Valuation of SunPharma, Dr Reddy & Pfizer Through FCFE and FCFF Models - Assignment 4

Submitted in partial fulfillment

of the requirements for the course

ECON F355: Business Analysis and Valuation

By

Group 12

2019B1A31017H_SAHIL VARMAN_7406539550
2019B3A30638H_SATHVIK KANTHETI_995909901
2019B1A41485H _SAMYAK JAIN_7275619772
2019B3A80620H_ANTONY JOSEPH_9995418924
2019B1A41468H_ABHISHEK BHANSALI_8949677936

Under Supervision of

Niranjan Swain

BIRLA INSTITUE OF TECHNOLOGY AND SCIENCE PILANI
25 DECEMBER 2022

Group Details

Group Number: 12

Industry: Pharmaceutical
Company Name: Pfizer's Laboratories, Sun Pharmaceuticals Industries Ltd., Dr. Reddy's Laboratories

S. No.	Name	ID No.
1	Sahil Varman	2019B1A31017H
2	Samyak Jain	2019B1A41485H
3	Antony Joseph K.	2019B3A80620H
4	Sathvik Kantheti	2019B3A30638H
5	Abhishek Bhansali	2019B1A41468H

Abstract

In this project the valuation of equity share and the company is done. The two-stage and three-stage models have been employed to calculate the NPV of the future values of earning projections(*dividend payout ratio) in the case of the dividend discount model. The FCFF and FCFE have been projected with growth rates of three different periods namely; 1) The Supernormal Growth Period where the company can take advantage of the company's moats and what has enabled it to emerge with higher future growth prospects than its competitors.
2) The Industry growth Period where eventually the company's competitive advantage such as a patent in the pharma sector runs out and it follows in line with its peers to a more conservative growth rate.
3) The economic growth rate, to which the form eventually falls in the long run.

Our data was acquired from multiple sources such as screener.com, Yahoo Finance and the Bloomberg Terminal, and all our calculations and projections were done on Google Sheets. What follows is a report describing in detail the steps we have taken to reach the valuation of the firms/equities through all three methods and also lists our conclusions.

Table of Contents

Introduction

SUN PHARMACEUTICALS INDUSTRIES LTD	
Narration	Mar-22
Sales	**38,654.49**
Expenses	28,396.92
Operating Profit	**10,257.57**
Other Income	-3,505.16
Depreciation	2,143.74
Interest	127.35
Profit before tax	4,481.32
Tax	1,075.50
Net profit	**3,272.73**
Curret assets	33,172.88
Curret Liabilities	20,466.49
EPS	13.64
Gross Block	38,502.00

PFIZER	
Narration	Mar-22
Sales	**2,610.99**
Expenses	1,775.05
Operating Profit	**835.94**
Other Income	62.65
Depreciation	115.00
Interest	10.70
Profit before tax	772.89
Tax	160.33
Net profit	**612.56**
Other Assets	3,030.23
Other Liabilities	996.85
EPS	133.90
Gross Block	1,383.00

Dr Reddy	
Narration	Mar-22
Sales	**21,545.20**
Expenses	17,777.50
Operating Profit	**3,767.70**
Other Income	554.70
Depreciation	1,165.20
Interest	95.80
Profit before tax	3,061.40
Tax	878.90
Net profit	**2,182.50**
Other Assets	17,714.70
Other Liabilities	6,988.50
EPS	131.14
Gross Block	19,786.00

All the data was taken from https://www.screener.in/

The EBIT value was calculated by adding the operating profit and the other income and then differenced with the depreciation.
Working capital was acquired by taking the difference between current assets and current liabilities.Thus, we calculated the change in working capital.
CAPEX was calculated by taking the difference between the gross block of the year and the gross block of the previous year. The recent tax rates for all the companies were calculated in Assignment 3 by taking the ratio of the total amount of tax paid by the firm and their profit before tax values for the most recent year.
The FCFF was calculated by multiplying EBIT and (1- current tax rate) and then adding the value of depreciation and subtracting the values of CAPEX and change in working capital, which were calculated before.
FCFE was calculated similarly but here the net CAPEX and the change in working capital factors were multiplied by (1-Debt Ratio) before being used to difference the net profits.

We divided both the FCFE and FCFF by the total number of shares to get the FCFF/share and FCFE/share values
We obtain the capital employed by taking the difference of total assets by current liabilities.
The ROCE value can thus be calculated by dividing the EBIT by the Capital employed.
We have replicated this for all 3 companies.
This has led us to get the FCFF and FCFE per share for each company so that we can project and get NPV values by the FCFF and FCFE valuation method.

Dividend Discount Model and Earnings calculations

The dividends are calculated by projecting the earnings and multiplying it with the average of the previous 5 years' dividend payout ratio. We can then use simple formulas or annuity growth and perpetuity growth to calculate the NPV of these values. The calculations have been explained below in greater detail as to what inputs were used and where they were derived from.

1. Dividend Discount Model

A 2- Stage model can be employed in Pharma companies as there is a patent or a niche that allows for supernormal growth in the short-term, which is due for correction over a period of time when the patent or exclusive rights to a product expire. Thus, the growth settles to a more conservative growth rate.

In our case, we took the supernormal rate to be constant as the companies chosen by us are top performers in their sector due to their large market share and market capitalisation, allowing them to spend heavily on R&D, which is a must for this Industry. It is assumed that the companies would follow the economic growth rate while using the perpetuity formula. If we had used the industry growth rate, it would skew the returns by a much bigger factor due to the fact that the values get compounded over the years. This could also be a problem in the case of the industry growth rate being close to the cost of capital in FCFF calculation or the Cost of Equity in the Dividend Discount Model.

A 3 stage model is usually used as it is the closest way to value pharmaceutical companies, which are subject to many changes in patent rights and susceptible to lawsuits from the public or even rival firms.

$$\frac{CF}{r-g1}\left[1-\left(\frac{1+g1}{1+r}\right)^{n}\right]$$

CF = first cash flow in annuity (CF in year 6 in a 5-year model)

r = discount rate

g1 = annuity growth rate

n = number of periods in annuity (5 in this case)

$$\frac{CF}{r - g2}$$

CF = first cash flow in perpetuity (CF in year 11 in this case)

r = discount rate

g2 = perpetuity growth rate

The Average Return on Equity and the Average Dividend Payout ratio were calculated by taking an average of the values for the last five years.

Pfizer ROE:

DATE	2018	2019	2020	2021	2022
Dividend Payout	0.25	0.24	0.30	0.32	0.26
Return on Equity	13.42%	14.24%	14.99%	20.79%	21.38%
Average ROE	16.97%				
AVERAGE DIV PAYOUT	27.34%				

Dr. Reddy's Laboratories ROE:

DATE	2018	2019	2020	2021	2022
Div payout ratio last 5 ys	35%	17%	21%	21%	23%
Return on Equity	0.0753	0.1385	0.1291	0.1094	0.1127
Average ROE	11.30%				
AVERAGE DIV PAYOUT	23.40%				

Sun Pharma. ROE:

DATE	2018	2019	2020	2021	2022
Div payout ratio last 5 ys	14%	12%	23%	25%	25%
Return on Equity	**20%**	**17%**	**18%**	**14%**	**19%**
Average ROE	17.478%				
AVERAGE DIV PAYOUT	19.80%				

3-Stage Model

The product of the Retention Ratio and the ROE for each firm was taken as our supernormal growth rate, which was assumed to last around four years, the industry rate for the moderate growth period and finally a stable growth rate which is equal to the economic growth rate as it is estimated to be in perpetuity (Long-term). In the second stage, we have assumed the value of the growth rate to decrease linearly from the high growth period growth rate to the industry average growth rate over 3 years.

2-Stage Model

Here, only the supernormal growth rate and the economic growth rate in the long term are used.

It is assumed the beta and the cost of equity are constant through all the stages, and the values used were calculated in Assignment 3. (The beta & COE values differed for the three companies).

Valuation Methodology

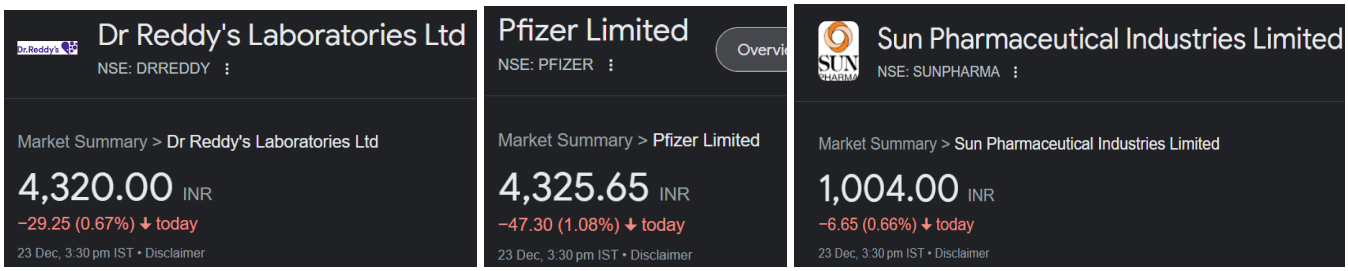
Here the valuations are done through the Dividend Discount Model. FCFE & FCFF can differ as they employ different inputs, and in certain cases, problems such as negative FCFE will also be tackled below.
However, since the supernormal growth and the economy rates are rough estimates, it will be hard to obtain reasonably accurate results. All the concepts taught in BAV have been applied to solve the valuation techniques, and Damodaran valuation is taken as a reference.
The basic universal ideology behind our reasoning of business valuation analysis of the stock being overvalued or undervalued will be based on the factor that if:

1) Market Price > Price of respective Valuation model; then we have concluded that the stock price is overvalued as the Market Price exceeds the intrinsic value*.

2) Market Price < Price of respective Valuation model; then we have concluded that the stock price is undervalued as the Market Price is below the intrinsic value*.

***This is assuming our valuation is error free and to be correct.**

CURRENT STOCK PRICE OF COMPANIES as on 23rd December;



1.1 Pfizer:

Data	
IERP	1.37%
Return Risk free	6.87%
Beta	0.421
Cost of Equity	7.45%
Growth rate for earings period 1 - Supernormal growth	12.33%
Growth rate for earings period 3- Industry Growth	5.83%
Growth rate for FCFF period 3- basis- Economy Growth	4.00%

Two-stage model calculation:
The dividends were calculated assuming a two-stage dividend discount model, as shown in the image below.

Dividend Discount 2 stage model	Stage 1					Stage 2
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27
Earnings projection in Cr	18,367.60	20631.92	23175.39	26032.42516	29241.66071	30411.32714
Dividend Projection in Cr	5021.70184	5640.769	6336.154	7117.265039	7994.670038	8314.45684
Cash Flows in Cr	5021.70184	5640.769	6336.154	7117.265039	249224.4823	
Net Present value in Cr	208,487.53					
Net present value / total no of shares	185.6846051					

Two-stage model calculation: Here, the NPV/share obtained= 185.6846.

Three-stage model calculation:
As shown in the image below, the dividends were calculated assuming a three-stage dividend discount model.

Linear Decrease to g2	0.021656809		
	10.16%	8.00%	5.83%

Fig. Growth rate for stage 2 and stage 3

Dividend Discount 3 stage model	Stage 1					Stage 2			Stage 3
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27	Mar-28	Mar-29	Mar-30
Earnings projection in Cr	18,367.60	20631.92	23175.39	26032.42516	29241.66071	32213.24458	34789.16	36817.6550	38290.36
Dividend Projection in Cr	5021.70184	5640.769	6336.154	7117.265039	7994.670038	8807.101068	9511.358	10065.9468	10468.58
Cash Flows in Cr	5021.70184	5640.769	6336.154	7117.265039	7994.670038	8807.101068	9511.358	313794.114	
Net Present value in Cr	229,625.81								
Net present value / total no of shares	204.5109262								

Three-stage model calculation: Here, the NPV/share obtained= 204.5109.

1.2 Dr. Reddy's Laboratories:

Data	
IERP	1.37%
Return Risk free	6.87%
Beta	0.424
Cost of Equity	7.45%
Growth rate for earings period 1 - Supernormal growth	8.66%
Growth rate for earings period 3- Industry Growth	5.83%
Growth rate for FCFF period 3- basis- Economy Growth	4.00%

Two-stage model calculation:
The dividends were calculated assuming a two-stage dividend discount model, as shown in the image below.

Dividend Discount 2 stage model	Stage 1					Stage 2
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27
Earnings projection in Cr	13,658.13	14840.25	16124.70	17520.31714	19036.72357	19798.1925
Dividend Projection in Cr	3196.00242	3472.620	3773.180	4099.754212	4454.593316	4632.77704
Cash Flows in Cr	3196.00242	3472.620	3773.180	4099.754212	138741.8938	
Net Present value in Cr	117,084.62					
Net present value / total no of shares	138.0477041					

Two-stage model calculation: Here, the NPV/share obtained= 138.0477.

Three-stage model calculation:
The dividends were calculated assuming a three-stage dividend discount model, as shown in the image below.

Linear Decrease to g2	0.009414449		
	7.71%	6.77%	5.83%

Fig.Growth rate for stage 2 and stage 3

Dividend Discount 3 stage model	Stage 1					Stage 2			Stage 3
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27	Mar-28	Mar-29	Mar-30
Earnings projection in Cr	13,658.13	14840.25	16124.70	17520.31714	19036.72357	20505.1567	21893.81	23170.39919	24097.21
Dividend Projection in Cr	3196.00242	3472.620	3773.180	4099.754212	4454.593316	4798.2066	5123.152	5421.873412	5638.748
Cash Flows in Cr	3196.00242	3472.620	3773.180	4099.754212	4454.593316	4798.2066	5123.152	168868.6108	
Net Present value in Cr	125,140.54								
Net present value / total no of shares	147.5459819								

Three-stage model calculation: Here, the NPV/share obtained= 147.5459.

1.3 Sun Pharmaceuticals:

Data	
IERP	1.37%
Return Risk free	6.87%
Beta	0.68
Cost of equity	7.80%
Growth rate for earings period 1 - Supernormal growth	14.02%
Growth rate for earings period 3- Industry Growth	5.83%
Growth rate for FCFF period 3- basis- Economy Growth	4.00%

Two-stage model calculation:
The dividends were calculated assuming a two-stage dividend discount model, as shown in the image below.

Dividend Discount 2 stage model	Stage 1					Stage 2
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27
Earnings projection in Cr	38,151.00	43498.64	49595.86	56547.73478	64474.05339	67053.01552
Dividend Projection in Cr	7553.898	8612.730	9819.980	11196.45149	12765.86257	13276.49707
Cash Flows in Cr	7553.898	8612.730	9819.980	11196.45149	361818.6908	
Net Present value in Cr	300,820.82					
Net present value / total no of shares	107.4061528					

Two-stage model calculation: Here, the NPV/share obtained= 107.4062.

Three-stage model calculation:

The dividends were calculated assuming a three-stage dividend discount model, as shown in the image below.

Linear Decrease to g2	0.027287478		
	11.29%	8.56%	5.83%

Fig.Growth rate for stage 2 and stage 3

Dividend Discount 3 stage model	Stage 1					Stage 2			Stage 3
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27	Mar-28	Mar-29	Mar-30
Earnings projection in Cr	38,151.00	43498.64	49595.86	56547.73478	64474.05339	71752.07289	77893.72	82435.54775	85732.96
Dividend Projection in Cr	7553.898	8612.730	9819.980	11196.45149	12765.86257	14206.91043	15422.95	16322.23845	16975.12
Cash Flows in Cr	7553.898	8612.730	9819.980	11196.45149	12765.86257	14206.91043	15422.95	462615.8958	
Net Present value in Cr	335,358.37								
Net present value / total no of shares	119.737565								

Three-stage model calculation: Here, the NPV/share obtained= 119.7376.

2. FCFE

A firm's free cash flow to equity measures the cash left over after all costs, investments, capital expenditures, depreciation and debt have been paid. It measures the equity capital utilization of a firm. FCFE is used to measure the value of a company even if the company doesn't pay dividends, which makes it a better alternative compared to the dividend discount model. However, it doesn't tell the amount actually paid to shareholders, as companies sometimes retain their earnings and fund existing capital. The formula for calculating FCFE is given below:

$$\begin{aligned}\text{Free Cash Flow to Equity} = {} & \text{Net Income} \\ & - (\text{Capital Expenditures} - \text{Depreciation})(1 - \delta) \\ & - (\Delta \text{ Working Capital})(1-\delta)\end{aligned}$$

Here, the Supernormal growth was calculated by taking the average of the last 5 years' dividend payout ratios and thus getting the average retention ratio. (Retention Ratio = 1-Dividend Payout Ratio) . This retention ratio is multiplied by the average of the previous 5 years Return on Equity to get the FCFE. This was then divided by the number of shares to get the FCFE/share.
The value thus obtained was then subjected to growth at Supernormal, Industry and Economy growths for 4 years, 3 years and perpetuity, respectively.

For calculating the Industry growth rate two models were employed; the first used the daily returns of Nifty Pharma for the last year and the second used the past 5 years to get the growth. These returns were then annualized and were very close to each other. (The annualized return of the index as calculated by us was avoided as we had selected the best pharma companies with considerable market cap and would skew the returns upwards;i.e.Return on Index= 10.55%)
Method-1 was chosen as both have nearly the same values and the past 1 year daily returns will convey a better outlook for the future prospects of the industry rather than plainly the return from dividing the final and initial value for the past 5 years.

Method-1

Date	Price	Chg%	Returns		
Dec 22, 2022	12,892.75	-0.21%			
Dec 21, 2022	12,920.40	2.39%	1.002145	1.058307964	
Dec 20, 2022	12,618.45	-0.22%	0.97663	Annualized Retu	5.83%
Dec 19, 2022	12,646.45	0.08%	1.002219		
Dec 16, 2022	12,636.20	-1.40%	0.999189		
Dec 15, 2022	12,816.10	-0.52%	1.014237		
Dec 14, 2022	12,883.60	0.67%	1.005267		
Dec 13, 2022	12,797.75	0.31%	0.993336		
Dec 12, 2022	12,758.05	-0.13%	0.996898		
Dec 09, 2022	12,774.70	0.36%	1.001305		
Dec 08, 2022	12,728.70	-1.10%	0.996399		
Dec 07, 2022	12,869.80	-0.66%	1.011085		
Dec 06, 2022	12,955.35	-0.75%	1.006647		
Dec 05, 2022	13,052.90	-0.26%	1.00753		
Dec 02, 2022	13,086.95	-0.26%	1.002609		
Dec 01, 2022	13,120.65	-0.18%	1.002575		
Nov 30, 2022	13,144.20	0.43%	1.001795		
Nov 29, 2022	13,087.35	0.72%	0.995675		
Nov 28, 2022	12,993.95	0.20%	0.992863		
Nov 25, 2022	12,968.45	0.62%	0.998038		
Nov 24, 2022	12,888.15	0.09%	0.993808		

Method-2

5-Year return=	32.89%
Annualized retu	5.85%

Thus, 5.8307% was taken as the industry growth rate.

The economic growth rate was taken to be around 3-4 % as sir had instructed us to assume in class. To confirm this we took the last 5 years' growth rates and assumed that in the longer term the rapidly growing economy of India will also settle around 3-4%. (We will not omit the 2019-20 year, even though covid skewed the growth rate which was around 5-6% to a mere 3-4%).
We got a rough estimate of 3.223%

The calculations are shown below along with the tables.

2.1 Pfizer

Data for Pfizer	
IERP	1.37%
Return Risk free	6.87%
Beta	0.421
Cost of Equity	7.45%
Growth rate for earings period 1 - Supernormal growth	13.41%
Growth rate for earings period 2- Industry Growth	5.83%
Growth rate for earings period 3- Economy Growth	3.223%
Dividend payout ratio (average)	27.34%
Retention Ratio(average)	72.66%
ROE	16.97%
FCFE 2022 , per share	**163.12077694**
No of shares outstanding	45750372

The FCFE per share for the year 2022 alone is 163.1208.

Linear Decrease to g2	0.021656		
	10.16%	8.00%	5.83%

Fig: Growth rate of different stages.

The current share price of Pfizer Ltd. is 4325.65. The current share price is compared with the net present value of FCFE below.

Two-stage model calculation:

The FCFE was calculated assuming a two-stage growth discount model as shown in the image below.

FCFE valuation 2 stage	Stage 1					Stage 2
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27
FCFE projections/share	20.46595620	35.33651	61.01203	105.34338030	181.8858804	187.74806
Cash Flows /share	20.46595620	35.33651	61.01203	105.34338030	11,800.6852	
Net Present value/share	9,045.03245212					

The valuation according to FCFE two-stage model is 9045.032, which indicates that Pfizer is undervalued.

Three-stage model calculation:

The FCFE was calculated assuming a three-stage growth discount model, as shown in the image below.

FCFE valuation 3 stage	Stage 1					Stage 2			Stage 3
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27	Mar-28	Mar-29	Mar-30
FCFE projections/share	20.46595620	23.658098	27.34812	31.61370588	36.54459876	40.2583187	43.47756	46.01265447	47.49564
Cash Flows /share	20.46595620	23.658098	27.34812	31.61370588	36.54459876	40.2583187	43.47756	1,170.51709516	
Net Present value/share	883.43								

The valuation according to FCFE three-stage model is 883.43, which indicates that Pfizer is overvalued.

2.2 Dr. Reddy's Laboratories

Data for Dr Reddy	
IERP	1.37%
Return Risk free	6.87%
Beta	0.424
Cost of Equity	7.45%
Growth rate for earings period 1 - Supernormal growth	32.33%
Growth rate for earings period 2- Industry Growth	5.83%
Growth rate for earings period 3- Economy Growth	4.00%
Dividend payout ratio (average)	23.40%
Retention Ratio(average)	76.60%
ROE	11.30%
FCFE 2022 , per share	**192.4095298**
No of shares outstanding	1984661760

The FCFE per share for the year 2022 alone is 192.4095.

Linear Decrease to g2	0.009414		
	7.71%	6.77%	5.83%

Fig: Growth rate of different stages.

The current share price of Dr. Reddy's Laboratories Ltd. is 4320.00. The current share price is compared with the net present value of FCFE below.

Two-stage model calculation:

The FCFE was calculated assuming a two-stage growth discount model, as shown in the image below.

FCFE valuation 2 stage	Stage 1					Stage 2
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27
FCFE projections/share	0.43	0.77	1.35	2.39	4.22	4.3837537
Cash Flows /share	0.43	0.77	1.35	2.39	131.28	
Net Present value/share	102.73					

The valuation according to FCFE two-stage model is 102.73, which indicates that Dr Reddy's is overvalued.

Three-stage model calculation:

The FCFE was calculated assuming a three-stage growth discount model, as shown in the image below.

FCFE valuation 3 stage	Stage 1					Stage 2			Stage 3
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27	Mar-28	Mar-29	Mar-30
FCFE projections/share	0.43	0.5137140	0.608965	0.7218786319	1.274837664	1.37317464	1.466169	1.551658691	1.613725
Cash Flows /share	0.43	0.51	0.61	0.72	1.27	1.37	1.47	48.33	48.32765
Net Present value/share	34.11								

The valuation according to FCFE three-stage model is 34.11, which indicates that Dr. Reddy's is overvalued.

2.3 Sun Pharmaceuticals

Data for Sun Pharma	
IERP	1.37%
Return Risk free	6.87%
Beta	0.68
Cost of Equity	7.804%
Growth rate for earnings period 1	2.97%
Growth rate for earnings period 2	5.83%
Growth rate for earnings period 3	3.223%
Dividend payout ratio (average)	19.80%
Retention Ratio(average)	80.20%
ROE	17.478%
Growth(g)=	14.02%
FCFE 2022 , per share	-233.04
No of shares outstanding	2399334970

Here as we are getting a -ve FCFE value, we will have to go with the ROE* Total Shareholder's Equity as a proxy for FCFE.

FCFE PROXY	**3272.73**
FCFE PROXY/share	**13.64015463**

Fig. Proxy for FCFE

Linear Decrease to g2	0.027287		
	11.29%	8.56%	5.83%

Fig: Growth rate of different stages.

The current share price of Sun Pharmaceuticals is 1004.00. The current share price is compared with the net present value of FCFE below.

Two-stage model calculation:

The FCFE was calculated assuming a two-stage growth discount model, as shown in the image below.

FCFE valuation 2 stage model	Stage 1					Stage 2
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27
FCFE projections/share	13.64	24.58	44.29	79.81	143.83	148.461866
Cash Flows /share	13.64	24.58	44.29	79.81	7,669.34	
Net Present value/share	5,816.65					

The valuation according to FCFE two-stage model is 5816.65, which indicates that SunPharmaceuticals is undervalued.

Three-stage model calculation:

The FCFE was calculated assuming a three-stage growth discount model, as shown in the image below.

FCFE valuation 3 stage model	Stage 1					Stage 2			Stage 3
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27	Mar-28	Mar-29	Mar-30
FCFE projections/share	13.64	14.0454446	14.46277	14.89250973	15.33501102	17.0660718	18.52684	19.6071127	20.23904
Cash Flows /share	13.64	14.05	14.46	14.89	15.34	17.07	18.53	461.45	
Net Present value/share	358.58								
Source of Data	Annual report,	www.screener.in							

The valuation according to FCFE three-stage model is 358.58, which indicates that SunPharmaceuticals is overvalued.

The free cash flow to equity, in contrast to the dividend metrics, can occasionally be negative for various reasons.
Firstly, even for established businesses, a negative net income is not uncommon. The second is that, particularly early in a company's life cycle, reinvestment demands may exceed net income, which is frequently the case with growth companies. The third is that heavily leveraged companies aiming to lower their debt ratios may experience years of negative FCFE due to massive debt repayments that must be financed with equity cash flows. FCFE may also be negative in the major reinvestment years and positive in other years due to the peculiarities of the reinvestment process, where corporations spend substantial sums in long-lived and short-lived assets in some years and nothing in others.

$$\text{Free Cash Flow to Equity} = \text{Net Income} - (\text{Capital Expenditures} - \text{Depreciation})(1 - \delta) - (\Delta \text{ Working Capital})(1-\delta)$$

3. FCFF

A firm's free cash flow to firm measures the cash left over after a change in net working capital, capital expenditure, depreciation expenses, taxes and investments. It measures the performance and efficiency of business operations. FCFF includes both bondholders and stockholders as claimants of the money left over. Every form of cash flow, including reinvestment is included in FCFF and hence accurately measures the value of a firm.

The supernormal growth, industry average growth and economic growth are the same as calculated above for the FCFE valuation.

3.1 Pfizer

Data for Pfizer	
IERP	1.37%
Return Risk free	6.87%
Beta	0.421
Cost of equity	7.45%
Cost of Debt	7.40%
Debt to equity ratio	0.00
Weight of Debt	0.00%
Weight of Equity	100.00%
WACC	0.07
Growth rate for FCFF period 1 - basis- Supernormal growth	13.41%
Growth rate for FCFF period 2- basis- Industry Growth	5.83%
Growth rate for FCFF period 3- basis- Economy Growth	4.00%

Dividend payout ratio (average)	27.34%
Retention Ratio(average)	72.66%
ROE	16.97%
FCFF 2022 , per share	**7.81**
No of shares outstanding	3069747836

The FCFF per share of 2022 alone is 7.81.

Linear Decrease to g2	0.0216568098		
	10.16%	8.00%	5.83%

Fig: Growth rate at different stages.

The current share price of Pfizer Ltd. is 4325.65. The current share price is compared with the net present value of FCFF below.

Two-stage model calculation:

The FCFF was calculated assuming a two-stage growth discount model, as shown in the image below.

FCFF valuation 2 stage model	Stage 1					Stage 2
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27
FCFF projections/share	7.81	9.03	10.44	12.07	13.95	14.50803911
Cash Flows /share	7.81	9.03	10.44	12.07	434.88	
Net Present value/share	361.27					

The valuation according to FCFF two-stage model is 361.27, which indicates that Pfizer is overvalued.

Three-stage model calculation:

The FCFF was calculated assuming a three-stage growth discount model, as shown in the image below.

FCFF valuation 3 stage model	Stage 1					Stage 2			Stage 3
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27	Mar-28	Mar-29	Mar-30
FCFF projections/share	7.81	9.030920313	10.43950243	12.06778569	13.95003761	15.36766252	16.59653	17.56424429	18.26681
Cash Flows /share	7.81	9.03	10.44	12.07	13.95	15.37	16.60	547.54	
Net Present value/share	398.155								

The valuation according to FCFF three-stage model is 398.155, which indicates that Pfizer is overvalued.

3.2 Dr. Reddy's

Data for Dr Reddy	
IERP	1.37%
Return Risk free	6.87%
Beta	0.424
Cost of equity	7.45%
Cost of Debt	7.40%
Debt to equity ratio	0.12
Weight of Debt	10.71%
Weight of Equity	89.29%
WACC	0.07217
Growth rate for FCFF period 1 - basis- Supernormal growth	24.18%
Growth rate for FCFF period 2- basis- Industry Growth	5.83%
Growth rate for FCFF period 3- basis- Economy Growth	4.00%

Dividend payout ratio (average)	23.40%
Retention Ratio(average)	76.60%
ROE	11.30%
FCFF 2022 , per share	**75.2767679**
No of shares outstanding	1984661760

The FCFF per share of 2022 alone is 75.2768.

Linear Decrease to g2	0.009414449213		
	7.71%	6.77%	5.83%

Fig: Growth rate at different stages.

The current share price of Dr. Reddy's Laboratories Ltd. is 4320.00. The current share price is compared with the net present value of FCFF below.

Two-stage model calculation:

The FCFF was calculated assuming a two-stage growth discount model, as shown in the image below.

FCFF valuation 2 stage	Stage 1					Stage 2
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27
FCFF projections/share	75.28	93.48	116.08	144.16	179.01	186.174395
Cash Flows /share	75.28	93.48	116.08	144.16	5,966.34	
Net Present value/share	4,895.38					

The valuation according to FCFF two-stage model is 4895.38, which indicates that Dr. Reddy's is undervalued.

Three-stage model calculation:

The FCFF was calculated assuming a three-stage growth discount model, as shown in the image below.

FCFF valuation 3 stage	Stage 1					Stage 2			Stage 3
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27	Mar-28	Mar-29	Mar-30
FCFF projections/share	75.28	93.47971424	116.0843807	144.1551629	179.0138421	192.822408	205.8808	217.8852976	226.6007096
Cash Flows /share	75.28	93.48	116.08	144.16	179.01	192.82	205.88	7,261.89	
Net Present value/share	5,246.18								

The valuation according to FCFF three-stage model is 5246.18, which indicates that Dr. Reddy's is undervalued.

3.3 Sun Pharma

Data for Sun Pharma	
IERP	1.37%
Return Risk free	6.87%
Beta	0.68
Cost of equity	7.80%
Cost of Debt	7.40%
Debt to equity ratio	0.20
Weight of Debt	16.67%
Weight of Equity	83.33%
WACC	0.0744
Growth rate for FCFF period 1 - basis- Supernormal growth	3.06%
Growth rate for FCFF period 2- basis- Industry Growth	5.83%
Growth rate for FCFF period 3- basis- Economy Growth	4.00%

Dividend payout ratio (av	19.80%
Retention Ratio(average)	80.20%
ROE	17.48%
FCFF 2022 , per share	**36.35**
No of shares outstanding	5545540976

The FCFF value per share we get for 2022 alone is 36.35.

Linear Decrease to g2	0.02728747871		
	11.29%	8.56%	5.83%

Fig: Growth rate for different stages.

The current share price of Sun Pharmaceuticals is 1004.00. The current share price is compared with the net present value of FCFF below.

Two-stage model calculation:

The FCFF was calculated assuming a two-stage growth discount model, as shown in the image below.

FCFF valuation 2 stage	Stage 1					Stage 2
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27
FCFF projections/share	36.35	37.47	38.61	39.80	41.02	42.65595921
Cash Flows /share	36.35	37.47	38.61	39.80	1,280.90	
Net Present value/share	1,098.03					

The valuation according to FCFF two-stage model is 1098.03, which indicates that SunPharmaceuticals is undervalued.

Three-stage model calculation:

The FCFF was calculated assuming a three-stage growth discount model, as shown in the image below.

FCFF valuation 3 stage	Stage 1					Stage 2			Stage 3
	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27	Mar-28	Mar-29	Mar-30
FCFF projections/share	36.35	37.46579681	38.61346485	39.796288	41.01534539	45.64527741	49.55230	52.44159916	54.53926
Cash Flows /share	36.35	37.47	38.61	39.80	41.02	45.65	49.55	1,637.74	
Net Present value/share	1,222.64								

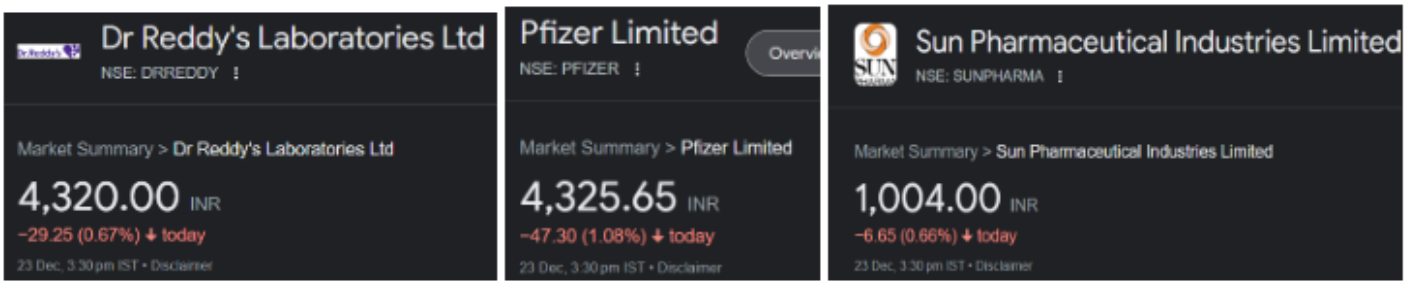
The valuation according to FCFF three-stage model is 1222.64, which indicates that SunPharmaceuticals is undervalued.

4. Summary and Conclusions

Our first step in this project was to calculate the expected growth rates for all three firms for all the phases in the two stage and the three stage model. We achieved this by using the product of the previously calculated ROE and the Retention Ratio of the company for the supernormal growth rate, the economy growth rate as the stable growth rate in the final phases, and a linearly decreasing growth rate for the transition period in the three stage model.

Our first approach to valuation was the Dividend discount model where we used the most recent dividends to project all future expected dividends and summated their PVs to calculate Net Present Value.

The following are our results in NPV/share format in Rs and the valuation is done based on the price of the companies on the **23rd of December*.**
*



Dividend Discount Model

Pfizer:
2-stage model–185.6846 (Overvalued; as Market Price > Intrinsic Value).
3-stage model– 204.51 (Overvalued; as Market Price > Intrinsic Value).

Dr. Reddy's lab.:
2-stage model– 138.04 (Overvalued; as Market Price > Intrinsic Value).
3-stage model– 147.54 (Overvalued; as Market Price > Intrinsic Value).

Sun Pharma:
2-stage model– 107.40 (Overvalued; as Market Price > Intrinsic Value).
3-stage model– 119.73 (Overvalued; as Market Price > Intrinsic Value).

Next, we NPV/share values with the help of the projected FCFE. The FCFE measures the cash left over after all costs, investments, capital expenditures, depreciation and debt have been paid and it was calculated with the data reported on March, 2022 and then projected for the subsequent years until perpetuity with growth depending on their corresponding models and stages.

The following are our results in NPV/share Rs.:

Free Cash Flow to Equity

Pfizer:
2-stage model– 9045.03 (Undervalued; as Market Price < Intrinsic Value).
3-stage model– 883.43 (Overvalued; as Market Price > Intrinsic Value).

Dr. Reddy's lab.:
2-stage model– 102.73 (Overvalued; as Market Price > Intrinsic Value).
3-stage model– 34.11 (Overvalued; as Market Price > Intrinsic Value).

Sun Pharma:
2-stage model– 5816.65 (Undervalued; as Market Price < Intrinsic Value).
3-stage model– 358.58 (Overvalued; as Market Price > Intrinsic Value).

Our final approach to calculating NPV was with the help of FCFF. A firm's free cash flow to firm measures the cash left over after change in net working capital, capital expenditure, depreciation expenses, taxes and investments. FCFF indicates the value remaining out for all of the firm's investors, including bondholders and shareholders, whereas FCFE denotes the amount left over for the firm's common equity holders only. The FCFF for year 2022 was calculated and projected similarly to the way we did it while using FCFE.

The following are our results in NPV/share Rs.:

Free Cash Flow to Firm

Pfizer:
2-stage model– 361.27 (Overvalued; as Market Price > Intrinsic Value).
3-stage model– 398.155 (Overvalued; as Market Price > Intrinsic Value).

Dr. Reddy's lab.:
2-stage model– 4895.38 (Undervalued; as Market Price < Intrinsic Value). (*This Valuation was quite close to the current stock price, indicating that the market value is close to the NPV FCFF/share projections of Dr Reddy). This valuation has been the most consistent until now as it is significantly close to the current market price and shows that the FCFE for Dr Reddy by the 2-stage model is undervalued.

3-stage model– 5246.18 (Undervalued; as Market Price < Intrinsic Value). The valuation is in line with the 2 Stage model above. It also highlights the Undervaluation of the FCFF/share in Net Present Value terms.

Sun Pharma:
2-stage model – 1098.03 (Undervalued; as Market Price < Intrinsic Value). This valuation is the best and closest fit to the market values of Sun Pharma's stock and is accurate as the range in which it operates is quite consistent with the current stock price. This Undervaluation can be attributed to the herd mentality of the investors due to the overall market slowing down due to the recent COVID scare.

3-stage model– 1222.64 (Undervalued; as Market Price < Intrinsic Value.) The 3-stage model also closely follows the 2-stage model and sheds light on the fact that the figure is from the intrinsic value obtained from the Net Present Value of FCFF/share.

Conclusion

The DDM has not given very satisfactory results, as the valuation is not very close to the current market price. This can partially be attributed to the lack of dividends given by some of these companies and the keen interest of these companies to reinvest their earnings instead back into the business to further their development in preparation of APIs (Active Pharmaceutical Ingredients) an build on their R&D to achieve a competitive advantage in the future through the use of a patent or the rights of developing a new technique.

The FCFE is a mixed bag as it has a varying valuation in the case of Pfizer and Sunpharma, both undervalued in the 2-stage model and overvalued in the 3-stage model. This can be attributed to a higher than the industry growth rate of the company, which will also be higher than the economic growth rate, which is consistent with the returns on industry and economy obtained. For the 3-stage case, overvaluation can be caused due to saturation of the company moats or patents in the long-term. Pfizer can be valued with this method with some minor adjustments to the growth rates.

Finally, for the FCFF, we have obtained exemplary results in the case of Dr Reddy and Pfizer, which have intrinsic valuations in line with their current market price. This valuation technique seems the best choice among the three, especially for the latter two companies.

5. References

BLOOMBERG TERMINAL
https://www.screener.in
https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ratings.htm
https://www.moneycontrol.com
https://www.taxmanagementindia.com/visitor/detail_article.asp?ArticleID=6854
https://www.rbi.org.in/Scripts/BS_NSDPDisplay.aspx?param=4
https://companiesmarketcap.com
https://www1.nseindia.com/index_nse.htm
https://www.google.com/finance/
https://finance.yahoo.com