Empirical Measures of the Firm Cost of Equity Capital: A Critical Review

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Abstract: This paper provides a critical review of the main empirical models used to calculate the firm's cost of equity capital by the prior accounting literature from a theoretical perspective. In addition, this paper aims to determine which empirical models are the most appropriate for calculating the cost of equity for the firms listed in the Egyptian capital market.

مستخلص: يوفر هذا البحث تحليلاً نقديًا للنماذج التجريبية الرئيسية المستخدمة لحساب تكلفة رأس مال حقوق ملكية الشركة، وذلك في إطار ما تناولته الدراسات المحاسبية السابقة من منظور نظري تحليلى، بالإضافة إلى تحديد النماذج التجريبية التى تناسب الشركات المدرجة في سوق رأس المال المصري لحساب تكلفة حقوق الملكية.

1. Introduction

The cost of equity capital represents an asset's required return, which is the minimum return that equity holders require based on the asset's risk. A more risky asset will have a higher required return. The required return is also called the opportunity cost for investing in the asset. If the expected return is greater (less) than the required return, the opportunity is more (less) attractive (Tahoun, 2005).

Prior studies in accounting and finance literature mostly used two approaches to evaluate the firm's cost of equity the Capital Asset Pricing Model (CAPM) approach and the Discounted Cash Flow (DCF) approach.

According to the CAPM, the expected excess return (expected return minus the risk-free rate) on any asset is equal to the expected systematic risk of the asset relative to the market return (β), times the expected risk premium on the market return (Bartholdy & Peare, 2003). While the discounted growth model *"is a mathematical model that calculates the present value of the future cash flows to predict the value the firm shares"*. The model links the value of a share to the present value of the future dividend payments accruing to that share (Watson and Heads, 2007).

The remainder of this paper proceeds as follows: Section 2 discusses the definition of the cost of equity. Section 3 illustrates the most common empirical models used to calculate the cost of equity.

2. Definition of the Cost of Equity

Botosan (2006) has defined the cost of equity as *"the minimum rate of return equity investors required for providing capital to the firm"*. Further, the author depicted it as *"the risk-adjusted discount rate that investors apply to the expected future cash flows to arrive at the current stock price"*. Similarly, Heinle and Smith (2017) have defined the cost of capital as *"the discount that is applied to price relative to expected cash flows"*.

From an economic viewpoint, Pratt (2002) defined the cost of equity as "*the expected rate of return that the market requires in order to attract funds to a particular investment*". This definition is related to the economic theory of 'substitution', which suggests that an investor would not invest in a specific asset if a more appealing alternative were available.

Thus, the cost of capital comes from the marketplace, where financial analysts and investors pricing the risk of different assets to make rational investment decisions.

From the above-mentioned definitions, it seems that the cost of equity for the firm is equivalent to the investor-required rate of return.

3. Empirical Models used to Calculate the Firm's Cost of Equity Capital

There is no consensus among academics or practitioners as to the best empirical model to use in the calculation of the cost of equity capital. Generally, in the accounting and finance literature,

some prior research preferred using the (CAPM) to calculate the cost of equity capital because of its underpinning theoretical arguments (e.g., Karp & Vuuren, 2017). While other studies have chosen the Implied Cost of Equity Capital (ICEC) as a proxy to the firm's expected returns, which based on the (DCF) approach (e.g., Gordon & Gordon, 1997; Easton, 2004).

The following subsections illustrate the most common empirical models used by prior studies to calculate the cost of equity:

3.1. Capital Asset Pricing Model (CAPM)

The (CAPM) has provided the first clear framework to explain whether and how the asset's risk affects its expected return. The CAPM is suggested by Sharpe (1964) and Lintner (1965), and forms on the portfolio model developed by Markowitz (1959). The portfolio model argued that investors are believed to be risk-averse and only think about the mean and variance of their one-period asset return.

As a result, investors are more likely to choose an optimal 'mean-variance' portfolio that reduces variance and increasing asset return (Litzenberger et al., 1980; Moumen, 2015). The CAPM enhanced the portfolio model by adding a testable forecast about the risk-expected-return relationship.

The CAPM assumes that an asset's expected return above the risk-free rate is a function of non-diversifiable risk, which is determined by the covariance of the asset return with the market portfolio return (Bollerslev et al., 1988).

The vital function of the CAPM is that it distinguishes between macro and microeconomic events that are likely to influence stock returns. While the market return reflects the effect of macro-economic events, the systematic

risk shows the vulnerability of firm's assets to these events. The residual parameter reflects the effect of firm-specific disclosure on the stock returns. This residual is reflected by the firm's abnormal return, as it is known as the unsystematic risk that could be removed by a diversified portfolio (Moumen, 2015).

The formula of the CAPM developed by Sharpe (1964) and Lintner (1965) predicts the following relationship between risk premiums and betas, is as follows:

$$R_i = rf + \beta\,(R_m - rf)$$

Where, (R_i) is the expected return on stock (i), (rf) is the risk-free rate, and (R_m) is the risk premium or the excess rate of return above the riskless rate of interest (rf) on the stock (i). The β is the market risk, which represents the systematic risk inherent in the stock (i).

Brigham and Houston (2015) stated that there are some drawbacks to use the CAPM to calculate the cost of equity capital. First, there is a dispute about whether to use long-term or short-term treasury yields as a proxy for the risk-free rate (rf). Second, it is difficult to estimate the beta (β) that investors expect the firm to have in the future. Third, it is difficult to estimate the proper market risk premium.

Similarly, Botosan (2006) has mentioned that estimating the firm's historical beta is sensitive to some factors, such as market index, return interval, and the estimation period. Despite the criticisms offered by the empirical literature to the CAPM, much prior research continued to use it in calculating the cost of equity capital (e.g., Bartholdy & Peare, 2003).

3.2. Gordon & Gordon Model (1997) (Dividend Discount Approach)

The typical model of Gordon (1962) suggests that the discount rate, which equals the current share price plus the projected future dividend flow, determines a stock's expected return, as shown in the below equation: (Martins et al., 2006)

$$P_0 = \sum_{t=1}^{\infty} dps_t/(1+r)^t$$

Where(P_0) is the current share price, (dps_t) is the expected dividend per share at date (t), and (r) is the equity capital cost. Thus, the cost of equity capital is given by:

$$r = dps_t / P_0 + g$$

Where, (*g*) is the expected constant dividend growth rate. The expectation of steady dividend growth and the direct relationship between dividends and income are the key criticisms levelled at Gordon's model (Martins et al., 2006).

Hence, Gordon and Gordon (1997) tried to avoid this drawback by developing a variation of the original Gordon model with a finite horizon. Gordon and Gordon (1997) assume that each firm's return on equity reverts to its cost of equity capital beyond the forecasted timeline. The model also assumes that analysts' estimates of short-term dividends and long-term earnings per share are reliable reflections of investors' expectations (Botosan & Plumlee, 2005).

3.3. Ohlson-Juettner (2005) (OJ)

Ohlson and Juettner-Nauroth (2005) have developed a model in which the expected earnings per share (*eps*) and its subsequent growth evaluate a firm's value. The core of the model is that the firm's cost of equity capital is expressed as a function of the next-year firm expected (eps_1) and (eps_2). Although, Ohlson and Juettner-Nauroth (2005) mentioned that the expected dividend per share (*dps*) aids as the ultimate source of the firm value, and its growth rate is interacting with the expected growth rate of the firm's (*eps*).

However, the (OJ) model does not impose restrictions on how the expected (*dps*) sequence should develop. For example, Gordon model assumes steady dividend growth and a homogeneous relationship between (*dps*) and (*eps*), whereas the (OJ) model did not assume that (Martins et al., 2006).

According to (OJ) model, the calculation of the cost of equity capital can be derived from this formula:

$$r = \frac{1}{2}\left(\gamma - 1 + \frac{dps_1}{P_0}\right) + \sqrt{\frac{1}{2}\left(\gamma - 1 + \frac{dps_1}{P_0}\right)^2 + \frac{eps_1}{P_0} \times \left(\frac{\Delta eps_2}{eps_1} - (\gamma - 1)\right)}$$

Where, (*r*) is the cost of equity capital, (dps_1) is the dividend per share expected at the end of year (1), (P_0) is the current price per share, (eps_1) is the expected earnings per share at the end of year (1), (eps_2) is the expected earnings per share at the end of year (2), and the parameter (γ).

3.4. Omran & Pointon (2004)

Omran and Pointon have suggested a model based on the (P/E) ratio to calculate the cost of equity capital in the emerging markets, particularly in the Middle East region. Omran and Pointon applied this model in Egypt on a sample of 119 Egyptian firms over the period 1998-1999. The notion of this model based on the inverse of the price-earnings (PE) ratio. The suggested model is as the following equation:

$$K_e = 1 / [PE\ ratio – (e\_0\text{-}d\_0) /e\_0]$$

Where (K_e) denotes the cost of equity capital, (PE) ratio is the price to earnings per share ratio, (e_0) is earnings per share, and (d_0) is the dividend per share.

3.5. Easton (2004) (PEG)

According to the Easton model, the expected rate of return is calculated as the implied rate of return by current prices and forecasts of future earnings and earnings growth. The expected rate of return is computed according to the following function:

$$r_{PEG} = \sqrt{(eps_2 - eps,)/Po}$$

Where, (r) is the cost of equity capital, (eps_2), (eps_1) refer to earnings per share forecasts of two-year-ahead and one-year-ahead respectively, and (P_0) is the stock current price. According to the (PEG) ratio, analysts' intuition that stock is fairly prices if the (PEG) is one. However, if a (PEG) ratio is greater than one, it will support a sell recommendation, and if it is less than one, it will support buy recommendation.

4. Conclusions

From the previous discussion, it is difficult to infer whether one model is superior to the other. Thus, researchers mostly determine the model to be used according to phenomena under study and the data availability. For example, it is noted that most prior studies in developed countries preferred to use multiple valuation methods. While, in Egypt, prior studies preferred to follow the CAPM approach to calculate the weighted average cost of equity or using Omran and Pointon's (2004) model.

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