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The Implied Cost of Capital: An Empirical Assessment in the Tunisian Context

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Abstract

This research is a feedback to Wang (2015) suggesting that realized returns should be used in conjunction with ICCs to make more robust inferences about expected returns. We examine the validity of six firm-specific ICCs along with a synthetic one, in the Tunisian context, according to their feasibility and their correlation with realized return. The examined estimators are calculated according to three types of earnings forecasts: smoothing, random walk and cross-section. These estimators represent three main valuation approaches: Present Value of Expected Dividend (PVED), Residual Income Valuation Model (RIV) and Abnormal Earnings Growth (AEG). Our results confirm the assertions of Gerakos and Gramacy (2013) on random walk forecasts' good performance as well as those of Li and Mohanram (2014) on the poor quality of Hou et al. (2012)'s cross-section forecasts. Furthermore, dividend seems best reflecting Tunisian stock market expectations concerning future revenues which would be generated by the valuated asset. These findings bring into question the relevance of new accounting valuation approaches which are anchored rather on equity book value (RIV) and on earnings forecasts (AEG).

Keywords: earnings forecasts, earnings quality, expected return, implied cost of capital, market expectations

1. Introduction

The cost of capital is crucial for any financial or investment decision. Its knowledge is necessary for optimal resources allocation. It is a main accounting and financial valuation topic which never ceases to intrigue evaluators, researchers and practitioners. At the beginning, this topic used to be tackled within financial theory. During latest decades, it began also to impose as a fundamental accounting subject matter, to such an extent to be considered among the factors of reconciliation between finance and accounting. In fact, the incentive of accounting researchers to the cost of capital has started taking importance following the failure of standard financial valuation approaches to provide a reliable expected return estimator and thus the development of the Implied Cost of Capital (ICC) as an alternative approach (Note1). ICC has the merit to be derived independently of risk factors. However, its admission as a reliable expected return proxy remains dependent on its empirical validity which does not seem to be initially obvious, especially in the presence of different estimators. Then, the main question to be asked is: "How should we assess various ICCs; and what determine their quality?"

The purpose of this study is to estimate the Implied Cost of Capital via the implementation of a panel of models that represent three main valuation approaches; and to examine their relative validity. To do so, we estimate the ICC of a Tunisian companies' sample according to six valuation models representing three different valuation approaches. Estimators' validity is studied using two criteria: the feasibility and the correlation with realized return. ICC estimator is the optimal solution of an iterative process based on inputs of each valuation model. The first criterion is justified by the fact that this ICC determination iterative process results not always in an optimal solution. Thus, a model is considered as valid when it is empirically feasible. As to the second criterion, it comes from the fact that the ICC is an expected return estimator. And to be reliable, this estimator should positively predict future realized return. Indeed, even though several studies, like Elton (1999); Davis, Fama and French

(2000), Vuolteenaho (2002) and Lundblad (2007), have established that realized return is a poor expected return proxy, reference to realization remains always necessary for any forecasts validation. Wang (2015) suggests that realized returns should be used in conjunction with ICCs to make more robust inferences about expected returns.

The remainder of the paper is organized as follows: Section 2 discusses related literature and hypothesis development. Section 3 presents our methodology while Section 4 provides details on our empirical results. Section 5 concludes.

2. Literature Review and Hypotheses Development

The Implied Cost of Capital is a methodology for estimating the cost of equity capital. It consists on reverse-engineering the standard estimation procedure. Thus, instead of seeking to derive a model expressing the rate of return as a function of its determinants, ICC methodology proceeds by estimating the rate of return as being the internal rate of return ensuring the equality between current stock price and the present value of expected revenues that would be generated by the valuated asset. Hence, the ICC is an ex ante expected rate of return estimator. It represents the rate of return as expected by the market. Therefore, the major attribute of ICC methodology is that expected rate of return estimators are based on forecasts rather than extrapolation from historical data.

Several ICC estimators have been derived. The difference between them lies in the specification of the variable representing expected future revenues which would be generated by valued asset. A review of related literature allowed distinguishing three main specifications: Dividend, Residual Income and Abnormal Growth in forecasted Earnings. Each specification is appropriate for a well-defined context. Thus, the first specification is suitable for companies that regularly distribute dividends. In the absence of dividend distribution, it is rather the Residual Income or the Abnormal Earnings Growth which should be implemented, provided that future activity is beneficial. Furthermore, it is worthwhile to note that Abnormal Earnings Growth approach includes Residual Income and Dividend approaches as special cases.

Despite its simplicity, Dividend approach is often faced, when implemented, to the non-availability of dividend forecasts and their expected growth rate. This approach is inoperative for companies which not distribute dividend. RIV approach requires earnings forecasts rather than dividends for ICC estimation. This allows reducing ICC estimation bias. Despite these advantages, Implied Cost of Capital estimation according to RIV approach is in turn, faced up to several problems inherent to either firm-specific or portfolio ICC estimation. Indeed, while future residual income are calculated using forecasted earnings and equity book values are obtained via the clean surplus relation, perpetual growth rate of abnormal earnings beyond the explicit forecasting horizon remains problematic.

RIV approach has experienced several applications, particularly in cost of equity capital estimation. Pioneering works are those of O'Hanlon and Steele (2000), Claus and Thomas (2001), Gebhardt et al. (2001), as well as those of Easton et al. (2002). The difference between these studies lies in assumptions they made about the rate of growth beyond the explicit forecasting horizon. Claus and Thomas (2001), for example, consider the same residual income growth rate for all firms. This rate is approximated by the expected inflation rate. Gebhardt et al. (2001), have faded the terminal return-on-equity to an industry median return-on-equity. O'Hanlon and Steele (2000) and Easton et al. (2002), simultaneously estimate the expected rate of return and the residual income growth rate implied by the data.

The major reason for RIV approach's widespread acceptance rests on its ability to assign a useful role for accounting data in equity valuation. This approach has shown its effectiveness in several issues, but especially for estimating the cost of equity capital. However, some shortcomings related to clean surplus assumption violation, mainly on per share equity base, are not to be neglected. At this subject, Ohlson (2005) indicates that futures capital transactions which change the number of shares outstanding, usually translates into a violation of this assumption on the per share level. However, several studies have ignored this detail and have continued to calculate the forecasted equity book value by assuming that the per share clean-surplus assumption holds; the effect of such conceptual irregularity on implied expected rate of return validity is unknown. Ohlson (2005) further observes that for the residual income valuation model to hold on a total dollar basis, issuances and re-purchases of shares must be value-neutral from the point of view of new future shareholders. Once again, the effect of this assumption violation on the validity of the implied expected rate of return is not examined. All these incompatibilities are resolved in the Abnormal Earnings Growth Approach context.

Rather than focusing on equity book value and residual income, Abnormal Earnings Growth approach anchors the equity valuation on capitalized future earnings and makes adjustments via future expected abnormal growth in earnings. Apart from the technical reasons pointed out by Ohlson (2005), the AEG approach finds its justification in the focus by the investment community on earnings rather than book values. The empirical success of the AEG approach at the subject of ICC estimation is due, in large part, to the seminal work of Ohlson and Juettner-Nauroth (2005) (henceforth designed OJ (2005)). Indeed, starting from the PVED formula and without imposing any restrictions on the dividends sequence evolution, OJ (2005) have derived a model linking current stock price to next period expected earnings per share, short and long-term earnings per share growth and cost of equity capital. The interest of the OJ model (2005) was established at more than one level. Thus, while embedded in the AEG approach, this model represents a generalization of several models belonging to other approaches, particularly the free cash flow model, the Market-to-book (M/B) model and the perpetual growth dividend model. This indicates the substantial conceptual robustness of the OJ (2005) model.

Ohlson and Juettner-Nauroth (2005) model performances are also manifested through dividend growth model establishment regardless the dividend payout ratio constancy assumption. This confirms Modigliani and Miller (1961) dividend policy neutrality. In addition to these conceptual attributes, the interest of the OJ model (2005) is mainly empirical. Indeed, the model is at the basis of many studies dealing with AEG approach implementation, particularly in the Implied Cost of Capital estimation, such as Gode and Mohanram (2003); Easton and Monahan (2005); Lee, So, and Wang (2014); Hou et al. (2012). Furthermore, the introduction of some restrictions on the main model allowed regaining several ratios that are widely used by practitioners, such as Price-to-forward Earnings (PE), Price-to-forward Earnings Growth (PEG) and modified Easton (2004) PEG.

Despite the AEG approach theoretical and empirical success, some studies like Easton (2009), Claus and Thomas (2001), Gebhardt et al. (2001), advocate that in appropriate contexts (Note 2), RIV approach is more relevant. Furthermore, many theoretical studies claim that RIV approach would be more suitable to classical economy activities characterized by a high level of physical assets, while AEG approach would be more appropriate to modern economy activities characterized by high level of intangible assets. Provided that our sample is dominated by classical economy firms, we expect that RIV approach ICCs would be more valid than those given by AEG and Dividend approaches. Applied to our two validity criteria, this hypothesis looks like:

H1: RIV approach ICCs are more feasible than AEG and Dividend approaches estimators.

H2: RIV approach ICCs are more correlated with realized return than are AEG and Dividend approaches estimators.

3. Methodology

We estimate annual firm-specific Implied Cost of equity Capital for each firm of our sample, according to a variety of models. Models are chosen to represent three main ICC estimation approaches, taking into account inputs availability required by each model in our database. Hence, we use two variants of the Gordon & Gordon (1997) model (T = 1 and T = 3) along with Damodaran (1999) model to represent the Dividend approach. We implement the two growth phases' model by Claus & Thomas (2001) to represent RIV approach. And finally, we employ two other models representing AEG approach: the Price-to-forward Earnings Growth (PEG) ratio and the modified Price-to-forward Earnings Growth by Easton (2004). The two models representing AEG approach are derivatives of Ohlson and Juettner-Nauroth (2005)'s model.

3.1 Estimation Procedure

For each company in our sample, we estimate the annual ICC according to each of the six retained estimators, at the end of June of each year throughout the period of study. To do so, we use current stock price along with one, two or three period ahead forecasted earnings, depending on each model requirements. Forecasted earnings are those of smoothing, random walk and rolling panel cross-section. The choice of the end of June for the ICC calculation is motivated by the need of a stock price that reflects the maximum of information on valued assets.

Each ICC estimator represents the optimal solution of an iterative process driven on the basis of inputs required by the model. Some of these models result in undefined forms of the ICC. This is so when the iterative process does not result in an optimal solution or when the process admits a solution but achieved ICC estimators are abnormally low or high or even negative. To avoid outliers' effect on our results, ICC estimators out of range [0%, 100%] are ignored. This range of variation comes from the ICC definition which is a rate of return as expected by the market. That is a rate of the minimum return required by investors to hold the valued asset. According to this conception, ICC can't be negative, as the investor would not require a negative rate of return. Similarly, within business, it makes no sense to talk about negative equity cost. On the other hand, investor requirements should be realistic. Indeed, beyond certain reasonable threshold profitability, it would be difficult to satisfy them. The maximum rate of return that would be required for holding an asset depends on several parameters including market characteristics, asset specificity and investor attitude. We retain a ceiling rate of return of 100%.

3.2 ICC Estimation Models

Several ICC estimation models have been derived. In this study, we use six valuation models representing three main valuation approaches: Dividend, RIV and AEG. Model choice is constrained by forecasted earnings availability in our database. To control estimation model effect on the scope of empirical results, we use further a synthetic estimator defined as the average of the six estimators.

3.2.1 Dividend Approach

Dividend approach includes many ICC estimation models. The difference between these models lies especially in the explicit forecasting horizon length and the terminal value as well as in the dividend growth proxies to be considered beyond the explicit forecasting horizon. In this study, we retain two variants of the Gordon & Gordon (1997) model (T = 1 and T = 3) along with a reduced version of Damodaran (1999) model.

Based on the dividend discounted formula, Gordon & Gordon (1997) considered a finite forecasting horizon (T) with a terminal value defined as the present value of explicit forecasting horizon last period's forecasted earnings, to establish a relationship between current stock price and the Implied Cost of equity Capital. The model is expressed as follows:

$$P_0 = \sum_{t=1}^{T-1} \frac{d_t}{(1+r_E)^t} + \left(\frac{x_T}{r_E(1+r_E)^T}\right) \tag{1}$$

Where:

P_0 *is the stock price at the valuation date (t=0);*

d_t *is the year t forecasted dividend as expected at the valuation date (t=0); and,*

x_T *is the latest forecasted earning of the explicit forecasting horizon as expected at the valuation date (t=0).*

This valuation formula gave rise to multiple versions of the model depending on the length of the explicit forecasting horizon. The first version of Gordon & Gordon (1997) model we use, is characterized by a single period explicit forecasting horizon (model ICC1: T = 1) so as the Cost of Capital reduced to a relationship between next period forecasted earnings and the current stock price. The model takes the following form:

$$P_0 = \frac{x_1}{r_E} \quad \Rightarrow \quad r_E = \frac{x_1}{P_0} \tag{ICC1}$$

Where:

P_0 *is the current stock Price;*

r_E*, is the Implied Cost of equity Capital; and,*

x_1 *is the one period ahead earnings forecasts, as expected at the valuation date, (t=0).*

The advantage of ICC1 lies in its simplicity and in the limited number of variables required by the model along with the reduced explicit forecasting horizon. Indeed, only one period ahead forecasted earnings is required, without any terminal value. This model derives its legitimacy from the fact that prediction error more affects further distant forecasts. This is a consequence of the positive relation between uncertainty and forecasting horizon length. Hence the need to reduce the explicit forecasting horizon. Furthermore, the terminal value negligence is motivated by the hypothesis of one year ahead forecasted earnings perpetuity renewal.

In this framework, one year ahead forecasted earnings are sufficient to determine the ICC. This is absolutely an easily implementable empirical form, yet too simplistic. Indeed, the stock price cannot be limited only to next year forecasts. That's why we intend to implement a longer explicit forecasting horizon version of Gordon & Gordon (1997) model (ICC2: T = 3). This horizon choice is dictated by the availability of earnings forecasts in our data base. Formal expression of ICC2is as follows:

$$P_0 = \frac{d_1}{(1+r_E)} + \frac{d_2}{(1+r_E)^2} + \frac{x_3}{r_E(1+r_E)^3} \tag{ICC2}$$

Where:

P_0 *is the current stock price (t=0);*

d_t *is the forecasted dividend for next year t (t = 1, 2, 3), as expected at the valuation date (t=0);*

r_E*, is the Implied Cost of equity Capital, and;*

x_3 *is the last forecasted earnings of the explicit forecasting horizon as expected at the valuation date (t=0).*

The extension of the explicit forecasting horizon beyond next year is justified by the fact that forecasting model needs to include much more information on value expected determinants. Hence, value effect of prediction errors on most distant amounts is weaker than those on nearest ones. This result is due to the valuation function geometric form. Thus, if prediction error is unavoidable, it is better to make it on furthest than on closest amounts. Accordingly, the extension of the explicit forecasting horizon could improve the valuation model.

Damodaran (1999) has kept the same scheme as that proposed by Gordon and Gordon (1997) but with an otherwise formulated terminal value. Indeed, the model of Damodaran (1999) consists of two phases: a five-year growth phase followed by a stability phase where the fifth year forecasted dividend is expected to grow at the expected GDP long term growth rate. We use this formulation but with a three-year explicit forecasting horizon (model ICC3). This choice is motivated mainly by the availability of our data base earnings forecasts. Indeed, our explicit forecasting horizon is limited to three periods. Accordingly, formal expression of the third ICC within dividend valuation approach would be as:

$$P_0 = \frac{d_1}{(1+r_E)} + \frac{d_2}{(1+r_E)^2} + \frac{d_3}{(1+r_E)^3} + \frac{d_3(1+g)}{(r_E-g)(1+r_E)^3} \qquad \text{(ICC3)}$$

Where:

P_0 *is the current stock price;*

d_t *is the forecasted dividend for next year t (t = 1, 2, 3), as expected at the valuation date (t=0);*

r_E, *is the Implied Cost of equity Capital, and;*

g, *is the perpetual dividend growth rate beyond the explicit forecasting horizon.*

We adopt Cornell (1999)'s measure of the dividend perpetual growth rate beyond the forecasting explicit horizon as the expected GDP long term growth rate. We assume an adaptive expectations structure according to which the expected GDP growth rate is represented by the last five years geometric growth rate (Note 3). With regard to a suite of dependent values from one year to another, the geometric mean is more appropriate than the arithmetic average for expected GDP growth rate determination. Furthermore, the geometric mean is less sensitive to Outliers than arithmetic average. Hence, beyond the explicit forecasting horizon, all companies are supposed to grow at the same rate.

3.2.2 Residual Income Valuation Approach

The absence of forecasted dividend databases and the non-adaptation of dividend valuation models to no distributing dividend companies, gave rise to alternative ICC estimation approaches. Residual Income Valuation is one of the most prominent of these approaches. According to RIV, Implied Cost of Capital would be the rate of return that allows equality between current stock price, on one hand, and the sum of the beginning-of-the-period equity book value adjusted by the present value of the expected future residual income that would be generated by the valued asset, on the other hand. Several empirical forms of this approach could be derived. The difference between these forms lies in assumptions made about the explicit forecasting horizon length as well as in the long term earnings forecasts (beyond the first two or three years). The most eminent empirical models developed within this framework remain those of Claus and Thomas (2001) and Gebhardt et al. (2001).The narrowness of our explicit forecasting horizon limits our choice to a reduced version of Claus and Thomas (2001)'s model expressed as:

$$P_0 = b_0 + \frac{x_1 - r_E b_0}{(1+r_E)} + \frac{x_2 - r_E b_1}{(1+r_E)^2} + \frac{x_3 - r_E b_2}{(1+r_E)^3} + \left(\frac{(x_3 - r_E b_2)(1+g_{ri})}{(r_E - g_{ri})(1+r_E)^3}\right) \qquad \text{(ICC4)}$$

Where,

P_0, *is the current stock price;*

x_t, *(t = 1, 2, 3), is the one, two or three years ahead earnings forecasts, as expected at the valuation date (t=0);*

b_{t-1}, *(t =1, 2, 3), is the beginning of the period equity book value;*

r_E, *is the Implied Cost of equity Capital, and;*

g_{ri}, *is the residual income growth rate beyond the explicit forecasting horizon.*

We adopt Claus and Thomas (2001) hypothesis according to which, the long term residual income growth rate beyond the explicit forecasting horizon, is approximated by the expected inflation rate as determined by the valuation year risk free interest rate (r_f), minus 3% $(g_{ri} = r_f - 3\%)$. The risk free interest rate being approximated by the 10-year interest rate Treasury bills.

Botosan (1997) indicates that the unknown rate of return (cost of capital) appears in both the numerators and denominators of the terms on the right-hand side of valuation model (ICC4), resulting in a polynomial in (r_f) with several possible roots. Nevertheless, empirically, only one root is a positive real number. Each year, we seek the value of r_E that satisfies equation (ICC4); the first iteration being close to the risk-free rate.

3.2.3 Abnormal Earnings Growth Approach

While RIV approach is based on two main variables (equity book value and residual income), AEG approach focuses only on forecasted earnings. Almost, all models within this approach retain the one period ahead forecasted earnings as anchor value along with many alternative estimates of the present value of expected earnings beyond next period, which are supposed growing abnormally. The valuation function is as follows:

$$P_0 = \frac{x_1}{r_E} + \sum_{t=2}^{T} \frac{(agr)_t}{r_E(1+r_E)^{t-1}} + \frac{agr_T(1+\Delta_{agr})}{r_E(r_E-\Delta_{agr})(1+r_E)^{T-1}} \tag{2}$$

Where:

P_0 is the current stock price;

r_E, is the Implied Cost of equity Capital; and,

x_1 is the one period ahead earnings forecasts, as expected at the valuation date, (t=0).

$(agr)_t = x_t - x_{t-1} - r_E(x_{t-1} - d_{t-1})$, is the year t earnings per share abnormal growth;

Δ_{agr}, denotes the perpetual rate of change of expected earnings abnormal growth, beyond the explicit forecasting horizon.

This approach gave rise to a large number of ICC estimators. We retain in this study the most used ones. The first model we use is the Modified Price-to-forward Earnings Growth (MPEG) by Easton (2004), taking into account an explicit forecasting horizon of two years (T = 2) and a null long term growth change in earnings (Δ_{agr}= 0) (Note 4). Under these conditions, the formal valuation model expression will be:

$$p_0 = \frac{x_2 + r_E d_1 - x_1}{r_E^2} \tag{ICC5}$$

Where x_1 and x_2 are one and two period ahead forecasted earnings andd_1, is one period ahead forecasted dividend.

This model is very convenient thanks to the advantage of its limitation to short term earnings forecasts. However, the major critic often addressed to it is the same expected rate of change in abnormal growth in earnings assumption beyond the explicit forecasting horizon (no change in earnings abnormal growth is considered: Δ_{agr}= 0). Gode and Mohanram (2003) released this restriction assuming the same expected rate of change in abnormal growth in earnings for all firms as measured by the risk free rate minus 3%.

The second AEG approach model we use for ICC estimation is derived by Easton (2004) with a two-period explicit forecasting horizon (T = 2). The model expression is as follows:

$$P_0 = \frac{x_1}{r_E} + \frac{x_1[\, x_2 + r_E d_1 - (1 + r_E)x_1]}{r_E\left[r_E - \dfrac{x_3 + r_E d_2 - (1 + r_E)x_2}{x_2 + r_E d_1 - (1 + r_E)x_1}\right]} \tag{ICC6}$$

Where,

P_0, is the current stock price;

x_1, x_2, x_3, is the one, two or three years ahead earnings forecasts, as expected at the valuation date (t=0);

r_E, is the Implied Cost of equity Capital, and;

d_1, d_2 is the one, two years ahead dividend forecasts, as expected at the valuation date (t=0).

It must be noted that the two AEG approach models we use are reduced forms of the Ohlson & Juettner - Nauroth (2005)'s model.

3.3 Sample and Data

Our sample consists of 32 Tunisian companies listed on the Tunis Stock Exchange (TSE) over a period of 16 years from 1997 to 2012. This choice is dictated both by the effective date of the Tunisian Accounting System (beginning of January 1997), and by the Tunisian Stock Exchange narrowness before that date. Given that, all ICC estimation models we use require forward-looking information of at least one year ahead, ICC is estimated over periods ranging from 15 to 13 years depending on the valuation model requirements(one, two or three years ahead forecasts). Hence, models requiring one year ahead forecasts are estimated through a period of 15 years. Those requiring two-year ahead forecasts are estimated over a period of 14 years. And finely, those requiring three-year ahead forecasts are estimated over a period of only 13 years.

Financial data regrouping stock prices, number of outstanding shares and dividends are extracted from the TSE website. Accounting data are collected from financial statements available on the TSE website. As for Treasury bonds rate, they are obtained from Tunisia Central Bank (TCB) and Financial Market Council (FMC) websites. Given that ICC estimation models inputs are considered in per share values, used stock prices are adjusted for stock splits occurring throughout the study period, in order to have homogeneous variables unit variance limiting time series heteroskedasdicity.

3.4 Variables Measurement

ICC estimation models we use involve three types of variables. A first type that is directly observable, such as stock price, current earnings, current dividend and beginning of the period equity book value. A second type including synthetic variables that are generated, either according to predictive models, such as forecasted earnings, or simply calculated using observable and/or synthetic variables such as forecasted dividend or equity book value. The last type of variables, meanwhile, includes non-observable ones to be measured by observable indicators. That is the case of earnings; dividend or residual income expected growth, or the change of such growth beyond the explicit forecasting horizon.

3.4.1 Stock Price

All firms in our sample close their fiscal year on December 31. According to Tunisian Accounting System requirements, financial statements should normally be published no later than three months after the fiscal year end. But in fact, this stipulation is observed only for tax statements. Most Tunisian companies take more than three months after the fiscal year end to publish their financial statements. Hence, we estimate the ICCs at the end of June of each year. All models inputs are measured at this date. The aim is to use a stock price that reflects much more information about the valued security.

3.4.2 Forecasted Earnings

ICC estimation models performance depends on forecasted earnings quality. Hence several works have been devoted to improve ICC estimators via the use of good quality earnings forecasts. Yet, the most used earnings forecasts are those of analysts. Given the non availability of analysts' earnings forecasts in the Tunisian context, on one hand, and the over-optimism bias characterizing them, on the other, we limit our study to technical (econometric) earnings forecasts. We use spatially smoothing, random walk and cross sectional forecasts. These earnings forecasts are doubly adjusted. The first adjustment concerns stock splits, while the second refers to negative earnings forecasts, which are replaced by a theoretical forecasted earnings calculated as 0.6% of forecasting year total assets. The purpose sought behind the use of these three forecasts varieties is to examine the quality forecasts effect on ICC estimator's performance.

3.4.3 Forecasted Dividend

In the absence of specific dividend forecasting model, this variable will be determined via forecasted earnings. Thus, for each year, the forecasted dividend of a given firm is obtained by multiplying the forecasted earnings for this year (one, two or three-year ahead) by the same year dividend distribution rate (Note 5). The latter rate is calculated by dividing distributed dividend by the net profit after tax for the concerned year. This is for profitable firms. For loss-making firms during a given year, they are supposed not to distribute dividend for this year. Consequently, their payout ratio will be zero (Note 6). Moreover, dividend distribution rate cannot exceed the unit. Besides being an input for some valuation models, forecasted dividend is also used in equity book value forecasts.

3.4.4 Forecasted Equity Book Value

Beginning of the period per share equity book value is obtained by dividing the total equity book value at the end of the previous year by the number of shares outstanding at that date. Forecasted per share equity book value is determined according to the clean surplus relation expressed as follows:

$$b_{t+\tau} = b_{t+\tau-1} + x_{t+\tau} - d_{t+\tau} \tag{3}$$

Where:

$b_{t+\tau}$, *is the* τ *period ahead forecasted equity book value;*

$b_{t+\tau-1}$, *is the beginning of the period forecasted equity book value;*

$x_{t+\tau}$, *is the* τ *period ahead earnings forecasts, and;*

$d_{t+\tau}$, *is the* τ *period ahead dividend forecasts.*

The use of these variables in estimating six ICCs (ICC1, ... ICC6) allows to obtain the annual cost of equity capital for each of the firms in our sample throughout the period of study.

4. Results

All ICCs are proxies of the same expected rate of return. Although they represent different valuation approaches, all these estimators are derived from the Present Value of Expected Dividend (PVED) formula. Thus, their implementation should normally lead to similar, if not identical, ICC values. However, the divergence between these models concerning the expected revenue proxies related to the valued asset and regarding assumptions about explicit forecasting horizon length, terminal value and expected growth rate, translates into differences between the calculated ICC. Hence, we expect high level correlation between firm-specific ICCs along with a positive correlation of each of them with realized return. On the other hand, some models lead to undetermined ICC forms fault of iterative process solution. This is why the feasibility of the model can be used as a comparison criterion while examining ICCs' performance.

4.1 Descriptive Statistics

Table 1 displays descriptive statistics of ICCs estimated according to smoothing, random walk and cross-sectional earnings forecasts. ICCs are calculated using publicly available information at the end of June of each year throughout the period of study.

Table 1. ICCs' descriptive statistics

Panel A: According to smoothing earnings forecasts

Approach	ICC estimator	Nber Obs.	Mean	Median	Standard Deviation	Minimum	Maximum
Dividend	ICC1	448	0.0984334	0.0881093	0.0620289	0.0042434	0,4942673
	ICC2	416	0.099182	0.0885914	0.0577706	0.0057546	0,4481926
	ICC3	350	0.1082137	0.0989628	0.0490186	0.0484508	0,5759971
RIV	ICC4	384	0.0834073	0.0776823	0.0342683	0.0209862	0,2847406
AEG	ICC5	379	0.1521544	0.1142209	0.1280486	0.0170701	0,93539
	ICC6	384	0.1055547	0.082338	0.0967009	0.004023	0,9786308
Synthetic ICC		448	0.1065258	0.09223	0.0576551	0.0096167	0.3709509
Realized Return		439	0.1488017	0.0498221	0.4762353	-0.5715206	5.194118

Panel B: According to random walk earnings forecasts

Approach	ICC estimator	Nber Obs.	Mean	Median	Standard Deviation	Minimum	Maximum
Dividend	ICC1	447	0.1082812	0.0883838	0.0803329	0.0009642	0,5117701
	ICC2	416	0.08831	0.0795629	0.050048	0.0009614	0,402723
	ICC3	350	0.0961511	0.0941565	0.0219461	0.0497441	0,1828166
RIV	ICC4	386	0.0740592	0.0692386	0.0221354	0.0221354	0,3628134
AEG	ICC5	384	0.0559793	0.0528997	0.0264025	0.0086565	0,1487179
	ICC6	384	0.1055547	0.082338	0.0967009	0.004023	0,9786308
Synthetic ICC		448	0.0878648	0.078234	0.0454177	0.0009628	0.3827683
Realized Return		439	0.1488017	0.0498221	0.4762353	-0.5715206	5.194118

Panel C: According to cross-sectional earnings forecasts

Approach	ICC estimator	Nber Obs.	Mean	Median	Standard Deviation	Minimum	Maximum
	ICC1	320	0.095219	0.0730644	0.0813506	1.72e-11	0,6093076
Dividend	**ICC2**	287	0.115114	0.0769014	0.1077565	0.0010499	0,623676
	ICC3	330	0.1186868	0.0881983	0.0762747	0.0472254	0,554139
RIV	**ICC4**	150	0.0993732	0.07432	0.0735957	0.0244082	0,5230587
AEG	**ICC5**	189	0.3015418	0.2760161	0.2040089	0.0106462	0,9491475
	ICC6	125	0.1280569	0.0760937	0.1455716	0.0086484	0,8206013
Synthetic ICC		320	0.131996	0.1029634	0.0873524	0.0099279	0.4902294
Realized Return		320	0.1668759	0.068749	0.4866025	-0.5715206	5.194118

Panel A of table 1, shows thatICC5 has the highest mean, median and standard deviation of all individual estimators. The average realized return is greater than mean values of all ICCs, including synthetic estimator. The extent of realized return range translates into a high volatility of the latter. Furthermore, realized return negative values should result in a negative correlation with a number of estimators. Panels B and C of table 1 leave arise almost the same observations for random walk and cross-sectional earnings forecasts.

For the three types of forecasted earnings, the average realized return is generally superior to the average values of all ICCs including the synthetic one. This result indicates that our estimators' expected return is underestimated compared to achievements. In addition, the realized return's standard deviation is higher than that of all estimators, including the synthetic one. This result points out a high volatility of realized return.

4.2 ICC Estimators' Feasibility

The study of ICC estimators' feasibility is justified not only by the fact that some of estimation models lead to undetermined ICC forms fault of iterative process solution, but also by the possibility that some ICC estimators would be outside of the ordinary range varying between zero and 100%. The lower bound of this validity interval comes from a regularity condition according to which the solution of the valuation function within ICC methodology cannot be negative, as it represents an "internal rate of return". As the upper bound, it expresses the evaluator realism. Indeed, it is possible that return could exceed 100%. But, this remains a special case which cannot be used to establish a general result. In practice, it is rare, if not impossible, that an investor may require a rate of return higher than 100%.

Table 2 shows feasibility percentages of different estimators obtained according to smoothing, random walk and cross-section earnings forecasts. Feasibility percentages are obtained by dividing the number of years for which the estimator exits by the total number of observations (Note 7).

Table 2. ICC estimators' feasibility (in %)

Approach	ICC estimator	Earnings forecasts		
		Smoothing	**Random walk**	**Cross-sectional**
	ICC1	100	100	100
Dividend	**ICC2**	100	100	99.65
	ICC3	84.38	84.13	79.86
RIV	**ICC4**	92.31	93.03	86.81
AEG	**ICC5**	84.82	85.71	58.75
	ICC6	92.31	92.31	43.40
Synthetic ICC (Average)		100	100	100

Table 2 shows that smoothing and random walk earnings based ICC estimators exhibit very close feasibility percentages. Cross-sectional earnings based ICC feasibility percentages are relatively low, indicating the modest quality of this type of forecasts. According to the feasibility criterion, the first two estimators (ICC1 and ICC2), representing dividend approach, are the best. This result indicates that our first research hypothesis (H1) regarding estimators 'validity according to their feasibility is rejected, since highest feasibility percentages are those of dividend approach ICCs, and non those of the RIV approach as predicted. This finding means that the dividend is a good representation of Tunisian stock market expectations concerning future revenues that would be generated by the valuated stock. However, dividend approach dominance is confirmed only for cross-sectional earnings based ICC estimators. Indeed, for smoothing and random walk earnings forecasts, the lowest feasibility estimator belongs also to the dividend approach. This incompatibility stemming from the membership of the best and the worst estimator to the same approach would come from the reverse relation between forecasts accuracy and forecasting horizon length. In fact, while ICC1 and ICC2 estimators are limited to one and two-period ahead forecasts, ICC3requires three-period ahead forecasts.

ICC5 and ICC6 feasibility percentages are modest for all types of earnings forecasts. This AEG approach failure, especially at the level of cross-sectional earnings forecasts, could come from earnings incapacity to represent Tunisian Stock Market expectations. Indeed, the AEG value is anchored on the next period forecasted earnings. As for the synthetic estimator, it has a ceiling feasibility percentage. This is intuitive given that this estimator represents the average of firm-specific estimators. Then, it is sufficient that one individual estimator among the six exists so as the synthetic one would be defined.

4.3 Realized Return and ICCs Estimators' Correlations

Each year and for every type of earnings forecasts, we calculate correlations between the six firm-specific estimators along with realized return and the synthetic estimator. Displayed values in table 3 are averages of annual correlation coefficients throughout the period of study.

Table 3. Realized return and ICCs estimators' correlations

Panel A: According to smoothing earnings forecasts

	ICC1	ICC2	ICC3	ICC4	ICC5	ICC6	Synthetic ICC	Realized Return
ICC1	1.0000							
ICC2	0.8682***	1.0000						
	(0.0000)							
ICC3	0.7237***	0.8058***	1.0000					
	(0.0000)	(0.0000)						
ICC4	0.6341***	0.8457***	0.7052***	1.0000				
	(0.0000)	(0.0000)	(0.0000)					
ICC5	0.3794***	0.6696***	0.4436***	0.6233***	1.0000			
	(0.0000)	(0.0000)	(0.0000)	(0.0000)				
ICC6	0.5999***	0.7151***	0.4822***	0.6108***	0.5994***	1.0000		
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)			
Synthetic ICC	0.7816***	0.9430***	0.7502***	0.8335***	0.8032***	0.8587***	1.0000	
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)		
Realized Return	0.0732	0.0831	-0.0425	0.0348	0.0691	0.1745**	0.1031	1.0000
	(0.2807)	(0.9795)	(0.2898)	(0.7359)	(0.5724)	(0.0128)	(0.2191)	

Panel B: According to random walk earnings forecasts

	ICC1	ICC2	ICC3	ICC4	ICC5	ICC6	Synthetic ICC	Realized Returns
ICC1	1.0000							
ICC2	0.9887***	1.0000						
	(0.0000)							
ICC3	0.6121***	0.6721***	1.0000					
	(0.0000)	(0.0000)						
ICC4	0.6577***	0.6733***	0.5109***	1.0000				
	(0.0000)	(0.0000)	(0.0000)					
ICC5	0.5103***	0.5574***	0.8369***	0.4164***	1.0000			
	(0.0000)	(0.0000)	(0.0000)	(0.0000)				

ICC6	0.5024***	0.5101***	0.3839***	0.4273***	0.3222***	1.0000		
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)			
Synthetic ICC	0.8865***	0.9010***	0.7151***	0.7089***	0.6284***	0.8064***	1.0000	
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)		
Realized Return	0.1943***	0.2319***	0.2372***	0.1935***	0.2304***	0.1450**	0.2328	1.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0002)	(0.0000)	(0.0128)	(0.0000)	

Panel C: According to cross-sectional earnings forecasts

	ICC1	ICC2	ICC3	ICC4	ICC5	ICC6	Synthetic ICC	Realized Return
ICC1	1.0000							
ICC2	0.7486***	1.0000						
	(0.0000)							
ICC3	0.5689***	0.8828***	1.0000					
	(0.000)	(0.0000)						
ICC4	0.4561***	0.8736***	0.7872***	1.0000				
	(0.0000)	(0.0000)	(0.0000)					
ICC5	0.4085***	0.4729***	0.3133***	0.3432***	1.0000			
	(0.0000)	(0.0000)	(0.0000)	(0.0000)				
ICC6	0.5135***	0.5383***	0.2925	0.3839***	0.4817***	1.0000		
	(0.0001)	(0.0000)	(0.2770)	(0.0034)	(0.0000)			
Synthetic ICC	0.7461***	0.9038***	0.7375***	0.7453***	0.7496***	0.7455***	1.0000	
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)		
Realized Return	0.1008*	-0.1322	-0.1501	-0.2290	-0.1551	-0.0468	-0.1386	1.0000
	(0.0712)	(0.6634)	(0.1912)	(0.4331)	(0.7028)	(0.2271)	(0.6713)	

Note. *** indicates a significance level of 1%; ** indicates a significance level of 5%; * indicates a significance level of 10%; ( ) indicates the correlation P-value.

Panel A of table 3 shows that the highest correlation coefficients between smoothing earnings forecasts based firm-specific ICCs are those between the first three estimators (ICC1, ICC2 and ICC3). This is because these estimators belong to the same approach (dividend). The lowest correlation within firm-specific estimators is that between ICC1 (dividend approach) and CIC5 (AEG approach). This result is intuitive given the differences between the two approaches and between formal expressions of the two estimators. Indeed, while ICC1 is limited to one period ahead earnings forecasts as the asset value determinant, ICC5 requests one and two-period ahead earnings forecasts along with one period ahead dividend forecasts.

All firm-specific ICCs exhibit high correlation with the synthetic estimator. This is because the latter is the average of individual estimators. Table 3 panel A last line shows that all smoothing earnings forecasts based ICCs are positively correlated with realized return, except ICC3. ICC6 displays the highest correlation coefficient rising to0.1745. Although the realized return isn't a good expected return proxy, positive correlation can be used as an indicator of ICC estimators' validity. Hence, despite the weakness of correlation coefficients, all smoothing earnings forecasts based estimators are valid, exceptICC3.

Panel B of table 3, indicates that ICC1 and ICC2 exhibit the highest correlation between random walk earnings forecasts based individual ICCs. This result confirms dividend approach dominance for smoothing earnings forecasts based estimators. The lowest correlation between firm-specific estimators concerns the two AEG approach's estimators (ICC5 and ICC6). At first glance, this result seems abnormal, yet it would be explained by the differences between the two estimators' formal expressions. Indeed, while the ICC6 requires one, two and three-year ahead earnings forecasts along with one and two-year ahead dividend forecasts,ICC5 is limited to one and two-period ahead earnings forecasts with only one period ahead dividend forecasts combined within a simpler form than that of ICC6.

Practically, smoothing forecasts based results are qualitatively consistent with those based on random walk forecasts that have yet made an improvement at the level of correlation with realized return. Indeed, all the latter forecasts based estimators are positively correlated with the realized return (including ICC3), with significantly higher correlation coefficients. Paradoxically, ICC3, which has proved not valid according to the smoothing earnings forecasts, exhibits the highest correlation coefficient with realized return according to the random walk forecasts.

Cross-section earnings forecasts based results (panel C, Table 3) confirm the relatively high level correlation between dividend approach estimators. The lowest firm-specific estimator correlation is between ICC3 and ICC6 with a coefficient of 0.2925. ICC2 always exhibits the higher correlation with the synthetic estimator. However, the most important result in panel C of table 3concerns the correlation with realized return. Indeed, except ICC1, all estimators are negatively correlated with realized return. This result is consistent with the findings of Larocque & Lyle (2014) highlighting a negative relationship between Ohlson and Juettner-Nauroth (2005)'s model ICC derivatives and future Return On Equity (ROE). However, with regard to smoothing and random walk earnings forecasts based results, this negative correlation may be viewed as an indicator of cross-section earnings forecasts poor quality.

Altogether, Table 3 results demonstrate that for the three types of earnings forecasts, those of random walk give the most correlated estimators with realized return. This result is an indicator of this type of forecasts' good quality. It is consistent with Gerakos and Gramacy (2013)'s findings according to which "random walk is hard to beat". Additionally, cross-section earnings forecasts based estimators are negatively correlated with realized return, except ICC1. This result confirms Li and Mohanram (2014)'s assertions about the lack of performance related to ICCs based on Hou et al. (2012)'s cross-section model earnings forecasts.

The most correlated estimators with realized return are ICC1 and ICC3 for random walk and cross-section earnings forecasts; and ICC6 for smoothing earnings forecasts. Hence, the more valid estimators according to correlation with realized return are those of Dividend approach if earnings forecasts are those of the random walk and cross-section. However, for smoothing earnings forecasts, the more valid estimators are those of AEG approach. Thus our second research hypothesis (H2) on the validity of the estimators according to their correlation with realized return is also rejected, since RIV approach estimators are not the most correlated with realized return. Moreover, the synthetic estimator exhibits acceptable correlation coefficients with realized return compared to firm-specific estimators. Hence, its usefulness as a means to control the valuation model effect on the scope of established results.

5. Conclusion

The purpose of this study is to check up the validity of a number of Implied Cost of equity Capital estimators according to their feasibility and their correlation with realized return. Six ICCs have been examined using three types of earnings forecasts. Selected models represent three main valuation approaches: Dividend, Residual Income and Abnormal Earnings Growth. Furthermore, we derived a synthetic estimator representing the average of the six individual estimators.

According to feasibility criterion, our results show that the first two estimators representing dividend approach are the best for the three types of earnings forecasts. These findings mean that dividend is a good representation of Tunisian Stock Market expectations concerning future revenues that would be generated by the valuated asset. Hence the rejection of our first research hypothesis (H1). As for AEG approach feasibility deficiency, especially according to cross-sectional earnings forecasts, it could come from earnings incapacity to reflect Tunisian Stock Market expectations or probably from the poor quality of Hou et al. (2012)'s model earnings forecasts as established by Li and Mohanram (2014).

Regarding the correlation with realized return, our results reveal that the random walk earnings forecasts give the most correlated estimators. This result confirms the findings of Gerakos and Gramacy (2013) on the good performance of random walk forecasts. Moreover, almost all cross-sectional earnings forecasts based estimators are negatively correlated with realized return indicating, once again, the poor quality of Hou et al. (2012)'s model earnings forecasts as evidenced by Li and Mohanram (2014). Additionally, according to the correlation with realized return criterion, the more valid estimators are those of Dividend approach for random walk and cross-sectional earnings forecasts and those of AEG approach for smoothing earnings forecasts. Hence, the rejection of our second research hypothesis (H2). However, this rejection should be considered with regard to the representativeness of each approach in our panel models. Indeed, whereas Dividend approach is represented by three estimators and AEG approach by two estimators, RIV approach is represented only by one estimator. Results would be more reliable with the same number of estimators for all studied approaches.

Correlation with realized return and estimators' feasibility are just indicators of the ICCs preliminary validity. A more comprehensive study requires other estimator performance criteria such as time series estimator stability or estimator ability to predict future realized returns as invoked by Lee et al. (2014).

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Notes

Note 1. See Easton (2009)'s survey of the accounting literature on ICC and its usefulness. Indeed, the ICC has experienced several applications, such as testing the inter-temporal CAPM (Pastor et al., 2008), the international CAPM (Lee et al., 2009), and the default risk (Chava & Purnanadam, 2010). In all these studies, ICC has provided new evidences on the risk/return relationship more intuitive and consistent with theoretical predictions on examined issues than those obtained using ex-post realized return.

Note 2. If implementation assumptions are satisfied.

Note 3. Geometric mean of a suite of values $x_i, i = 1, \ldots n$, is given by the expression: $\bar{x} = \sqrt[n]{\prod_{i=1}^{n} x_i}$.

Note 4. The hypothesis of no change in growth ($\Delta_{agr} = 0$) doesn't mean that there is no growth. But, it indicates the existence of a constant steady growth.

Note 5. We assume that the company maintains the same dividend distribution rate during the explicit forecasting horizon. Some studies like Esterer and Schröder (2006), have used a distribution rate determined by the historical geometric average of the five years preceding the forecast date.

Note 6. Profitable firms dividend distribution rate (k) is given by the relation: k = max [0, min (1, dps/eps)], whereas that of loss-making firms is determined by the relation: k = max [0, min (1, dps/(0,6% Total asset))].

Note 7. The total number of observations is obtained by multiplying the number of years of the study period by the number of firms in the sample.

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