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Article

The Role of the Capital Asset Pricing Model (CAPM) in Determining the Weighted Average Cost of Capital (WACC) (Analytical Research)

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Abstract: Many researchers and learners could not differentiate between the capital asset pricing model and the weighted average cost of capital. This prompted the researcher to shed light on and explain the role played by the capital asset pricing model in constructing and calculating the cost of capital according to the weighted average. The research also discussed that the pricing model extracts a percentage and not a real value, which surprises most followers because the model is called a pricing model and not a pricing ratio. But the truth is that the pricing model extracts the required return ratio, which is included in pricing the common stock according to the Jordan model. When pricing, the transaction costs for trading the stock will be calculated, and these costs are included in calculating the cost of capital. Accordingly, the capital asset pricing model is included in calculating the weighted average cost of capital. The research also reached a set of recommendations, the most important of which is to work on analyzing the financial models in all their details to help other researchers understand and know the method and mechanism by which these models work.

Keywords: CAPM, WACC, Return

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1. Introduction

The Capital Asset Pricing Model (CAPM) is extensively taught in various courses as a comprehensive framework for reasoned analysis of the anticipated returns that financial assets ought to demand, taking into account their inherent risk characteristics [1]. The emphasis of the present paper revolves around the CAPM, particularly its pivotal role in shaping the Weighted Average Cost of Capital (WACC) formula, an indispensable measurement that greatly influences firm valuation and the critical decision-making process concerning potential investments [2], [3]. The primary objective of this paper is to provide invaluable insights to the readership, enabling them to fully comprehend and appreciate the multifaceted contributions of the CAPM model in the intricate domains of firm valuation and the intricate calculations associated with WACC.

CAPM (Capital Asset Pricing Model) is not just an abstract model; it is rather a comprehensive system of beliefs that governs the variables influencing the returns of financial assets and the cost of capital utilized in investment financing [4]. As such, in addition to introducing the CAPM itself, we will delve into a broader discussion of this system in the second section of this enlightening essay. Furthermore, we will explore how this system engenders CAPM implications for the distribution of individual asset returns

within the model, thereby shedding light on this aspect in the third part of the essay. Undoubtedly, the application of CAPM to firm valuation has firmly taken root and become well-established [5]. It is frequently employed as a tool to assess the systematic risk associated with a firm's equity stake. However, it is worth noting that the employment of the Weighted Average Cost of Capital (WACC) formula to discount cash flows generated by a firm is a time-honored tradition that dates back centuries. In the subsequent two sections of this paper, we will meticulously examine and contemplate these pertinent matters [6]. This rigorous analysis will lay the foundation of understanding the fundamental principles of the WACC investment rule, while assuming that the rewards bestowed upon investors and managers are determined through competitive means, duly referencing the CAPM as the guiding framework. Later on, in the final section of this comprehensive study, we will relax the stringent assumption that participants in financial markets behave in a perfectly competitive manner and rigidly adhere to prevailing market prices. By doing so, we will unlock a new dimension of analysis, allowing us to delve deeper into the intricacies of financial market behavior and gain valuable insights into the dynamic nature of prices [7]. Through this expanded exploration, we aim to enrich our understanding and enhance the applicability of the CAPM and its related principles in the real world, where the complexities of human decision-making and market imperfections play a significant role.

Foundations of the Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) is a fundamental principle of modern finance. CAPM is based on the logical principle that there is a direct relationship between the level of risk and the potential reward. In essence, the company's cost of equity capital is determined by the perceived level of systematic risk associated with the company, as seen from the perspective of the investor. It should be noted that investors, in general, require a premium for shouldering any form of risk. Keeping all other factors constant, the anticipated return on an investment tends to be higher as the investor perceives an increased level of risk [8], [9], [10]. An essential measure used to evaluate an investment's sensitivity to market movements is called beta. Each asset possesses its own unique beta, the numerical value of which is equivalent in magnitude but opposite in sign to its correlation with the overall market. The beta coefficient effectively gauges an investment's systematic risk, which essentially represents the risk that cannot be mitigated through diversification, even by adding other investments to one's portfolio. By engaging in the strategy of diversification, an astute investor can effectively eradicate the firm-specific or unsystematic risk from their investment portfolio [11]. Through the practice of diversifying their portfolio in such a prudent manner, investors can effectively circumvent a significant portion of the potential risk associated with their investments, as the price of any individual stock they possess could potentially plummet unexpectedly. It is important to note that firm-specific risk in an investment does not warrant a risk premium, as it is not correlated to the general market conditions. Consequently, an investor must thoroughly analyze the amount of systematic risk that exists in a given security and subsequently adjust the discount rate accordingly [12], [13]. It is crucial to acknowledge that market risk cannot be diversified away; regardless of how vast the investor's portfolio may be, there will always be an inherent level of market risk. In the event that an investor acquires a portfolio that precisely mirrors the composition of the market, any deviations in returns from the anticipated outcome will be a direct consequence of market risk. It should be understood that the degree to which an investor's equilibrium portfolio comprises of risky assets will be directly influenced by their level of risk aversion [14], [15]. It is invariably to the investor's advantage to diversify their investments across a multitude of risky assets, as this serves as an effective mechanism to minimize company-specific risk and safeguard their overall investment portfolio.

2. Materials and Methods

Risk and Return Relationship

Now we know that individuals are risk-averse, meaning that they need higher expected returns to compensate for bearing additional risk of increasing return variability. In other words, the expected return on any asset will depend on the level of that risk; the higher the risk, the better the expected return. For this reason, an investor may require compensation for having a well-diversified portfolio. The relationship between risk and expected return is termed a risk-return tradeoff.

In economic theory, an individual will receive the compensation he demands to hold a risky asset. Take an example of two firms, with one offering a riskless investment plan that yields a return of 5%, and the other offering a risky investment plan that will yield either 20% or -15% with a probability of 0.50. Assuming you are given the capital to invest, on which plan will you choose? Of course, the first one, because the expected return of the second one is 2.5%, which is less than the guaranteed return of 5% on plan 1. An investor's decision to invest in a risky stock depends on that stock's expected return and perceptions of risk. In other words, the higher the risk, the higher the expected return that must be offered, and there can only be two ways of compensating for an investment risk: by increasing the rate of return, the actual expected return on the investment, or by reducing the investment price. In developed economies, the process of risk assessment is highly developed and matters because of a good understanding of associated risks and adjusting their rate of returns. The greater the risk, the greater the return and vice versa. Thus, a supply-side role has applications in capital and portfolio management and in the cost of capital.

Systematic vs. Unsystematic Risk

In financial markets, it is important to distinguish between two types of risk: market-wide risk, known as systematic risk, and industry/company-specific risk, known as unsystematic risk. Systematic risk refers to the possibility of an event harming a large portion of the market in conjunction with its consequences. It concerns events that can significantly lower the value of any investment across any asset. Unsystematic risk is associated only with a certain sector or company, and the event will have an impact only if the investor has positions held in the stock of the company or the securities of the sector. The difference between the two kinds of risks lies in the fact that for systematic risk, it is nearly impossible to find diversified investment, while for unsystematic risk, diversification can result in very limited exposures to the risk. Diversification refers to the concept that if one were to diversify their investments—and therefore spread their portfolio over different sections of the economy such as retail, manufacturing, oil, technology, etc.—the risk on the total portfolio could be significantly decreased as these different sections operate independently. It is through the use of the beta coefficient that investment performance and thorough assessment of portfolio performances are primarily addressed, through the relation of the individual stock performance to the overall market movements. We emphasize the distinction between systematic and unsystematic risk as we believe asset prices and asset-pricing techniques are highly influenced, explicitly or implicitly, by the type of risk they represent. We believe the unsystematic component of assets is necessary to understand investor portfolios.

A couple of points should be made at this level. First, it is impossible to diversify away systematic risk; thus, an investor's portfolio can be entirely comprised of assets with zero correlation to their wealth level, but they will still be exposed to share market movements. Moreover, shareholders are rewarded for exposure to systematic risk, an implication of which will be discussed in a subsequent section. Second, the systematic risk represents the risk that aims to determine, given that systematic risk is directly proportional to the interest that can be paid by the investment to the shareholders. Consequently, systematic risk implicitly provides a method by which the interest to be

collected from equity or to be paid to debt can be mathematically calculated into the overall cost of capital and the cost of equity. Importantly, the unsystematic risk is not incorporated into such a calculation.

Calculation and Components of the Weighted Average Cost of Capital

The cost of equity is not directly observable; utilizing the capital asset pricing model is the widespread practice in the assessment of the cost of equity. This model stipulates that the required return on marketable securities, which may be denoted as the risk-free rate plus the risk premium, is proportionate to the systematic risk of an asset. After obtaining the cost of equity through this model, it is combined with the market value of equity to determine the equity weight. For the cost of debt, it is common practice to obtain the current market interest rates on loans and bonds to determine this cost. The cost of debt reflects the opportunity cost, whereas the interest rate is the cost of debt for a lower-rated firm. Since an informed organization should have a clear understanding of its components, any distortion or mistake in the perception of these components would influence and distort the cost of capital and, inevitably, the capital budget decisions of the firm. The weighted average cost of capital is interpreted as the average rate of return that an organization is expected to pay on all its capital, counting debts and equities. This can be assessed using the formula mentioned as follows: as strong signals this is the weighted average of all indicators. The weighted average cost of capital is with respect to a company's project and assumptions about the company's after-tax cost of debts and the independent play assumption that does not depend on the company's capital structure.

3. Results and Discussion

Cost of Equity

When establishing the Weighted Average Cost of Capital (WACC) for the firm, the cost of equity is one parameter that has to be ascertained. The cost of equity is defined as the expected return that investors ask for taking the risk of investing in the equity shares of a firm. As such, the estimation of the cost of equity is extremely important, as other corporate finance strategies can affect the cost of equity of the firm. A number of approaches, such as the Capital Asset Pricing Model, Dividend Discount Model, and Bond Yield Model, can be used to calculate the cost of equity for the firm [16]. The Capital Asset Pricing Model is the most widely used model for estimating the cost of equity, as estimated through the systematic risk metric of beta. It integrates the risk-free rate of the government security and an equity risk premium [17].

Considering the prominent role of the stock market in influencing the behavior of investors, a market-based process is used, and the risk premium differs according to the risk stemming from investing in equities of a particular firm. A number of finance professionals have given a pay-off matrix using the outcomes of selecting various choices while deciding the cost of equity of the firm [18], [19], [20]. Academics have made a number of assumptions as to the related payoff when determining the cost of equity. These researchers have assumed that when ascertaining the cost of equity, the managers will look at a firm's business risks, classifying these risks into market versus non-market risks in a formal systematic manner. The restraint on managers determining a firm's cost of equity is to address various real-world concerns that investors look at when computing the cost of their external funds. As operations of a firm are influenced by supply and demand market conditions, especially if firms are likely to trade publicly on the stock exchange, the cost of such equity is heavily influenced by the firm's overall market and business risks [21]. This sub-section attempts to look at each of the previous costs of capital and add the cost of equity as discussed above. Some examples will be provided in the next sub-section for illustration. In conclusion, it is important to correctly determine the cost of equity, which is a basic determinant to ascertain WACC in corporate finance operations.

Cost of Debt

The cost of debt is an essential constituent of the calculation of the weighted average cost of capital (WACC). It is the effective rate that a company pays on its borrowed funds, i.e., loans, bonds, etc. It can be defined formally as the rate that discounts the bond's issued price to the bond's market price in current time [22]. The commitment to pay an obligation in the form of coupon and principal, of which the amount, its maturity time, and the rest must be paid annually, is known as the bond. The annual funds can be presented as E1/E0 - 1, net of tax, with E1 being interest taxable and 1 - T the tax margin. The assigned ratio values are agreed upon after the borrowing of capital. In general, the common means to measure the cost of debt is through interest on the initially borrowed funds [23].

By not paying the tax, the primary loan's pre-tax cost of debt is evaluated. But bear in mind that governments usually minimize the primary loan's total cost. It motivates businesspeople to borrow money to gain the tax shield on the loan interest, in essence. The evaluation method is as follows: the use of accurate costs of debt in investment and financing opportunities further factors in higher borrowing expenses when interest rates increase. It controls the cost of debt in terms of a debt-adjusted-for-tax [24]. The study carrying it is therefore essential because it aids companies in formulating funding decisions and forming the decisions of the company's capital construction. It assesses the cost of borrowing money that can be achieved from borrowing capital requirements [25]. The cost to be incurred as a source of financing must be paid to companies that provide borrowed capital.

Weighted Average Cost of Capital Formula

The Weighted Average Cost of Capital (WACC) is the weighted average percentage return required by the provider of finance. It represents the average rate of return required by all the providers of finance who belong to a particular category. The WACC, in turn, is a critical input in capital budgeting and firm valuation, and therefore in determining how corporations make decisions with respect to value creation [26]. The WACC formula, used to facilitate the determination of the weighted average cost of capital, is represented as the following equation. WACC = Ke x EKE + Kd x (1 - t) x (KD) In this formula, E / (E + D) is the ratio of equity to total financing, with E known as equity and D as debt. Ke indicates the cost of pure equity, whereas Kd stands for the cost of debt financing. One significant aspect in financial analysis and modeling is that the cost of equity is difficult to measure; hence, it is often replaced by the Capital Asset Pricing Model formula, which is relatively more usable and convenient. The Weighted Average Cost of Capital (WACC) calculates the weighted average of the costs of debt and equity finance in the business, and because interest payments on debt are tax-deductible, WACC adjustments are necessary to account for this. WACC is a basic yardstick change utilized by company administrators when employing Adjusted Present Value and Internal Rate of Return investment appraisal models [27], [28]. Without proper determination of the weights and the cost of financing components, the investment appraisals will be inaccurate. WACC is usually utilized to find the equity, given a financial value we require referring to the Net Present Value of an investment proposition. WACC can be used in a range of economic scenarios and it can be utilized to give the cost of equity/equity weight in a debt-free scenario.

Application of CAPM in WACC Determination

The main appeal of the Capital Asset Pricing Model has always been its use as a means to determine the cost of equity for the computation of the Weighted Average Cost of Capital. The WACC can be employed as a discount rate to convert future cash inflows and outflows into present value for investment analysis. Investment projects with returns exceeding the calculated WACC are accepted; they deliver more cash than the cost of their financing. For planning purposes—especially useful in the determination of leveraged firm value—firms should strive to invest in projects promising more than the WACC. Given its already proven importance, the WACC essentially carries implications for a

variety of corporate decision-making processes, including optimal capital budgeting and capital structure [29]. Efficient management, therefore, requires that managers are able to make optimal use of the WACC in these processes, which in turn hinges on an effective computation of the WACC. The only specifically unique input to WACC is levered beta, which we cannot reasonably assert to change in the same manner as MRP. As the single non-constant among WACC inputs, a lower cost of debt increases WACC, thereby decreasing the present value of our free cash flows and growth perpetuity as well [30]. Though WACC change is quantitative, its implications are unique. First, changes in the cost of debt do not affect the required rates of return for projects of superlative NPV. As a result, the implication is towards a certain conservatism; as it is true for every discounter in the investment world, every firm should find all acceptable projects instead of cherry-picking a few. Further, the WACC changes do not redistribute firm value intertemporally; changes in WACC do instead affect capital markets [31]. In particular, firms should seek to take advantage of decreased profits until such time that cost of debt increases affect operational versatility, thus influencing the value of the enterprise. Broadly speaking, this conservatism has fostered the acknowledgment of the unchanging ECR—it is irrelevant regardless of perspective and firm concerns [32], [33].

Limitations and Criticisms of CAPM and WACC

Conclusions CAPM and WACC have become widely accepted and appreciated for their contribution to financial theory and their ease of application in the business sectors. However, both have been applied with increasing reservations and criticisms. The validity of CAPM rests on a number of assumptions that have been seriously challenged in financial literature, such as market efficiency, investor rationality, and risk being accurately measured by only one factor [34], [35]. The practical outcomes of these criticisms are that CAPM can often give false results regarding asset performance. It is increasingly realized in corporate finance that the use of historical data cannot be used properly to forecast expected future returns or correlations between returns with different levels of risk.

4. Conclusion

The use of past data always gives you the best possible result that such a model can produce, and the outcome is an average of past results as well. Therefore, to forecast probabilities of future outcomes, especially when new firms enter markets, these models do not give an accurate expected outcome. WACC is applied widely in the business sectors and also in financial institutions. However, the price of risk capital is known to fluctuate from time to time, due to shifts in economic and market conditions. During the boom, the cost of debt is lower than during the downturn in the economy, which complicates the calculation of the weighted average cost of capital. Although the use of the weighted average cost of capital could be seen as a downside, one cannot deny that the utilization of these costs in the discounted cash flows could be an easy valuation in the clearance of shares or stocks in business entities. The trade-off theory of capital structure could be applied when WACC has been calculated to make necessary adjustments during the upturn or downturn of the economic climate. Amidst the apparent criticism leveled against CAPM and WACC, they have their own strengths and weaknesses. It is advised that an alternative approach to uncertain future cash flows could be worth considering to re-establish share prices, especially by applying a method called the corporate valuation model with cash flows to equity rather than this simple model.

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