

# Integrating ESG Factors into Discounted Cash Flow Valuation A Case Study of Microsoft

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## Abstract

This study takes Microsoft as the research subject and explores how environmental, social, and governance (ESG) factors can be integrated into the traditional Discounted Cash Flow (DCF) valuation method. First, a traditional DCF model is established based on Microsoft's 2016 financial data. ESG-related expenses are then incorporated into earnings before interest and taxes (EBIT) for adjustment. The results show that after ESG-related expenses are incorporated into the traditional DCF model, the estimated value of the company decreases. This study develops a practical and transparent method for quantitatively integrating ESG factors into corporate valuation and demonstrates how sustainability-related investment may affect a company's long-term development.

## Keywords

ESG, Discounted Cash Flow, corporate valuation, Microsoft, enterprise value.

## 1. Introduction

In recent years, the use of discounted cash flow (DCF hereinafter) model as a tool to estimate the intrinsic value of a company based on its expected future cash flows and the time value of money is becoming more and more popular. There are about 78.8% of professional analysts use a DCF approach when valuing individual equities [5]. The core principle behind the model is time value of money. For example, what's the 100 dollars in 10 years later worth in today's money? Whether it is worth more or less depends on factors like inflation and opportunity cost of capital.

In a DCF analysis, the future free cash flow needs to be generated after paying for its operations, taxes and capital expenditures. The model will search for businesses historical financial information, management guidance and expected economic conditions to forecast cash flow for the next 5 to 10 years and assume the company grows at a stable long-term rate afterward. Afterwards, the discounted rate has to be calculated by Weighted Average Cost of Capital(WACC hereinafter). WACC is the minimum return a company needs to earn to satisfy investors and company managers. It is a specific type of discount rate and tells us how much to discount future cash flows. To lower the risk for investors, it's better that the company keeps their WACC at a low rate which means the company has a high valuation. The next step is to discount all future free cash flows(FCFF hereinafter) which is the cash a company generates after paying for its operations and investments by WACC to its present value.

$$FCFF = EBIT(1 - Tax) + D\&A - CAPEXchange\ in\ WC \quad (1)$$

Cost of Equity:

$$R_e = R_f + \beta(R_m - R_f) \quad (2)$$

Cost of Debt:

$$R_d = \text{InterestExpense} / \text{AverageInterest} - \text{Bearing} \quad (3)$$

$$WACC = R_e \times E / (E + D) + R_d \times D / (E + D) \times (1 - T) \quad (4)$$

Subsequently, the terminal value(TV) needs to be calculated to predict future cash flows of a company after the explicit forecast period ends. Adding up the present value of terminal value and present value of forecast cash flows, the sum represents a company's Enterprise Value which can be adjusted for debt and cash to determine its Equity value.

$$TV = FCF_{(n+1)} / (WACC - g) \quad (5)$$

$$EV = \sum [FCFF_t / (1 + WACC)^t] + [(FCFF_n \times (1 + g) / (WACC - g)) / (1 + WACC)^n] \quad (6)$$

Today's companies not only focus on their finance and revenue, but also care more about their reputation, which makes them pay more attention on environmental, society and governance (ESG). According to the United Nations-Accenture[18], the ESG proposition was strongly considered as an indivisible section of the generation of businesses value. A outstanding ESG performance contributes to a reduction in the cost of debt and cost of equity will have. This conclusion is based on a dataset consistent of 3066 firm-year observation of S&P 500 from 2015 to 2021 [19]. Even though previous studies have already demonstrated the ESG performance influence the firm's value, there are few studies showing a practical framework of integrating ESG factors into measurable DCF model. The DCF model depends very heavily on assumptions and the estimate value from model will be very sensitive to these input. This have already been proved by analysis based on a DCF calculation of BASF [16]. Since the change in cost of debt and equity determine the WACC, which serves as discount rate in DCF valuation, the conversion of future cash flows into present value will become uncertain.

I propose that integrate ESG factors into financial impacts that can be incorporated into DCF model is essential for creating more rigorous calculation and provide a mid-to-long term valuation precision for investors.

## 2. Main Body

Although DCF model is one of the popular method used to approach for company valuation, the weakness are quite standout. The accuracy of the results are independent to the assumptions used in estimate future cash flows and discounted rate and the traditional DCF model assume the company value equals to the financial cash flow only. However, the ESG refers to 3 criteria that helps to measure the social impact and sustainability which may influence companies's future performance [13]. Meanwhile, the ESG can contribute to long-term growth in a company by higher productivity, reducing business risks, enhancing innovation(PWC, 2023; Deloitte, 2022; Woo&Tan, 2022)[15]. The use of scenario analysis and sensitive testing after integrate ESG factors into financial models facilitates more precise and risk-adjusted valuation. The potential of a company been clearly reflected in factors like discounted rates and cash flow prediction [3]. The study by Kumar et al.[10] illustrate that integrating a positive performance ESG and a good quality stock can improve the investment return. To maintain the practical company valuation, ESG factors should been valued as a critical factors for determine and driving long-term value instead of an exclusionary factors [14].

Existing research shows that ESG performance can influence firm value through multiple financial channels, like future cash flows and cost of capital [7,8]. Large numbers of studies discussed the relationship between ESG performance and business value and most of them are focusing on testing the impact of ESG performance on corporate valuation.

This research will use Microsoft as case study to illustrate how the unpriced risks will influence the future performance of DCF after integrating ESG factors into DCF and the formula after adjusting.

There are 3 reasons why I chose Microsoft is the suitable research subject.

Microsoft provide comprehensive financial and ESG information: this research requires for massive financial information from official website to support the model of the traditional DCF valuation.

Microsoft demonstrates significant emphasis on ESG: the business has extensive ESG initiatives including employee well-being, environmental sustainability and responsible governance. There are sufficient evidence shows how employee-related ESG factors could affect valuation assumptions.

Microsoft experienced momentous business transformation after 2016: followed by the rapid development in technology and computing, Microsoft accelerated its transitions to AI investment, digital services and subscription-based software. Meanwhile, ESG become essential in corporate strategy and this makes a huge difference on Microsoft's subsequent development.

### **3. Research Methodology**

The traditional DCF value ignores the unpriced risks represent by ESG factors, employee-risks, sustainability costs and governance risks. The ESG rating agencies recognized Microsoft as a leading ESG performer, these external assessments proved that Microsoft's mature ESG management practices. Although Microsoft is a relatively strong ESG performer, ESG-related challenge still exists.

Fortunately, Microsoft had already achieved carbon neutrality before 2016 and in Corporate Social Responsibility (CSR) report the business committees the ideas of making this planet a better place with following number of fronts, prioritizing energy supply by heavily dependents on wind, solar and hydro power electricity and enhance privacy principles to protect customers' right to privacy.

Instead of adjusting WACC, modify EBIT is more transparent for understanding the valuation model but use it allows ESG-related expenditures to be explicitly reflected in FCFF. This approach accounts for how environmental and humane capital investments shape firms' profitability from business operations instead of altering their capital structure.

This adjustment model assumes that maintaining high ESG performance requires for additional operating expenses, while conventional DCF model believes historical operating costs stayed constant throughout the forecast period. Eventually, the ESG-adjusted DCF is expected to produce a lower intrinsic valuation than the traditional DCF valuation model.

The DCF value from estimation by using datas from Microsoft form 2016 10-K report is \$432.37 billion [11]. However, the actual market value at the end of June 2016 was approximately \$362.52 billion. This indicates that the DCF valuation overestimated Microsoft's value about 19.3%. The DCF valuation assume that the FCFF, WACC and growth rate are consistent in the forecast years. Nevertheless, in the real life situation, maintaining a strong ESG performance leads to increase in future cost and investment which will lower the FCFF and the actual market value will lower than the estimate market value. For example, the historical CAGR of 4.35% reflects historical conditions and does not fully capture the effect of future ESG-related

investments and conflicts. Therefore, the sustainable long-term growth assumption is revised downward.

**Table 1.** Summary of Key Inputs and Outputs of the Traditional DCF Valuation.

| Metric                    | Value             |
|---------------------------|-------------------|
| EBITI                     | \$20,182 million  |
| Change in Working Capital | \$-589 million    |
| FCFF                      | \$16,023 million  |
| Cost Of Debt              | \$53,687 million  |
| Cost Of Equity            | \$353,234 million |
| WACC                      | 6.78%             |
| Terminal value            | \$598,378 million |
| DCF value                 | \$432,373 million |

Source: Created by the author with values from the Microsoft FY2016 financial data.

In July 2012, Microsoft rolled out an internal carbon fee and separate business teams are responsible for carbon emissions they generate through daily operations. Instead of adjusting growth rate, I will incorporate ESG considerations into Microsoft's future operating expenses. This approach forces business to bear more monetary cost generated by carbon emissions, employee well-being and technology innovation over the years. Consequently, the additional cost lowers the value of EBIT which may lead to a decrease in FCFF and result in a fall in the DCF value.

#### 4. Environmental Adjustment

Traditional DCF model always ignores the environmental liabilities and assumes the future free cash flows are generated only by operating performance. Fortunately, Microsoft introduced an internal carbon pricing mechanism that charges greenhouse gas emissions from business departments since 2012. However, followed by the stricter carbon emission regulations and carbon price mechanism, the additional cost on environmental protection will increase significantly. The value of firm such as expected cash flows, compliance costs and profitability may be affected by climate-related risks [9]. The impact of ESG on firm value is mostly reflected through future operating cash flows. The reshape of firm's operating cost structure caused by investment in environmental and sustainability initiatives changes the structure of EBIT and influences FCFF [8].

Climate-related risks are becoming an important factor that should be taken into financial material considerations in carbon-intensive and technology industries. To make the adjustment more formal and easier for understanding, carbon costs are adopted as a proxy for environmental impact. The overlook of future carbon-related cost may lead to an overestimation of firm's value by DCF model, especially when future climate regulation is increasingly stringent. Therefore, incorporating future carbon costs into projected operating expenses provides a more realistic estimation of future FCFF and enterprise value.

Microsoft's historical carbon emission value from 2013 to 2016 is used to estimate the future emission growth rate by CAGR and the final carbon emission growth rate was 13.09% per year. However,

Microsoft made climate commitments to lower future emissions and rise investment in renewable energy to decline environmental pollution, this may lead to overestimate of future environmental costs. Microsoft announced that the business is devoted to reducing carbon emissions by more than 50% by 2023. The estimate carbon emission growth rate is calculating below:

The total carbon emission including Scope1, 2:

$$tCO_2e = 88,486 + 2,060,534 = 2,149,020 \quad (7)$$

Target emission in 2030: 50% reduction fro 2016 level

$$E_{2030} = E_{2016} \times 50\% = 2,149,020 \times 50\% = 1,074,510 \quad (8)$$

Forecast period:

$$2030 - 2016 = 14 \text{ years} \quad (9)$$

Carbon Emission Reduction rate:

$$CAGR = (E_{2030} \div E_{2016})^{(1/14)} - 1 = -0.00483 = -4.83\% \quad (10)$$

Future Carbon Emission: current carbon emission assume to be E2016

$$\text{Future carbon emission} = \text{Current carbon emission} \times (1 - 4.83\%)^t \quad (11)$$

Although the Social Cost of Carbon is adopted as the benchmark for the valuation scenarios, the base-year market carbon price is derived from the California Cap-and-Trade Program because it represents the mature and transparent carbon pricing mechanisms operating in 2016. The annual average carbon price in 2016 is \$12.73 which is supported by California Cap-and-Invest program(CARB) [4]. According to the High-Level Commission on Carbon Prices recommendations, the study concludes that carbon prices should reach US\$40-80/tCO<sub>2</sub> in 2020 [17]. I will use CAGR to calculate the estimate growth rate of the carbon price with 2 scenario:

Carbon price growth rate: carbon price in 2016 is \$12.73

Low Scenario (The carbon price reached \$40 by 2020)

$$g = (P_{2020}/P_{2016})^{(1/4)} - 1 = (40/12.73)^{(1/4)} - 1 = 33.0\% \quad (12)$$

High Scenario (The carbon price reached \$80 by 2020)

$$g = (P_{2020}/P_{2016})^{(1/4)} - 1 = (80/12.73)^{(1/4)} - 1 = 58.3\% \quad (13)$$

Forecast Carbon Price:

Low carbon price:

$$Price(n + 1) = Price_n \times (1 + 33\%) \quad (14)$$

High carbon price:

$$Price(n + 1) = Price_n \times (1 + 58.3\%) \quad (15)$$

Forecast carbon cost:

$$Carbon\ cost = Emission \times Carbon\ price \quad (16)$$

Environmental:

$$EBIT_{environment} = EBIT - Carbon\ cost \quad (17)$$

The carbon cost is subtracted straight from EBIT, given that carbon pricing is require to satisfy climate policy liability. This treatment is consistent with previous ESG-adjusted valuation studies, which incorporate climate-related costs into project operating cash flows instead of adjusting discount rates.

## 5. Social Adjustment

Social performance is an essential perspective to determine the financial performance of a business. Traditional DCF model believes that the future operational expense is defined by historical financial informations. Nevertheless, to maintain strong social performance business may increase investment on employee well-being, work-life balance, staff retention and workplace diversity. Although the expenditure on such activities will increase operating expense in the short-run, the labor productivity and satisfaction will contribute to sustainable long-term value growth [6].

According to Microsoft's 2016 annual report ad CSR report, Microsoft recognized employee as one of the most precious strategic resources. The company invested in diversity and inclusion, training skills, leadership development and workplace culture. The 2016 GRI report illustrates Microsoft provides wide range of disclosures in compliance with GRI 404 on employee learning and career advancement which reflect the firm's persistent investment in nurturing its workforce [12]. However, the expenditures about social and governance-related operating doesn't include in either annual report or CSR report. Consequently, these expense cannot be factor in the company financial data using to calculate DCF model.

The human capital management has been recognized as an important ESG factor and incorporated into long-term investment analysis because it have impact on firm's long-term value [2]. Nonetheless, in corporate financial statements expenditures like ethics programs, compliance systems and internal controls are rarely disclose to the public. ATZ and Whelan (2023) argue that it's difficult to directly incorporate social and governance into valuation models due to the limited information about indicators. This study combines social and governance expenditures into a single Additional Social and Governance Operating Cost. This approach reflected the constraints inherent in corporate public disclosures and avoid double counting between employee development and compliance-related activities. The adjusted EBIT is calculated as follows:

$$EBIT_{socialgovernance} = EBIT - Additional\ Social\&Governance\ Operating\ Cost \quad (18)$$

Since Microsoft does not reveal data for employee development, ethics training and governance programs, employee training expenditure is adopted as a proxy for social and governance operating cost to show the feasibility of my formula. The reason why employee training expenditure is selected is that it represents scarce observable ESG-related expenditure available for public to have access. Although the employee training cost doesn't capture the entire social and governance spending, it provides a draft framework and replicable proxy variable for broader additional social and governance operating expenditure and support the adjustment model is feasible. The Microsoft didn't disclose employee training cost, so the study takes the industry benchmark published by the Association for Talent Development[1].

$$EBIT_{social\&governance} = EBIT - Training\ cost\ per\ person \times numbers\ of\ employees \quad (19)$$

Based on the environmental and social-governance adjustments in precious sections, this study incorporates 3 ESG dimensions into a single adjustment to operating profit. The future climate polices and carbon price mechanism will generate predictable financial effects for enterprises. The environmental cost are estimated through multiplying project carbon emissions by the matching carbon price. The social-governance factors are proxied by employee training expenditure to incorporate through an additional operating cost. Consequently, both environmental and additional social and governance operating costs are detected in adjusted EBIT before calculating FCFF. This approach makes the ESG- related expenditures appear clearly within the forecasted operating cash flows and so provide more information to assess precise calculations while maintaining the transparency and reproducibility of the valuation model. Previous studies argued that ESG factors can influence firme value by the change in future cash flows and operating performance instead of direct changes in accounting earnings alone [8,7].

$$Adjusted\ EBIT = EBIT - Environmental\ cost - Additional\ Social\ and\ Governance\ Operating\ Cost \quad (20)$$

Forecast Free Cash Flow:

$$FCFF_{ESG} = Adjusted\ EBIT(1 - T) + D\&A - CAPEX - change\ in\ working\ capital \quad (21)$$

The Microsoft Esg-Adjusted Dcf Model Calculation:

Full-time employees in 2016: 114,000

Average annual training investment per employee in 2016: \$1,252

$$EBIT_{social\&governance} = 114,000 \times 1,252 = \$142,728,000 \quad (22)$$

$$CarbonEmission(2016) = 2,149,020tCO_{2e} \quad (23)$$

$$Carbon\ Emission\ Price\ in\ (2016) = \$12.73 \quad (24)$$

$$EBIT_{environmenta} = 2,149,020 \times 12.73 = \$27,357,024.6 \approx \$27,357,025 \quad (25)$$

$$EBIT_{2016} = \$20,182,000,000 \quad (26)$$

$$\text{Adjusted EBIT} = 20,182,000,000 - 142,728,000 - 27,357,025 = \$20,011,900,000 \quad (27)$$

**Table 2.** Comparing the influence on EBIT, FCFF and EV with different ESF-adjusted factors.

|      | <b>Traditional DCFE</b> | <b>Environmental Adjustment</b> | <b>Social&amp;Governance Adjustment</b> | <b>ESG Adjustment</b> |
|------|-------------------------|---------------------------------|-----------------------------------------|-----------------------|
| EBIT | 20,182,000,000          | 27,357,000                      | 142,728,000                             | 20,011,915,000        |
| FCFF | 16,022,700,000          | 15,999,447,000                  | 15,901,381,000                          | 15,878,130,000        |
| EV   | 432,373,286,000         | 431,745,790,000                 | 429,099,492,000                         | 428,471,996,000       |

The value are in \$

Source: Created by the author with values from Microsoft annual report in 2016, CSR 2016, CARB and ATD

## 6. Conclusion

### 6.1. Key Findings

This study examined how environmental, social and governance (ESG) factors can be incorporated into the traditional Discounted Cash Flow (DCF) valuation model. The conventional DCF models as one of the most widely used valuation approaches, they assume that future operating performance is fully determined by historical financial information would therefore overestimate the ESG-related investments. This study developed the ESG-adjusted DCF model by incorporating environmental, social and governance factors which add up additional costs into EBIT before estimating FCFF. According to the interviews with industry professionals, the application of ESG was always superficially presented, even though businesses and professionals all agreed on the inherent value of ESG.

### 6.2. Drawbacks

There are several drawbacks comes out from this study. It only analyses Microsoft, and the results may not apply to other firms or industry sectors when exploring ESG impacts on company value. There is limited public data covering social and governance expenditure. Therefore, employee training costs acted as a proxy, yet this fails to represent the full scope of relevant ESG spending. Apart from this, the valuation relies on predictions for future carbon prices, emission levels and operating expenses. Changes to these assumptions can reduce the accuracy of the calculated enterprise value.

### 6.3. My Contribution

The primary contribution of this research is the development of a practical and transparent methodology for integrating ESG considerations into corporate valuation. This study illustrates how ESG-related operating costs can be integrated into the projected cash flows instead of treating ESG as a qualitative concept or only adjusting the discount rate. The investors and researchers can use this structured and replicable framework to evaluate corporate social, environmental and governance performance as continuously standards to become more stringent.

### 6.4. Future Research

This framework throughout future development can be widely used in companies and industries to examine whether it remains effective across different business departments. In the future, firms may provide more information about social and governance-related expenditure because of developments in ESG reporting, this allows ESG-related estimates to be

more reliable and accurate. Furthermore, the future studies could improve the applicability of ESG-adjusting DCF valuation by investigate the effects of different carbon pricing assumptions and specific industry ESG adjustments.

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