The Corporate Cost of Capital and Financial Investment in New Zealand

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Abstract

We have estimated the cost of capital for the New Zealand listed non-finance corporate sector by the corporate internal rate of return method adopted by Fama and French (1999). The real IRR on value is 1.87% and IRR on cost is 4.38%. An industry analysis revealed large differences in returns, with five out of six industry sectors achieving positive nominal and real IRRs. The cash flows component analysis reveals that on average, New Zealand firms generated income equal to 4.93% of beginning of year book value, which is much less than the comparable US rate of 8.83% (Fama and French, 1999). Mirroring this income difference, the issuance of equity by New Zealand companies equal to 5.57% of the beginning book value, greatly exceeded the US rate of 0.81% (Fama and French, 1999). Although New Zealand firms tend to place more reliance on equity issues to finance their total investment requirements, debt issues are also often used.

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1. Introduction

One of the fundamental questions about the efficiency of corporations in society is their efficiency in wealth creation. The importance of the question is obvious; a measure is needed by public economists to discuss social economic problems, by private investors to allocate their wealth and by corporate management to make investment decisions.

Traditionally, corporate efficiency is evaluated from estimates of the income received by investors being, most commonly, the general equity return rate and corporate bond yields. Alternatively, we can measure efficiency at the level of corporate cash flows; the cash flows paid to investors are compared with the cash flows received from investors. Fama and French (1999) contend that the second measure is "less fraught with measurement problems" (p. 1939), yet few empirical researchers have used it as a measurement tool.

Fama and French (1999), hereafter FF, on which the present study is heavily based, use the standard finance textbook internal rate of return (IRR) for capital budgeting to derive a cost of capital characterized by treating all firms in the non-financial corporate sector as an investment project. According to their working definition, the "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).

Following the approach of Fama and French (1999), the present study examines three aspects of IRR-related issues in the New Zealand market, comprising the results of various

nominal and real IRR estimates on value and on cost; the capital structure of the aggregate sample firms, and recent investment and financing trends.

A distinguishing feature of this research is the consideration of the above issues by industry divisions. It is now widely believed that different industries could possess very different financial structures, showing distinctive risk and return characteristics. Identifying and comparing patterns of returns and capital structure using industry portfolios may enable us to identify relationships between industry risk and financial performance.

In New Zealand, as in many other western economies, conventional models like the CAPM remain the most prevalent techniques for performance measurement and benchmarking purposes. Despite their theoretical dominance and practical convenience, empirical results obtained from such models are often believed to be vulnerable to some inherent pitfalls. For instance, in New Zealand, the estimation of a market risk premium in the Capital Asset Pricing Model (CAPM) framework is predominantly used to determine firms' cost of capital (Chay et al. 1995, pp.27-28; Tohmatsu, 1998, p.85). This estimate of market risk premium is based mainly on the average simple realized returns, which, in some circumstances, may not be appropriate for estimating expected returns. Also, in calculating firm rates of return, many models assume that the investor automatically re-invests all dividends to be received into her investment. Though elegant, such an assumption often fails to capture the true picture of the firm's financial performance during a given time horizon.

Given these shortfalls, the challenge is to identify an alternative method to more accurately capture actual firm rates of return and further help to derive a useful benchmark when measuring firm costs of capital. The findings are hoped to provide a starting point in choosing practical benchmarks in assessing individual firms' performance. Also, the empirical results

of the research may help to form a better perspective on the overall performance of New Zealand's non-financial corporate sector since the last global stock market crash.

Our empirical results suggest that for the overall non-financial corporate sector in New Zealand, the nominal IRR on value and on cost are 4.19% and 6.78%, respectively. After an adjustment for inflation, the real IRR on value and on cost are 1.87% and 4.38% respectively. Our results also indicate that internally generated funds and equity issues tend to constitute a dominant part in financing firms' investments. Finally, the results fail to detect any stability of capital structure as observed either in book value or market value of the sample firms.

The remaining part of the report is organized as follows. Section 2 provides a review of literature, Section 3 introduces the methodology, Section 4 describes the data set and Section 5 reports the empirical results. Section 6 then concludes the report, including a brief discussion of the limitations of the study and suggestions for directions of further research.

2. Literature review

Early works relating to rates of return and costs of capital follow a financial economics tradition in a U.S. context. Among them, well-cited empirical research includes Nordhaus (1974), Feldstein & Summers, (1977), and Feldstein, Dicks-Mireaux and Poterba (1996), whose studies form a series that explores the aggregate economic trend in the United States from the early 1950's.

A particular merit of these studies is that most of them use the replacement value of assets in their computations when deriving the estimated cost of capital figures. The availability of well-estimated replacement values of assets can enhance the accuracy of cost of capital estimates. In contrast, the IRR on cost estimates in the FF paper use initial book value of

assets which reflects the historical cost of assets at their time of acquisition. As FF point out, this has the effect of understating initial assets and overstating the IRR on cost measure. In New Zealand, many (but not all) businesses revalue investment and fixed assets to net current value (akin to net realizable value) in their financial statements on the grounds of providing more timely and relevant information. Consequently, the proposed research will use book values for the cost of capital on cost estimates, with an understanding that they reflect a composite of historical cost and net current values.

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 for financing decisions, such as a firm's policy to maintain an appropriate debt ratio.

While the above studies deal with rates of return of the overall corporate sector, other research studies focus on rates of return from the perspective of a single industry. Baber & Kang's (1996) 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 method of computing equity returns by using accounting income measures, their study focuses on more illuminating cash flow information.

A more recent empirical study 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 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 1973-96 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 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. A more detailed description of their analysis is summarized in the methodology section of the report.

As the two researchers have acknowledged, their approach has its own problems. The first 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 this reason, the use of historical cost may cause an inappropriately higher IRR on cost which may invalidate their conclusion that on average, corporate investment during the sample period is profitable.

However, computing the various IRRs is not the sole focus 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)". Similarly, it is a major motivation for our research to extract this information in the context of the New Zealand corporate sector.

Chay et al. (1993, 1995) provide recent New Zealand-based research on the historical rates of return to equities. 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 & Sinquefield (1976, 1989).

One factor that may complicate the interpretation of IRR on value computed with the FF approach is the dividend imputation system practiced in New Zealand. According to the FF approach, dividends enter in the numerator of the equation that is used to back out the IRR on value (1999, p.1942). However, this approach does not allow for the complexity of a dividend imputation system, which allows various investors, depending on their own tax characteristics, to enjoy a benefit from zero to 100% of a dividend tax credit provided by firms. Two different approaches have been taken to account for the impact of dividend imputation. Lally (1992, 2001) attempts to value imputation credits in cost of capital estimates based on Brennan's (1970) after-tax version of CAPM. In contrast, Officer (1994) takes a net-cash-flow adjustment approach, accounting for the value of imputation credits offered by adjusting the discounted net cash flows. A detailed review of the two approaches is presented in Bowman and Marsden (1996). Due to its complex and controversial nature, a quantitative analysis of the impact of dividend imputation tax will not be explored in this study.

3. Methodology

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 discounted cash flows (DCF). However, the innovation made by Fama and French (1999) is that instead

of analyzing a specific asset or an individual project, they treat the whole corporate sector of a country as an investment project.

The uniqueness of this study is to divide the whole corporate sector into industry divisions and these divisions are treated as investment projects. The country corporate sector is simply the aggregate of these projects. This method provides a clearer insight of the performance of a country portfolio and sheds some light on corporate financing activities based upon their industry components.

Following and extending the FF approach, three steps which form the core of the research design of the present study, are outlined below.

Step 1: Data sorting

The first step is basically number crunching, i.e., sorting and calculating various components used to derive the IRRs. According to Fama and French (1999), 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 Equations (1) and (2) below:

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

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

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. (Fama & French, 1999)

All relevant accounting and financial data as required by the above equation are obtained and computed in order to calculate the IRRs.

Step 2: Decomposing IRRs

The accounting and financial data items, such as initial assets, earnings, investment outlays, and terminal values, which combine to produce the IRRs on value and cost are then decomposed and sorted to reflect their individual contribution to the final IRR results.

Step 3: Computing IRRs at industry-level and market-level

Step 3 derives and then compares industry-level IRR figures through a breakdown of the whole New Zealand corporate sector into six sample industries based on each sample firm's industry code. In practice, however, to simplify the calculations, all relevant accounting and financial data items are first subtotaled at the industry level to back out the industry-level IRRs and are then aggregated to obtain the IRRs for the overall corporate sector.

4. Data collection

4.1. Sample firms and financial data

Information from standard financial reports of firms listed on the New Zealand Stock Exchange (NZSE) was obtained from the Datex electronic database.

Since this research intends to estimate the cost of capital of the overall corporate sector in New Zealand, all non-financial firms listed from the year 1988 are included in the sample. The industry classification is based on The Investment Year Book (2001, 2002) published by Datex and The Fact Book published by the NZSE (2001).

The first sampling procedure was to identify the six industries (excluding financial firms and overseas firms) that constitute the NZ non-financial corporate sector, namely, Primary, Energy, Goods, Property, Service and Investment industries. Secondly, all firms from these six industries as listed in the Datex file were selected for inclusion in the sample.

Firms that lack sufficient Datex financial statement data for the IRR computation are excluded. In particular, firms with less than a minimum of two consecutive years of financial statement data are excluded from the sample. The reason is that in order to calculate simple returns, values for both the beginning and end of year are needed for each firm. The Datex file only provides end of year value data, hence the need for a criterion of a minimum of two consecutive years of data.

4.2. Sampling results

As a result of the above procedures, a total of 241 firms were identified in the Datex file (Datex CD file, 1998 to 2002 update). Based on the sampling criteria, 60 financial, overseas and new market firms (the majority of which have less than two years of data) were

disqualified, leaving 181 firms (Table 1) that constitute the sample for this study. Table (1) also lists the industry breakdown of the firms. In the last decade, the number firms listed on the NZSE has never exceeded 200, consequently these 181 firms are believed to be a close proxy of the true NZ non-financial corporate sector.

The sampling period of the research is from 1988 to 2001, a total of thirteen years. Compared with the majority of the empirical studies reviewed in the literature review section above, the sample estimation period is rather brief. The shorter sampling period is considered justified based on the following rationale.

Due to a lack of data, the study suffers some survivorship bias. Discussions of survivorship bias can be found in Fama and French (1999) and Chan et al. (1995). Since the earliest Datex CD update only goes back to the year 1995, some firms delisted in and before 1995 are not available for sample selection. Extending the sample to periods before 1988 would exacerbate this problem further.

While the shorter sampling period may make the data less representative of the population, it can arguably have an advantage. That is, a shorter but more recent sampling period can be more relevant for benchmarking purposes. Furthermore, it is worthwhile to note that though the sampling period is short, it still covers both the most recent bullish and bearish periods of the New Zealand stock market, and so ideally it should provide a practical benchmark for various stakeholders who require New Zealand cost of capital estimates.

A case in point is Chay et al.'s (1993, 1995) estimation of the geometric mean of equity return in the New Zealand market. In their study, a sampling period that covers over 60 years from 1931 to 1994 is used. This infers a rather improbable assumption that an investor has to

buy the equity index in 1931 and hold it to the year 1994. In contrast, a typical investor may consider a shorter sampling period, such as 10 to 20 years, to be more relevant.

4.3. Miscellaneous data issues

All firms in the Datex file that belong to the six nominated industries were identified. The industry codes for currently listed firms were found from the Investment Year Book; for delisted firms, industry code information was obtained from NZSE documentation with assistance from NZSE research service staff. Still, several delisted firms' industry codes were not available, and for these firms, an industry code was identified based upon the Business Description section of the Investment Year Book.

To calculate the market value of firm's shares, the Datex financial statement item "adjusted share price" is used. An alternative would be to calculate the mean or median of the firm's daily market price of shares. Given the incidence of thin trading for many NZ listed firms, it can be argued that the use of mean value may be more appropriate. Unfortunately, for many sample firms, the daily market price data are often either unavailable or incomplete for the earlier sampling years. As a compromise, the study consistently uses adjusted share prices.

Another problem is that for some sample years, the financial year includes two ending periods. To be consistent, the study uses the later ending period as the appropriate financial year. For example, if there are two balance dates in a financial year, including both July and September, then the September data will be used in this study.

To calculate the real IRR, data for the CPI or inflation rate is needed. Such data is obtained from a historical data file provided by the Department of Statistics. However, the CPI figures as presented in the historical data file are on a quarterly basis. To be consistent with the

annual accounting and financial data, the quarterly CPI figures are converted into their annual equivalents.

In some sample years, several firms' accounting and financial data are denominated in Australian dollars. To convert the relevant values into NZ dollars, the mean values of the Australia-NZ exchange rate are used. The respective daily exchange rates are obtained from a historical exchange rate file provided by the Reserve Bank of New Zealand.

Following the FF approach, the estimates of the capital stock of firms in this study include only debt that pays explicit interest. Other obligations like accounts payable are excluded from the calculation of market capital and book capital. That is, only those interest-bearing debts are included. Consequently, long-term debt is measured as 'non-current liabilities excluding other long term debt' (as the interest-bearing nature of other long-term debt is unknown); and short-term debt is measured as the sub-total of 'current liabilities' less 'creditors' and 'provisions' (treated as non-interest bearing debts).

In the 'shares summary' section of the Datex financial statements file, preferred shares are not explicitly listed as a distinct item. For this reason, the study does not make a distinction between ordinary shares and preferred shares.

5. Empirical results

5.1. IRRs and annual rates of return

5.1.1 The IRRs: the basic results

Table 2 summarizes nominal and real IRRs on value and on the cost for the securities of the sample NZ non-financial corporate sector as well as an industry breakdown of these IRRs. For the overall non-financial corporate sector, the nominal IRRs on value and on cost are

4.19% and 6.78% respectively. With an adjustment for inflation, the real IRRs on value and on cost reduce to 1.87% and 4.38% respectively.

In comparison, for the sampling period of 1973-1996, Fama and French (1999) calculated the real IRRs on value and on cost as 5.57% and 7.52%, respectively. Leaving aside the two studies' differences in sampling period, it is interesting to note that while the American non-financial corporate sector achieves much higher IRRs on both the initial market values of the securities (3.70% higher) and on their cost of investment (3.14% higher), their NZ counterparts perform better in securing a large margin between return on value and return on cost, representing a margin of over 2.51% compared to the American margin of 1.95%.

Table 2 also provides information on IRRs at the industry level. One distinguishing result is the large difference in IRRs among the six NZ non-financial industries. With the exception of Property, all industries achieved a positive nominal IRR on value, with the highest being Energy (8.47%) and Service (8.17%), followed by Primary (4.90%), Goods (3.15%) and Investment (1.66%). In contrast, Property achieved a large negative nominal IRR on value (–8.43%).

Similar results are produced for the IRR on cost. The highest returns are from Energy (12.71%) and Service (11.33%) followed by Goods (6.71%), Investment (4.89%) and Primary (4.32%), while Property again recorded a negative return (-2.67%).

In most industry sectors, the IRRs on cost exceed the IRRs on values, with the difference over the whole corporate sector being 2.58% in nominal terms and 2.51% in real terms. The exception is the primary industry, in which the IRR on cost is actually less than that on value. This reflects the depreciation of the Primary industry market values over the period; in 7 out of 12 years, the total market value of equity is lower than total book value.

A comparison of the nominal and real return rates reflects the adjustment for inflation. The average differences between nominal and real IRRs on value and on cost are 2.32% and 2.40%, respectively. At the industry levels, the differences range from 2.08% or 2.22% (for Service) to 2.73% or 2.84% (for Investment) on value or on cost, respectively.

From the above results, our general impression is that with the exception of Property, the industries seem to have achieved reasonably favorable financial results over the sampling period. The average IRR on value of the whole non-financial sector is largely dragged down by the less-than-satisfactory results of the Property industry. Excluding Property, the average nominal (real) IRR on value for the other five industries increases by 1.08% (1.04%) to a new level of 5.27% (2.91%) from the original 4.19% (1.87%).

5.1.2. Annual rates of return: results and comparison

Table 3 estimates the average simple return on wealth invested in the NZ non-financial corporate sector. The measure of simple annual rate of return is based on the assumption that the investor has a one-year holding period. The annual return includes dividend income, interest payments and market value appreciation of equity. From the general performance illustrated in Figure 1, it is evident that the real IRR is more volatile in early periods, becoming more smooth in the later years.

Examining the industry returns in Figure 2, we find that the yearly rate of return is characterized by high volatility, with the standard deviation in most industries being more than double the average mean level. In a single year, the rate of return ranges from a positive nominal return of 162.23% (Investment, Year 1999) to a negative return of –59.90% (Investment, Year 2000). The two extremes are in the same industry and adjacent in time; likely caused by market over-exuberance and a subsequent correction. The next highest

extremes are 62.18% (Energy, Year 1991) and –50.83% (Property, Year 1992), which might more indicative of the range of the distribution.

Table 2 compares nominal and real data of IRRs and annual average returns by industry. The IRR and geometric mean are most similar, and they result in the same relative ranking of industries. The individual industry IRRs and arithmetic mean returns are also similar at values close to the all-sector means, but for industries operating well above or well below the all-sector mean, the IRR is substantially lower than the arithmetic mean. For example, the IRR for Energy is 8.47%, whereas the simple average is 14.93% and the IRR for Property is –8.43%, whereas the arithmetic average is -2.46%.

Over the entire sampling period, our findings indicate that the most and least volatile industries are Investment and Goods, respectively, with standard deviations of nominal returns of 51.48% and 9.89%. It appears that for the sample period, the expected positive relationship between profitability and standard deviation does not hold.

We anticipate that an industry-specific internal rate of return is a more appropriate choice for the cost of capital than the geometric mean. The IRR is based on investment strategies that employ market information; hence any reinvestment in a given industry is due to the decisions of company managers. In contrast, the geometric mean is the result of reinvesting all income in the industry, which is not necessarily true. Our results indicate that for all industry sectors, on value returns, the IRR is 4.19% and the geometric mean is 4.18%. On cost returns, the IRR is 1.87% and the geometric mean is 1.68%. The difference between the IRR and geometric mean is largest for the Energy sector, with the geometric mean exceeding the IRR by 4.91%. Yet for the Investment sector, the geometric mean is 3.87% lower than its IRR.

5.2. Pattern of cash flows

5.2.1. General pattern of cash flows

Following FF's approach, we breakdown the cash flows in equation (3) below into two categories: cash inflows (left-hand side) and cash outflows (right-hand-side):

$$Y_t + Dp_t + dS_t + dLTD_t + dSTD_t = I_t + Int_t + Div_t \qquad (3)$$

where,

Y_t is the sum of interest expense and net profit;

Dp_t is depreciation expense;

$dLTD_t$ is the change in book value of long-term debt from year t-1 to t;

$dSTD_t$ is the change in book value of short-term debt, measured by debt in current liabilities (minus creditors and provisions);

I_t (Investment) is the change in book capital (the book value of long-term debt, short-term debt, and equity) from t-1 to t, plus depreciation;

Int_t is interest expense;

Div_t is dividends paid.

Table 4 calculates annual cash flows as a percentage of beginning of year book value. Despite annual deviations, Table 4 indicates that on average the annual cash operating earnings ($Y_t + Dp_t = 4.93 + 4.98 = 9.91\%$) are not sufficient to cover the annual investment ($I_t = 11.80\%$). This result suggests internally generated funds, i.e., cash earnings are totally consumed by investment activities in the NZ non-financial corporate sector. However, investment, is not the only cash outflow, as firms must also cover their dividends and interest payments. Reviewing Table 4, we find average annual interest payments (Int_t) amount to 3.78%, which cannot be covered by average annual long-term debt inflows ($dLTD_t$) of 2.88%. Some short-term debt (0.92%) must be used to cover the remaining interest payments. Additional equity issues (dS_t of 5.57%) are used to not only cover the remaining cash outflow

of dividends payments (Div_t of 3.71%), but also to fund the shortage of new investment needs (1.89%).

In order for our NZ data to have more relevance against some external benchmark, a comparison with Fama and French's (1999) data of cash flow patterns may help to illustrate how relatively well NZ firms performed during the sampling period. The two most relevant sub-sample periods from the Fama and French research that correspond to our sampling period are from 1987-1991 and 1992-1996.

Table 4 includes a comparison of the various NZ 1989-2001 cash flows with the US data. With respect to annual income generated over the period, the American average of 8.83% exceeds the New Zealand average of 4.93% by 3.9%. Adding together income and depreciation, the difference widens further to 5.24%. Yet the total cash outflows (investment, dividend and interest payments) for the two countries are comparable at about 19%. Given the deficiency in internally generated capital, New Zealand firms have resorted to financing their cash deficiencies largely through equity issues (5.57% in New Zealand versus 0.81% in US).

5.2.2. Generation of real IRRs: A closer look

Our purpose in this section is to decompose the real IRR to reveal the relative contribution of the various cash flow components. Table 5 lists annual and total net cash flows (equation 4a or 4b) for the sampling period in billions of Year 2001 dollars.

$$\text{Net cash flow} = (X_t - I_t) + (FS_t - FBC_t) \quad \text{—} \quad \text{entering firms at cost} \quad (4a)$$

$$\text{Net cash flow} = (X_t - I_t) + (FS_t - FBV_t) \quad \text{—} \quad \text{entering firms at value} \quad (4b)$$

From Table 5, total investment in the period from 1989 to 2001 is $58.40 billion and total cash inflows from operations are $50.80 billion. Consistent with the results from Table 4, investments exceed cash earnings by $7.59 billion. To satisfy the deficiency in investor's net cash flow, a net positive sum of capital is invested into firms via the security markets. Gross investment including depreciation is $58.40 billion, but deducting depreciation of $26.59 billion leaves real net investment over the period of $31.81 billion.

In most years over the period the net flows are negative, with the exceptions being 1993, 2000 and 2001. The highly positive net cash flow in 2001 is mostly a result of the terminal value of firms, and this in turn has a favorable impact upon the calculated IRR. The cumulative net cash flows are all negative until the terminal year of 2001, hence there is a unique real IRR.

Over the period, the total value of purchased firms is $71.23 billion in cost, (or $85.31 billion in value) and the total value of sold firms is $105.92 billion, resulting in a net cash income of $34.69 billion in cost (or $20.61 billion in value) accruing to investors. The last year terminal value is $66.51 billion, which is more than the total cash earnings over the entire period, hence the real IRR is strongly influenced by the terminal market value.

The annual real return rates are graphed in Figure 1, with a high of 20.65% occurring in 1994 at 20.65% and the low of -18.95% arising in the 1990 post-stockmarket crash. In 1994, positive returns arose due to a $9.99 billion increase in the market value of the sample firms despite the incidence of negative net cash flows of $1.27 billion at market value. Whereas in 1990, a decrease of $4.90 billion in the sample firms' value alongside negative net cash flows of $3.26 billion resulted in highly negative returns. It is apparent that changes in the market value of firms play an important role in determining the real return rate.

5.3. Capital structure and financing decisions

5.3.1. Capital structure

An interesting by-product that arises from the computation of various IRRs for the NZ non-financial sector is information on the changing pattern of capital structure over the sampling period. That is, we can reasonably anticipate that the capital structure of firms should to some extent, be responsive to changes in firms' earnings, investment, and dividend and interest payments to investors. Furthermore, we hope to provide additional evidence with respect to the theory of whether leverage targets of firms are a function of book or market capital (Fama and French, 1999, p.1951; Myers, 1977).

Table 6 summarizes the values of equity and debt (long-term and short-term combined) as a percentage of market and book capital for all firms. Averaging over the annual rates from 1988 to 2001, Panel A reveals that 64% of the total market value of firms in the sample is in the form of equity (common/preferred stock) while 36% is long-term or short-term debt. In terms of the total book values, the percentages are 53% equity and 47% debt.

The average capital structures are presented by industry in Panel B of Table 7. As a percentage of market value, the Primary sector has the highest debt ratio of 48% and the Goods sector has the lowest of 25%. In all industries the market value debt ratio is less than the book value debt ratio, with the exception of the Primary industry, where in most years the reverse is true.

The industry debt ratios, market values and annual return rates are plotted in Figure 2. From Chart A, we can see that most industry debt ratios are usually moving within a range of 20% to 60%. The distribution is more condensed in the 20% to 40% range. The Primary

industry experienced the highest debt level of 70% in 1991 while the Property sector experienced the lowest of 13% in 1988 and 1989.

Market values have been stable across most sectors, as depicted in Chart B of Figure 2. Notable exceptions are the Service industry, growing continuously from $1.29 billion in 1988 to $43.94 billion in 2001 and the Energy industry, growing from $0.21 billion in 1988 to $8.33 billion in 2000. These two are also the most profitable sectors over the test period. The Primary sector market value oscillates over the period, revealing two peaks of more than $23 billion in 1992 and 1997.

The annual return rates presented in Chart C reveal a cyclical pattern. The Investment sector has an extreme return of 1.63% in 1999, but averages only 0.08% over the entire time period.

No relationship is apparent between return rates and debt ratios, with most firms in New Zealand seeming to adopt a stable debt ratio policy. The most profitable sectors appear to be those with higher growth rates in market value.

5.3.2. Financing decisions

In section 5.2 we examined the issue of the pattern of cash flows and made some assumptions with respect to investment as a major cash outflow and its possible impact on firms' cash inflows. There we adopted a convenient and rather simple matching method. In the next section we will investigate more closely the relationship between investment activities and the different types of cash inflows.

Table 7 and Figure 3 suggest some insights into these matters. The table reveals that during the sampling period, as measured against beginning-of-year book capital, the average annual investment outlay is 11.80%, being close to the American level of 12.86% (Fama & French, 1999). Yet given that New Zealand companies have produced much lower earnings (2.42-8.39=-5.97%), they have needed to issue more equity (5.57-2.37=3.20%) to finance their investments.

Furthermore, when we look at the annual correlation between investment and each of the financing sources, we find investment is significantly correlated with the issuance of debt with a correlation coefficient of 93.6%. Investment also displays some co-movement with equity issue with a correlation coefficient of 54.1%. Earnings are least correlated with investment, with a correlation of only 27.2%. This suggests that internally generated funds are not important in determining New Zealand firms' investments.

These characteristics are also illustrated in Figure 3. We can see that the total debt issue curve is moving closely with the investment curve. Furthermore, from the industry sector graphs in Figure 4, we can see that investment is most highly correlated with total debt issues in the Primary, Goods, Property and Investment industries, with correlation coefficients of 94.5%, 88.2%, 79.1% and 74.9%, respectively. But the two most profitable industries of Energy and Service were different. In the Energy sector, investment is most closely correlated with internal funds, with a correlation coefficient of 77.8%. In contrast, in the Service sector, investment is equally moderately correlated with equity issues and debt issues, with a correlation of approximately 63%.

In summary, we have found that New Zealand firms place more reliance on equity issues to finance the total investment requirement over the test period due to the insufficiency of earnings. Debt issues are most frequently used to fund investment requirements.

Fama and French (1999) suggest equity issues are more commonly used in mergers with other firms. Although it is beyond the scope of the present study, the question of whether additional equity issues are closely correlated with merger activity is an empirical matter worthy of further research.

6. Conclusion

The first objective of this study is to determine the cost of capital for the New Zealand listed non-finance corporate sector. We have estimated this by the corporate internal rate of return method adopted by Fama and French (1999). In the sample period from 1989 to 2001, the nominal IRR on value is 4.19% and IRR on cost is 6.78%. After adjusting for the effects of inflation, the real IRR on value is 1.87% and real IRR on cost is 4.38%.

There is a sharp difference between the different industry sectors; five out of six industry sectors examined achieved positive nominal and real IRRs. The highest nominal IRR on value is 8.47% for the Energy sector and the lowest is -8.43% for the Property sector.

The yearly rate of return is characterized by high volatility; the standard deviation in most industry is more than double the average annual rates. Comparing the IRR with the simple average, geometric mean and median rate, we find that the geometric mean is closest to the IRR rates over the entire non-financial portfolio. However, the same conclusion is not true at the industry sector level.

The cash flow component analysis reveals that on average, New Zealand firms generated income equal to 4.93% of beginning book value, which is much less than the comparable US rate of 8.83% (Fama and French, 1999). Mirroring this income difference, the issuance of

equity by New Zealand companies equaled 5.57% of the beginning book value compared with the US rate of 0.81% (Fama and French, 1999).

Although New Zealand firms tend to place more reliance on equity issues to finance their total investment requirements, debt issues are also often used. The tendency of New Zealand firms to rely more heavily on equity may at least in part be due to the NZ dividend imputation tax system which reduces the tax-induced bias in favor of debt observed in a classical tax system such operates in the U.S.

Measured in 2001 dollars, New Zealand companies' real investment is $58.40 billion and the real earnings are $50.80 billion. The terminal value of $105.92 billion is almost double the total income and investment levels. The real return rate is dominated by the market conditions prevailing at the end of the test period and this is consistent with the annual rate result.

The capital structures observed in the six industry sectors did not show any relation to the return rate, market size or growth rate. The more profitable sectors are those with continuing growth.

To conclude the empirical test, we should note that the IRR results represent upper bound estimates. We do not have data on various costs incurred but omitted from the book values of firms when they entered into the sample, and furthermore, factors like survivorship bias would cause IRRs to be over-estimated. We have to admit that we are less confident about our inferences of the New Zealand capital structure measures against the book values of the sample firms, which would call for further more refined research. For example, with a larger sample base or more detailed information of the businesses in the different industry sectors, further research might find more consistency with the theory that, for the aggregate corporate sector, firm leverage ratios manifest detectable patterns as measured against book value.

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Table 1
Sample firms by industry

Industry classifications is based on The Investment Year Book (2001, 2002) published by Datex and The Fact Book published by NZSE (2001). Six industries (excluding financial firms and overseas firms) that constitute the overall NZ non-financial corporate sector are identified: Primary, Energy, Goods, Property, Service and Investment.

Industry	*Primary*	*Energy*	*Goods*	*Property*	*Service*	*Investment*	*Total*
Number of Firms	40	17	26	21	54	23	181

Table 2
IRR by Industry

Non-financial firms listed from the year 1988 are included in the sample. The industry classification is based on The Investment Year Book (2001, 2002) published by Datex and The Fact Book published by NZSE (2001). The IRRs are computed with industry sector portfolios using their cash flows from each year. The real IRR is calculated using the CPI inflation rate, which is obtained from a historical data file provided by the New Zealand Department of Statistics. The quarterly CPI figures from the file are converted into their corresponding annual figures.

Industry Sector	*Nominal*				*Real*			
	IRR		Annual Average		IRR		Annual Average	
	on Value	*on Cost*	*Arith*	*Geo*	*on Value*	*on Cost*	*Arith*	*Geo*
Primary	4.90	4.32	4.80	4.21	2.49	1.94	2.29	1.71
Energy	8.47	12.71	14.93	13.38	6.35	10.41	12.14	10.66
Goods	3.15	6.71	3.86	3.43	0.68	4.13	1.35	0.94
Property	-8.43	-2.67	-2.46	-7.42	-10.65	-5.00	-4.81	-9.65
Service	8.17	11.33	10.97	10.21	6.08	9.11	8.38	7.56
Investment	1.66	4.89	6.19	-2.21	-1.07	2.06	3.95	-4.56
All Sectors	4.19	6.78	4.76	4.18	1.87	4.38	2.28	1.68

Table 3
Annual Returns by Industry

The real IRR is calculated using the CPI inflation rate, which is obtained from a historical data file provided by the New Zealand Department of Statistics. The quarterly CPI figures from the file are converted into their corresponding annual figures.

	Primary		Energy		Goods		Property		Service		Investment		All Sectors	
	Nom	*Real*	*Nom*	*Real*	*Nom*	*Real*	*Nom*	*Real*	*Nom*	*Real*	*Nom*	*Real*	*Nom*	*Real*
1989	13.91	7.77	8.20	2.37	15.08	8.87	54.10	45.79	17.25	10.93	3.03	-2.52	24.57	17.85
1990	-0.30	-6.05	32.09	24.47	9.32	3.01	-45.07	-48.24	-2.65	-8.27	4.65	-1.39	-13.98	-18.95
1991	6.78	4.08	62.18	58.07	-10.59	-12.86	-1.50	-3.99	13.76	10.88	-12.27	-14.49	2.30	-0.30
1992	5.32	4.28	18.70	17.53	-6.71	-7.63	-50.83	-51.32	32.59	31.27	19.61	18.42	-2.01	-2.98
1993	17.20	15.70	13.75	12.29	11.74	10.31	-19.95	-20.98	24.71	23.11	0.36	-0.92	15.27	13.79
1994	19.33	17.22	-12.96	-14.50	-4.73	-6.41	51.26	48.58	35.08	32.69	15.59	13.54	22.83	20.65
1995	-0.02	-3.68	7.85	3.90	-7.37	-10.76	-36.60	-38.92	-1.89	-5.48	-3.68	-7.20	-4.37	-7.87
1996	-5.00	-7.13	32.85	29.86	8.97	6.52	14.00	11.43	-0.89	-3.12	0.31	-1.95	1.79	-0.50
1997	17.51	16.11	14.11	12.75	19.77	18.35	-1.59	-2.76	7.07	5.80	-3.07	-4.22	12.00	10.68
1998	-21.63	-22.63	-11.76	-12.89	-6.64	-7.84	-2.94	-4.18	9.07	7.67	-31.00	-31.89	-6.42	-7.62
1999	1.49	1.59	22.99	23.11	4.02	4.12	2.93	3.03	5.13	5.24	163.23	163.50	6.51	6.61
2000	7.70	4.97	-1.70	-4.19	8.94	6.18	-1.99	-4.47	12.68	9.82	-59.90	-60.91	7.86	5.13
2001	0.12	-2.41	7.72	4.99	8.45	5.70	6.16	3.47	-9.31	-11.60	-16.45	-18.57	-4.40	-6.82
Arith Mean	4.80	2.29	14.93	12.14	3.86	1.35	-2.46	-4.81	10.97	8.38	6.19	3.95	4.76	2.28
Geo Mean	4.21	1.71	13.38	10.66	3.43	0.94	-7.42	-9.65	10.21	7.56	-2.21	-4.56	4.18	1.68
Median	5.32	4.08	13.75	12.29	8.45	4.12	-1.59	-3.99	9.07	7.67	0.31	-2.52	2.30	-0.30
STDev	11.17	11.09	20.09	19.46	9.89	9.48	31.74	30.67	13.67	14.04	51.48	51.97	11.54	11.50
IRR	4.90	2.49	8.47	6.35	3.15	0.68	-8.43	-10.65	8.17	6.08	1.66	-1.07	4.19	1.87

Table 4
Aggregate annual cash inflows and outflows as a percentage of aggregate beginning of year book capital, 1989-2001

Note: Y_t is the sum of interest expense and net profit. Dp_t is depreciation expense. $dLTD_t$ is the change in the book value of long-term debt from year *t*-1 to *t*. $dSTD_t$ is the change in the book value of short-term debt, measured by debt in current liabilities (minus creditors and provisions). I_t (Investment) is the change in book capital (the book value of long-term debt, short-term debt, and equity) from *t*-1 to *t*, plus depreciation. Int_t is interest expense. Div_t is dividends paid. The net flow from the sale and repurchase of stock, $dS_t = (I_t + Int_t + Div_t) - (Y_t + Dp_t + dLTD_t + dSTD_t)$, balances the cash flow identity. $Sum_t = (I_t + Int_t + Div_t) = (Y_t + Dp_t + dS_t + dLTD_t + dSTD_t)$, is the total available value percentage, generated or raised in the year, relative to the beginning book value.

	Y(t)	*Dp(t)*	*dS(t)*	*dLTD(t)*	*dSTD(t)*	*I(t)*	*Div(t)*	*Int(t)*	**Sum**
1989	7.73	4.15	6.15	6.82	1.09	16.88	2.80	6.27	25.94
1990	6.99	4.30	6.59	6.04	1.75	17.75	2.58	5.35	25.67
1991	1.09	4.98	4.53	9.95	8.89	21.73	2.14	5.57	29.43
1992	2.53	3.94	4.46	-1.17	0.59	4.93	1.65	3.78	10.35
1993	1.76	4.85	2.66	-8.26	-6.59	-11.19	2.46	3.16	-5.57
1994	7.94	5.66	6.82	2.95	-4.19	11.06	4.71	3.41	19.18
1995	8.98	5.27	7.43	2.19	0.82	15.41	6.02	3.26	24.69
1996	4.53	5.13	9.08	4.61	-0.10	14.71	5.64	2.90	23.25
1997	5.17	5.66	3.25	1.92	2.10	10.16	4.87	3.06	18.10
1998	6.82	5.81	5.35	13.16	-1.10	22.09	4.68	3.27	30.03
1999	4.44	5.51	4.78	-0.28	0.65	8.12	4.05	2.93	15.10
2000	5.67	5.15	6.27	4.02	3.90	17.62	4.30	3.09	25.00
2001	0.50	4.28	5.04	-4.48	4.20	4.09	2.35	3.10	9.54
1989-2001	4.93	4.98	5.57	2.88	0.92	11.80	3.71	3.78	19.29
					FF				
1987-91	9.43	6.09	0.04	3.14	2.39	13.76	3.05	4.28	21.09
1992-96	8.22	6.55	1.57	1.59	0.22	11.96	2.82	3.36	18.14
Average	8.83	6.32	0.81	2.37	1.31	12.86	2.94	3.82	19.62

Table 5
Annual components of net cash flows for 1988-2001, in billions of 2001 dollars

The sample includes a total of 174 NZSE listed non-financial firms in the DATEX database that have data on the market and book value of capital for at least three consecutive years between 1988 and 2001. A firm enters the portfolio at the end of the first fiscal year that we have market and book value data, and it leaves at the end of the last fiscal year that we have market book value data. A firm's net cash flow from operations, $X_t - I_t$ is included in aggregate net cash flow beginning in the year after the firm enters the portfolio through the year it leaves the portfolio. X_t , the cash inflow from operation, is income before interest expense plus depreciation (Dp_t). Investment I_t is the change in book capital from *t*-1 to *t*, plus depreciation (Dp_t). FBC_t is the cost of new firms bought at the book value of capital in year *t*. FBV_t is the cost of firms bought at the market value of capital in year *t*. FS_t is the market value of capital of firms sold when they leave the sample or at the end of the sample period, 2001. When firms that enter the sample are bought at cost, New Flow, the total net cash flow for year *t*, is $(X_t - I_t) + (FS_t - FBC_t)$. When entering firms are bought at value, New Flow is $(X_t - I_t) + (FS_t - FBV_t)$. The real IRRs in Table 2 are the discount rates that set the present values of the streams of Net Flows equal to zero.

	New Firms at Book Value		*New Firms at Market Value*							
	Net Flow	FBC_t	*Net Flow*	FBV_t	FS_t	$X_t - I_t$	X_t	I_t	Dp_t	$I_t - Dp_t$
1988	-30.24	30.24	-38.06	38.06	0.00	0.00	0.00	0.00	0.00	0.00
1989	-1.75	0.32	-2.07	0.64	0.00	-1.43	3.40	4.83	1.19	3.64
1990	-4.37	2.39	-3.99	2.01	0.00	-1.98	3.46	5.44	1.32	4.12
1991	-7.05	1.37	-7.24	1.57	0.00	-5.68	2.20	7.88	1.80	6.07
1992	-4.71	5.38	-8.97	9.64	0.00	0.67	2.82	2.15	1.72	0.43
1993	23.44	0.35	23.14	0.66	15.19	8.60	3.19	-5.41	2.34	-7.75
1994	-1.09	2.13	-1.46	2.50	0.37	0.66	3.56	2.89	1.48	1.41
1995	-0.16	2.64	-0.27	2.76	2.82	-0.33	4.08	4.41	1.51	2.90
1996	-14.04	13.21	-12.81	11.98	0.76	-1.58	3.03	4.62	1.61	3.00
1997	-0.58	1.21	-1.85	2.48	0.33	0.30	4.87	4.58	2.55	2.03
1998	-4.73	2.71	-5.20	3.18	2.46	-4.47	5.96	10.43	2.74	7.69
1999	-1.14	8.57	-1.44	8.87	6.42	1.02	5.55	4.53	3.08	1.46
2000	6.60	0.70	6.33	0.97	11.07	-3.77	5.99	9.76	2.85	6.91
2001	66.90	0.00	66.90	0.00	66.51	0.39	2.68	2.29	2.40	-0.11
Sum	27.10	71.23	13.02	85.31	105.92	-7.59	50.80	58.40	26.59	31.81

Table 6
Components of Market and Book Capital

Common stock and preferred stock are the total equity values from the financial statements in Datex files. Their market values are computed from the number of shares issued and the current market price of these shares. Long-term and short term debt are interest-bearing liabilities. These values are measured relative to the total value of equity and interest-bearing debt.

A. All Firms

	Components of Market Capital		Components of Book Capital	
	Common/preferred Stock	*LT & ST Debt*	*Common/preferred Stock*	*LT & ST Debt*
1989	0.62	0.38	0.52	0.48
1990	0.66	0.34	0.50	0.50
1991	0.55	0.45	0.49	0.51
1992	0.47	0.53	0.41	0.59
1993	0.52	0.48	0.45	0.55
1994	0.72	0.28	0.57	0.43
1995	0.77	0.23	0.60	0.40
1996	0.75	0.25	0.63	0.37
1997	0.71	0.29	0.62	0.38
1998	0.71	0.29	0.59	0.41
1999	0.62	0.38	0.54	0.46
2000	0.63	0.37	0.51	0.49
2001	0.56	0.44	0.46	0.54
1988-2001	0.64	0.36	0.53	0.47

B. Industry sectors

Primary	0.52	0.48	0.53	0.47
Energy	0.71	0.29	0.66	0.34
Goods	0.75	0.25	0.61	0.39
Property	0.61	0.39	0.57	0.43
Service	0.66	0.34	0.53	0.47
Investment	0.67	0.33	0.53	0.47

Table 7
Aggregate investment and forms of financing as percent of aggregate beginning of year book capital

I_t (Net Investment) is the change in book capital (the book value of long-term debt, short-term debt, and equity) from *t*-1 to *t*, plus depreciation. Retained cash earnings, RCE_t is the sum of net profit and depreciation minus dividend and interest paid. $dLTD_t$ is the change in the book value of long-term debt from year *t*-1 to *t*. $dSTD_t$ is the change in the book value of short-term debt. dS_t is the net flow from the sale and repurchase of stock. We have the balance $I_t = RCE_t + dS_t + dLTD_t + dSTD_t$, where net investment comes from either retained cash or issued securities.

Year	I_t	RCE_t	dS_t	$dLTD_t$	$dSTD_t$
1989	16.88	2.81	6.15	6.82	1.09
1990	17.75	3.37	6.59	6.04	1.75
1991	21.73	-1.64	4.53	9.95	8.89
1992	4.93	1.05	4.46	-1.17	0.59
1993	-11.19	0.99	2.66	-8.26	-6.59
1994	11.06	5.47	6.82	2.95	-4.19
1995	15.41	4.98	7.43	2.19	0.82
1996	14.71	1.12	9.08	4.61	-0.10
1997	10.16	2.89	3.25	1.92	2.10
1998	22.09	4.68	5.35	13.16	-1.10
1999	8.12	2.97	4.78	-0.28	0.65
2000	17.62	3.43	6.27	4.02	3.90
2001	4.09	-0.66	5.04	-4.48	4.20
1989-2001	11.80	2.42	5.57	2.88	0.92
FF					
1987-91	13.76	8.19	0.04	3.14	2.39
1992-96	11.96	8.58	1.57	1.59	0.22
Average	12.86	8.39	0.81	2.37	1.31

Figure 1
Annual real return rates

The simple annual rate of return is measured based on the assumption that the investor has a one-year holding period. The annual return includes the dividend income, interest payment and market appreciation of the equity value.

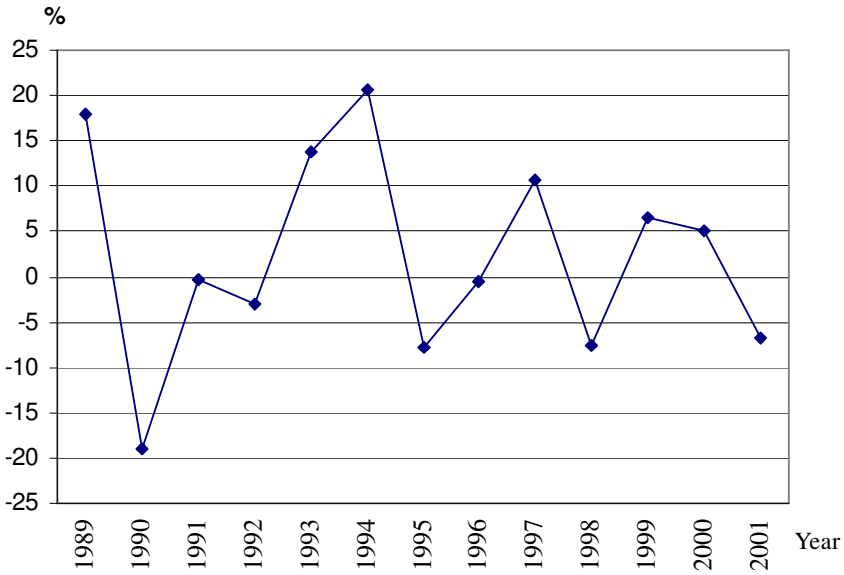


Figure 2
Industry Breakdown of debt ratios, market values and annual return

The debt ratios are usually moving in the range from 20% to 60%. The distribution is more condensed in the range of 20% to 40%. Most sectors are in stable levels of market value (Chart B). The special case is the Service industry, continuously growing from 1.29 billion in 1988 to a level of 43.94 billion in 2001. The other continuous growing industry is Energy growing from 0.21 billion in 1988 to 8.33 billion in 2000. These two are also the most profitable sectors in the test period. The annual return rates are nominal rates. The annual return rates are generally changing in cyclical form. The Investment sector has an extreme return of 1.63% in 1999, but its average is only 0.08% over the whole time period

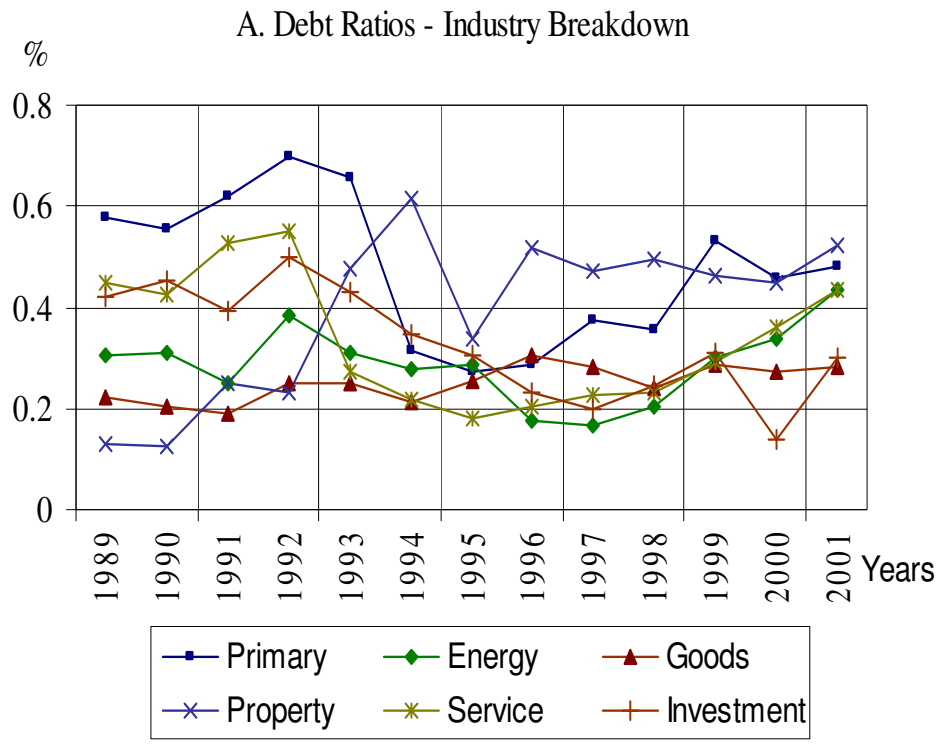
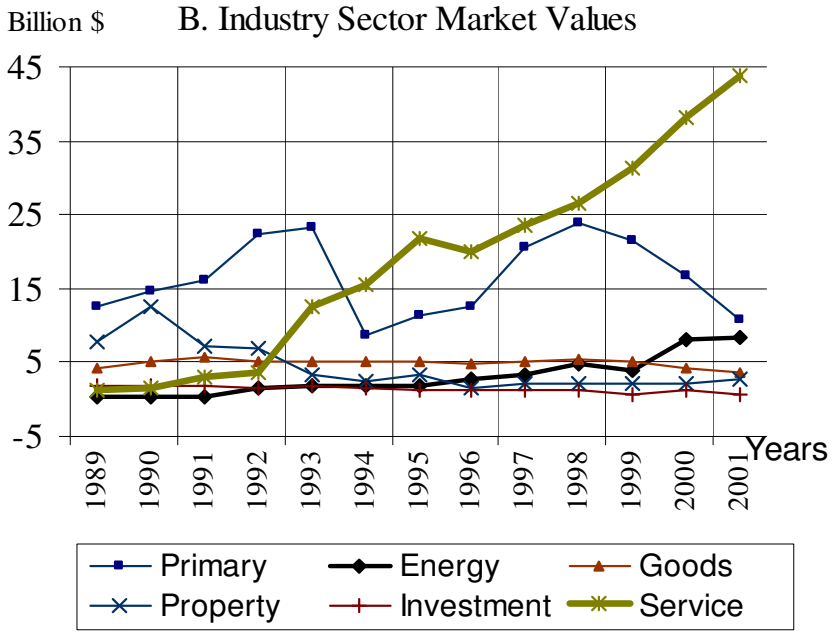


Figure 2 (continued)
Industry Breakdown of debt ratios, market values and annual return



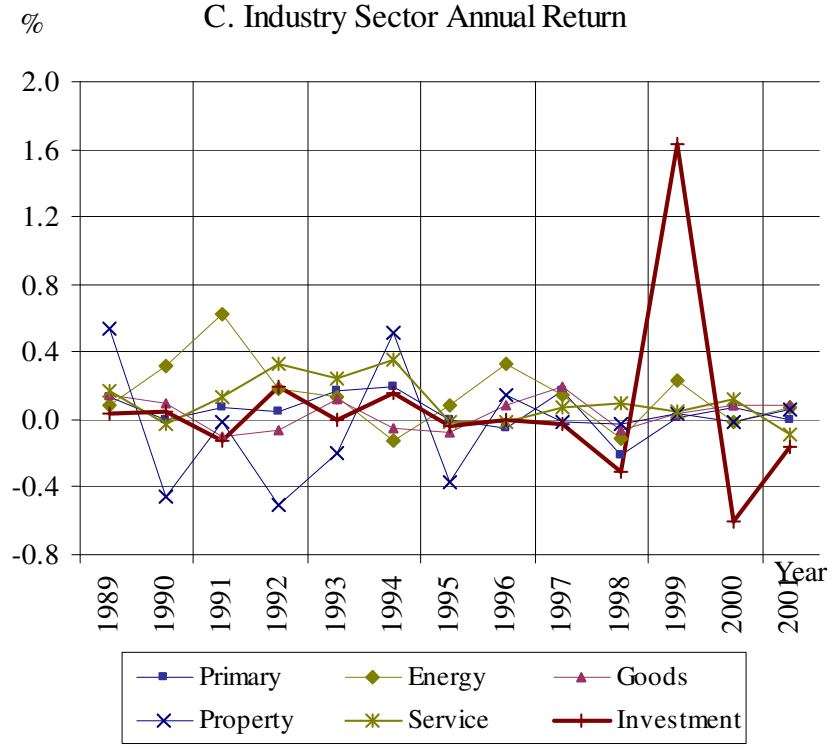


Figure 3
Investment and financing, all sectors

I_t (Net Investment) is the change in book capital (the book value of long-term debt, short-term debt, and equity) from *t*-1 to *t*, plus depreciation. Retained cash earnings, RCE_t is the sum of net profit and depreciation minus dividend and interest paid. $dLTD_t$ is the change in the book value of long-term debt from year *t*-1 to *t*. $dSTD_t$ is the change in the book value of short-term debt. dDt, the change in the book value of total debt, equals $dLTD_t$ plus $dSTD_t$. dS_t is the net flow from the sale and repurchase of stock. We have the balance $I_t = RCE_t + dS_t + dLTD_t + dSTD_t$, where net investment comes from either retained cash or issued securities.

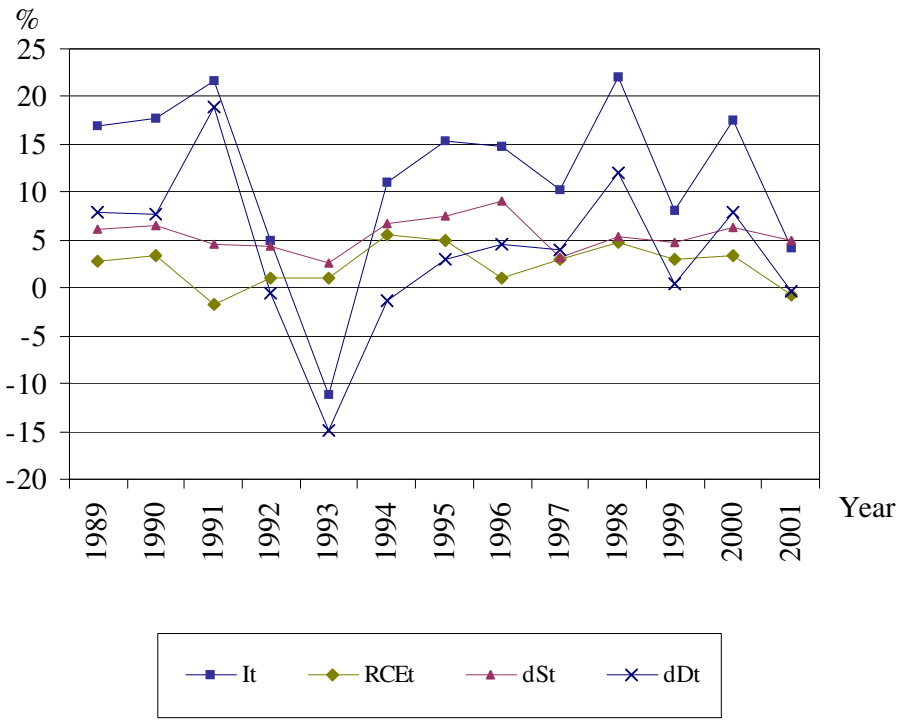


Figure 4 Investment and financing, industry breakdown

See the notes in Figure 3.