

*Third draft
30/04/02*

The Corporate Cost of Capital and the Return on Corporate Investment: New Zealand Evidence

Introduction

This proposed research attempts to achieve an understanding of these issues: “For the New Zealand corporate sector, what is the overall cost of capital, does corporate investment create return in excess of the cost of capital, and what is the recent trend in financing pattern in the New Zealand corporate sector?” Findings of the research are hoped to provide practical benchmark for comparison purposes and starting points in assessing individual firms’ performance. Also, the research would help to obtain some perspective on the overall performance of New Zealand’s corporate sector during the period of 1980-2001, a 22-year time span that covers both bullish and bearish years of New Zealand economy.

In addition to estimating cost-of-capital at overall corporate level, another goal of the proposed research is to achieve an understanding of how the market perceives “the risk associated with investing in a firm’s stock, and to examine how this perception varies systematically across firms and industries”(Gebhardt et al., 2001, p.136). That is, differences in the risks among industries should be reflected in their respective observed long-term IRRs, i.e., firms’ cost of capital at industry level.

This study will follow an approach advanced in Fama and French (1999). Using the standard finance textbook equation for estimating discount rate used for capital budgeting, they introduce a new methodology of deriving the cost-of-capital characterized by treating all firms in the non-financial corporate sector as an investment project. According to their working definition, “[t]he cost of capital for the non-financial sector is estimated as the internal rate of return (IRR) that equates the initial market values of firms with the present values of their post-entry net cash flows and their terminal market values” (Fama & French, 1999, p.1939).

The proposed research concerns computing two types of closely related IRRs: IRR on value (the return required by investors) and IRR on cost (the return delivered by the corporate sector). The central argument is, according to the empirical evidence found in New Zealand stock market, if IRR on cost is larger than IRR on value, it can be inferred that corporate investment on average adds value.

During the process of computing the two IRRs, of particular importance is the IRR on value. According to Fama & French (1999), there are three equivalent interpretations of IRR on value

- “it is the return to an investor who buys firms at market value when they enter the sample, receives or covers their subsequent net cash flows and then sells them at market value”;
- an estimate of the overall cost of capital for non-financial firms; and
- the compound return on the initial market values of all the securities of non-financial firms, including the securities they issue after they enter the sample (pp.1941-42).

IRR on value can be a useful benchmark with some potential applications. Currently, in New Zealand, the dominant practice is still the use of market risk premium in determining the cost-of-capital in the framework of the Capital Asset Pricing Model (CAPM) for firms (Chay et al. 1995, pp.27-28; Tohmatsu, 1998, p.85). This estimation of market risk premium is mainly based on the average simple realized return, which, in some occasions, might not be appropriate for estimating the expected return. Fama & French’s (1999) approach provides an alternative way of estimating the cost-of-capital which may offer a better answer to the appropriate market risk premium.

Aim

The aim of the proposed research is to explore the issue of cost of capital in New Zealand corporate sector. Specifically, it estimates the internal rates of return (IRR) earned by non-financial firms in New Zealand on (i) the initial market values of firms' securities and (ii) the cost of their investments. The IRR on value is dealt with as an estimator of the overall corporate cost-of-capital. Through computation of the IRRs on value and on cost, this study aims to achieve an understanding on the recent history of corporate earnings and investment & financing decisions as inferred from the calculation and analysis of these returns.

Objectives

In order to achieve the aim above, the proposed research has the following objectives:

- To compute various IRRs using data available. These include: IRRs on value and on cost, nominal and real IRRs, IRRs as average simple returns and as compound returns;
- to show how initial assets, earnings, investment outlays, and terminal values of the firms combine to produce the IRRs on value and cost;
- to provide some perspectives on the issue of IRR differences at industry level by comparing IRR figures between different industries. As an illustration, IRR differences between two typical industries, i.e., Primary (G01) and Services (G05) according to NZSE classification, will be examined. (Due to the fact of thinness of industries in New Zealand, median values of returns as well as average values of returns will be computed);
- to discuss, by way of comparing it with other relevant cost-of-capital estimation models, the advantages and shortfalls of the approach used in this study to derive the IRRs on value and on cost; and

- to discuss some implications to practitioners and academics alike in New Zealand as well as some public policy implications.

Literature Review

As a background for the proposed research, this section reviews relevant literature from four sources: 1) literature on empirical studies of equity return and cost-of-capital from the financial economics tradition, mostly using large-scale nationwide databases like COMPUSTAT in the United States; 2) more recent empirical studies in Australia and New Zealand that have a direct bearing on the present research; 3) classic journal articles that address the issue of appropriate estimation of expected equity returns. Since the present research mainly follows the methodology advanced by Fama and French (1999), wherever possible, other literatures' connection with the FF paper will be highlighted; and 4) literature on the implications of dividend imputation system due to its relevance to evaluating investor's effective rate of returns.

Literature from a financial economics tradition

Early works that are related to the issue of rates of return and cost-of-capital are done with a financial economics tradition, mostly U.S.-based. Among them, well-cited empirical research include Nordhaus (1974), Feldstein & Summers, (1977), Holland and Myers, (1979), and Feldstein, Dicks-Mireaux and Poterba (1997), whose studies form a series on exploring the aggregate economic trend in the United States started from early 1950's. In contrast to the FF paper, one characteristics shared by these studies is that they all adopt rather complicated methodology in estimating the profitability on non-financial private investment and cost-of-capital figures. Despite their methodological complexity, the results of the studies are disputable since they use average simple realized return to estimate historical returns and cost-of-capital. Specifically, their estimation of returns is based upon "the average, for a sample period, of the ratio of non-financial corporate earnings for year t to the replacement value of the non-financial capital stock at the end of year $t-1$ " (Fama & French, 1999, p.1964). However, one merit of the studies that needs to be noted here is that most of them use the replacement value instead of book value, as applied in the FF paper, of equity assets in their computation when deriving the estimated cost-of-capital figures. The availability of well-estimated replacement value of equity can make the practice of estimating

cost-of-capital more accurate. The proposed research will stick to using book value of equity with an understanding that the replacement value data might not be available in New Zealand. Another consideration in using the book value of equity is consistent with Myers' (1977) argument that book value of equity, in contrast to alternative measures like market value of equity, is preferred by management because of its advantage of stableness when firm's relevant financing decisions, firm's policy in maintaining an appropriate debt ratio, for instance, are made.

New Zealand literature on rates of return to equities

Chay et al. provide a recent New Zealand-based research on the historical rates of return to equities (1993, 1995). Their work documents the historical returns from investing in New Zealand equities and bonds during the period from early 1930's to 1990's. The methodology applied in their study comes from Ibbotson & Sinquefeld (1976, 1989). To cope with the long-term horizon of the sampling period, they first construct a monthly equity return index by using various sources like the Department of Statistics capital index, and then they convert the monthly returns series into annual returns by compounding the monthly returns. Such an equity index is a value-weighted gross index that covers returns from both capital gains and dividends (Chay et al., 1993, p.28). In their study, both the arithmetic mean return and the geometric mean returns are provided (Due to the importance of the issue, the respective merits and problems of the arithmetic return and the geometric mean return will be reviewed separately in a later section). A comment here is that though both the Chay et al. paper and the FF (1999) paper have used the geometric mean return, i.e., a compound return, Chay et al. hold a more usual but allegedly less practical assumption that all interim profits are re-invested to form cumulative returns over multiple periods. As argued by FF (1999), this assumption rarely reflects the actual picture of cash inflows and outflows and as a result, can cause a biased estimation of equity returns.

Literature from financial accounting tradition

While the above studies deal with rates of return of overall corporate sector, some other research focus on the rates of return issue from the perspective of a single industry. A recent example is the work of Baber & Kang (1996) from the financial

accounting literature. Baber & Kang's paper offers estimation procedures to induce the economic rates of return for the U.S. pharmaceutical industry during a sample period from 1976 to 1987, using a test sample of 88 U.S. firms selected from the COMPUSTAT data file. Different from the traditional way of computing equity returns by using accounting income measures, their study focuses on more illuminating cash flow information. Using techniques advanced by Salamon (1982), they begin by calculating cash recovery rates of return instead of the conventional accounting-based return-on-assets (ROA), analyzing the relationship between cash recovery rates of return (CRR) and IRR, and then use the results to estimate the IRR figures as implied by CRR (Baber & Kang, 1996, p.328). The result of the study shows that the implied internal rates of returns from the pharmaceutical industry exceed that for comparable U.S. industrial firms during the sample period.

Use and problems of average realized returns

A more recent empirical research that specifically addresses the issue of corporate cost-of-capital is that of Gebhardt et al. (2001). Their research provides a new approach to computing the cost of equity capital by using a discounted residual income model (RIM) to generate a market implied cost-of-capital for a large sample of U.S. firms, included in both the NYSE and AMEX return files from CRSP and a merged COMPUSTAT annual industrial file. The theoretical foundation of RIM is DDM, the dividend discount model. The implied cost-of-capital, as defined by Gebhardt et al., is "the internal rate of return (IRR) that equates the current stock price to the present value of all future cash flows to common shareholders" (2001, p.136-137). In order to estimate the implied cost-of-capital, they take a two-stage approach to solve the problem of terminal value estimation, which is the core of their estimation procedure. Specifically, they "forecast earnings explicitly for the next three years and then forecasting earnings beyond the third year implicitly" and then "forecast earnings beyond year three implicitly, by mean reverting the period $t+3$ ROE to the median industry ROE by period $t+T$ "(p.141).

Gebhardt et al.'s work represents a departure from the usual use of average realized returns in estimating cost-of-capital. According to them, the use of average realized returns in estimating cost-of-capital is embraced by much previous

empirical work for two reasons. The first one is obvious: expected returns are simply unobservable. The second reason is of the assumption that in an efficient market in which risk is correctly priced, the average realized return should be able to serve as an unbiased estimate of expected returns (Gebhardt et al., 2001, p.136). However, the use of average realized returns can be inappropriate since it suffers from the fatal problem of being “unavoidably imprecise”, as concluded by Fama and French (1997) with an extensive testing of CAPM and their own three-factor model. According to their research, there are at least three potential problems associated with risk premiums derived from the average realized returns: 1) difficulties in identifying the right asset pricing model; 2) imprecise estimates of the loadings of industries on the risk factors; and 3) uncertainty about true factor risk premiums. One prominent researcher and finance theorist, Edwin Elton, too, points out that average realized returns could be a poor proxy for expected returns (Elton, 1999).

The Fama & French (1999) approach

The work of Fama & French (1999) provides an estimation of real cost of capital (IRR on value) and the real return on cost of investment (IRR on cost) using COMPUSTAT data file for the 1950-96 and 19773-96 sampling periods. Their study is unique in its methodology in that it treats the corporate sector as an investment project and then derives the IRR on value and IRR on cost through by equating the initial market or book value of firms to all the relevant cash inflows and outflows as well as the terminal market or book value of firms.

As mentioned in an earlier section, FF’s approach releases the naïve assumption that all the dividends and interest earnings are re-invested into the firms or market portfolio. To this point, Fama and French argue that

...capturing the actual history of wealth invested in the corporate sector, our IRR on value requires net new investment in any year when the sum of net cash flow from operations... and funds needed to cover the difference between the market values of exiting and entering firms... is negative. Conversely, our approach reduces the value of invested wealth when the net flow from the corporate sector... is positive (1999, p.1942).

A more detailed description of the their operationalization of this argument is summarized in the methodology section of the research proposal.

As the two researchers have acknowledged, their approach has its own problems. The first one is the problem of their inference that IRR on cost exceeds IRR on value. “In the IRR on cost, however, the assets firms hold when they enter the sample are measured at reported book value. There is no adjustment for the replacement cost of reported assets, and past investments in intangible assets are unreported” (p.1940). Due to the this reason, the use of historical cost may cause an inappropriately higher IRR on cost which may invalidate their conclusion that on average the corporate investment during the sample period is profitable.

However, computing the various IRRs is not the sole interest of their paper. Through the process of computing the IRRs, interesting insights concerning firms’ investment and financing decisions can be obtained. To this point, Fama and French (1999) note that “examining the inputs for the IRR on value shows how (i) the initial pricing of firms, (ii) post-entry investments, (iii) earnings on investments, and (iv) the terminal values produced by expected future net cash flows combine to produce the overall return on wealth invested in the non-financial corporate sector (p.1940)”. Some substantiated picture, in relation to the above information to be found in the New Zealand corporate sector, is also a major interest of my proposed research.

Discount rates used for cost-of-capital estimation

A central issue in the estimation of cost-of-capital is whether the arithmetic mean or the geometric mean should be used. One seminal paper contributed to this field is that of Blume (1974). In that paper, Blume offers a rigorous discussion of the possible biases in using the arithmetic or geometric mean of one-period returns to estimate the long-run expected rates of return. As a solution to avoiding various biases by an uninformed use of either the arithmetic mean or geometric mean, he provides four different methods of obtaining unbiased estimators of rates of return. Of particular interest is the weighted unbiased estimator that is computed as a weighted average of both the arithmetic mean and the geometric mean (Blume,

1974, p.636). The idea is that the weighting can reduce the error in estimation of the means and serial correlation in returns.

However, as Brennan (1997) points out, Blume's proposition is based upon the assumption that "(excess) returns on the market portfolio are serially uncorrelated", which might not be true according to new "evidences of 'temporary components' which induce negative autocorrelation in stock returns"(Brennan, 1997, p.82). As an early advocate of the weighted unbiased estimator, Cooper (1996) also cautions that "estimation of discount rates would involve more complicated analysis than looking at the means of past returns.

Literature on the implications of dividend imputation

One factor that might complicate the interpretation of IRR on value computed with the FF approach is the dividend imputation system practiced in New Zealand. According to FF approach, dividend enters in the numerator of the equation which is used to back out the IRR on value (1999, p.1942). However, this approach does not reflect the complexity of dividend imputation system, which allows various investors, depending their own tax characteristics, to enjoy from zero to the whole benefit of the tax credit provided by firms. Due to its complex and controversial nature, the quantitative side of the impact of dividend imputation tax will not be explored in detail, that is, the proposed study will not directly include the factor of dividend imputation tax into the equation used to back out various IRRs. Rather, some implications of the dividend imputation tax will be discussed in the context of alternative assumptions concerning investor tax characteristics.

With the above qualification, I now briefly mention several recent studies on the topic of impact of dividend imputation. Currently, there are basically two different approaches to handling the impact of dividend imputation. One is the work by Lally (1992, 2001) that attempt to decide the value of imputation credits in the estimation of cost-of-capital based on Brennan's (1970) after-tax version of CAPM. The other is that of Officer (1994) who takes a net-cash-flow adjustment approach, that is, the value of imputation credit offered by firms can be accounted for by adjusting the discounted net cash flow. The major difference between the two approaches is that in Lally's model, the effect of imputation is confined to the cost

of equity whereas the expected cash flows will not be affected; in Officer's model the emphasis is on viewing dividend imputation as reducing the effective corporate tax rate instead of reducing the investor's personal tax rate on dividend income. Here the point is that when using the IRRs obtained from the FF model, investors need to consider the implication of the value of imputation credits in relation to the pre-personal tax returns. A detailed review of the two approaches is in Bowman and Marsden (1996).

The above has briefly reviewed some literature relevant to my proposed research. What needs to be noted here is that not all the relevant literature has been reviewed. The bibliography section of the research proposal includes more journal articles of relevance. A comprehensive review of the literature will be the task of the final research report. Next section deals with methodology issues.

Methodology

Data

Data necessary for this study are to be obtained from the Department of Finance, Banking and Property, which maintains databases on New Zealand Stock Market and Data on Balance Sheets and Income Statements.

All the data required by the study are of firms listed on the New Zealand Stock Exchange (NZSE). They are either in book values, which are in standard accounting categories and therefore can be obtained from the firms' annual financial statements, or in market values, e.g., firms' initial market values and terminal market values, which are generally released by NZSE and available to the general public. As mentioned above, such data will be obtained from the Department.

Sample selection and sample estimation period

Due to the time and resource limitation and scope of the research report, two research design options concerning sample selection will be considered. Depending on the estimated work load as indicated by the pilot data computing and analysis, the option that meets the time as well as academic requirement of the paper will be chosen.

Option One

Since the research intends to estimate the cost-of-capital of the overall corporate sector in New Zealand, all non-financial firms listed from the year of 1980 will be included in the sample. The industry classification will be based on that published by The Fact Book (NZSE, 2001).

Option Two

This option will include in the sample all the firms in the Barclay's Industrial Share Index and the more recent NZSE40 Index, both of which cover 40 of the largest and most liquid stocks listed and quoted in New Zealand Stock Exchange, as a proxy of overall corporate sector of New Zealand. It is estimated that the

Barclay's Industrial Share Index and NZSE40 Index represent about 70-80% of the aggregate market value in NZSE (Brailsford, 1993, p.3). Also, two typical industries, firms under the category of "Primary" and "Services" according to The Fact Book of published by NZSE, will be chosen and compared.

For this research, the sample estimation period is chosen to be from the year of 1980 to the year of 2001, totaling eleven years. Compared with the majority of the empirical studies as reviewed in the literature review section above, the sample estimation period is a little short. As a justification, a shorter sample period is to be chosen mainly due to the following considerations:

The first consideration in choosing a comparatively shorter sampling period is to reduce survivor bias and to provide a useful check on the results for some longer periods, see Chay et al. (1993, 1995), for example. Discussions of survivor bias can be found in Fama and French (1999), Chan et al. (1995). Also, a shorter but more recent sampling period is hoped to be more relevant for benchmarking purposes.

Another factor is obvious, that is, due to the resources limitations like time and manpower, which large decide a limited scope of the present research. However, what is worthwhile to be noted here is the fact that though the sampling period is short, it anyway includes both bullish and bearish periods of New Zealand stock market, which is hoped to provide a comparatively practical benchmark for various stakeholders of estimation of cost-of-capital in New Zealand.

[Theoretical foundation and the IRR computation procedure](#)

[Introduction](#)

This study adopts the methodology applied by Fama and French (1999). In appearance, FF's approach is basically the standard asset valuation technique discussed in most contemporary finance textbooks, i.e., the internal rate of return (IRR) derived by the discount cash flow (DCF) technique. However, the innovation made by FF is that instead of a specific asset or an individual project, they treat the whole corporate sector of a country as an investment project. Equally important, their approach effectively releases the usual but often unrealistic

assumption that all dividends and interests earned from an investment are re-invested into the project.

To operationalize FF's approach, four steps, which form the core of the research design of the proposed research, are outlined below.

Step 1: Data sorting

The first step basically is of number crunching, i.e., sorting and calculating various components used to derive the IRRs. According to FF, the IRRs on cost and on value, which are expressed as the discount rates of r_c and r_v , can be backed out by solving the Equation (1) and (2) below:

$$IV_0 = \sum_{t=1}^T (X_t - I_t) / (1 + r_v)^t + \sum_{t=1}^T (FS_t - FBV_t) / (1 + r_v)^t + TV / (1 + r_v)^T \quad (1)$$

$$IC_0 = \sum_{t=1}^T (X_t - I_t) / (1 + r_c)^t + \sum_{t=1}^T (FS_t - FBC_t) / (1 + r_c)^t + TV / (1 + r_c)^T \quad (2)$$

where,

IV_0 is the aggregate initial market value of firms that enter the sample at the beginning of the IRR estimation period;

IC_0 is their aggregate initial book value;

X_t is aggregate cash earnings (after taxes but before deduction of interest and depreciation) for year t for firms in the sample in year $t-1$;

I_t is the aggregate gross investment (net investment plus depreciation) of these firms;

FS_t (firms sold during year t) is the terminal market value of firms that leave the sample in year t ;

FBV_t (firms bought at value) is the initial market value of firms that enter the sample in year t ;

FBC_t (firms bought at cost during year t) is their book value;

TV is the terminal market value of firms that exist at the end of the sample period; and

T is the terminal year of the sample period

In order to obtain the IRRs, all relevant accounting and financial data as required by the above equation will be sorted and computed.

Step 2: Decomposing IRRs

In this step, it will be shown how initial assets, earnings, investment outlays, and terminal values combine to produce the IRRs on value and cost. In the meantime, various inflows and outflows will be cumulate to the final sample year at each of the four IRRs, i.e., nominal or real, on value or on cost, and then express them as a percentage of the terminal value of firms that exist at the end of the sample period.

Step 3: Computing IRRs at industry-level

Step 3 provides and compares industry-level IRR figures through a breakdown the whole New Zealand corporate sector into various industries according to industry code designated by NZSE.

Data analysis

The analysis of all the numerical data as required by the proposed research will be sorted and computed with the assistance of spreadsheet and database software. There are two choices: Excel and Access. As reported by a technical staff of the Department of Finance, Banking and Property of Massey University, in certain cases, when the data volume is relatively large, for example, working with Excel might not be as convenient as that of Access. For this reason, Access may be chosen as the primary data processing tool. Some self-training on the use of Access is expected. Also, some frequently used standard statistical application will be involved in the data analysis.

Expected Findings

The primary findings of the research could either be that IRR on cost of investment is less than IRR on cost of capital, suggesting investments in the corporate sector in New Zealand during the sample period are not profitable, or that IRR on cost of investment is higher than IRR on cost of capital, indicating investments are profitable. At the same time, it is hoped to reveal some information about the recent pattern of the overall corporate capital structure in response to earnings, investment, and distributions to security holders.

Remaining Work

As discussed in a previous section, one shortfall of the proposed research is that it uses book value instead of replacement value when computing IRR on cost.

Therefore, further research work is recommended to obtain data on the replacement value so as to provide a more refined estimation of the real IRR on cost and compare the result with IRR on value and to see whether the corporate investment creates added value in excess of cost.

Another direction of further research is re-examining the IRRs using a longer sampling period. The IRRs derived in this study are all historical rates of return. For this reason, results obtained with the same methodology can provide some check on the conclusion to be made in the present study.

Further research work that includes more effort in addressing the issue of the impact of imputation tax may also be fruitful since it would shed more light of practicality and utility in the U.K., Australia as well as New Zealand context.

Proposed Report Structure

The research report will be structured as follows:

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- Introduction
- Literature Review
- Data & Methodology
- Analysis & Results
- Discussion
- Area of Further Research
- Conclusion
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- Appendices

Timetable

	Completion Date
Draft Research Proposal	15 April 2002
Completed Research Proposal	1 May 2002
Completion of Literature Review	15 June 2002
Pilot Data Computing & Analysis	30 June 2002
First Two Chapters of Research Report	5 August 2002
Research Seminar Oral Presentation	16 September 2002
Data Computing & Analysis	30 September 2002
First Draft of Research Report	30 October 2002
Second Draft of Research Report	20 October 2002
Final Research Report & Submission	1 December 2002

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