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Extended Abstract

The effect of investment inefficiency on the implied cost of equity capital: Evidence from Indian firms

Jains P Chacko[1],

PhD Student, IFMR GSB, Krea University

Jains_c.rs18@krea.ac.in

Lakshmi Padmakumari

Assistant Professor, IFMR Graduate School of Business, Krea University

lakshmi.padmakumari@krea.edu.in

Abstract

Investing in positive NPV projects is intended to increase the firm's market value. This study investigates the effect of investment inefficiency on the implied cost of equity capital in the context of Indian firms using panel data over six years from 2016 to 2021. We adopt an implied cost of equity capital approach to measure the expected returns because studies found that it precisely captures the variations in the firm's market value since it is the rate implied in the market value of equity and future earnings forecasts. In India, the earnings forecast of sell-side analysts to compute the implied models is not sufficiently available. Against this backdrop, our study adopts model-based earnings forecast technique, namely, the Earnings Persistence model, developed by Li and Mohanram (2014), to estimate the forecasted earnings values to compute the implied models. The period used for estimating the predicted earnings values is 2006 to 2021. The findings of our empirical investigation suggest that investment inefficiency

[1] Corresponding author

increases the firm's expected returns. The findings help managers make better investment decisions that keep the expected returns at lower levels.

Keywords: Cost of equity, ex-ante cost of capital, implied cost of equity capital, corporate investment, and investment inefficiency

Introduction

The market existence of every firm is dependent on their investment in innovation, R&D and consequentially increased productivity. Firms enhance their market value by investing in projects with a positive net present value (NPV). Using information embedded in the firm's market value to make investment decisions became an area of interest among academic researchers. Pieces of evidence suggest that managers use such information to make better-informed investment decisions[2]. One variable that indicates marginal investment (i.e. the additional amount to be expended on investment activities) could be the expected rate of return for the investors. According to the theoretical documentation of Jorgenson (1971) and Abel and Blanchard (1986), the cost of capital is inversely related to investment, and this relationship significantly influences the capital budgeting decision of a firm. However, there was no clear indication of how the firms' cost of equity (COE) affects investment because the observed association is on the cost of capital, which consists of both costs of debt and equity, not just COE. Studying this relationship is crucial for every firm in its capital budgeting decisions.

Frank and Shen (2016) address this gap by examining the relationship between investment and the weighted average cost of capital (WACC) in US firms by building on Abel and Blanchard (1986). The study found strong evidence for the inverse relationship between the WACC and investment. However, the association is more complex than the prediction, and the complexity is predominantly because the study uses the WACC, consisting of the weighted average costs of debt and equity, to measure the capital cost. The debt and equity costs measures define the direction of the relationship between investment and WACC. Frank and Shen (2016) address the complexity of the relationship between WACC and investment. They identified an inverse relationship between the WACC using implied cost of equity capital and investment and a direct relationship between the WACC using factor-based COE and investment. The implied cost of equity capital (hereafter ICOE) is" the rate implied in the firm's market value and future earnings forecast", according to Gebhardt *et al.* (2001). It is estimated using earnings forecasts

[2] Managers use the firm's market value in making better-informed investment decisions since the market value per share contains aggregated information from investors (Dow and Gorton, 1997; Subrahmanyam and Titman, 1999).

in dividend discount models or residual income models. Factor-based COE is the rate computed using realised returns and price-earnings ratio. The direct relationship between factor-based COE and investment overwhelms the negative effect of the cost of debt on investment. On the other hand, the inverse relationship between ICOE and investment complements the negative impact of the cost of debt on investment.

According to Xu (2020), a firm's COE reduces the investment in two ways; first, the COE is the rate used to estimate the NPV by deducting the initial outflow from the discounted future cash flows of the investment. Also, when the COE increases, which is also the discounting factor, the NPV reduces. The second is that when the expected rate of return increases, the firm's ability to bring in low-cost external finance reduces, which will lead to a minimum or no investment in positive NPV projects. This effect is similar in the case of both firms that are financially constrained and non-constrained; that is to say, firms are unable to generate funds for their marginal investments.

The relationship between the ICOE and investment in India is not sufficiently investigated. We define investment in our study as "research and development expenditure plus capital expenditures plus acquisitions minus sale of property plant and equipment", which is the total investment variable in Richardson (2006). We aim to investigate the following through this study. First, to examine the relationship between the ICOE and investment expenditure. Second, to explore the relationship between investment inefficiency and ICOE, wherein we define investment inefficiency as the level of investment above and below what is implied in the firm's characteristics. Our study adds to the literature by empirically proving the expected relationship in the context of Indian firms. Finally, the study examines the presence of any curvilinear relationship between investment inefficiency and ICOE. Any curvilinear relationship between ICOE and investment will help corporates decide the optimum investment level to keep the ICOE minimum.

Our study considers an ICOE approach considering the theoretical and empirical documentation in the existing literature. Studies by Claessens *et al.* (2002) and La Porta *et al.* (2002) argue that improved corporate governance activities increase the firm's market value through the future expected cash flows. Later studies found that it is not the expected cashflows but the agency costs and information asymmetry reduction that leads to an increase in the firm's market value (Lambardo and Pagano, 2002; Hail and Leuz, 2006; Lambert et al., 2007; Guedhami and Mishra, 2009; Chen et al., 2009). These studies clarify that better corporate governance practices increase the firm's market value by reducing the expected return caused

by reduced agency costs and information asymmetry. Another way to look at ICOE is the rate that equates the firm's current market value and the future earnings forecasts. Hence, it can be seen as an internal rate of return (El Ghoul *et al.*, 2011). The primary motivation behind adopting an ICOE approach is the identifications of Lee *et al.* (2010) and Pham *et al.* (2011). The former study stated that using an ICOE approach, numerous studies found new evidence on risk and return that is highly consistent with the theoretical predictions[3]. This is because the measure of expected returns precisely captures the variation in the firm's market value compared to other standards of the firm's market value (e.g. Tobin's q and ROA). The later study observed that the measure of expected returns reacts more accurately to the yearly changes in the corporate governance environment. The study also argues that the measure of expected return is not biased because of the exogenous factors[4] that affect the firm's expected growth and profitability in the future.

Financing cost is one of the main determinants of firm-level investments. Our study first hypotheses a negative relationship between ICOE and investment. The rationale behind the relationship is that when the expected rate of return or ICOE increases, the firm's ability to raise external finance reduces. This will result in reduced investments. Secondly, our study expects a positive relationship between investment inefficiency and ICOE because when the firm fails to meet the optimum level of investment, this will positively affect the expected returns. Higher expected returns reduce the firm's market value. Our study also conducts a battery of multivariate analyses and found evidence supporting our hypotheses.

Data and methodology

The unit of analysis of our study is listed firms in India with earnings data available from 2006 to 2021. We downloaded data from CMIE prowess for 1667 firms. The period considered to estimate the forecasted earnings values is 2006 to 2021, and the period used in the empirical examination is 2016 to 2021, all subject to the data availability of the variables. The financial variables are winsorised at 1% to avoid biases resulting from outliers.

[3] Easton (2009) gives a comprehensive review of the studies in the prior literature. The ICOE approach has been used widely in the coroprate finance literature. Pastor *et al.* (2008) used ICOE approach to test the intertemporal CAPM, Lee *et al.* (2009) used ICOE to test the interational asset pricing models and and Chava and Purnanandam (2010) used ICOE to test the effect of default risk on stock returns to cite a few among number of studies.

[4] It refers to the industry and economic conditions that are exogennous to managerial decisions which defines the variations in Tobin's Q over time as identified in Pham *et al.* (2011).

Our study follows the existing literature in adopting an Ex-ante COE capital approach, commonly known as ICOE, to measure expected returns. ICOE is the rate that is implied in the current market value of equity and the future earnings forecast of firms. To estimate the ICOE models, we need the earnings forecast of sell-side analysts. In the context of Indian firms, the earnings forecast of sell-side analysts is limited to a small subset of firms. Against this backdrop, our study adopts a model-based earnings forecast technique, Earnings Persistence (EP) model, developed by Li and Mohanram (2014) to estimate the forecasted earnings values to compute the ICOE models.

This study computes three ICOE models: the Easton (2004) model, Ohlson and Juettner-Nauroth (2005) model and the price-earnings growth (PEG) model. The rationale behind considering these three models is the requirement of earnings forecasts. These three models require only two periods ahead of earnings forecast while the other models like Claus and Thomas (2001) and Gebhardt et al. (2001) need earnings forecast for an extended period. We follow the Hou *et al.* (2012) methodology in implementing ICOE models. According to their implementation, if year *t* is 2016, the coefficients to estimate the forecasted values of earnings *t+1* are estimated using a pooled regression over 2007-2015. Similarly, the coefficients to estimate the forecasted values of earnings *t+2* is estimated using a pooled regression over a period of 2006-2015.

Our study defines investment as the sum of capital expenditure, research and development expenditure, and acquisitions minus property plant and equipment sales. This is the same as the total investment variable computed in the paper by Richardson (2006). This variable is used as a dependent variable in our multivariate analysis to examine the relationship between ICOE and investment. Also, the variable is used as the dependent variable in the model to predict the optimum firm-level investment.

In the empirical examination that investigates the relationship between ICOE and investment, we use the control variables, Tobin's Q and stock returns[5] as the measures of market opportunities, cash ratio as the measure of liquidity, size to control for the size of the firm, firm age to control for the effect of mature firms[6], and leverage to control for the degree of financial distress. The control variables used in the empirical examination that examines the relationship

[5] We also include stock return as a meausre of market opportunities because it controls for what is not captured in the Tobin's Q. This is taken from Richardson (2006) that follows the prior literature Barro (1990) and Lamont (2000).

[6] Mature firms refers to firms that are well-established in the industry which hold a significant market share and have a steady growth.

between investment inefficiency and ICOE are; leverage and cash ratio to control for the financial constraints, beta to control for the risk, book to market ratio to control for the firm type, and asset turnover ratio as an inverse measure of agency costs[7]. We use the same set of control variables in our optimum level of investment model.

To test our first hypothesis that there is a negative relationship between ICOE and investment, we used a dynamic panel technic two-step system GMM that controls simultaneity and unobserved heterogeneity. The study adopted a GMM model because of the lagged dependent variable, investment, as an explanatory variable in the model. Before employing the GMM model, the same is estimated using Pooled OLS and Panel FE techniques without the lagged dependent variable and found qualitatively similar results to the GMM model.

The primary variable of interest in the second hypothesis that there is a positive relationship between investment inefficiency and ICOE is investment inefficiency. Investment inefficiency is caused by not investing to the optimal level implied in the firm characteristics. In this study, the variable is the residual of the optimum investment model developed based on the variables identified by Richardson (2006). The positive residual of the optimum investment model is overinvestment, and the negative residual of the optimum investment model is underinvestment. The study considers both overinvestment and underinvestment as inefficiency, and therefore, investment inefficiency is the absolute residual of the optimum investment model. The model's dependent variable is ICOE under the three models and an equal-weighted average of all the three models. The study used pooled OLS with time dummies and industry dummies to estimate the baseline results and panel FE with time dummies to estimate the robustness results. The standard errors in pooled OLS and panel FE are clustered at the firm level.

In the regression analysis to examine the effect of ICOE on investment, we address the problem of simultaneity and unobserved heterogeneity using a dynamic panel technique, two-step system GMM. In the second set of analyses to examine the effect of investment inefficiency on ICOE, the problem of unobserved heterogeneity is addressed using a panel fixed-effects approach. Also, we used the lagged values of explanatory variables in our models, and therefore, we do not suspect any other sources of endogeneity in our analysis.

Findings

[7] ATR is an invesrse measure of agency costs and this is considered following Nguyen et al. (2020).

This section explains the findings of our study. First, the study found a negative relationship between the implied cost of equity capital (ICOE) and investment. The relationship may be justified as financing cost is the primary determinant of investment. When the expected return (ICOE) increases, the firm's ability to raise external finance reduces. This will result in reduced investment in the positive NPV projects. Second, the study found a positive relationship between investment inefficiency and ICOE. The ultimate aim of every investment is to create value. When a firm fails to invest to the optimum level of investment implied in the firm characteristics, this will increase the expected returns and increased expected returns decrease the firm's market value.

Third, the study found a positive relationship between underinvestment and ICOE. From the literature, we observed that financing constraints cause underinvestment. When a firm fails to invest to the optimum level of investment implied in the firm characteristics, this will also increase the expected returns. Finally, the study observed a positive relationship between overinvestment and ICOE. Against our expectations, we found that overinvestment is negatively related to expected returns. We expected a positive relationship due to the increased agency conflicts that lead to overinvestment. The negative relationship may be due to the investor's perception that higher investment levels create value. So there exists a negative relationship between overinvestment and expected returns. Reduced expected returns increase the firm's market value. The results are consistent across all the three ICOE models and the equal-weighted average of all the three models. Our results are free from simultaneity and unobserved heterogeneity concerns because the models are estimated using GMM, panel FE, and lagged models. No other source of endogeneity is suspected in the models. Our analysis found no clear evidence favouring the curvilinear relationship between investment inefficiency and ICOE. The findings help managers make better investment decisions that keep the expected returns at lower levels.

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