Journal of Business, Accounting, and Economic Research
ISSN 3064-7991
Volume 11 Issue 4
October-December 2023
Impact Factor: 5.25
Enquiry: contact@continentalpub.online
Published by Continental Publication | https://continentalpub.online/index.php/Business-Accounting-Economic

STRATEGIC FLEXIBILITY AS A TOOL FOR BOOSTING FIRM VALUE IN TURBULENT TIMES

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Abstract: *Real options analysis has emerged as a pivotal tool for evaluating firms involved in research and development endeavors, particularly those characterized by significant managerial flexibility and inherent uncertainty. This analytical approach not only aids investors in making well-informed investment decisions but also empowers company management by offering insights into the organization's strengths and weaknesses, facilitating strategic planning. The central aim of this paper is to assess the value of Estee Lauder Companies, emphasizing the crucial factors of flexibility and risk. Employing the real options method, the study endeavors to provide a comprehensive estimation of the company's value, shedding light on its potential for growth and adaptation within a dynamic market landscape.*

Keywords: *Real Options Analysis, Estee Lauder Companies, Managerial Flexibility, Risk Assessment, Strategic Planning*

1. Introduction

Real options analysis has proven to be exceptionally valuable in assessing firms engaged in research and development activities, especially those operating under considerable managerial flexibility and substantial uncertainty [1]. The evaluation of a company, facilitated by such analysis, plays a critical role in guiding investors towards more informed investment decisions [2]. Furthermore, it equips company management with a deeper understanding of the firm's strengths and weaknesses, thereby enabling precise and strategic planning. The primary objective of this paper is to estimate the value of Estee Lauder Companies, with a particular focus on the elements of flexibility and risk. This estimation is primarily conducted through the application of the real options method [3].

2. Valuation Procedure of Real Options

This part delineates the array of methodologies employed in this paper, encompassing Monte Carlo simulation, the Security Market Line (SML) approach within the Capital Asset Pricing Model (CAPM), real options analysis, and sensitivity analysis [4].

The initial phase involves the computation of the FCFF, pivotal in valuation analyses. The FCFF is calculated as per the following formula:

$$FFFFFFFF = EEEEEE + DDEEDD - \Delta\Delta\Delta\Delta\Delta\Delta FF - II\Delta\Delta II \quad (1)$$

Among them, NWC, representing the change in Net Working Capital, is computed using the formula (2):

ΔΔΔΔFF = IIIIIIIIIIIIIIIIIII + RRIIRRIIIIIIRRRRRRIIII − SShIIIII IIIIItt RRIIRRRRIIRRIIIIIIIII) (2)

Then calculate the logarithm value of $FCFF_t$ by using formula (3) and calculate their mean value(α) and variance(σ).

$$RRIIllRR = \log \frac{FFFFFFFF^{tt}}{FFFFFFFFtt-1} \qquad (3)$$

The ensuing step involves the generation of random values, z, from a standard normal distribution for ˜ each simulated scenario within the Monte Carlo framework [5]. The simulation adheres to the principles of geometric Brownian motion. We set the initial FCFF value, S_0, as the Estee Lauder Companies' FCFF for the year 2020. The forecast of FCFF, along with its expected mean value[$E(S_T)$], and variance, are determined using the formulas below:

Random evolution of the FCFF:

$$SS_{tt} = SS_{tt-1} * \exp(\alpha\alpha * \triangle II + \sigma\sigma * z\tilde{z} * \triangle II) \qquad (4)$$

Mean value of FCFF:

$$EE(SS_{tt}) = SS_0 * \exp(\mu\mu * \triangle II * II) = SS_0 * \exp(\mu\mu * EE) \qquad (5)$$

Variance of FCFF:

$$IIRRII(SS_{TT}) = SS_0^2 * \exp(2 * \alpha\alpha * \triangle II * II) * [\exp(\sigma\sigma^2 * \triangle II * II) - 1] \qquad (6)$$

Subsequently, the total liability from the year 2025 onwards, extending into perpetuity, is predicted using formula (7), wherein ω represents the weight of total liabilities for each respective year.

$$EETT_{2025-\infty} = \frac{\sum_{2011}^{2020} TTTTyyyyyyyy * \omega\omega yyyyyyyy}{\sum_{2011}^{2020} \omega\omega yyyyyyyy} \qquad (7)$$

The subsequent step involves the computation of the cost of equity using SML method as part of the CAPM model, as delineated in formula (8). In this context, R_e represents the cost of equity; R_F denotes the risk-free rate; β symbolizes the beta coefficient indicating the systematic risk of the asset; and ($R_M R_F$) signifies the market risk premium, which is the difference between the expected market rate of return and the risk-free rate of return.

$$RR_{ee} = RR_{FF} + \beta\beta * (RR_{MM} - RR_{FF}) \qquad (8)$$

Subsequently, the calculation of the Weighted Average Cost of Capital (WACC) is undertaken as per formula (9). In this formula, R_d denotes the cost of debt, t represents the tax rate, E signifies equity; D indicates debt, and A refers to total assets.

$$\Delta\Delta EEFFFF = RR_{ee} * \frac{EE}{AA} + (1 - II) * RR_{dd} * \frac{DD}{AA} \qquad (9)$$

Then, the value of the entity is predicted utilizing the DCF Entity method, as detailed in formula (10). In this formula, V_{ENT} represents the value of the entity.

$$II_{EEEETT} = \frac{FFFFFFFF}{WWAAFFFF} \qquad (10)$$

Predict the equity value of Estee Lauder Companies from 2025 to infinity by deducting liabilities from assets. Following this, the real option method is employed as articulated in formula (11), where IV_t

denotes the intrinsic value of Estee Lauder Companies, namely, the value of equity. Subsequently, this value is discounted to the year 2021 using formula (12).

$$IIII_{tt} = \max(EE - EETT, 0) \quad (11)$$

$$EEEEEEIIIIEE_{2021} = \frac{EEEEEEEEttEE^{2025}}{(1+RRyy)^4} \quad (12)$$

To calculate the probability distribution of the equity value, the process begins with identifying the maximum and minimum values using the formulas MAX(.) and MIN(.) function in EXCEL. Subsequently, the equidistant interval is calculated by formula (13). Given that the paper divides the range into 10 intervals, the denominator used for this calculation is 10. The value of equity at each equidistant points is then computed as defined by formula (14), where E_j represents the value of equity at equidistant point j. Finally, the FREQUENCY(.) function in EXCEL is utilized to determine the probability associated with each boundary.

$$EEEEEEIIEEIIIIIIRRIIII\ IIIIIIIIIIIIRRRR = \frac{EE^{mmyymm} - EE^{mmmmmm}}{10} \quad (13)$$

$$EE_{jj} = EE_{jj-1} + IIEEEEEIIEEIIIIIIRRIIII\ IIIIIIIIIIIIRRRR \quad (14)$$

The final step entails an analysis of the sensitivity of Estee Lauder Companies' equity value in response to the fluctuation in its total liabilities.

3. Application of Real Options: Valuation of Estee Lauder Company

3.1. Forecast of Free Cash Flow of Estee Lauder

This subpart presents the prediction of Estee Lauder company FCFF employing Monte Carlo simulation, anchored in the principles of geometric Brownian motion[6]. Initially, the FCFF value for Estee Lauder from 2011 to 2020 is calculated using formula (1). The outcomes of this computation are illustrated in Table 1.

Table 1: Calculation of FCFF from 2011 to 2020 (in million,$).

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
EAT	700.8	856.9	1019.8	1204.1	1088.9	1114.6	1249.0	1108.0	1785.0	684.0
Depreciation(DEP)	294.4	295.8	336.9	384.6	409.0	415.0	464.0	531.0	557.0	611.0
Inventories	995.6	983.6	1113.9	1294.0	1215.8	1263.0	1479.0	1618.0	2006.0	2062.0
Short-term liabilities	1943.3	2125.8	1934.6	2056.7	2129.8	2680.5	2823.0	3310.0	4605.0	5179.0
Receivables	945.6	1060.3	1171.0	1379.3	1174.5	1258.3	1395.0	1487.0	1831.0	1194.0
NWC	-2.1	-81.9	350.3	616.6	260.5	-159.2	51.0	-205.0	-768.0	-1923.0
ΔNWC	0.0	-79.8	432.2	266.3	-356.1	-419.7	210.2	-256.0	-563.0	-1155.0
INV	0.0	0.0	0.0	13.6	924.0	1577.0	1631.0	1377.0	0.0	0.0
FCFF=EAT+DEP-ΔNWC-INV	995.2	1232.5	924.5	1308.8	930.0	372.3	-128.2	518.0	2905.0	2450.0

Table 1 shows the time series of Estee Lauder Companies' FCFF. The series, represented by a straight line, can be interpreted as a static, known set of cash flows. A critical observation from Table 1 is the presence of a negative FCFF value, indicating a generally declining trend in Estée Lauder's cash flow from 2011 to 2017. Specifically, in 2017, the FCFF turned negative but exhibited a recovery from mid2017, surpassing the highest value of the preceding six years and peaking in 2019. The concurrence of negative FCFF is indicative of a potential inability of a company to sustain profitable growth, which may lead to increased debt levels and possibly inadequate liquidity for ongoing operations. The observed fluctuations over time suggest considerable uncertainty[7]. Short-term variations in FCFF can arise due to cyclical inflows and outflows, reflecting the nature of the company's collections and sporadic investments; therefore, interpretations of FCFF trends might not uniformly apply across different companies. Notably, the trend in FCFF appears to mirror the growth or decline in Estee Lauder's skincare business.

In addition, the mean value and standard deviation for the logarithmic value of FCFF are calculated as input data, as illustrated in Table 2. Employing Monte Carlo simulation, the paper estimates the implied volatility of logarithm returns on future cash flows. It is important to note that the number of returns is one fewer than the total number of periods considered. For instance, in the period from 2011 to 2020, while there are 10 cash flows instances, there are only nine corresponding cash flow returns. This volatility is expressed as standard deviation in the table.

Table 2: Calculate the mean and standard deviation from the logarithm of the historical FCFF.

Year	logR=log(FCFFt/ FCFFt-1)	mean value	standard deviation
2011		0.0435	0.4121
2012	0.0929		
2013	-0.1249		
2014	0.1510		
2015	-0.1484		
2016	-0.3976		
2017	-0.4630		
2018	0.6064		
2019	0.7488		
2020	-0.0740		

Following the initial analysis, the study proceeds to identify other necessary input parameters for the Monte Carlo simulation. Given that the data utilized in this research are annual, the interval for the simulation is set to 1 year. The FCFF value recorded in the last year for Estee Lauder is taken as the starting point for subsequent calculation. This involves computing the mean value and standard deviation of the FCFF, which are crucial parameters for the simulation. The results of these computation are presented in Table 3.

Table 3: Calculation of the input data by using the geometric Brownian motion method (GBM).

mean value(in million,$) μ	0.0435
standard deviation(in million,$) σ	0.4121
interval $\triangle t$	1
initial $FCFF_0$(in million,$) S_0	2450

Upon determining the input parameters, random values are generated utilizing Excel's specialized "Random Number Generation" module. This module facilitates the generation of random numbers conforming to a predefined probability distribution. These parameters are then applied to forecast the FCFF values using Geometric Brownian Motion, as outlined in formula (4). The predictions incorporating the uncertainty of the first ten scenarios are depicted in Figure 1.

Figure 1 presents the time series of the predicted cash flows. Analysis of the chart reveals that only three out of these ten scenarios exhibit an upward trend, while the remaining scenarios predominantly display a downward trend, coupled with significant volatility. Notably, all predicted FCFF values are positive, suggesting that the company is expected to generate value over these five years. Typically, positive FCFF values imply potential revenue growth, the likelihood of yielding excess returns to investors, and, under conditions of low stock prices coupled with increasing free cash flow, a heightened probability of subsequent increases in profits and stock value.

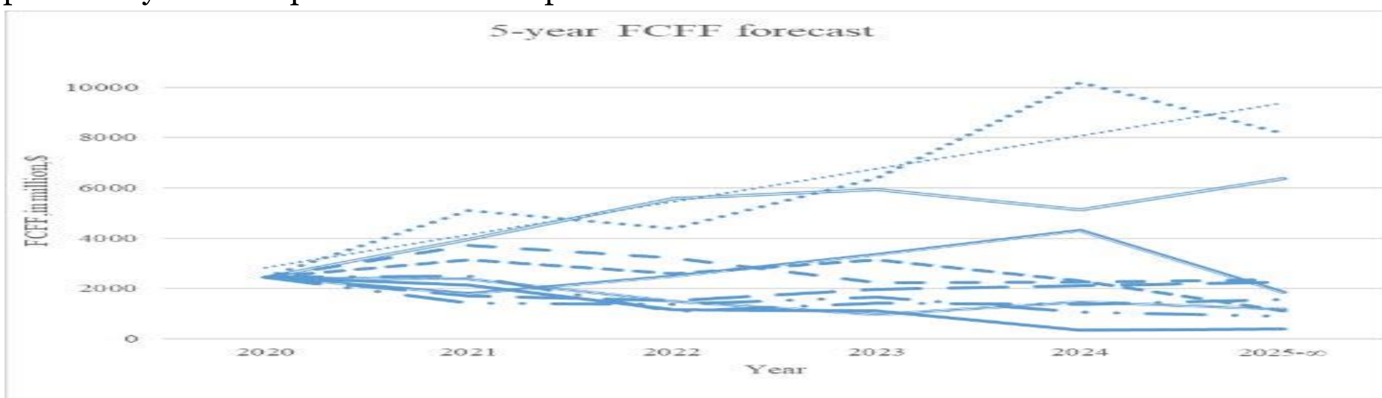

Figure 1: Simulation of FCFF of the first ten scenarios.

The trend line in Figure 1 represents the second scenario and can be interpreted as a hypothetical, static set of future free cash flows. Conducting a discounted cash flow (DCF) analysis on these static cash flows yields an idealized valuation of the project, predicated on the assumption that future cash flows are precisely known, embodying no uncertainty, and therefore exhibit zero volatility around the forecasted values. However, this scenario stands in contrast to the practical realities of financial forecasting for a firm[8]. In real-world conditions, there exists a degree of uncertainty, implying that actual free cash flows may diverge from forecasts – they could be higher, lower, or align with the predicted levels at various periods. This uncertainty introduces risk, which in financial terms, translates to volatility. The greater the risk associated with a firm's operations, the higher the volatility and, consequently, the greater the deviation of actual cash flows from their forecasted values. When volatility is theoretically reduced to zero, the resultant cash flow values converge to the static, forecasted trend line, as depicted in the second scenario.

3.2. Prediction of Total Liability from 2025 to Infinity

This subpart is dedicated to predicting the total liabilities of Estee Lauder Companies from the year 2025 into perpetuity. The approach adopted involves taking the weighted average of the company's total liabilities over the preceding ten years, as documented in Annex 1. The weighting assigned to the total liabilities for each year from 2011 to 2020 is in ascending order, starting from 1 and increasing incrementally to 10 for each successive year. This weighted average is then calculated by formula (7).

The outcomes of this computation are presented in Table 4. Based on this analysis, the predicted value of Estée Lauder Companies' total liabilities from the year 2025 onwards is estimated to be 5487 million dollars.

Table 4: Prediction of total liabilities from 2025 to ∞.

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total liabilities	3627	3846	3843	3999	4573	5636	7166	7857	4605	5179
weight	1	2	3	4	5	6	7	8	9	10
TL(2025-∞)(In millions, $)	5487									

3.3. Prediction of the Value of the Entity

This section details the calculation of the WACC for Estee Lauder's industry, employing Formula (9). The initial step involves computing the cost of equity for Estee Lauder's industry based on the CAPM method, as depicted in formula (8). In this context, the U.S. long-term treasury bond rate is selected as the risk-free rate. The beta value, risk premium, and cost of equity are subsequently presented in Table 5. The resulting computation indicates that the cost of equity is 0.062.

Table 5: Input parameters and value of the cost of equity and cost of debt.

Risk-free rate (R_f)	0.015
β	1.103
Risk premium [$E(R_m)$-R_F]	0.042
Cost of euity	0.062

The input parameters, along with the value of WACC, are comprehensively detailed in Table 6. For the cost of capital, this study employs the value obtained directly from (Useful data sets) website. These values are instrumental in calculating the value of the entity for two distinct stages.

Table 6: Input parameters and the value of WACC.

Cost of equity (Re)	0.062
E/A	0.837
Tax rate (t)	0.101
Cost of debt (Rd)	0.036
D/A	0.163
WACC	0.056

To determine the value of a firm, it is imperative, as highlighted by Shrieves, Ronald E., and John M. Wachowicz Jr. (2001), to compute the present value of operating free cash flow (FCF). Prior to discounting these cash flows to their present value, their actual amounts must be determined. This segment of the analysis is dedicated to predicting the value of the entity. In valuing a company, the underlying asset is perceived as the market value of the entity, which is often considered perpetual.

The valuation is then conducted using formula (10). For this analysis, the input value of the WACC over a span of the six years is consistently set at 0.056, figure previously calculated. The results of this prediction for the initial ten scenarios are illustrated in Figure 2.

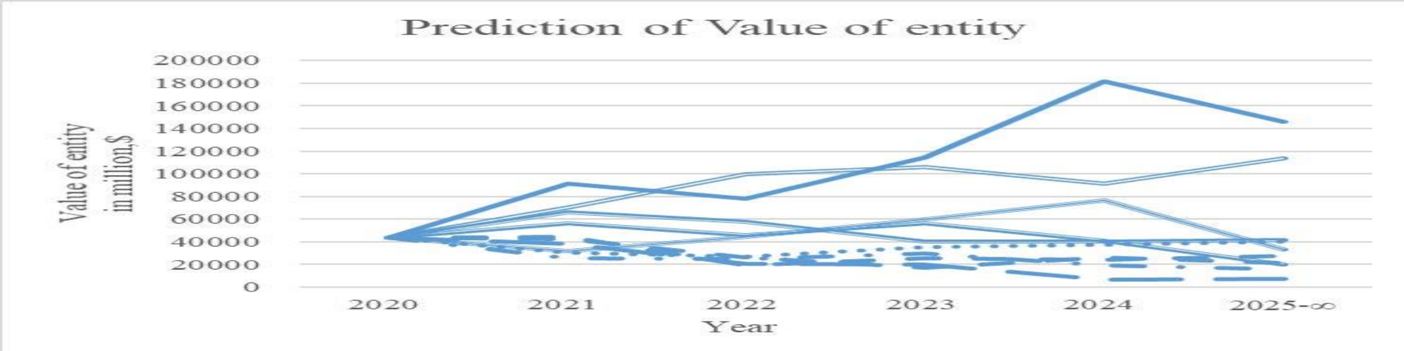

Figure 2: Simulation of the value of entity of the first ten scenarios.

An examination of the data presented in the figure reveals that the asset value of Estee Lauder Companies is predominantly exhibiting a downward trend. This trend becomes more apparent when juxtaposed with Figure 4.3, which illustrates the simulation of FCFF for the first ten scenarios. A parallel can be observed between the changing trend of the entity's value and that of its FCFF. This correlation aligns with the definition of enterprise value as posited by financial economists: the enterprise value is conceptualized as the present value of a company's expected cash flow, discounted at the company's weighted average cost of capital (WACC) [9]. This valuation metric is intrinsically linked to the firm's financial decision-making and reflects the time value of money, risk, and the sustainable development capacity of the company's funds. There exist a positive correlation between the enterprise value and the free cash flow of the enterprise, that is, under the same conditions, the greater the cash flow of the company. Under equivalent conditions, a higher cash flow typically signifies a t greater enterprise value.

3.4. Prediction of the Value of Equity

This section focuses on the prediction of the value of equity. Firstly, the value of equity determined by subtracting liabilities from assets, a calculation reflected in Table 7 under the column labelled "(ATL)" for the period 2025-∞. The second approach involves identifying equity values greater than zero utilizing the real options method. This method employs the MAX(.) function in EXCEL to extract positive equity values. Following this, the values from 2025 are discounted to the base year of 2021 using formula (12), where "R_E" denotes the cost of equity, as previously specified in Table 6. The results of these calculations for the first ten scenarios are presented in Table 7.

Table 7: Prediction of the value of equity for the second stage and discounted value in 2021(in million, $).

	max(A-TL,0)	A-TL	max(A-TL,0)	A-TL
Scenario	2025-∞	2025-∞	2021	2021
1	140466	140466	110486	110486
2	1619	1619	1273	1273
3	15611	15611	12280	12280
4	35033	35033	27556	27556
5	10586	10586	8327	8327
6	27462	27462	21600	21600
7	22521	22521	17715	17715

8	36494	36494	28705	28705
9	108471	108471	85320	85320
10	14406	14406	11331	11331

Table 8: Key statistics (in million, $).

	A-TL	MAX(A-TL,0)
Mean value	38598	38576
St.dev	44369	44388
Variance	1970528725	1972226343
Min	0	-2622
Max	414029	414029
Perc.97.5%	160133	160133
Perc.2.5%	421	421

Table 8 comprehensively presents statical measures including the mean value, standard deviation, variance, as well maximum and minimum values of Estee Lauder's equity value, alongside its percentile distribution. The table reveals an increase in the equity value of Estée Lauder from -2622 million to 414029 million dollars. Notably, the 2.5% and 97.5% percentiles suggest a potential range for Estée Lauder's equity value between 421 million and 160133 million dollars, with a 95% confidence level at a 5% significance level. The actual equity value in 2021, as reported in the annual report of Estée Lauder Companies, was 6091 million dollars, which is significantly lower than the forecasted range, indicating a potential undervaluation of the company. However, it should be noted that this valuation is an approximation and subject to limitations due to potential external factors[10].

The preceding analysis suggests that the current market valuation of Estee Lauder below its potential. Based on the forecasted equity and entity values, it can be speculated that, although Estee Lauder's stock price and equity value may experience short-term fluctuations and a downward trend, the long-term projection indicates potential growth.

3.5. Probability Distribution of the Equity Value of Estee Lauder

This section is dedicated to calculating the probability distribution of Estee Lauder's equity value in 2021, aiming to ascertain the company's value with greater accuracy.

The first step involves determining the minimum and maximum equity value using Excel's MAX (.) and MIN (.) functions. Following this, the equidistant interval is calculated as per formula (13), resulting in a total of 10 intervals. The boundaries of each interval are then computed using formula (14). Subsequently, Excel's FREQUENCY(.) function is utilized to calculate the probability associated with each boundary value, along with the cumulative probability. The results of this analysis are presented in Table 9, which depicts a discrete distribution.

Table 9: Probability distribution of Estee Lauder's equity values.

	max(A-TL,0)	Frequency (2021)	Probability	cumulative probability		A-TL	Frequency (2021)	Probability	cumulative probability

MIN	0	19	0.019	0.019	MIN	-2622	1	0.001	0.001
	41403	666	0.666	0.685		39043	654	0.654	0.655
	82806	206	0.206	0.891		80708	230	0.23	0.885
	124209	63	0.063	0.954		122373	69	0.069	0.954
	165612	23	0.023	0.977		164038	23	0.023	0.977
	207015	9	0.009	0.986		205704	9	0.009	0.986
	248418	9	0.009	0.995		247369	9	0.009	0.995
	289820	1	0.001	0.996		289034	1	0.001	0.996
	331223	1	0.001	0.997		330699	1	0.001	0.997
	372626	1	0.001	0.998		372364	1	0.001	0.998
MAX	414029	2	0.002	1	MAX	414029	2	0.002	1
	SUM	1000	1	1		SUM	1000	1	1
INTERVAL	41403				INTERVAL	41665			

The data are visualized as probability distributions in Figures 3 and 4, which illustrate the probability distribution and cumulative probability of max(A-TL,0) and (A-TL), respectively. A probability distribution graphically represents the frequency of equity values within each interval as a proportion of the total number of equity values. To construct this distribution, the number of equity values in each interval is divided by the total number of equity values. These ratios are then plotted on the vertical axis of the chart. An examination of these figures reveals that the probability distributions of the values of max(A-TL) and (A-TL) are notably concentrated. The most frequently occurring values, as depicted in the charts, are 41403 and 39043, respectively.

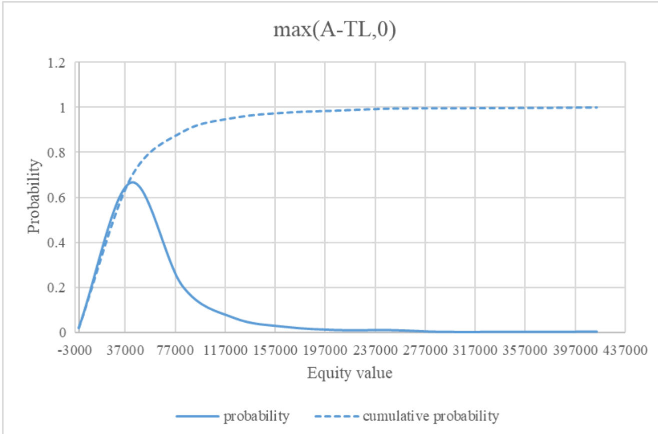

Figure 3: Probability distribution and cumulative probability of max(A-TL,0).

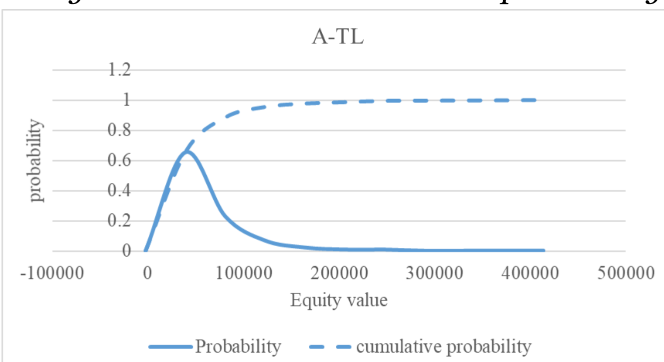

Figure 4: Probability distribution and cumulative probability of (A-TL).

The observed forms of these two probability distribution plots exhibit characteristics reminiscent of the Poisson distribution and the Weibull distribution[11]. Notably, the graphical representation of the Weibull distribution shows a particularly striking resemblance. This similarity suggests that the distribution of Estée Lauder's equity values may follow a pattern akin to that modelled by the Weibull distribution, which is often used to describe the distribution of lifetimes of objects and is characterized by its flexibility in modelling various types of data distributions[12].

4. Conclusion

This study posits a positive correlation between the equity value and the stock price of Estée Lauder. Reflecting on the analyses conducted, there is a strong indication that the current valuation of Estée Lauder is undervalued. The forecasts, grounded in comprehensive financial analyses, suggest a potential increase in both the stock price and equity value of Estée Lauder in the future. While short-term fluctuations are anticipated, indicative of the inherent volatility in the market, the overarching long-term trend appears to be one of growth. This conclusion underscores the need for a balanced perspective that considers both immediate market conditions and the long-term financial trajectory in investment and valuation strategies.

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