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SPECIFICS OF WACC FOR SUSTAINABLE PROJECTS

ABSTRACT

The paper examines the limitations of using the traditional *Weighted Average Cost of Capital (WACC)* to evaluate sustainable projects, which often have unique financial, environmental, and social risks and benefits. It proposes the concept of *Sustainable Weighted Average Cost of Capital (SWACC)*, which adjusts the *WACC* by incorporating *environmental, social, and governance (ESG)* risk premiums. The paper discusses how *ESG* factors can affect the cost of capital and the *SWACC* of sustainable projects, and highlights the challenges of quantifying and integrating *ESG* risks into the *SWACC formula*. The paper suggests that *SWACC* can provide a more accurate and tailored approach to valuing sustainable projects, but also calls for further research on its application and standardization.

Keywords: wacc, swacc (sustainable wacc), esg, fcf (free cash flow), ecf (equity cash flow), risk, risk premiums, sustainability, financial models.

***JEL Classifications*:** G12, G31, Q51, Q56.

Introduction and Motivation

Understanding the cost implications and returns on sustainable projects is crucial for both corporations and investors. The *Weighted Average Cost of Capital (WACC)* serve as standard metrics in finance to evaluate investment opportunities. Its application in the realm of sustainable projects, however, needs a deeper dive.

Historically, *WACC* has been employed to understand the average rate that a company expects to pay to finance its assets (*Modigliani and Miller, 1958*). It combines the cost of equity and the cost of debt, with each type of capital being proportionally weighted. In simpler terms, it acts as the hurdle rate which an investment must exceed to be considered.

Sustainable projects, by their nature, often come with unique financial, environmental, and social risks (*Hart and Ahuja, 1996*). They may offer long-term benefits, but they might also entail higher upfront costs or face regulatory uncertainties. Given these distinct characteristics, the use of traditional *WACC* might not fully encapsulate the nuanced financial landscape of sustainable projects.

The conventional *WACC* might undervalue sustainable projects, particularly because these projects might promise better long-term profitability and reduced risk exposures, especially in sectors prone to environmental regulations.

In response to these challenges, the concept of *Sustainable Weighted Average Cost of Capital (SWACC)* is being proposed, which integrates *WACC* to the required rate of return for sustainable investments. This metric adjusts the traditional *WACC* by integrating *environmental, social, and governance (ESG) risk premiums*.

Companies with strong *ESG* metrics are increasingly perceived as less risky and more attractive to investors (*Friede et al., 2015*). As sustainable investing becomes mainstream, incorporating *ESG factors into SWACC* can provide a more accurate representation of the risk and return dynamics.

Dhaliwal et al. (2011) highlight that firms with high *ESG* ratings tend to have a lower cost of capital. This potentially translates to a more favorable *SWACC* for sustainable projects, reflecting their strategic and financial merits.

While the introduction of *SWACC* provides a more tailored approach to evaluating sustainable projects, its application isn't without challenges. One of the primary criticisms revolves around the quantification of *ESG* risks and their integration into the *SWACC formula (Krüger, 2015).* Standardizing *ESG* metrics across industries and geographies remains a topic of debate among financial analysts.

As the focus on sustainability intensifies, traditional financial metrics like *WACC* are being adapted and refined to better suit the sustainable investment landscape. The development and use of *SWACC* encapsulate this evolution. However, the finance community continues to grapple with its nuances, indicating a rich field for further research.

WACC

There are primarily two methods to value companies using discounted cash flows:

Method 1: Using Expected Equity Cash Flow (ECF) and Required Return to Equity (*Ke*) In this method, the value of a firm's equity *E* is calculated as the present value of its expected equity cash flows ECF, discounted at the rate of return required by equity holders *Ke.* The corresponding equation is:

$$E=PV\,[Ke;ECF] \quad \text{(Equation 1)}$$

The value of the firm's debt *D* is calculated as the present value of its expected debt cash flows *CFd,* discounted at the required rate of return on the debt *Kd.* Mathematically, this can be expressed as:

$$D=PV[Kd;CFd] \quad \text{(Equation 2)}$$

Free Cash Flow (FCF) is a theoretical construct that represents the equity cash flow that would be generated if the firm had no debt. The relationship between *FCF and ECF* is given by:

$$ECF = FCF+\Delta Dt-It(1-T) \quad \text{(Equation 3)}$$

Here, ΔDt is the increase in debt and *It* represents interest paid by the company. $= \Delta CFdt = It-\Delta Dt.$

Method 2**:** Using Free Cash Flow (FCF) and Weighted Average Cost of Capital (WACC)

The second approach involves calculating the value of the firm's equity *E* and debt *D* as the present value of the expected Free Cash Flows (FCF), discounted at the Weighted Average Cost of Capital (*WACC*). This is denoted by:

$$E+D=PV[WACC;\ FCF] \quad \text{(Equation 4)}$$

WACC is the discount rate at which the *FCF* needs to be discounted to yield the sum of the present values calculated using Method 1 (Equations 1 and 2). Therefore, *WACC* is expressed as:

$$WACC= [Et-1 \times Ke + Dt-1 \times Kd \times (1-T)] / [Et-1 + Dt-1] \quad \text{(Equation 5)}$$

Here, *T* is the effective tax rate. $Et-1$ and $Dt-1$ are the values derived from the valuation process and are not based on market or book values.

WACC is a composite measure that incorporates two disparate elements:

- A cost component, represented by the cost of debt
- A required return component, represented by the required return to equity *Ke*

Adjusting WACC to Sustainable projects

Valuing sustainable projects introduces additional layers of complexity due to factors such as regulatory constraints, long-term goals, and environmental, social, and governance (*ESG*) considerations. Below are adjustments that can be made to the discounted cash flow valuation methods to account for these factors:

***Adjustments for Method 1*:** Expected Sustainable Equity Cash Flow and Required Return to Sustainable Equity (*Kes*)

1. Risk Adjustment for Kes: Given that sustainable projects could be riskier due to novelty and costs, the required return to sustainable equity *Kes* might be higher compared to conventional projects.

2. Long-term Cash Flows: Sustainable projects often aim for long-term impact. Therefore, when estimating the expected sustainable equity cash flows *SECF*, one may need to consider a longer time horizon.

3. Incorporate ESG Factors: The *SECF* should also incorporate potential ESG-related cash inflows or outflows, such as carbon credits or costs of sustainability measures.

4. Regulatory Risk: Consider potential changes in tax incentives, penalties, or regulations affecting sustainable projects when calculating *SECF*.

Equation Adjustment: **The adjusted equation may look like the following:**

$$Es=PV[Kes; SECF]$$

Adjustments for Method 2: Free Cash Flow and Sustainable Weighted Average Cost of Capital (*SWACC)*

1. Risk-Adjusted SWACC: The *SWACC* should be adjusted to reflect the greater risk profile of sustainable projects. This can be accomplished by adding a risk premium to both the cost of debt and equity in the *SWACC* formula.

2. Debt Financing Considerations: The nature and availability of debt financing may differ for sustainable projects, which could influence Ds and subsequently *SWACC.*

3. ESG Adjustments in Cash Flows: Similar to Method 1, the *SFCF* in this method should also account for ESG-related cash flows, both positive and negative.

4.Variable SWACC: Given that sustainable projects could be more sensitive to external changes like regulatory shifts, a variable *SWACC* that changes over time may be more appropriate.

5. Equation Adjustment: The adjusted equation for enterprise value could look like:

$$Es+Ds=P\ [SWACC; SFCF]$$

6. SWACC Formula: The adjusted SWACC formula might appear as:

$$SWACC=Es-1+Ds-1(Es-1\times Kes)+(Ds-1\times Kds\times(1-T))$$

By incorporating these adjustments, one can arrive at a valuation that more accurately reflects the risk profile and cash flow dynamics of sustainable projects.

Let's consider an example of a sustainable energy project, such as a solar power plant. We'll estimate the Sustainable Weighted Average Cost of Capital (*SWACC*) using the following hypothetical data:

- *Value of sustainable debt (Ds) = $10,000,000*
- *Value of sustainable equity (Es) = $3,000,000*
- *Cost of sustainable debt (rs) = 5%*
- *Required return to levered sustainable equity (Kes) = 12%*
- *Effective tax rate (T) = 12%*
- *Required sustainable market risk premium (PMs) = 5%*

First, we calculate the tax shield on the debt:

$$Tax\ Shield = Ds \times rs \times T = \$10,000,000 * 0.05 * 0.12 = \$60,000$$

Here, *Ds* represents the value of sustainable debt, *rs* is the cost of that debt, and *T* is the effective tax rate. When you plug these numbers into the formula, you get a tax shield of $60,000.

$$SWACC = ((((Es \times Kes) + (Ds \times rs \times (1 - T))) / Es + Ds) + PMs$$

Then, we'll calculate *SWACC* using the adjusted formula, which will equal to *6%+5%=11%*.

So, the Sustainable Weighted Average Cost of Capital (*SWACC*) for this solar power plant project would be 11%. This rate could be used to discount the expected Sustainable Free Cash Flows (*SFCF*) to estimate the net present value of the project in a sustainable context.

The Weighted Average Cost of Capital (*WACC*) for a sustainable project may differ from a conventional project due to several factors. Below are some of the key aspects that could lead to variations in the *WACC* between sustainable and traditional projects:

Risk Profile

1. Higher Perceived Risks: Sustainable projects, especially those that are innovative or in emerging sectors like clean technology, may have higher perceived risks. This can drive up the cost of equity (*Ke* for traditional and *Kes* for sustainable) and possibly the cost of debt r for traditional and *rs* for sustainable).
2. Long-Term Viability: Sustainable projects often aim for long-term environmental and social benefits, which may have less certain financial outcomes in the short term, leading to higher risk premiums.

Capital Structure

1. Debt Availability: Sustainable projects might find it either easier or more difficult to secure debt funding depending on investor appetite for sustainability, affecting the proportion of debt (*D* for traditional and *Ds* for sustainable) in the capital structure.

2. Green Bonds: Sustainable projects may have access to specialized financial instruments like green bonds, which could have different cost structures.

Regulatory and Tax Considerations

1. Tax Incentives or Penalties: Governments might offer tax incentives for sustainable projects, affecting the effective tax rate (*T*) and thereby influencing the *SWACC*.
2. Regulatory Risks: Potential future regulations like carbon pricing could be a risk factor for traditional projects but an advantage for sustainable ones.

Market Conditions

1. Investor Preferences: Growing interest in *ESG* (Environmental, Social, Governance) could lower the cost of equity for sustainable projects due to higher demand.
2. Market Premium: The required market risk premium (*PM* for traditional and *PMs* for sustainable) could differ due to market perceptions of sustainability as a value driver or risk mitigator.

Operational Factors

1. Cash Flows: The cash flows from sustainable projects might have different characteristics, such as long-term contracts for renewable energy, affecting the Free Cash Flow (*FCF* for traditional and *SFCF* for sustainable).
2. Terminal Value: Sustainable projects may have a higher terminal value due to their long-term orientation, affecting the discounted cash flow calculations.

Comparative examples using hypothetical numbers to illustrate how WACC might differ between a sustainable project and a traditional project.

Traditional Manufacturing Project

For a traditional manufacturing project, let's assume the following:

- *Value of debt (D) = $400,000*
- *Value of equity (E) = $600,000*
- *Cost of debt (r) = 5%*
- *Required return to equity (Ke) = 9%*
- *Effective tax rate (T) = 30%*

Calculating WACC for the traditional project

$$WACC = ((E \times Ke) + (D \times r \times (1 - T))) / (E + D)$$

$$= ((600{,}000 \times 0.09) + (400{,}000 \times 0.05 \times 0.7)) / 1{,}000{,}000$$

$$WACC = ((600{,}000 \times 0.09) + (400{,}000 \times 0.05 \times 0.7)) / 1{,}000{,}000$$

$$= (54{,}000 + 14{,}000) / 1{,}000{,}000 = 0.068$$

$$WACC = 0.068 \text{ or } 6.8\%$$

Sustainable Energy Project

For a sustainable energy project (e.g., wind farm), we might consider:

- *Value of sustainable debt (Ds) = $400,000*
- *Value of sustainable equity (Es) = $600,000*
- *Cost of sustainable debt (rs) = 4% (lower due to green bonds or other incentives)*
- *Required return to sustainable equity (Kes) = 11% (higher due to perceived risks)*
- *Effective tax rate (T) = 30%*

Calculating SWACC for the sustainable project

$$SWACC = ((Es \times Kes) + (Ds \times rs \times (1 - T))) / (Es + Ds)$$

$$= ((600{,}000 \times 0.11) + (400{,}000 \times 0.04 \times 0.7)) / 1{,}000{,}000$$

$$SWACC = (66{,}000 + 11{,}200) / 1{,}000{,}000 = 0.0772$$

SWACC= 0.0772 or 7.72%

Comparative Summary

The *WACC* for the traditional manufacturing project is 6.8%, while the *SWACC* for the sustainable energy project is 7.72%. The sustainable project has a higher *SWACC* mainly due to the higher required return to equity, reflecting the perceived higher risks, even though its cost of debt is slightly lower. This could make the sustainable project appear less financially attractive when considering only the financial returns, even though it may have other forms of value, such as environmental benefits.

Proposals for further research

Adjusting the Weighted Average Cost of Capital (*WACC*) for sustainable projects involves accounting for the specific risks and opportunities associated with such ventures. Here's how WACC for sustainable projects can be further adjusted:

Reassessing the Cost of Equity

Risk-Free Rate: Given that sustainable projects might have longer horizons, using long-term government bonds as a proxy for the risk-free rate might be considered.

Beta (β): Sustainable projects may have different risk profiles compared to a company's typical projects. Deriving a new beta for sustainable projects by finding comparable or adjusting the company's existing beta might be needed.

Market Risk Premium: This remains unchanged unless it is believed that sustainable projects have a different market risk profile in your specific context.

Reassessing the Cost of Debt

Credit Spread: Sustainable projects can potentially affect a company's credit risk. Some projects can reduce risk (e.g., through improved reputation or diversification), leading to a lower credit spread. Conversely, unfamiliar technologies or markets can increase risk.

Incorporate Specific Risks

Specific Risk Premium: Incorporating a specific risk premium or adjusting the discount rate upwards to account for uncertainties associated with sustainable projects, such as technology risk, regulatory changes, or market acceptance might be implemented.

Incentives and Subsidies: Governments often offer incentives, grants, or tax breaks for sustainable or green projects. These can significantly lower the effective cost of capital.

Green Bonds: If a company issues green bonds to finance sustainable projects, the cost of this debt might be different (often lower) than other forms of debt, given the growing demand from *ESG*-focused investors.

Stakeholder Perception and *ESG* Premium: Companies recognized for their sustainable efforts might enjoy a lower cost of capital due to positive stakeholder perceptions. *ESG* (Environmental, Social, Governance) focused investors might accept a lower return, leading to a lower *WACC*.

Reputation and Brand Value: Sustainable projects can enhance a company's reputation and brand value. This can be factored into *WACC* by recognizing that enhanced brand value might reduce overall business risk and thus, the cost of equity.

Adjust the Debt-Equity Ratio: If sustainable projects change the risk profile of the company or are financed differently than typical projects, the debt-equity ratio used in the *WACC* calculation might need adjustment.

Incorporating these adjustments requires both quantitative analysis and a fair amount of judgment. It's essential to collaborate with experts who have experience in sustainability and understand the nuances associated with sustainable project financing.

Conclusion

In the context of sustainable projects, the Weighted Average Cost of Capital (*WACC*) take on additional layers of complexity due to factors such as increased risk, novelty, and unique cost structures. These factors require adjustments in the way we consider and calculate *SWACC* for sustainability-focused ventures.

Just like in traditional projects, SWACC in sustainable projects serves as the rate at which Free Cash Flows must be discounted to align with the valuation using Equity Cash Flows. However, it's vital to understand that the SWACC for sustainable projects may differ, often being higher to account for the unique risks and uncertainties associated with sustainability initiatives.

As with traditional projects, the correct calculation of *WACC* in sustainable projects is tightly linked with the appropriate valuation of tax shields (*VTS*). But given the evolving nature of tax incentives and subsidies for sustainable projects, a dynamic approach may be more suitable.

Various debt policies, from fixed debt levels to fixed leverage ratios, can have different impacts on the *SWACC* and hence should be carefully considered.

In conclusion, while the foundational principles of *SWACC* and *WACC* remain the same, their application in the realm of sustainable projects necessitates a nuanced approach. A thorough understanding of the unique challenges and opportunities presented by sustainability is essential for accurate project valuation and financial planning.

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