MEASURING THE COST OF CAPITAL IN AUSTRALIA

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ABSTRACT

The cost of capital is the minimum rate of return that an investment project must earn in order to cover its funding costs and any tax liabilities. Australian studies on this subject have produced a wide range of estimates. This paper demonstrates that a wide range of outcomes can result from often arbitrary assumptions used in constructing measures of the cost of funds.

The paper suggests that any conclusions drawn about intertemporal trends or international comparisons of the cost of capital should be treated with care. For managers, it serves as a reminder that the use of simple invariant rules-of-thumb for investment decisions may be inappropriate. In particular, changes of tax regime and inflation should be taken into account in setting 'hurdle rates' for investment proposals.

TABLE OF CONTENTS

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1. INTRODUCTION

The cost of capital is a somewhat nebulous concept. The concept referred to in economic analysis, where the focus is on how the cost of capital in Australia has changed over time, how it compares with other countries, and how it affects firms' investment decisions, may be different from that considered important by the business community. As well as conceptual differences, there are substantial difficulties with measurement. Furthermore, the cost of capital refers, strictly speaking, to *expected* returns. *Realised* returns, although often the only kind of data available, may not be a good guide. It is not surprising that a wide range of estimates of Australia's cost of capital has been produced over the last decade or so.

This paper outlines the relationship between the cost of funds and the cost of capital and the underlying variables which comprise them. The difficulties in measuring these concepts, and the variety of estimates that can be derived from different but plausible approaches are illustrated by some calculations. Various Australian studies are surveyed to underscore how differences in concept and measurement translate into significant differences in estimated magnitudes.

2. WHAT IS THE COST OF CAPITAL?

Modern financial theory - and increasingly corporate practice - says that firms should evaluate investment projects based on discounted cash flows. The 'Net Present Value' method involves discounting cash flows (operating returns and scrap value, less initial purchase price and taxes net of concessions) at an appropriate rate and proceeding with those projects with a positive NPV (or if capital constrained those with high NPV/outlay). The 'Internal Rate of Return' method involves calculating the discount rate at which NPV is zero and comparing this with a 'hurdle' rate.

A starting point for setting the appropriate discount rate or hurdle rate is a measure of the cost of acquiring the finance for the project. The cost of funds to the company is the weighted average of the interest rate and the return to equity[1], less any tax benefits received by the company. In most corporate finance literature, this rate is referred to as the "cost of capital", but to distinguish it from the more complex concepts examined below, this concept is referred to *in this paper* as the cost of funds to the company.[2] The cost of funds is therefore independent of the nature of the project. However, if the project is of above-average risk, then this too must be taken into account in investment decisions. [3]

The cost of funds would not be a satisfactory basis for comparing different tax regimes (a higher tax rate, other things equal, lowers the cost of funds; this counter-intuitive result arises because the cost of funds incorporates the interest deductibility aspect of taxation, but not the taxation on corporate profit itself. So the cost of funds would be lower in a country with higher company tax). Nor would it be useful for comparing the viability of a particular project under two different depreciation regimes or under different rates of inflation.

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[1] To avoid unwarranted complexity, it is implicitly assumed in much of this paper that, when looking at the cost of equity, the cost of retained earnings and the cost of issuing new shares are equal. Strictly speaking, differential tax rates on retained and distributed earnings and transactions costs, mean the cost of funds should be a weighted average of the cost of debt, the cost of profit retention, and the cost of new share issues.

[2] From the firm's viewpoint it is not all that important whether the calculations are done in real or nominal terms so long as consistency is maintained. Pohlman et al's (1988) survey of large U.S. firms showed about half the firms used nominal and half real cash flows. Pike (1988) shows a similar variety for the U.K. In this paper we assume the cost of funds is a nominal measure unless otherwise stated.

[3] While adjusting the cost of funds (for example, by applying the Capital Asset Pricing Model -see below) is probably the best way of allowing for risk, in practice other procedures may be followed. Lilleyman's (1984) survey of Australian firms found that 27 per cent incorporated risk by increasing the discount rate while 23 per cent subjectively adjusted the cash flows (other firms did not use discounted cash flow techniques but often changed the payback period to adjust for risk). Gitman and Mercurio's (1982) U.S. survey showed that 32 per cent of firms incorporated risk by adjusting the cost of funds, 39 per cent by adjusting cash flows, 20 per cent by adjusting both and 9 per cent in other ways. Oblak and Helm's (1980) survey of multinational firms showed a similar variety of practice.

The cost of capital is defined *in this paper* as the gross real return a project needs to earn to be viable. It provides the basis for comparisons across countries and over time, as well as between different tax and depreciation regimes. It can answer such questions as: "what return should public sector projects achieve to put them on an equal footing with private sector projects?" A higher measured cost of capital says that the project must have a higher return to be viable. This may be because of high risks or taxation factors. It may reflect the "mix" of funding between debt and equity. As the calculation is based on historical data rather than (unmeasurable) expectations, it may reflect abnormal actual returns during the data period. This concept of the cost of capital is much richer than the intuitive starting point of some weighted combination of borrowing and equity costs.

Sections 2.1 to 2.3 examine methods for measuring and weighting the two sources of finance which comprise the cost of funds and give examples to show the significance of differing approaches. The distinction between the cost of funds and the cost of capital is the focus of section 2.4. Section 2.5 discusses the implications of dividend imputation.

2.1 The Cost of Equity

Measurement of the cost of equity is probably the most difficult and controversial aspect of this procedure. Three common methods of estimating the cost of equity are: the capital asset pricing model; the earnings/price model; and the realized gains approach.[4]

2.1(a) Capital Asset Pricing Model (CAPM)

The CAPM, developed by Sharpe (1964) and Lintner (1965), is a widely used approach to estimate the cost of equity for individual companies. It focuses on why required rates of return may vary across stocks. It is assumed that firms need not compensate individuals for firm-specific risk because it is

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[4] The limited survey evidence shows a variety of approaches. In Gitman and Mercurio's (1982) U.S. study 23 per cent of respondents used 'market return adjusted for risk' (ie. CAPM or similar), 31 per cent used the 'dividend yield adjusted for growth', 16 per cent the earnings/price model and others an unspecified 'return required by investors'.

easy for an individual to hold a well-diversified portfolio of investments.[5] The relevant measure of risk is thus "beta", a measure of the covariance between returns for the individual security and returns on the market portfolio. A beta of more than one means that the security's return tends to move more than proportionally with movements in the market; in this sense it is riskier than the market portfolio and shareholders demand a higher-than-market return.[6]

When estimating the cost of equity for the economy as a whole, beta equals one and the CAPM becomes similar to the realized gains approach (discussed below). However, the CAPM has also been extended to an international context, where betas are estimated for each country relative to the world market.[7]

2.1(b) Earnings/Price Model

Another approach for estimating the cost of equity is the earnings/price model. In this model, the cost of equity is assumed to be the discount factor implicitly adopted by shareholders when determining the present value of their expected returns, that is the share price. This discount rate takes into account the opportunity cost and the riskiness of the project. Assuming the stream of income to the shareholder is represented by company earnings[8], the relationship between future earnings (E_t), the cost of equity (R_e), and the current market price of the stock (P_0) is[9]:

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5 See modern financial textbooks such as Copeland and Weston (1983) pp190-192 for a discussion of firm specific (diversifiable) and market (non-diversifiable) risk in the context of the CAPM.

6 A survey of empirical evidence on the CAPM is given in Section IV of Fama (1991). His basic conclusion is that early tests supported the CAPM but more recent work suggests additional variables to beta, such as size or earnings yield, are also important determinants of returns. The CAPM has also been extended to allow for the effects of taxes arising from dividend payments, uncertain inflation, liquidity, and market capitalisation are discussed in Van Horne (1989), pp. 73-80.

7 Richards (1991) discusses the International Asset Pricing Model in more detail.

8 This assumption does not hold if capital gains are taxed differently to other income or if, by accepting retained earnings, the shareholder is able to defer tax payments to a time when they will face a lower tax rate (eg retirement). Note that the E/P model is a variation of the Dividend Discount Model, where it is assumed that dividends paid represent the stream of income to the shareholder.

9 Throughout this paper, nominal magnitudes are given in upper case, real magnitudes in lower case and growth rates in italics.

$$P_0 = \sum_{t=1}^{\infty} \frac{E_t}{(1 + R_e)^t} \qquad (1)$$

The E/P model can be rewritten to allow for constant expected growth of earnings (g):

$$P_0 = \sum_{t=1}^{\infty} \frac{E_1(1 + g)^{t-1}}{(1 + R_e)^t}$$

$$P_0 = \frac{E_1}{R_e - g} \qquad (2)$$

This expression can be rearranged to give the required return to equity as a function of the E/P ratio and the expected growth rate of earnings.

$$R_e = \frac{E_1}{P_0} + g \qquad (3)$$

The first term on the right hand side of equations (3) is intuitive - if potential investors demand immediate high rates of return then the cost of attracting these investors is high. The E/P model also takes account of investors' assessments of future operating and investment performance. Investors are willing to pay now for expected superior future returns. If investors demand that returns grow rapidly over time then the required return to equity is also high. This is captured by the second term.

The pros and cons of the E/P method are well documented.[10] In summary:

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[10] See Irvine (1991), Richards (1991), and McCauley and Zimmer (1989).

- data on E/P ratios are easily available; and
- E/P ratios contain useful information regarding the stock market's valuation of future earnings flows, including the riskiness of those flows.

But:

- the ratios are volatile and have a cyclical pattern;
- while the price data are available instantaneously the earnings data have considerable lags; and
- adjustments for expected growth are important to the outcome, but difficult to make and generally unreliable. [11]

Furthermore, there are limitations inherent in the use of accounting data. During times of high inflation, historical-cost estimates may result in vastly different estimates of earnings and asset values. For example, when fixed assets and inventories are measured at historical cost, during inflationary periods it is quite likely that deductions made from gross income for depreciation will be insufficient to capture the increasing replacement cost of the asset while the income from inventory sales will overstate true income (if the First-In-First-Out method of inventory accounting is used).[12] The combined effect is to overstate true firm income and to understate the true value of the firm's assets. Alternatively, if an accelerated depreciation schedule is used for taxation purposes, earnings may require an upward adjustment. Thus a rate of return based on historical-cost accounting will be a misleading indicator of a firm's economic performance and of its cost of capital.

Even if efforts are made to adjust accounting earnings to remove biases and the effects of inflation and taxation, problems remain - especially when

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[11] McCauley and Zimmer (1989), in a widely quoted application of the E/P ratio method, find adjustment for expected growth appears to increase the cost of equity by about 2 percentage points in most countries in most years. Since adjustment for growth does not affect country rankings, McCauley and Zimmer propose that growth potential should be ignored. However, the fact that expected growth does not affect rankings in this case is most likely a by-product of the data used - which were heavily qualified IMF projections of potential business sector output growth for the period 1974 to 1995 and were quite similar for all countries for the period 1989-95. See Adams, Fenton and Larsen (1987) for more details.

[12] See Willmann (1990), p10.

making cross-country comparisons. Different countries (and indeed, different companies) have different accounting conventions or managerial incentives that may affect reported earnings considerably. It is important to be aware of these differences and, where possible, to adjust properly for them before making international or even inter-company comparisons.

2.1(c) Realised Gains Approach

This approach measures the return to shareholders (usually including capital gains) as a proportion of market value. In this sense, it is similar to the E/P approach and is often used in preference because of its simplicity. While the E/P approach attempts to be forward looking by incorporating the expected growth rate of earnings (and so measures the required, expected or ex-ante rate of return), the realised gains approach relies on the assumption that past returns are an accurate reflection of the returns required by shareholders in the future (and so measures the realised or ex-post rate of return).

Over long periods of time this assumption is reasonable, as investors and lenders probably expect to realise their returns over the long rather than the short term and expect a variety of random shocks (all of which have small probabilities of occurring) during the term of the investment. However, over the short term, this method (and the E/P approach) can be misleading because of the volatility of share prices. It can also give quite contrary signals as to the true cost of equity in periods when alternative rates of return are changing. For example, when interest rates are falling, a comparable decline in the required rate of return on equity is expected. For this to occur stock prices must rise. Using the realised gains method, however, an increase in stock prices appears as a short-term increase in the cost of equity (via an increase in the capital gain).

Even over the longer term, the realised gains approach (like the E/P approach) gives estimates which are very sensitive to the time period chosen. The graph below shows two measures, differing in the averaging period, of the (ex post) pre-tax rate of return to shareholders.[13] The nominal return is calculated from 'accumulation' indices which assume all

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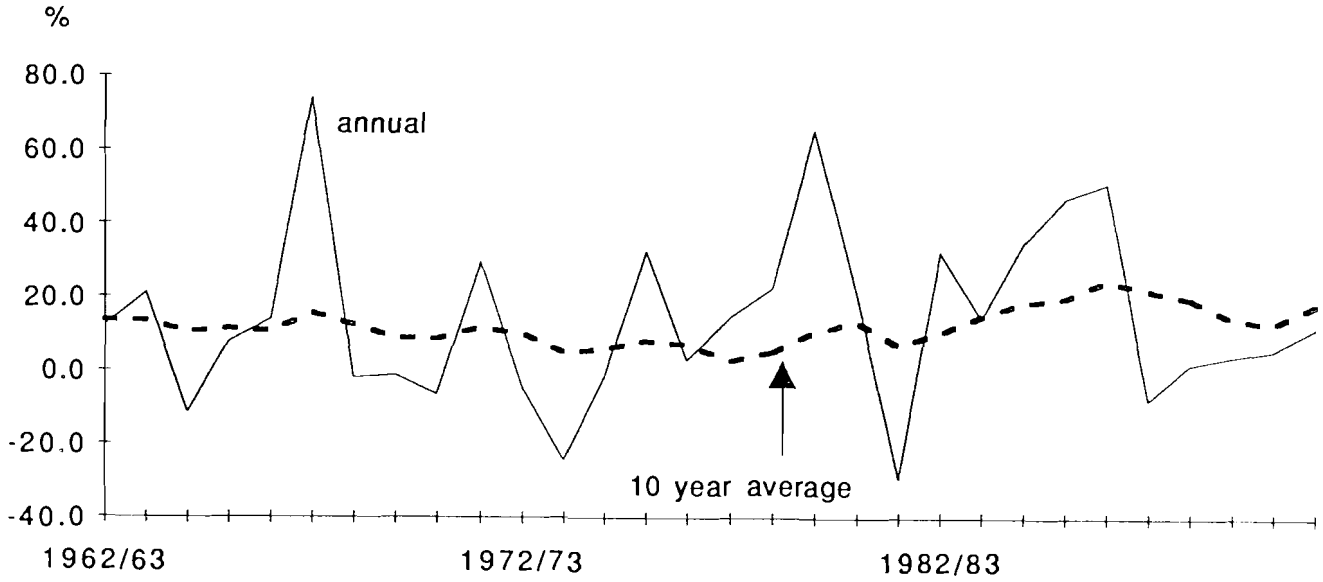
[13] Data and sources are given in Appendix 2.

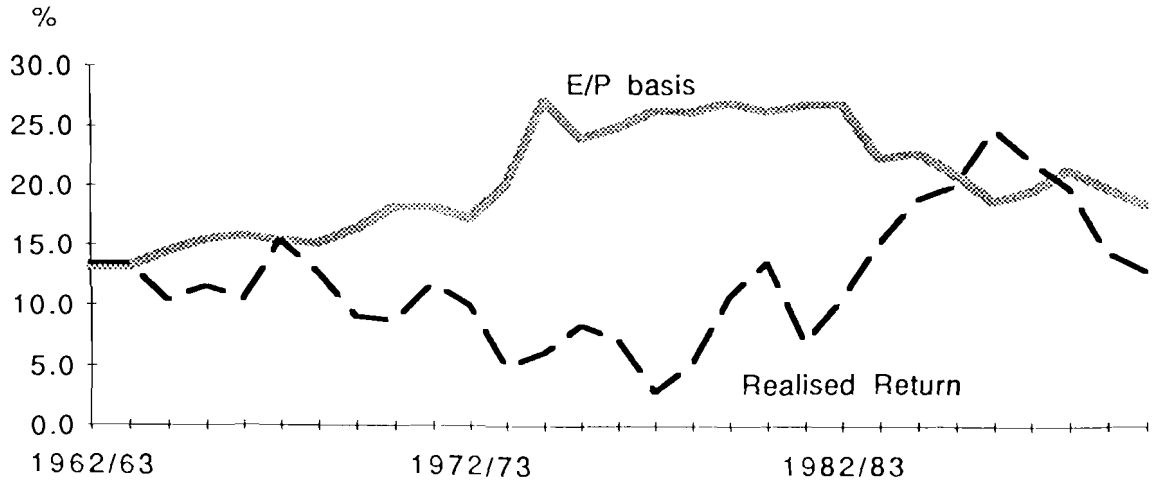
dividends are re-invested. It is clear that the result is heavily dependant on the time period chosen: the annual returns are far more volatile than the ten-year returns. The results for the cost of equity will vary greatly depending on which time period is assumed to be relevant in the formation of expectations.

REALISED RETURN TO SHAREHOLDERS



The following graph compares the realised returns (using the ten-year average) with a measure calculated on the E/P basis. The latter requires an assumption on the expected growth of earnings. Given that the profits share of GDP, while fluctuating over the cycle, has shown no very strong trend, it is assumed that the longer term expected growth in corporate earnings can be proxied by the expected growth in GDP. For the purposes of the graph it is further assumed that the expected longer-term growth rate of GDP is that rate achieved over the previous ten years.

COST OF EQUITY



It is clear from the graph that the two approaches yield starkly different results. Even after the decennial averaging, the poor performance of the stockmarket over much of the 1970s and the boom in the mid-1980s causes the realised gains measure to fluctuate much more than has the measure based on E/P ratios. Some would suggest that the 1970s and/or 1980s experiences were exceptional and aberrant and so would not have affected expectations to the extent shown.[14] It is true that their influence could be almost smoothed away by taking a 20 or 30 or 40 year average. But others would object to an approach which postulated that the cost of equity was virtually constant and barely affected by actual returns. Clearly there is considerable scope for judgement in selecting the appropriate measure. This in itself should give pause to those wishing to present a definitive measure.

2.2 The Cost of Debt

The cost of debt is easier to measure than the cost of equity, since nominal rates of interest are directly observable. Computing a measure is a matter of choosing an interest rate and then adjusting that rate for the tax deductibility of interest payments.

There is no consensus regarding the interest rate(s) that should be used to measure the cost of the debt component of the cost of funds. At an industry level, the cost of debt will vary according to the risk associated with the project. When measuring an average or aggregate cost of debt there appear to be two common methods:

- a medium or long-term industrial funding rate, which represents the average cost of funds over the life of a 'typical' private-sector investment project; and

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[14] The Department of Finance (1987) suggest that the cost of capital since the mid-1970s may overstate the long-run required rate because of depressed corporate profitability and instability in crude-oil prices. It is not clear, however, whether the cost of capital in either period, or an average of the two is a better estimate of the long-run expected cost of capital. In order to determine this it would be necessary to know whether the type and frequency of "shocks" to which the Australian economy was exposed during the latter period were abnormal, or whether the relative "calm" of the earlier period was an historical aberration.

- a weighted-average rate of interest with weights reflecting the mix of debt outstanding in the non-financial corporate sector.

The former approach has been used in a number of Australian studies, including those of Carmichael and Stebbing (1981), Johnston et. al. (1984) and Dews (1989). All these studies used a medium-term industrial debenture rate to represent the cost of debt. The latter approach has been used by Irvine (1991) and the Australian Manufacturing Council (1990) who both used a weighted-average of short-term and long-term rates.

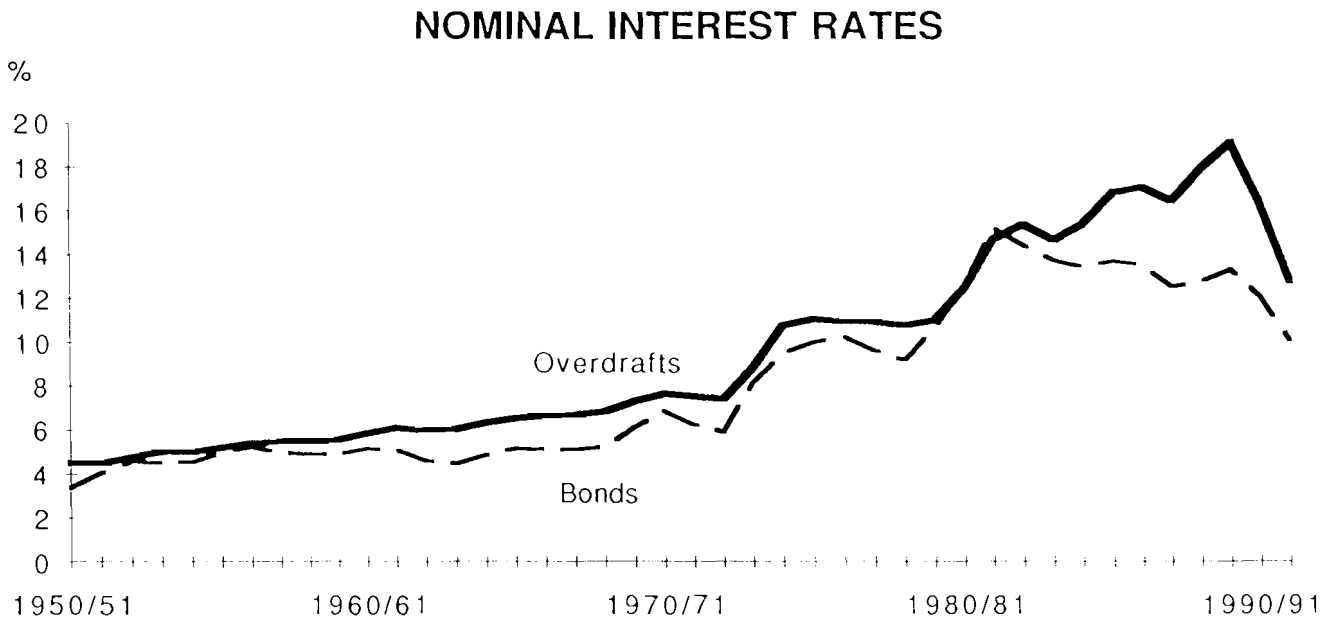
As with the various cost of equity measures, the alternative measures for the cost of debt both have shortcomings. The decision to use a medium or long-term rate is based on the premise that an investment decision is normally long term and that the relevant cost of debt is the expected cost of debt over the term of the project. The cost of debt should represent the opportunity cost of tying the funds up in the project, that is the rate of return that funds invested in a venture of similar risk could have earned.

Presumably a long-term rate will reflect borrowers' expectations regarding interest rates over the life of the project better than will a short-term rate. Borrowers may actually finance long-term investments by 'rolling-over' short-term funds (or indeed by utilising an overdraft), but if the expectations hypothesis (which suggests that the term structure of interest rates is determined by investors' expectations regarding future spot rates relative to current spot rates) holds, then the long term rate is still the best measure of the expected cost over the period of the investment. However, Fama (1984) found that the expectations hypothesis does not fully explain the term structure of interest rates.

If the hypothesis is generally false, it may be more sensible to use a weighted-average of short and long-term rates in calculating the cost of debt in cost of capital estimates. However, if the hypothesis is approximately holds, then a weighted average that includes only short-term rates at any one point in time does not adequately reflect information regarding <u>expected</u> future short-term rates. For example, in periods of relatively tight monetary policy (or an inverse yield curve) a weighted-average measure will overstate the cost of capital by not sufficiently allowing for the expected future fall in spot short-term rates.

Almost all measures of the cost of debt include only easily observable, direct interest costs. But bank loans or bond issues may often include fees or may be just one item in a package of services provided by a bank. Furthermore, banks may require corporate borrowers to hold liquid balances yielding less than market rates with them which raises the effective cost of loans.

The graph below compares two nominal interest rates for which a run of data is readily available; the prime overdraft rate (a floating rate) and the government 10-year bond rate (a fixed rate). Both will understate the costs of borrowing for many companies, especially in the latter period. Only a very small proportion of bank customers are able to borrow at the prime rate. Banks apply margins over the quoted or 'prime' rates to reflect the risk of individual companies. Corporate bonds will have higher yields than government securities, reflecting both the default risk and the partially (though decreasingly so) 'captive' nature of the market for government securities. The rate on industrial debentures given in Dews (1988), for example, averaged 2 percentage points above the bond rate over the period 1962 to 1986.



As interest on debt is tax-deductible for companies, the cost of debt should be expressed in after-tax terms. Some studies employ an "effective" tax rate rather than the statutory tax rate. An effective tax rate is the ratio of

actual tax paid to earnings after interest (but before any tax allowances). An effective rate less than the statutory rate tells us that the firm is able to reduce its taxable income by an allowance for depreciation or by some other tax allowance. Of course, if changes to the corporate tax system are expected, then these should be incorporated into estimates of the effective tax rate but measuring this effect would be quite difficult. Furthermore, for many purposes it is marginal rather than average tax rates that are relevant. While in the Australian system the average and marginal statutory rates are the same, this is not necessarily true of the effective rates.

2.3 The Cost of Funds

The cost of funds takes into account the after-tax cost of both debt and equity funds.

$$R_f = R_e \frac{E}{F} + (1 - t_c) R_d \frac{D}{F} \qquad (4)$$

where:

R_e = average cost of equity;

t_c = corporate tax rate;

R_d = nominal interest rate;

D = value of debt outstanding;

E = value of equity outstanding; and

F = D+E, total funds employed.

Weighting debt and equity to reach a cost of funds creates its own set of conceptual and measurement problems. The available survey evidence shows a variety of responses of firms to these questions.[15]

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15 Freeman and Hobbes (1991) found that in Australia while 62 per cent of firms constructed a weighted average 28 per cent just used the cost of debt while 2 per cent just used the cost of equity. Oblak and Helm's (1980) survey of multinational firms found 54 per cent using a weighted average, 13 per cent just the cost of debt and 25 per cent just the cost of equity. In Gitman & Mercurio's (1982) U.S. survey 16 per cent of respondents used book values, 29 per cent used market values, 42 per cent used their target weights and 17 per cent used only debt or equity costs depending on how they planned to fund the particular project.

In calculating proportions of debt and equity to total funds employed, market value rather than book value weights should be used, in order to be consistent with the market values used in calculating the costs of the various types of financing, and with the aim of maximizing value to shareholders. For pragmatic reasons the market value of equity and the book value of debt are often used.[16]

As discussed further by Ryan (1990), the mix of debt and equity has changed substantially over time. This should be accounted for in any estimate of the cost of capital. The extent of its impact will reflect both the size of the change in gearing and the difference between the measures of the cost of equity and cost of debt employed.

A problem with using the observed capital structure to weight debt and equity costs arises if corporations are making their investment decisions based on a planned change in the mix of debt and equity. If the target capital structure differs from the current structure, new financing patterns must be used to make the transition. It is the marginal flows of debt and equity in the current period which are relevant to the cost of capital in that period - not the stock of debt and equity outstanding. The latter represents an accumulation of past decisions only. In Australia, changes associated with the introduction of imputation in 1987/88 may have changed the desired mix of debt and equity towards equity. This means that cost of funds estimates using debt to equity ratios based on stock (rather than flow) data and using a similar methodology to that of Carmichael and Stebbing (1981) and Dews (1989) may give undue weight to the cost of debt in recent years.

The following graph shows the quantitative importance of some of these factors. The four lines all use the same measures of the costs of debt and equity. They differ only in the weights employed. Measure (a) is based on values for the stock of debt and equity taken from the data on the liabilities of the private non-finance sector. Measure (b) is based on the net changes in these figures each year. (It could be argued that it is the gross changes that are more relevant but data are not available.) Measure (c) is also based

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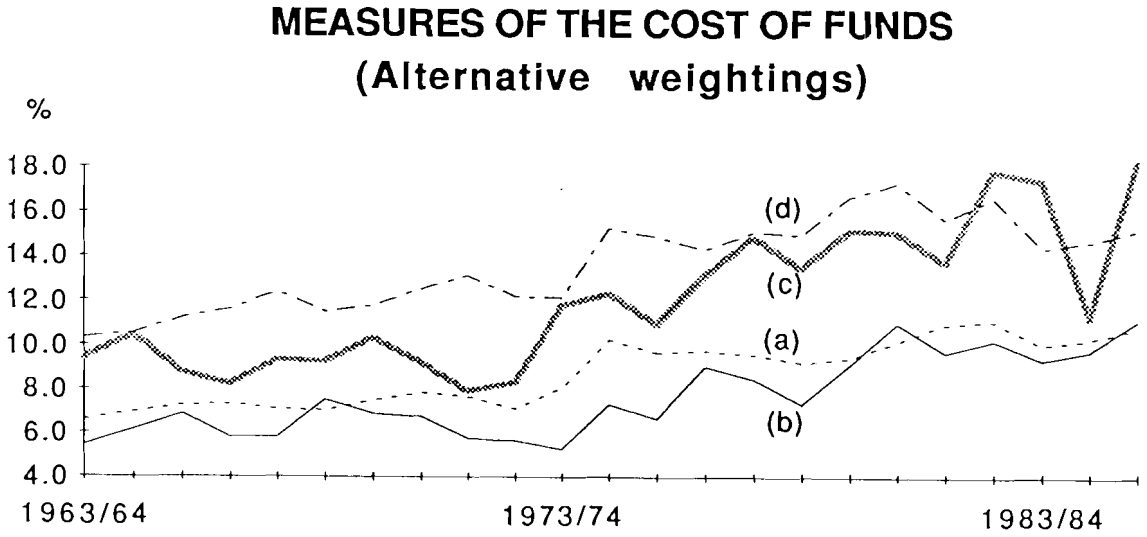
16 For examples, McCauley and Zimmer (1989), Dews (1989) and Carmichael and Stebbing (1981) use this combination.

on marginal shares but the data are taken instead from financial flow accounts. Measure (d) is based on the market value of debt and equity for a sample of 50-60 companies listed on the Sydney Stock Exchange. It is evident that while the broad sweep of the series are similar, quite different stories could be told about the cost of funds over shorter periods of time depending on the weighting procedure adopted.



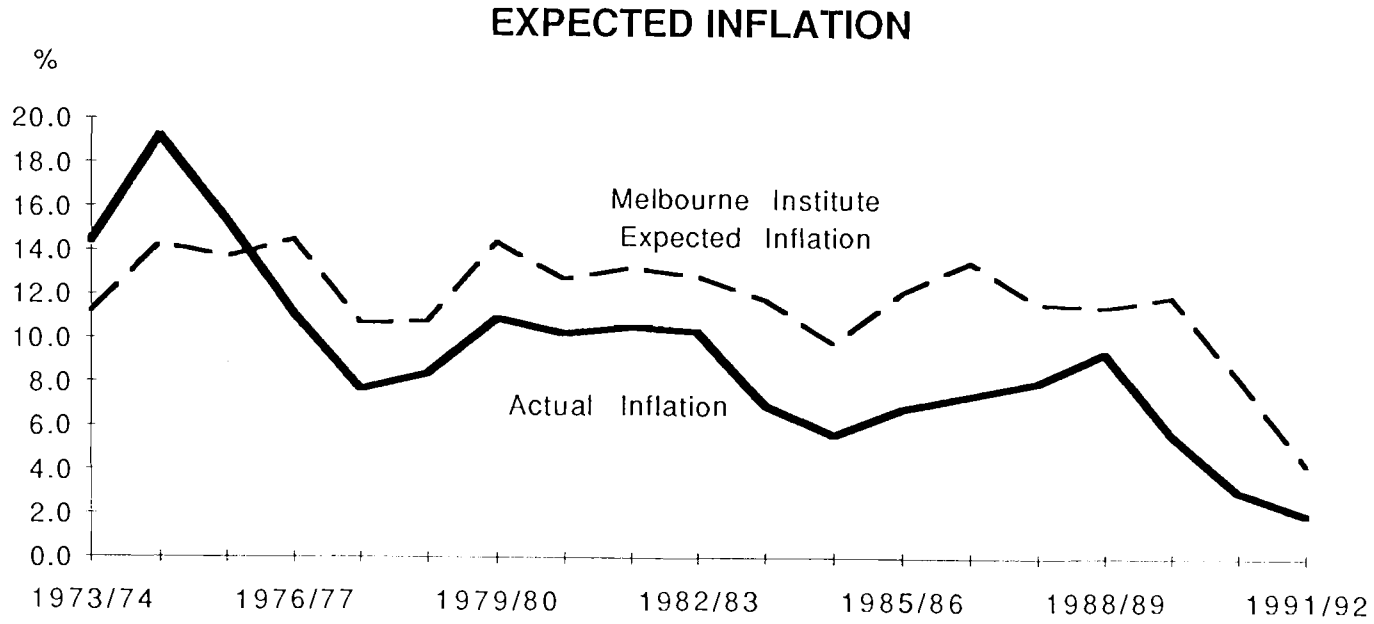
2.4 The Cost of Capital

The cost of funds measures the weighted average after-tax cost to the firm of required payments to its debt and equity holders. To derive the cost of capital, the cost of funds must be adjusted for inflation, the taxation of corporate earnings and the tax treatment of depreciation and any other allowances - factors which are likely to differ substantially across countries and projects, even when they are financed identically.

Expected inflation can be measured in numerous ways. One of the most common methods is to use some form of adaptive expectations model, which assumes that expectations are formed on the basis of past inflation. Carmichael and Stebbing (1981) and Dews (1989) followed this approach. In other studies such as the Department of Finance (1987), Australian Manufacturing Council (1990) and Irvine (1991), the inflation rate in the current period is used. These studies implicitly assume that expectations change very quickly and that the present inflation rate contains most of the information relevant to the future values of the inflation rate. Unless this

assumption is true, in periods of high inflation these methods overestimate expected inflation and underestimate the real cost of debt and equity.

Alternative measures of inflationary expectations can be derived from survey-based measures of expectations, such as the (Melbourne) Institute of Applied Economic and Social Research survey of consumer sentiment (shown in the following graph) and the CAI-Westpac survey of manufacturers. Measures derived from long-term bond yields could also be used. A number of measures of expected inflation are reviewed in Hawkins (1980), Heenan (1991) and Visco (1984). Despite the plethora of available techniques there seems to be no consensus as to which method is best.



The expression for the cost of capital for a generic project with no special tax concessions is therefore;

$$r_c = \frac{R_f}{1-t} - p \qquad (5)$$

where p = (expected) inflation.

Substituting from (4) and rearranging allows the expression to be cast in real terms:

$$r_c = \frac{r_e}{1-t}\frac{E}{F} + r_d \frac{D}{F} \qquad (6)$$

2.5 The Effect of Dividend Imputation on the Cost of Capital

The introduction of dividend imputation in 1987 has reduced the differential impact of tax on debt and equity returns. Ryan (1990) concludes that imputation has eliminated the basic source of tax bias towards debt financing, though it has not eliminated all the distortionary effects of inflation on corporate behaviour.

Views differ on the impact of imputation on the cost of capital. Some argue that as Australia is a small open economy with respect to investment funds, the cost of capital will be set in world markets.[17] A change to a more attractive tax regime for dividend payments will cause the price of shares to rise so as to leave the return to shareholders, after they have paid their personal tax, much the same as before. Another view is that the initial reduction in the cost of capital from imputation will make a number of marginal investment projects viable. Additional projects will be undertaken driving up the marginal cost of equity again.

Officer (1991) argues that a proper measure of the cost of capital needs to take account of the fact that under an imputation system, part of the return on equity represents credits against personal tax. He takes into account the imputation system by replacing the company tax rate in (6) with t(1-g),

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[17] Officer (1987) argues along these lines. In this view, any difference in the cost of capital in Australia compared with other countries is explained by distortions in capital markets such as limitations or restrictions on capital mobility or information or differences in investors' aversion to risk in different countries. These factors are likely to be diminishing over time. Tease (1990) finds that there is evidence of increased capital mobility in Australia in the 1980s following financial deregulation. It is generally accepted in Australian studies that rates of return required by investors are set in world markets. Richards (1991) takes the most extreme view evident in recent studies by assuming that Australian equities are priced relative to the world market. They are valued by the way that their returns co-vary with the world market return irrespective of differences in tax treatment of debt and equity. However, Gruen (1991) and Bullock and Rider (1991) argue that high-inflation countries are likely to have relatively high real interest rates.

where g is the proportionate value of personal tax credits. So the cost of capital is :

$$r_c = \frac{r_e}{(1 - t(1 - g))} \frac{E}{F} + r_d \frac{D}{F} \qquad (7)$$

In the absence of imputation, g = 0, and equation (7) reverts back to equation (6). In a world of full imputation, where the personal tax credits are attributed their full face value by the market (so g = 1) and shareholders face the same marginal rate as companies (7) simplifies to a simple weighted average with no taxation effects.

$$r_c = r_e \frac{E}{F} + r_d \frac{D}{F} \qquad (8)$$

There are some reasons why it is unlikely that imputation credits will be attributed their full face value by the market. These include:

- all shareholders may not be in a position to make full use of imputation tax credits, as a result of insufficient income and/or concessional tax rates for particular groups such as life insurance companies and superannuation funds;
- the benefits of imputation tax credits are received with a considerable time lag from the time that dividends are actually paid; and
- shareholders may expect further changes in the tax system, suggesting that they may attribute greater risk to the return provided by imputation credits than they do to the return provided by other forms of income.

These factors imply that g will be less than 1 but greater than zero. While this answer is unsatisfactory, to be any more precise requires empirical estimation of g. As an indication of the quantitative significance of imputation, the following graph shows two versions of one measure of the cost of capital after the introduction of imputation.[18] The solid line is based on (6) assuming g = o while the dashed line is based on (8) assuming g = 1.

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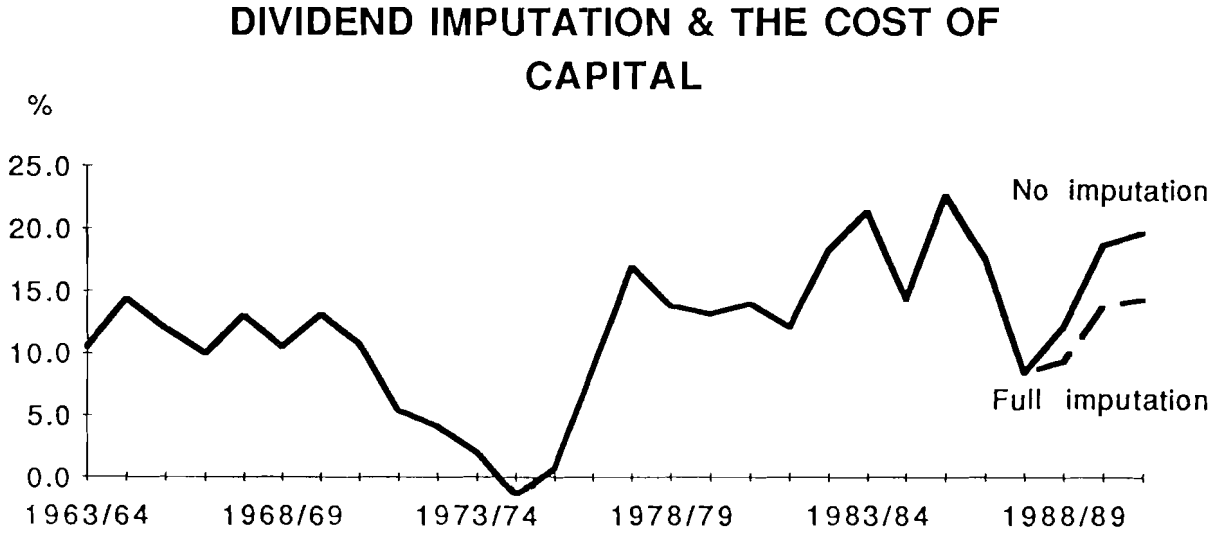
[18] The magnitude of the imputation effect will depend on the weight given to equity in calculating the cost of funds.



3. RESULTS OF OTHER AUSTRALIAN STUDIES

There have been a number of recent Australian studies of the cost of funds and the cost of capital. Not surprisingly given the above discussion, they have resulted in a wide range of estimates. In some cases the variety of approaches may have obscured rather than enlightened debate on the issue.

Some of the main studies are described in Appendix 1 and a summary of some estimates is shown in the following graph. The assumptions underlying them differ and the estimates were produced with different data and with different purposes in mind. For a thorough examination of the assumptions and exact details of each of the estimates, the original works should be consulted.

Two of the measures are taken from Brunker (1984). Measure (a) is his estimate of the real cost of funds scaled up to be expressed in pre-tax terms. Measure (b) is his estimate of the cost of capital , which is higher than the other estimates as it includes depreciation.[19] Dews' measure has also been scaled up to place it on a pre-tax basis.[20] The Department of Finance series is for required return on total assets.[21] The Bureau of Industry Economics series is interpolated from a graph on the cost of capital for equipment with a 20 year life.[22]

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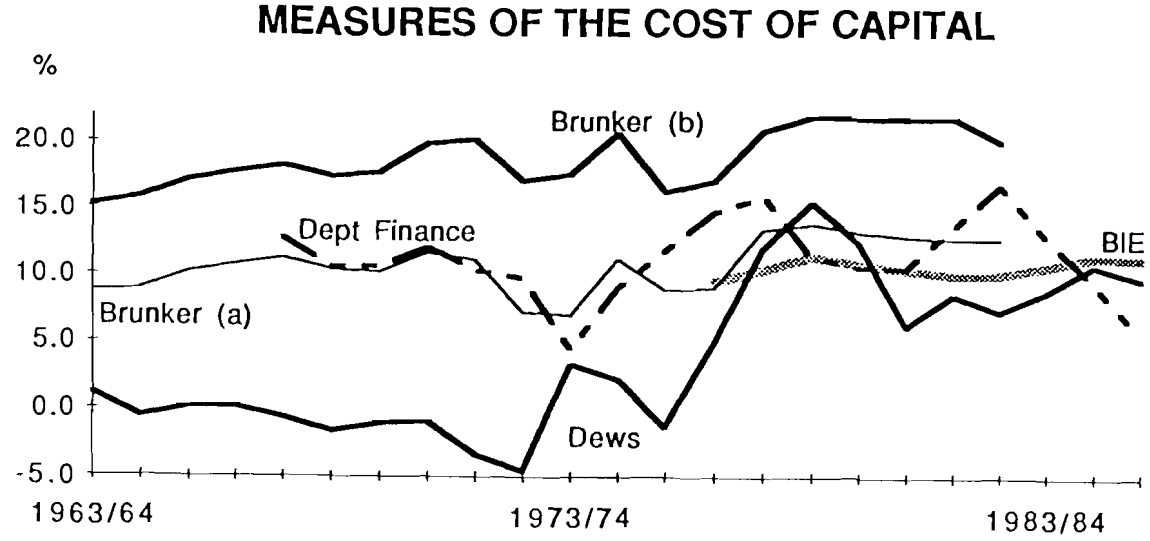
[19] The two series are on pages 16 and 22 respectively of Brunker (1984).

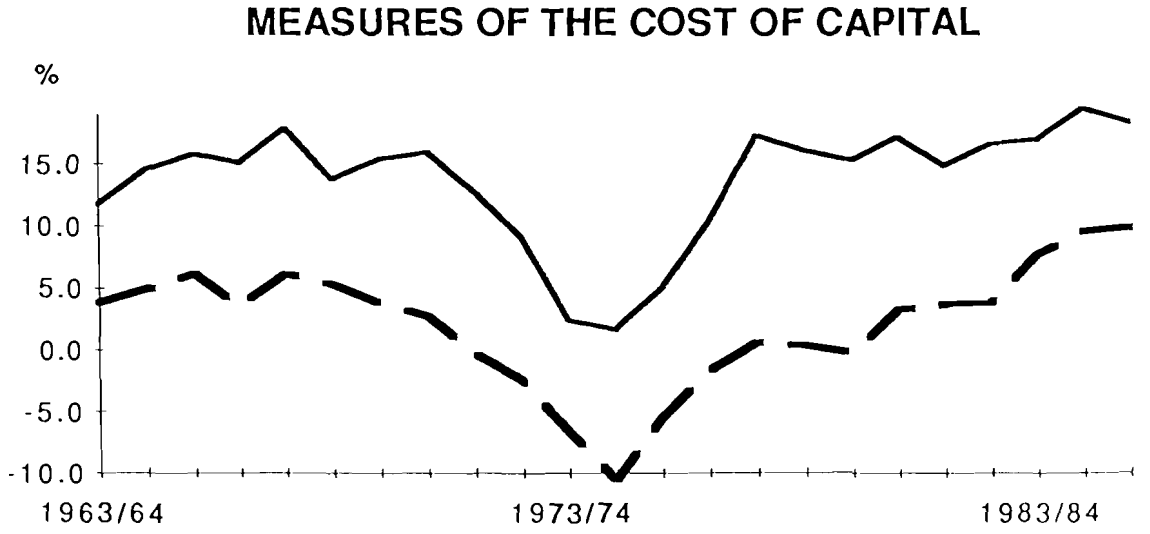
[20] The data is given in Appendix III of Dews (1988).

[21] Column (9) on page 58 of the Department of Finance (1987).

[22] Figure 4 in Bureau of Industry Economics (1991).



The following graph shows two versions of the cost of capital calculated using different combinations of the assumptions discussed above (but the same data sources).[23] It shows a similar degree of dispersion of the measures to the above graph, again emphasising how the choice of assumptions can generate differing conclusions.



[23] The higher line uses the E/P approach for equity returns, the overdraft rate for debt returns, and weights them using Dews' (1988) data. By contrast, the lower line uses the realised gains approach for equity returns, the bond rate for debt returns, and weights them using the marginal private non-finance sector liabilities data.

4. INTERNATIONAL COMPARISONS

Given the variety of estimates presented for the cost of capital in Australia, one should be wary of claims that that Australia's cost of capital is definitely above or below that prevailing overseas. In particular, it would be hard to draw conclusions that Australia's taxation regime is either over-generous or is stifling investment by its effect on a solitary measure of the cost of capital. Furthermore, there may be valid reasons for a higher cost of capital in some countries. For example, developed countries may face a higher cost of capital than developing countries, perhaps reflecting higher effective tax rates. But the higher cost of capital may be balanced by a higher standard of publicly-provided infrastructure.

The Department of Finance (1987) argues that Australia may suffer a relatively high cost of access to international financial markets due to a balance of payments constraint that occurs if an increase in investment is expected to result in an increase in overseas borrowings and imports that outweigh any increase in export earnings. They also suggest that the existence of an Australian risk premium on equity funds may be due to the mix of investment projects undertaken in Australia (more specifically, the predominance of energy-related investment which commands a high cost of funds around the world). They suggest that this distortion may take the form of a risk premium paid on the cost of funds but no evidence of this is provided. The Australian Manufacturing Council (1990) also suggests the existence of a risk premium resulting from the price volatility of imported investment capital arising from the instability of Australia's commodity-based currency. Richards (1991) finds some tentative evidence of an Australian risk premium by estimating a version of the International Asset Pricing Model. Irvine (1991), on the other hand, provides long-run evidence to the contrary, suggesting that the cost of funds in Australia is similar to that in the rest of the world.

Some economists from the Bureau of Industry Economics essentially follow the E/P ratio methodology, used in McCauley and Zimmer (1989), to estimate the cost of funds and the cost of capital for Australia, the U.S., the

U.K., Germany, and Japan.[24] They estimate the cost of capital for various types of investments (equipment, factories, and R&D projects), recognizing that the cost of capital varies for different assets because of different tax and depreciation treatments. Their work indicates that the cost of funds for Australia has increased from a relatively low level in the late 1970s to be among the highest of the countries studied during the 1980s (though they acknowledge that there is a great deal of uncertainty surrounding their estimates). The high cost of funds reflects a relatively high cost of equity and a relatively low after-tax cost of debt. The BIE suggest that the high cost of equity may reflect the combined effect of a comparatively volatile commodity-based economy, possibly inadequate equity markets, and sustained high inflation rates. Australia has had a relatively low after-tax cost of debt, reflecting relatively high rates of inflation and corporate taxation so making the deductibility of nominal interest payments more valuable. BIE note that with inflation now at the lowest rate for 30 years, the situation has changed markedly for both the cost of debt and the cost of equity. The removal of 5/3 depreciation for machinery and lower rates of plant depreciation in Australia have acted to increase the cost of capital. The reduction in the corporate tax rate from 49 to 39 per cent provided an offsetting influence.

The OECD (1991) present an international comparison of a variety of measures of the cost of capital. Australia had a high cost by some measures but when the comparison was done on the return to a personal investor on the top marginal tax rate (and so incorporated the effect of dividend imputation), the cost of capital in Australia was below the OECD average.

5. CONCLUSIONS

The cost of capital for an individual firm is the real pre-tax return that is required to justify an investment. The cost of capital can have important macroeconomic consequences. For example, a higher cost of capital will lead to less investment in capital, more use of labour, lower labour productivity and subsequently lower real wages, at any given level of output.

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[24] See Bureau of Industry Economics (1991) and Archinal et al (1992).

The variety of methods employed in this paper, and the other studies surveyed, provide a wide range of estimates of the cost of funds and consequently the cost of capital. These estimates vary quite markedly and do not seem to move closely together. For this reason a definitive measure of the cost of capital is not presented in this paper. The major problem with searching for the "best" measure of the cost of capital is that it is impossible to tell, even with the benefit of hindsight, whether the estimates of the cost of capital are empirically correct by some objective standard. An area for future research would be to test whether some of the alternative measures in this paper are more "useful" in predicting movements in investment or other economic variables. However, such tests would be joint tests of the pertinence of the particular series and the validity of the economic model into which they were fed.

Many companies, especially smaller firms, use 'rules of thumb' rather than calculations of discounted cash flows in assessing investment projects. Some common examples are average rate of return and payback period. Freeman and Hobbes' (1991) survey of large Australian companies showed that, while around three-quarters of firms used discounted cash flow measures for investment evaluations, many of them also employed payback period as a secondary method of evaluation. Around a quarter of firms only used payback period and average rate of return. These 'naive' procedures were more likely to be used for atypical or low value projects.[25] With recent falls in inflation and interest rates, rules of thumb applied to nominal cash flows should also be adjusted to avoid rejecting viable investment projects. For example, a ten year project generating constant real annual cash flows that is just acceptable when inflation is 12 per cent and the cost of funds is 20

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[25] A comparison with an earlier survey by Lilleyman (1984) shows that the use of more sophisticated measures is increasing over time. Freeman and Hobbes' results accord with those from overseas studies. A study for the U.K. by Pike (1988) showed that while 84 per cent of firms use discounted cash flow measures in investment appraisals, payback period is used even more frequently. In Moore and Reichert's (1983) survey, while 86 per cent of large U.S. firms mainly used discounted cash flow measures, a similar proportion were also using methods such as payback period or average rate of return which ignore the time value of money. Oblak and Helm (1980) surveyed multinational corporations and found three-quarters of them made primary use of discounted cash flow measures while the others mainly used payback periods and accounting rates of return. Payback period was an important secondary measure.

per cent would have a payback period of 5 years. If inflation falls to 2 per cent and the cost of funds to 9.3 per cent the project is equally acceptable but the payback period is now stretched out to 7 years. Reliance on a payback period rule derived in past times of high inflation will result in worthwhile projects being rejected if not modified for a low inflation environment.

Inter-country comparisons of the cost of capital should only be made with a great deal of caution. Comparisons should only be made among estimates using the same, and plausible, concepts and methodology. Even then, there are important differences in accounting conventions across countries which will prove to be important if accounting data are used.

The cost of capital is not meaningful if considered in isolation from the availability of finance.[26] It would be helpful to know about any impediments facing Australian firms in the equity and capital markets and whether there are any unseen costs that are not fully reflected in a measure of the cost of capital. In particular, it would be interesting to identify whether there are differences in access to sources of capital among firms and to ascertain whether smaller firms face particular disadvantages.

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[26] See Industry Commission (1991) and Chapter 15 of House of Representatives Standing Committee on Finance and Public Administration (1991) for a review of the availability of finance to Australian business.

APPENDIX 1: AUSTRALIAN STUDIES OF THE COST OF CAPITAL

Australian Manufacturing Council (1990)

The AMC sought to examine the competitiveness of Australian companies, particularly in the traded sector. On the basis of interviews with Australian companies, they estimate the real cost of debt as around 6 per cent and the real cost of equity as between 11 and 14 per cent. With a debt:equity ratio of 41:59, this leads them to conclude the real weighted average cost of funds is around 10 per cent.

Brunker (1984)

Brunker sought to specify and measure the user cost of capital for the Australian manufacturing sector in order to include it as an explanatory variable in econometric analysis. His series differs from most others in taking explicit account of each of the various tax components and physical depreciation required to calculate the cost of capital. He first derives a cost of funds and then adjusts this to take specific account of the corporate tax rate, investment allowances, depreciation allowances and valuation adjustments. His final estimate is an aggregate real user cost of capital (including plant and equipment, buildings and structures and inventories and other working capital) for the manufacturing sector. The average cost of capital for the period was 18 per cent.

Carmichael and Stebbing (1981) and Dews (1988, 1989)

Although the methodology used is the same in these studies, the objectives were somewhat different. The first paper examined the macroeconomic effects of the interaction between inflation and taxation while Dews' papers emphasised the importance of determining an appropriate measure of the cost of capital and its effect on business investment.

Carmichael and Stebbing (1981) estimate an after-tax, real, weighted-average cost of funds which Dews (1988, 1989) updates. Their approach assumes the firm maximises profits by investing until the after-tax marginal product of capital equals the real after-tax cost of funds. The value of

equity and the net cash flow of the firm are defined according to the theory of the valuation of the firm. The expected real return to equity is estimated based on these definitions and the average earnings yield on equity. The debt to equity ratio is estimated from a sample of companies, and the cost of debt proxied by a real after-tax industrial debenture rate. Grossing up Dews' estimates by the complement of the corporate tax rate, then the average cost of capital is around 4 per cent per annum for the period 1962 to 1986 and 8 per cent for the period 1975 to 1986.

Johnston, Parkinson and McCray (1984)

Johnston et al aimed to introduce a rate of return objective for public business authorities as part of a strategy to place their operations on a more commercial footing. They employ two different approaches to estimate a target rate of return for public enterprises based on rates of return achieved in the corporate sector. They use an opportunity cost approach, based on National Accounts data, and a cost of funds approach, based on a grossed up, weighted average of debt and equity costs. Both measures they develop are ex post (realised) returns and they suggest that when applying their measures as a hurdle rate "some allowance can be made for expected future developments".[27]

To construct the cost of funds measure, Johnston et. al. compare the value of a geometric mean of share market accumulations and the geometric average yield on 10-year government bonds (to proxy for the risk-free rate). They find that a typical private-sector enterprise has a long-run ex post cost of capital of 11 per cent. The cost of capital estimate assumes a debt to equity ratio of 40/60, uses a stock-exchange estimate of the nominal "effective" tax-rate of 37 per cent, and assumes an equity risk premium of just under 3 per cent. Based on overseas and domestic experience they derive a real long-run cost of private-sector debt of 4 per cent (based on a rate of 3 per cent for public debt plus a 1 per cent margin for risk).

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[27] Johnston, et.al., (1984), page 9. The authors provide other estimates but they are either based on more limiting assumptions than those discussed here or are less comparable to the other cost of capital measures outlined in this paper.

Department of Finance (1987) and Swan (1988)

DoF aims to estimate a discount rate that is relevant to a framework for project appraisal in government departments and agencies as well as business authorities. They use a methodology similar to the opportunity cost approach of Johnston et.al., but provide estimates that reflect the realised real rate of return to total assets, rather than the return to fixed assets only.

Measures based on national accounts estimates are sensitive to assumptions made about the value of assets such as land - which are not included in the national accounts, but must be included in the denominator of a cost of capital estimate. Johnston, et.al. show that an estimate of the cost of capital may vary by nearly 7 percentage points in some years depending on which estimate of the capital stock is used. Nevertheless, DoF's estimates of the actual rate of return are reasonably close to some independent estimates, based on stock-market data made by Swan (cited in DoF (1987)). Swan estimates that the average ex post cost of capital over the period 1967/68 to 1982/83 was about 6 per cent.

Unlike Johnston, et.al., DoF allow for expected future developments. They extend their national accounts based analysis of actual returns to debt and equity holders for the period 1976-77 to 1985-86, to derive a measure of the ex ante cost of capital. This measure averages 12 per cent over the period . This estimate includes a real required rate of return on new equities of 18 per cent (pre-company tax). With the real rate of interest on two-year bonds averaging 3 per cent over this period the implied risk premium on equity is around 15 per cent, above most other estimates. Swan re-estimates the DoF estimates, using "better data and methodology"[28] and finds that the ex ante cost of capital is significantly lower at 7.5 per cent.

[28] Swan (1988), page 1.

APPENDIX 2: DATA SERIES

Sources:

GDP Deflator: *Reserve Bank of Australia Occasional Paper 8.* Table 5.6b and Australian Bureau of Statistics Cat No. 5206.0

Expected Inflation: Institute of Applied Economic and Social Research. December survey.

Nominal GDP: *Reserve Bank of Australia Occasional Paper 8.* Table 5.2b and Australian Bureau of Statistics Cat No. 5206.0

Accumulation Index: *Reserve Bank of Australia Occasional Paper 8.* Table 3.18 and Australian Stock Exchange

Earnings Yield: Melbourne Stock Exchange 50 Leaders and Australian Stock Exchange All Ordinaries

Company tax rate: *Reserve Bank of Australia Occasional Paper 8.* Table 2.23

Overdraft rate: *Reserve Bank of Australia Occasional Paper 8.* Table 3.21a and *Reserve Bank Bulletin*

10 year bond rate: *Reserve Bank of Australia Occasional Paper 8.* Table 3.23 and *Reserve Bank Bulletin*

Weights for Cost of Funds: 'Liabilities of the Private Non-Finance Sector' in *Reserve Bank Bulletin* December 1988; various Financial Flow Accounts Supplements, and Dews (1988) Appendix III.

DATA SERIES

	GDP Deflator yr on yr % change	Expected Inflation	Nominal GDP yr on yr % change	Accumulation Index (All Ords) end yr	Earnings Yield (aver)	Company Tax Statutory Rate	Overdraft rate (aver)	10 yr bond rate (aver)
1962/63	1.6		8.0	202	6.1	40.0	6.0	4.6
1963/64	3.7		11.1	245	6.0	40.0	6.1	4.5
1964/65	2.6		10.0	217	6.9	42.5	6.4	4.9
1965/66	2.5		5.1	234	8.2	42.5	6.6	5.2
1966/67	3.4		10.3	267	8.4	42.5	6.7	5.1
1967/68	2.4		6.9	465	7.6	42.5	6.7	5.1
1968/69	4.6		12.7	456	6.8	45.0	6.9	5.2
1969/70	4.0		10.8	451	8.0	45.0	7.3	6.1
1970/71	5.1		10.4	422	9.4	47.5	7.7	6.9
1971/72	7.7		11.9	547	8.5	47.5	7.6	6.2
1972/73	9.0		14.0	522	6.9	47.5	7.4	5.9
1973/74	14.4	11.2	19.7	395	9.0	47.5	8.9	8.2
1974/75	19.2	14.3	20.7	391	14.9	45.0	10.8	9.5
1975/76	15.4	13.7	18.1	519	10.5	42.5	11.1	10.0
1976/77	11.1	14.5	14.2	534	11.0	42.5	11.0	10.2
1977/78	7.7	10.7	8.7	614	12.2	46.0	11.0	9.6
1978/79	8.4	10.8	13.9	754	11.9	46.0	10.8	9.2
1979/80	10.9	14.4	13.5	1250	12.5	46.0	11.0	10.7
1980/81	10.2	12.7	14.0	1507	11.4	46.0	12.5	12.6
1981/82	10.5	13.2	12.0	1070	11.9	46.0	14.7	15.2
1982/83	10.3	12.8	8.9	1419	12.5	46.0	15.4	14.4
1983/84	7.0	11.8	13.0	1623	8.6	46.0	14.7	13.8
1984/85	5.6	9.8	11.3	2190	10.0	46.0	15.4	13.4
1985/86	6.8	12.1	11.0	3223	9.0	46.0	16.9	13.7
1986/87	7.4	13.5	10.0	4878	7.0	46.0	17.1	13.5
1987/88	8.0	11.6	13.2	4507	7.4	49.0	16.5	12.5
1988/89	9.4	11.5	14.1	4589	9.2	49.0	17.9	12.8
1989/90	5.7	12.0	8.9	4784	8.2	39.0	19.1	13.3
1990/91	3.1	8.3	1.7	5066	8.0	39.0	16.3	12.1

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