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Review

A review of the literature on methods of computing the implied cost of capital

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ABSTRACT

In this paper we critically review the existing literature on methods of computing the implied cost of capital (ICC). The ICC literature is characterised by a large number of heterogeneous studies reflecting different approaches, models to assess their validity and methods to mitigate potential biases. However, so far there is neither consensus on which ICC approach performs best, how shortcomings can be mitigated effectively, nor how methods can be evaluated adequately. We systematically categorise the various approaches available in the literature, extract assumptions underlying the models, and discuss the empirical results as well as limitations against this background. In doing so, we are able to show what can reasonably be deduced from existing research and what is still unclear, thereby opening up areas for future research.

Contents

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1. Introduction

For a long time the cost of capital has been a topic of great interest in research and practice. Investors require a precise estimate of a firm's cost of equity capital for equity valuation, managers need the same for capital budgeting and academic research requires a reliable estimate when examining the effects of variables of interest on the cost of equity capital. A broad range of researchers have, therefore, a vested interest in identifying the best proxy for the cost of equity capital. However, to date there exists no overall accepted way of computing the cost of equity capital. Before the implied cost of capital approaches were developed, researchers and valuation practitioners relied on cost of equity capital estimates based on historically observable data. These estimates are primarily based on empirical implementations of the Sharpe-Litner Capital Asset Pricing Model (CAPM), versions of the Fama and French (1992) three-factor model or the Carhart (1997) four-factor model. However, the usefulness of these estimates is limited. Fama and French (1997, 2004) conclude, for example, in the case of the CAPM that estimates are "unavoidably imprecise" and empirical problems "probably invalidate their use in applications". Shortcomings such as these form the reason why over the last few years a substantial body of literature has developed a variety of estimates for computing the implied cost of capital by reverse engineering accounting-based valuation models. The basic idea behind (firm-level) implied cost of capital is to calculate the cost of capital as the internal rate of return using a valuation model, thereby equating the present value of future dividends or income streams with the current market price. In contrast to the empirical implementation of the CAPM using ex post data for ex ante valuation, ICC methods rely on forward looking forecasted data. This approach has intuitive appeal and a substantial body of literature dealing with ICC has, therefore, emerged. Various ICC methods have been developed in literature and empirical research has been conducted assessing their validity. In this paper we critically review the existing literature which is characterised by a large number of heterogeneous studies. One stream of literature focusses on the development of ICC methods and their empirical implementation using varying underlying business valuation models and estimation levels. Since these studies show markedly different results for ICC estimates, other strands of literature (i) assess the performance of different approaches and (ii) discuss the shortcomings of different approaches and try to mitigate them. However, there is neither consensus on which approach performs best, how shortcomings can be mitigated, nor how methods can be evaluated adequately.

Since ICC is a theoretical concept, in this paper we not only synthesise the empirical results of the studies, but also discuss the models developed on a conceptual level. Our review, therefore, goes beyond specific implementation aspects regarding the model, time-horizon and estimation level. This allows us to categorise the various ICC approaches available in literature systematically, to extract the assumptions underlying the different models, and discuss the empirical results and limitations against this background. In this way, we are able to show what can reasonably be deduced from existing research and what is still unclear, thereby opening up areas for future research.

The rest of this paper is structured as follows: Section 2 describes the general approach to calculate ICC. Section 3 reviews the ICC approaches as well as the methods to validate them developed in literature and discusses major shortcomings. The conclusion in Section 4 summarises key findings and provides ideas for further research in the field of implied cost of capital.

2. General research approach

In many respects existing research papers have followed a relatively predetermined pattern in estimating the implied cost of equity capital. Based on the assumption that market prices are efficient, ICC literature sets the equity value of a company as equal to the quoted share price[1] and inserts expected dividends, earnings, book-values (numerator) and growth expectations into an accounting-based valuation formula to determine the discount factor, i. e. the market's expected rate of return. The most common approach to proxy expected dividends, earnings and book-values is to use sell-side analysts' forecasts for the detailed plan horizon, available from Thomson Reuters Institutional Brokers Estimate System (I/B/E/S) or from Value Line; alternatively earnings forecasts can be derived by using cross-sectional (mechanical) forecast models. Furthermore a terminal value has to be specified.

Almost all approaches are similar in that they are based on an equity model, i. e. the firm's equity valuation, and that they assume a constant deterministic discount factor over time at any given point (estimation date). The reasons for using an equity model are essentially based on the availability of data. Since data providers, especially I/B/E/S, provide forecasts of earnings or dividends that are due to equity holders for more firms and longer time periods than flows that are due to the whole entity, the research is heavily restricted to equity approaches. The assumption that expected rates of return can be approximated by a constant (non time-varying) deterministic discount rate is, apart from a few exceptions (see, for example, Ang & Liu, 2004; Gode & Ohlson, 2004), common in the literature (see, for example, Claus & Thomas, 2001; Gebhardt et al., 2001). A major reason for taking this approach is that if a deterministic discount factor (implied cost of capital) is assumed, discounting future dividends or earnings is straightforward (see, for example, Kruschwitz & Löffler, 2006; Fama & French, 1996; Laitenberger & Löffler, 2006).[2] Accordingly, assuming a constant deterministic discount factor at a given point in time represents the 'state-of-the-art' when it comes to equity valuation (see, for example, Ohlson & Gao, 2006).[3]

The following underlying business valuation models have been used in the ICC literature:

- The Dividend Discount Model (DDM):

$$V_0 = \sum_{t=1}^{T} \frac{Dt}{(1+R_E)^t} + \frac{D_{T+1}}{(1+R_E)^T (R_E - G_D)}, \tag{1}$$

where V_0 is the firm's current value, D_t represents the dividends for period t, R_E is the cost of equity capital, and G_D is the growth rate of the dividends in the terminal value.

- The Residual Income Valuation Model (RIM):

$$V_0 = CSE_0 + \sum_{t=1}^{T} \frac{RI_t}{(1+R_E)^t} + \frac{RI_{T+1}}{(1+R_E)^T (R_E - G_{RI})}, \tag{2}$$

where RI_t represents the future residual income for period t, RI_t is for the earnings in t (E_t) less a charge for the cost of equity, i. e. the cost of capital (R_E) multiplied by common shareholders equity of time t minus one (CSE_{t-1}), CSE_0 is for the common shareholders equity at time 0, and G_{RI} is the growth rate of residual income in perpetuity.

- The Abnormal Earnings Growth Model (AEGM):

$$V_0 = \frac{E_1}{R_E} + \sum_{t=1}^{T} \frac{AEG_{t+1}}{R_E (1+R_E)^t} + \frac{AEG_{T+2}}{R_E (1+R_E)^T (R_E - G_{AEG})}, \tag{3}$$

where E_1 stands for the earnings in period one, AEG_{t+1} represents the abnormal earnings growth in period t plus one, i.e. the earnings in period t plus one, plus the dividends in t multiplied by the cost of capital, minus one plus the cost of capital multiplied by the earnings in

[1] During the rest of the paper the value of the firm (V_0) is equal to the quoted price (P_0) which implies market efficiency.

[2] In case the discount factor is a random variable, specific methods are necessary to compute the expectations as, for example, a Taylor series approximation.

[3] Most studies estimate the implied cost of capital on a year by year basis, deriving thereby different constant cost of capital based on the information set at the estimation date (see, for example, Fig. 1).