and discuss the limitations of our analysis in this part. Section V will be the conclusion part, in which we will summarize the results, the future outlook, and its significance for future studies.

II. DATA & METHOD

A. Data

The data is collected from plenty of open access sources, including SEC.gov | Company Search Page [16], <https://finance.yahoo.com/> [17]. The data of Johnson & Johnson is collected from EDGAR Entity Landing Page (sec.gov) [18]. The data of GlaxoSmithKline Plc is collected from EDGAR Entity Landing Page (sec.gov) [19]. The data of AstraZeneca Plc is collected from EDGAR Entity Landing Page (sec.gov) [20]. The data of MERCK & Co is collected from EDGAR Entity Landing Page (sec.gov) [21]. The data of Pfizer Inc is collected from yahoo finance [22]. The data of Bristol Myers Squibb Co is collected from EDGAR Entity Landing Page (sec.gov) [23]. The data of Novo Nordisk A/S is collected from EDGAR Entity Landing Page (sec.gov) [24].

The data of Amgen Inc is collected from EDGAR Entity Landing Page (sec.gov) [25].

B. Ratio Calculation

Several indicators are utilized to evaluate those pharmaceutical companies, including P/E, EV/SALES, EV/EBITDA, Gross Profit, GP/Assets, Gross margin, Asset turnover, and EPS growth. Table I lists the calculation formulae for different types of ratios.

TABLE I: THE CALCULATION FORMULAE OF DIFFERENT RATIOS

P/E	Share Price/ Earnings per Share
EV/SALES	EV/ Revenue
EV/EBITDA	EV/ EBITDA
Gross Profit	Revenue - Cost of Goods Sold
Sales Growth	(net sales of the current period - net sales of the current period)/net sales of the prior period×100%
GP/Assets	Gross Profit/ Assets
Gross Margin	Gross Profit/ Revenue
Asset turnover Ratio	Revenue/ Assets
EPS growth	EPS for the year just ended - EPS for the prior year
EBITDA	Net Income + Interest + Taxes + Depreciation + Amortization or Operating Profit + Depreciation + Amortization
Dividend yield	Annual dividends per share/Current share price

EV shows the value of an enterprise. EBITDA, including investment income, non-operating income, and expenses, also shows the influence of non-operating factors, e.g., depreciation policies, i.e., it can reflect the operating capacity of a company. P/E is an index for valuing an enterprise. The higher the value of P/E is, the higher the market's expectation of its growth will be. EV/SALES shows the ability to generate revenue. EV/EBITDA not only includes both returns to shareholders (in EBITDA) and market value (in EV) but also includes the income of creditors (in EBITDA) and the market value of the debt (in EV). Sales growth is a metric that indicates the periodic financial performance and the business profitability. GP/Assets is used to reflect the ability of an enterprise to gain profits from its operating assets. The higher the ratio is, the better capability to use its assets. Gross margin is an important index to measure the profitability of an enterprise. Commonly, the highest gross margin indicates the higher the profitability of the enterprise and the higher ability to control costs. Asset turnover is an important index to evaluate the management quality and utilization of all assets. Generally speaking, the higher the number of turnover times and the lower the number of turnover days, the stronger the operation capacity. EPS growth is defined as the percentage increase in profits that a company receives for each share—the higher the number, the better the company's management ability. The dividend yield is the percentage of a company's share price that it pays out in dividends each year. A higher dividend yield is more resilient and means higher payouts.

C. Evaluation Method

We select the best stock based on the following four criteria: valuation (P/E, EV/SALES), growth (Sales Growth, EBITDA Growth, EPS growth), profitability (GP/Assets), payout (average dividend yield). Besides, we combine all of the characteristics in an identical way. The equations above are the factors we used to articulate why our company stands out.

III. RESULTS

TABLE II: THE CALCULATION RESULTS FOR GLAXOSMITHKLINE PLC

Financial Year	2016	2017	2018	2019	2020
Dividends	5983	5284	5005	5235	5340
EBITDA	10791	12217	12406	12577	13182
EPS	0.46	0.84	1.86	2.45	3.06
Net Income	1125	2073	4618	6152	7720
Revenue	34898	41320	39662	45169	46215
P/E	84.00	42.00	21.00	19.00	12.00
EV/Sales	3.17	2.53	3.08	3.33	2.59
EV/EBITDA	10.26	8.56	9.85	11.96	9.07
Gross Profit	25941	30605	29484	33052	34147
GP/A	36%	40%	40%	31%	32%
Gross Margin	74.33%	74.07%	74.34%	73.17%	73.89%
Asset					
Turnover	47.90%	54.20%	53.60%	42.80%	42.80%
Ratio					
Dividend per Share	2.46	2.16	2.03	2.11	2.14
Dividend Yield	6.38%	6.09%	5.32%	4.50%	5.83%
Sales Growth		18.40%	-4.01%	13.88%	2.32%
EBITDA					
Growth		13.21%	1.55%	1.37%	4.82%
EPS Growth		82.61%	121.43%	31.72%	24.90%

Table II summarizes the results of GlaxoSmithKline Plc. GlaxoSmithKline is one of the largest pharmaceutical companies headquartered in London, United Kingdom. Referring to valuation, GlaxoSmithKline's P/E is declining continuously and even reaches 12.00, which shows it is undervalued and has great potential.

TABLE III: THE CALCULATION RESULTS FOR NOVO NORDISK A/S

Financial Year	2016	2017	2018	2019	2020
Dividends	3382	3043	2921	2915	3255
EBITDA	7145	8202	7654	8609	9591
EPS	2.12	2.48	2.44	2.46	2.91
Net Income	5382	6157	5925	5850	6816
Revenue	15864	18035	17152	18325	20534
P/E	16.92	21.64	18.88	23.53	24.00
EV/Sales	5.48	7.12	6.29	7.34	7.85
EV/EBITDA	12.16	15.66	14.11	15.62	16.80
Gross Profit	13801	15651	15034	16125	18058
GP/A	99.70%	94.70%	88.49%	85.48%	77.03%
Gross Margin	87.00%	86.78%	87.65%	88.00%	87.94%
Asset					
Turnover	114.60%	109.13%	100.96%	97.14%	87.60%
Ratio					
Dividend per Share	1.35	1.24	1.22	1.24	1.41
Dividend Yield	3.77%	2.32%	2.65%	2.14%	2.01%
Sales Growth		13.69%	-4.90%	6.84%	12.06%
EBITDA					
Growth		14.79%	-6.68%	12.47%	11.41%
EPS Growth		16.98%	-1.61%	0.82%	18.29%

Table III shows the results of Novo Nordisk A/S. Novo Nordisk A/S is an American multinational pharmaceutical company. Since its growth rates are high in 2020 and have been steadily rising in most of the years, it is forecast to be more profitable over the next few years.

Table IV lists the results of Johnson & Johnson. Regarding value, Johnson & Johnson's P/E in 2020 is 28.56, indicating it's a relatively high valued stock. However, in terms of growth, its EBITDA growth rate is not steady and consistent throughout the years, with 2.10%, 11.10%, -0.66%, and -3.26% each year from 2017 to 2020. Similarly, sales growth dropped from 6.34% in 2017 to 0.64% in 2020. On the bright side, its profitability exhibited by the GP/A ratio is consistently high, with the company generating a five-year average dividend yield of 2.61%.

TABLE IV: THE CALCULATION RESULTS FOR JOHNSON & JOHNSON

Financial Year	2016	2017	2018	2019	2020
Dividends	8621	8943	9494	9917	10481
EBITDA	24964	25489	28318	28130	27214
EPS	5.93	0.47	5.61	5.63	5.51
Net Income	16540	1300	15297	15119	14714
Revenue	71890	76450	81581	82059	82584
P/E	19.43	297.28	23	25.91	28.56
EV/Sales	4.13	5.12	4.34	4.79	5.14
EV/EBITDA	11.89	15.34	12.51	13.98	15.59
Gross Profit	54004	57463	61633	61663	61457
GP/A	38.24%	36.53%	40.30%	39.09%	35.14%
Gross Margin	75.12%	75.16%	75.55%	75.14%	74.42%
Asset Turnover Ratio	50.91%	48.60%	53.34%	52.03%	47.22%
Dividend per Share	3.19	3.33	3.57	3.77	3.98
Dividend Yield	2.76%	2.39%	2.76%	2.58%	2.53%
Sales Growth		6.34%	6.71%	0.59%	0.64%
EBITDA Growth		2.10%	11.10%	0.66%	-3.26%
EPS Growth		-92.07%	1093.62%	0.36%	-2.13%

TABLE V: THE CALCULATION RESULTS FOR MERCK & CO

Financial Year	2016	2017	2018	2019	2020
Dividends	24274	21353	19806	23504	26722
EBITDA	10095	8148	9087	14526	14615
EPS	15309	12725	13404	17972	17973
Net Income	1.41	0.87	2.32	3.81	2.78
Revenue	3920	2394	6220	9843	7067
P/E	161818	151738	198098	230924	206972
EV/Sales	41.75	64.68	32.94	23.87	29.42
EV/EBITDA	4.33	4.18	5.07	5.29	4.84
Gross Profit	11.26	13.17	15.99	13.79	12.92
GP/A	31658	32196	33123	37165	38027
Gross Margin	33.19%	36.64%	40.08%	44.04%	41.52%
Asset Turnover Ratio	79.53%	80.25%	78.32%	79.34%	79.23%
Dividend per Share	41.74%	45.66%	51.18%	55.50%	52.40%
Dividend Yield	1.87	1.92	2.05	2.29	2.49
Sales Growth	3.17%	3.41%	2.68%	2.52%	3.05%
EBITDA Growth		0.79%	5.41%	10.75%	2.46%
EPS Growth		-16.88%	5.34%	34.08%	0.01%

Table V summarizes the results for Merck & Co. Merck & Co. is also a highly valued stock- a high P/E ratio of 29.42 in 2020. The EBITDA growth and sales growth is increasing from year 2017-2019, while largely hindered by the COVID in 2020 (Sales growth from 2017 to 2020: 0.79%, 5.41%, 0.75%, 2.46%; EBITDA growth from the same period: -16.88%, 5.34%, 34.08%, 0.01%). Concerning payout, the company produces on average a 2.97% dividend yield per year. Regarding profitability, the firm exhibits high consistent growth, with GP/A growing from 33.19% in 2016 to 41.52% in 2020.

Table VI shows the calculation results for Pfizer Inc., an American multinational pharmaceutical biotechnology company, which pays dividends reliably and sustainably. Nevertheless, compared to others, its growth is forecast to decline in the future for decreasing sales growth in recent years, and its EPS growth dropped from 200.85% to -56.79%.

TABLE VI: THE CALCULATION RESULTS FOR PFIZER INC

Financial Year	2016	2017	2018	2019	2020
Dividends	7446	7789	8060	8174	8571
EBITDA	20058	21116	21818	20257	14064
EPS	1.17	3.52	1.86	2.87	1.24
Net Income	7215	21308	11153	16273	9616

Revenue	52824	52546	53647	51750	41908
P/E	27.76	10.29	23.47	13.65	29.69
EV/Sales	4.19	4.57	5.08	5.03	5.58
EV/EBITDA	11.04	11.37	12.49	12.86	16.64
Gross Profit	42654	43219	44009	43021	34669
GP/A	24.85%	25.16%	27.61%	25.69%	22.48%
Gross Margin	80.75%	82.25%	82.03%	83.13%	82.73%
Asset Turnover Ratio	30.78%	30.59%	33.65%	30.90%	27.17%
Dividend per Share	1.23	1.30	1.41	1.48	1.54
Dividend Yield	3.78%	3.60%	3.23%	3.77%	4.18%
Sales Growth		-0.53%	2.10%	-3.54%	-19.02%
EBITDA Growth		5.27%	3.32%	-7.15%	-30.57%
EPS Growth		200.85%	-47.16%	54.30%	-56.79%

TABLE VII: THE CALCULATION RESULTS FOR BRISTOL MYERS SQUIBB CO

Financial Year	2016	2017	2018	2019	2020
Dividends	3120	3487	3482	3555	3843
EBITDA	12000	12452	12509	11756	12576
EPS	10.24	2.69	12.62	12.88	12.31
Net Income	7722	1979	8394	7842	7264
Revenue	22991	22849	23747	23362	25424
P/E	14.28	64.65	15.43	18.72	18.68
EV/Sales	4.54	5.22	5.36	7.02	6.13
EV/EBITDA	8.70	9.58	10.17	13.96	12.39
Gross Profit	20935	20881	21593	21041	22705
GP/A	26.97%	26.12%	32.51%	35.24%	36.07%
Gross Margin	91.06%	91.39%	90.93%	90.07%	89.31%
Asset Turnover Ratio	29.62%	28.58%	35.75%	39.13%	40.39%
Dividend per Share	4.23	4.83	5.53	6.01	6.65
Dividend Yield	2.89%	2.78%	2.84%	2.49%	2.89%
Sales Growth		-0.62%	3.93%	-1.62%	8.83%
EBITDA Growth		3.77%	0.46%	-6.02%	6.98%
EPS Growth		-73.73%	369.14%	2.06%	-4.43%

Table VII shows the calculation results for Bristol-Myers Squibb, one of the largest pharmaceutical companies in the world. It was profitable until 2020. However, the EPS growth is different. Table VIII exhibits the calculation results for Amgen Inc., a prominent US pharmaceutical company. Its earnings are forecasted to grow and pay a reliable dividend.

TABLE VIII: THE CALCULATION RESULTS FOR AMGEN INC

Financial Year	2016	2017	2018	2019	2020
Dividends	3120	3487	3482	3555	3843
EBITDA	12000	12452	12509	11756	12576
EPS	10.24	2.69	12.62	12.88	12.31
Net Income	7722	1979	8394	7842	7264
Revenue	22991	22849	23747	23362	25424
P/E	14.28	64.65	15.43	18.72	18.68
EV/Sales	4.54	5.22	5.36	7.02	6.13
EV/EBITDA	8.70	9.58	10.17	13.96	12.39
Gross Profit	20935	20881	21593	21041	22705
GP/A	26.97%	26.12%	32.51%	35.24%	36.07%
Gross Margin	91.06%	91.39%	90.93%	90.07%	89.31%
Asset Turnover Ratio	29.62%	28.58%	35.75%	39.13%	40.39%
Dividend per Share	4.23	4.83	5.53	6.01	6.65
Dividend Yield	2.89%	2.78%	2.84%	2.49%	2.89%
Sales Growth		-0.62%	3.93%	-1.62%	8.83%
EBITDA Growth		3.77%	0.46%	-6.02%	6.98%
EPS Growth		-73.73%	369.14%	2.06%	-4.43%

Table VIII shows the calculation results for Amgen Inc., a prominent US pharmaceutical company. Its earning is forecast to grow and pay a reliable dividend.

TABLE IX: THE CALCULATION RESULTS FOR ASTRAZENECA PLC

Financial Year	2016	2017	2018	2019	2020
Dividends	3540	3543	3541	3583	3669
EBITDA	5787	5133	4375	4040	6757
EPS	1.38	1.19	0.85	0.52	1.22
Net Income	3499	3001	2155	1335	3196
Revenue	23408	22597	22123	24530	26766
P/E	19.80	29.16	44.68	95.88	40.98
EV/Sales	3.42	4.48	4.96	5.82	5.37
EV/EBITDA	13.83	19.70	25.07	35.36	21.26
Gross Profit	20145	19233	18420	20623	22490
GP/A	32.22	30.36%	30.37%	33.60%	33.70%
Gross Margin	86.06	85.11%	83.26%	84.07%	84.02%
Asset Turnover Ratio	37.44	35.67%	36.48%	39.97%	40.11%
Dividend per Share	1.40	1.40	1.40	1.37	1.40
Dividend Yield	5.12%	4.03%	3.68%	2.74%	2.80%
Sales Growth		-3.46%	-2.10%	10.88%	9.12%
EBITDA Growth		-11.30%	-14.77%	-7.66%	67.25%
EPS Growth		-13.77%	-28.57%	-38.82%	134.62%

Table IX summarizes the results of AstraZeneca Plc. AstraZeneca Plc is a large joint biopharmaceutical company formed by Astra AB and Zeneca Group PLC. Its earnings grow well and are forecast to grow continuously. It pays dividends as sustainable and reliable as its competitors.

IV. COMPARISON WITH COMPETITORS

For the valuation comparison (shown in Fig. 1), the P/E ratio of GSK in 2020 ranked lowest at 12 in 2020. Bristol Myers Squibb Co had negative EPS, which caused the P/E ratio to be negative and unable to compare with others. For the dividend yield comparison, the average dividend yield of GSK from 2016 to 2020 ranked 1st at 5.62%. The dividend yield is an essential part of our valuation, so the highest dividend yield is important here. The sales growth rate of GSK is 18.4% (2017), -4.01% (2018), 13.88% (2019), 2.32% (2020). The sales growth rates of GSK are mostly above 0%.

The sales growth rate of GSK is 18.4% (2017), -4.01% (2018), 13.88% (2019), 2.32% (2020) as illustrated in Fig. 2. The sales growth rates of GSK are mostly above 0%. The sales growth of the GSK performs above the average of the other companies do.

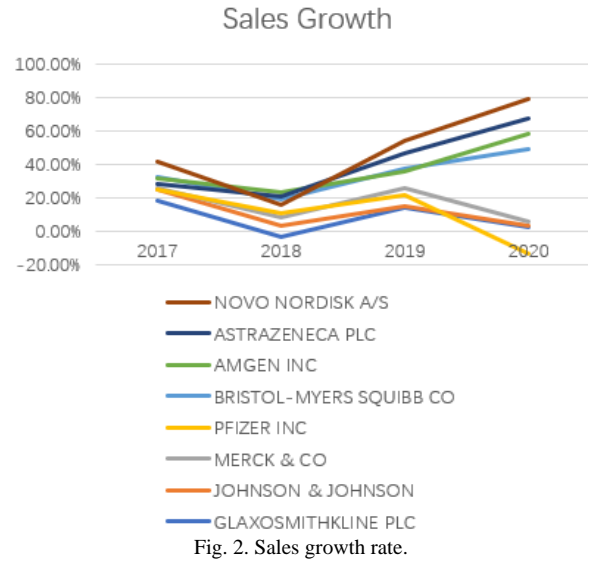


Fig. 2. Sales growth rate.

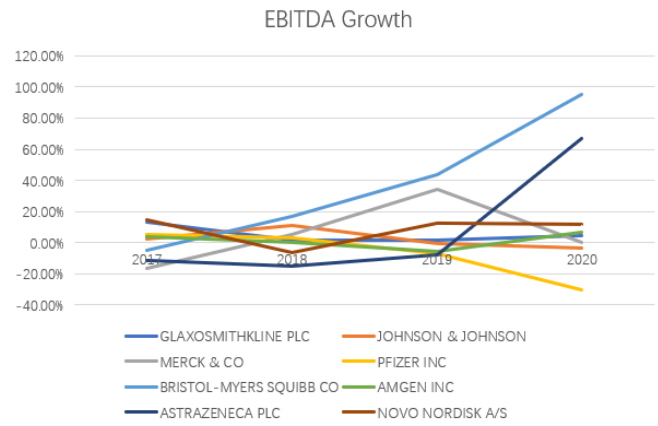


Fig. 3. EBITDA growth rate.

GlaxoSmithKline Plc had all positive growth rates for the five years for the EBITDA Growth Rate comparison, as depicted in Fig. 3. Detailedly, the rates of the GSK are 13.21%, 1.55%, 1.37%, 4.82% from 2016 to 2020; however, the EBITDA Growth Rate of the other seven companies had different negative growth rates for the five years. As a result, GlaxoSmithKline Plc performed better than the other seven companies did.

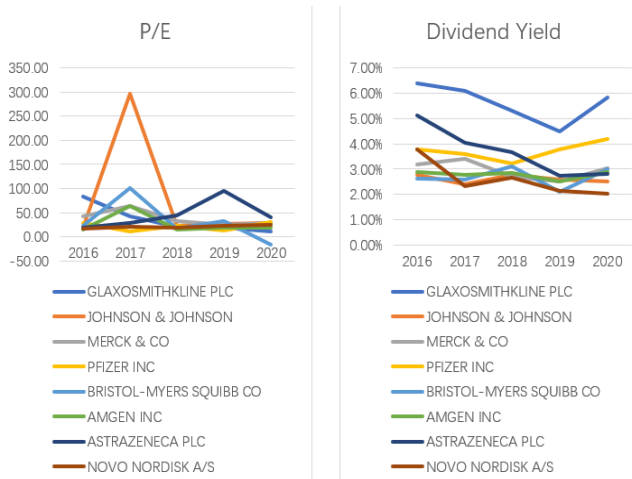


Fig. 1. P/E ratio of 2020 and dividend yield.

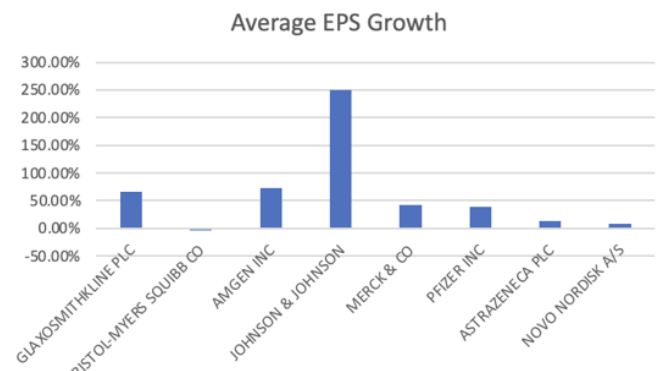


Fig. 4. Average earnings per share growth rate.

GlaxoSmithKline Plc ranked at 3rd of the eight companies when comparing Average Earnings Per Share Growth Rate. Detailly, the EPS growth rates of the GSK are 82.61%, 121.43%, 31.72%, and 24.90% for the five years (seen from Fig. 4). Compared to the other seven companies, the GSK shows sustainable growth with non-negative rates.

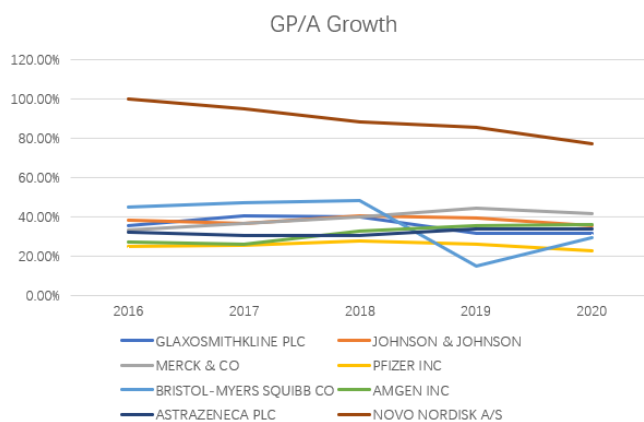


Fig. 5. GP/A growth rate.

GP/A Growth Rate is Gross Profit divided by Assets. For the comparison of profitability, the GP/A ratio of GSK is 35.59% (2016), 40.12% (2017), 39.84% (2018), 31.32% (2019), 31.62% (2020) (seen Fig. 5 GP/A Growth Rate). Overall, the GP/A ratio of GSK is above the average of the list.

Though we have most financial data of GlaxoSmithKline Plc, other helpful information is missing to evaluate the company. In addition, the comparison of the GSK with the other medical companies is not proper because some of the companies have other exceptional businesses that the GSK does not familiar with, and vice versa.

V. CONCLUSION

Overall, GlaxoSmithKline Plc performed excellently in the past five years. In our opinion, a good stock has two main advantages: high dividend yield and low P/E ratio. Moreover, without a comparatively high dividend yield, the company with a low P/E ratio has a value trap; without a comparatively low P/E ratio, the company with a high dividend yield is unsustainable and has financial bubbles. Considering the lowest P/E ratio, highest dividend yield, and other comparatively advantageous data, such as sales growth rate, average sales, EBITDA growth, average EPS growth, GP/A ratio, we choose the GSK stock as recommended investment stock.

In macroscopic fashion, as the pandemic continues, there is still growth space for the stocks of medical companies. To be specific, we need to find one company with stable and sustainable growth, progressive medical technology, and a sound and mature system.

This research of investment in GlaxoSmithKline Plc is mainly focusing on four parts: valuation, growth, profitability, and payout. In these four parts, we evaluate the data of the GSK over the past five years and compare the data of the GSK with several other medical companies. In this way, we showed the reason for choosing GSK based on the advantages of it. These results offer a guideline for the data analysis of

GlaxoSmithKline Plc.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

These authors contributed equally.

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