THE COST OF CAPITAL: SOME ISSUES

Nigel Dews*

Reserve Bank of Australia

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ABSTRACT

The cost of capital is a potentially important determinant of business investment, yet there have been few attempts to provide an adequate measure of it. In this paper the importance of the cost of capital and weaknesses inherent in existing measures are discussed. A new series for the cost of capital is then constructed according to the methodology developed by Carmichael and Stebbing (1981).

The measure of the cost of capital developed in this paper incorporates the cost of both debt and equity finance. It also allows for changes in corporate tax rates, expected inflation and changes in sources of finance. It appears that, following large fluctuations in the cost of capital during the 1970s, the series may have again become more stable, but at a higher average level than was evident during the 1960s.

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1. Introduction

One factor which is potentially important in determining business investment is the cost of capital to the firm. In this paper a series for the cost of capital is constructed and its behaviour during the recent period of financial deregulation is examined.

Section 2 discusses the importance of the cost of capital in investment decisions and illustrates that both debt and equity sources of financing need to be taken into account. Recent trends in the cost of both debt and equity are examined in section 3. Section 4 discusses the theory of the cost of capital and derives a measure developed by Carmichael and Stebbing (1981). While this measure of the cost of capital is based on a number of assumptions and is subject to the limitations of the available data, it provides a useful summary of the various, and sometimes offsetting, influences that affect the cost of capital for the firm. Movements in the series, both pre- and post-deregulation are discussed in section 5. A conclusion and suggestions for future work are contained in section 6.

2. The Importance of the Cost of Capital

A large number of factors have been identified by the literature as influences on investment. These include:

- the supply of new business opportunities;
- growth of demand relative to capacity;
- movement in product prices relative to factor costs;
- changes in the relative user costs of the various factors of production;
- the activity of governments; and
- business confidence.

This list is far from exhaustive; many of these variables are interrelated and appear to have different weights in business investment

decisions at different times. The cost of capital, which is the focus of this paper, is determined by, and also influences, many of these factors.

Ultimately, the decision to invest depends on whether the present value of the expected return from investment, net of direct operating expenses and taxes, exceeds the cost of capital. On marginal investments the two will be equal.

This means that before investment in new capital proceeds, the expected rate of return on that investment should exceed the yield that can be obtained on low risk financial assets by a margin sufficient to cover tax, risk and depreciation. The cost of capital can thus be thought of as the "hurdle" rate of return required on new investment projects. That is, the minimum rate of return a new project must yield to be undertaken profitably.

In Tobin's q theory, investment spending is determined by equating the marginal (stock market) value of capital assets with the marginal cost of those assets. When market participants value existing capital above its replacement cost (q is greater than unity) there should be an incentive for businessmen to invest in new capital. Conversely, there should be a disincentive to invest when q is less than unity. In this approach the market value of capital assets incorporates expectations about future profitability and risk. Thus, according to Tobin the rate of investment should be positively related to q.[1]

The weakness of this approach is its simplicity. It makes no attempt to account for factors such as political uncertainty and speculation that affect the timing as well as the magnitude of investment decisions, or that affect the market value of capital without affecting the decision to invest. Also, marginal q (the ratio of an additional unit of capital spending to replacement cost) is not directly observable. Thus equality between average and marginal q is implicitly assumed.[2]

Figure 2.1 shows Tobin's q, together with business fixed investment as a proportion of the capital stock. Allowing for a lag of at least a year between the

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1. For a further explanation see Tobin (1969), Dews (1986) and McKibbin and Siegloff (1987).

2. Further details of the conditions under which this equality holds see McKibbin & Siegloff (1987).

emergence of the incentive to invest and the actual installation of capital, the graph suggests a fairly close relationship along the lines predicted by Tobin. Taking a slightly different approach, McKibbin and Siegloff (1987) suggest that q theory explains a statistically significant part of investment. In their study, approximately 10 per cent of investment is explained by q theory.

The period since 1982, however, does not apear to fit well with the general picture; in that period, q indicates a strong rise in the incentive to invest while actual investment, as a proportion of the private sector's capital stock, has been falling.

Another measure, which is sometimes also referred to as a q ratio is the EPAC incentive ratio. This ratio compares the expected rate of return on new capital with the rate of return required to meet depreciation and the opportunity cost of funds (that is, the rate of return on alternative low risk assets). Figure 2.2 shows the ratio of investment to capital against the EPAC variable. Again, the relationship is predicted and quite credible. In particular, the EPAC measure explains the lacklustre performance of investment over the past two years better than does Tobin's q, although the latter provides a better explanation of the early to mid 1970s.

In concept, this measure is quite similar to Tobin's q since it incorporates many of the same factors. In practice, the two are quite different, largely as a result of the data used. In particular, the EPAC measure uses a long-run measure of expected returns based on the AMPS model.[3] Tobin's q, on the other hand, is based on data from a sample of 50-60 companies listed on the Sydney Stock Exchange.

The difference between these two measures during the past few years highlights the need to take into account both debt and equity costs when measuring the cost of capital. Both of these measures have weaknesses. Tobin's q reflects expected profitability relative to the cost of equity funded investment, while the EPAC measure does not take into account the fact that investment can at times be funded more cheaply using equity finance than debt finance. The next section takes a closer look at the divergent movements in the cost of debt and equity. Sections 4 and 5 explore a more comprehensive measure of the cost of capital.

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3. For further details, see Whitelaw, et. al. (1987) and Murphy et.al. (1986).

Figure 2.1

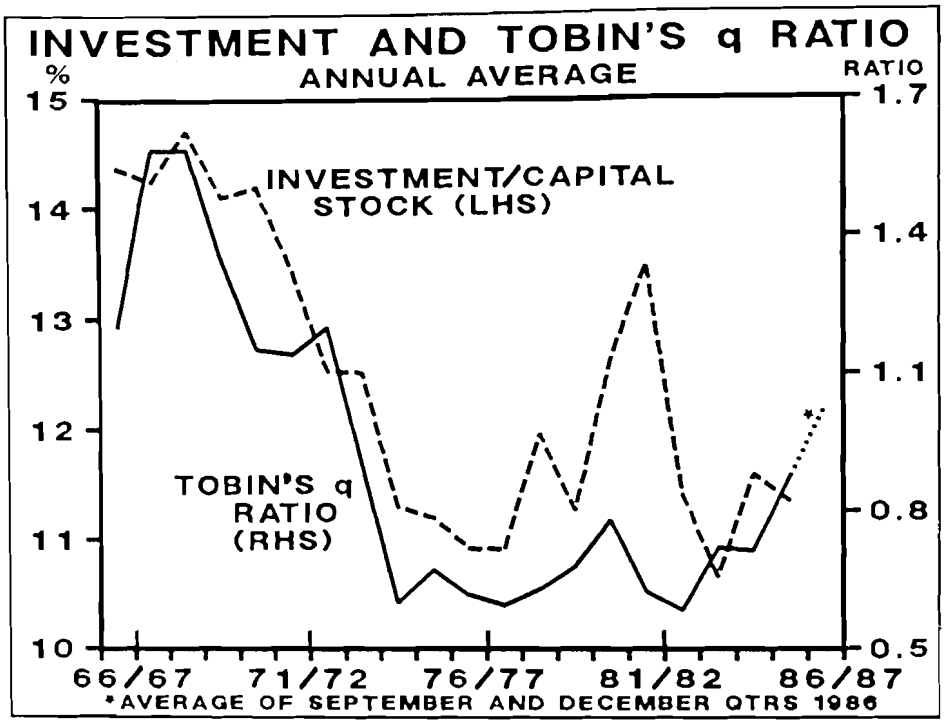
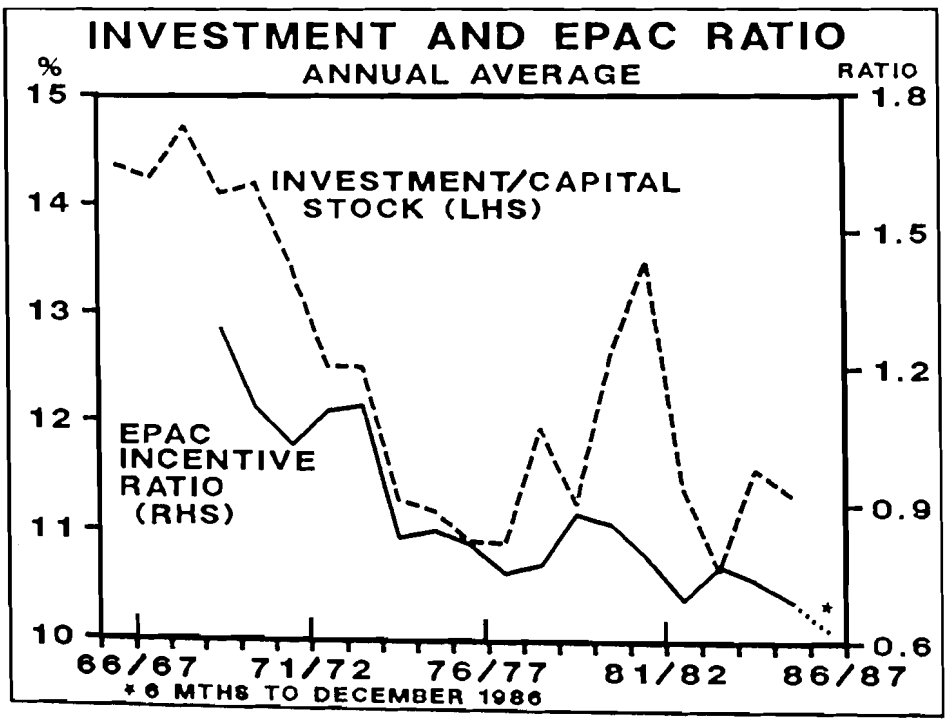


Figure 2.2



3. Trends in the Cost of Debt and Equity

The relative importance of debt and equity as financing tools and recent trends in each are discussed in this section. This highlights the need to take the cost of both into account when attempting to determine the cost of capital.

a. The Cost of Debt

There is no one interest rate, either nominal or real, which is relevant to all firms' decisions to invest. Figure 3.1 shows three potentially relevant interest rates in both nominal and real terms, and real terms after tax considerations have been taken into account. It appears that shorter term rates are the most volatile.

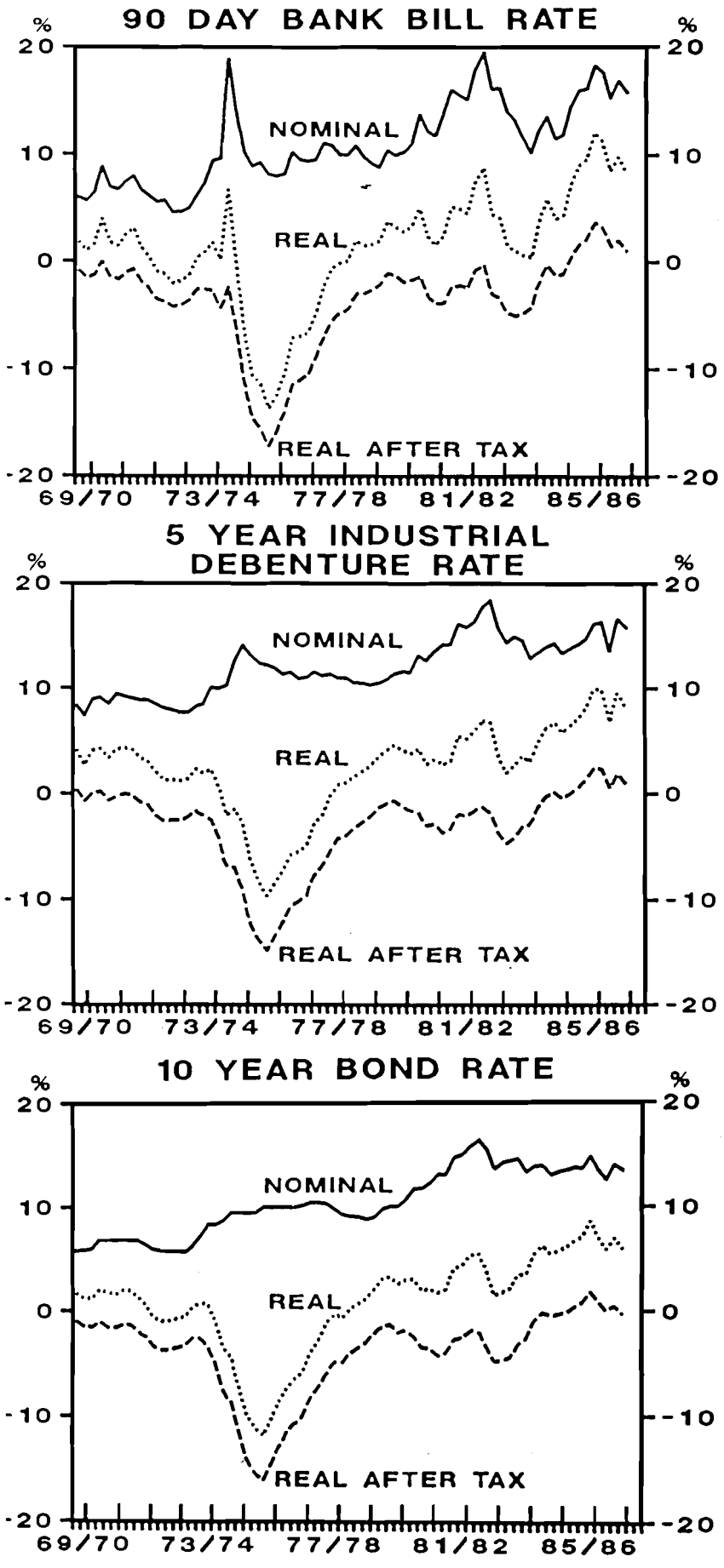
By historical standards, nominal interest rates in Australia have been high during the 1980s. Although this can partly be explained by inflation, interest rates have generally also increased in real terms, at least until recently. Other common features evident from figure 3.1 are:

- nominal interest rates surged in the mid 1970s, due to large budget deficits, tight liquidity conditions and expectations of high rates of inflation. Subsequently conditions eased markedly and nominal interest rates were more stable until the end of the decade. In 1981-82 interest rates rose to record levels, when, despite the slowing in economic activity, the overall demand for funds remained high. After declining for a short period in 1982-83, rates rose once more during the mid 1980's. Recently, there have been some falls;

- real interest rates reveal a somewhat different pattern. After a period of relative stability in the early 1970s, they declined rapidly in the mid 1970s then rose fairly steadily until the early 1980's. Real rates appear to have peaked during 1985-86;

- real after-tax interest rates appear to have risen by substantially less than pre-tax rates since the early 1970s. Unlike both nominal and real rates, real after-tax interest rates were at similar levels to those evident in the early 1970s through most of the first half of the 1980s. Real rates also appear to have increased in more recent times, although not to the same extent as other rates. The real

Figure 3.1 Real, Nominal and After-tax Real Interest Rates



post-tax interest rate on 10-year bonds, for example, is not substantially greater than its average level during the 1960s.

Interest rates relevant to an investment decision vary according to a number of factors including, the particular borrowing requirements of each firm and its susceptibility to risk. Borrowers face different rates depending on their credit worthiness, the purpose of borrowing and the length of repayment. Tax considerations are also important.

There are many channels through which interest rates may influence investment. These include cash flow considerations, opportunity cost, risk and the cost of capital. Different types of interest rates are relevant depending on the channel being discussed. For example, nominal interest rates are probably most relevant for short term cash flow considerations. Sustained real interest rate changes are more relevant for the cost of capital "hurdle" with which real rates of return from an investment are compared, because, other things being equal, an increase in inflation lowers the cost of borrowing for the firm.

In theory, a real interest rate represents the terms on which current consumption can be exchanged for future consumption. An investor gives up current consumption and acquires a claim to a stream of (risky) future payments with which to purchase future consumption. These payments must be adjusted to take account of expected inflation which affects the present value of any future income stream. Other things being equal, the less the future purchasing power of the prospective payments, the lower the cost to the firm.

Measuring real interest rates, however, involves many uncertainties as various measures of inflation are available. Since borrowing decisions are forward looking, nominal interest rates should be adjusted for expected inflation rather than the current rate of inflation. Since expectations are not directly observable, it is common practice to use a measure of past inflation.[4]

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4. The measure of expected inflation used in real interest rate calculations in this paper is the average change in the non-farm GDP deflator, over the previous four periods (not including the current period). This is consistent with the approach taken by Atkinson and Chouraqui (1985). The advantage of this method is its simplicity. Alternative approaches involve the use of rational or adaptive expectation models. For a fuller discussion of various forms of interest rates see Atkinson and Chouraqui (1985).

Tax considerations also need to be taken into account. It is increases in the after-tax real rate of interest that raise the cost of borrowing to finance investment since nominal interest expenses are generally tax deductable for borrowers (provided they are profitable). This cost is, in turn, affected by changes in tax arrangements for firms and the distortions created by the interaction between inflation and taxation.

The term to maturity of the interest rate is also important. Since an investment decision is generally a long-term one, borrowers may have a preference to borrow at a fixed rate over a long period of time. For this reason, the cost of capital measure constructed in this paper contains a five year debenture rate. However, the deregulation of financial markets in combination with increased nominal interest rates may have altered the importance of longer term interest rates. This point is discussed further in section 5.

b. The Cost of Equity

The cost of debt is only part of the story of the cost of capital. The perhaps less-often discussed side is the cost of equity finance. From the firm's point of view, the earnings yield (or earnings to price ratio) represents the cost of raising equity finance. Substantial increases in stock prices over recent years and subsequently low earnings yields for equities suggest, at face value, that the cost of equity has been relatively low by historical standards.

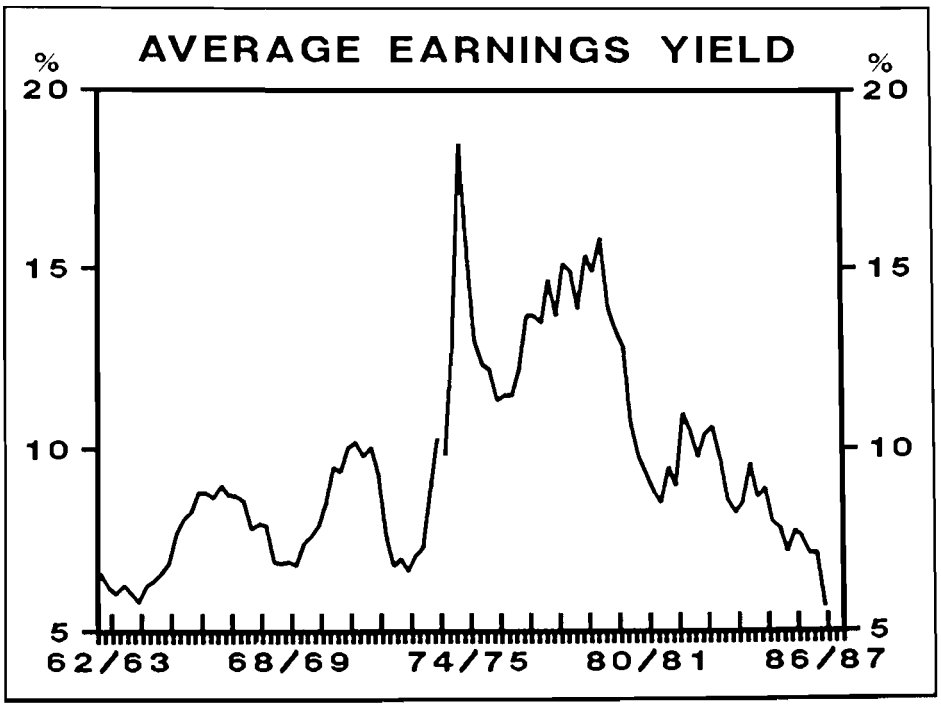
Earnings yields for equities from December 1962 to March 1987 are shown in figure 3.2. Data prior to 1974 are the average earnings yield of "50 leaders" from the Melbourne Stock Exchange. This is not strictly comparable with the average earnings yield for "all ordinaries" companies (weighted by market capitalisation) shown for the later period.

The earnings yield remained at less than 10 per cent through most of the 1960s and did not fluctuate by more than 5 percentage points throughout the period. In the mid 1970s, however, the average earnings yield rose quite dramatically, and then fell sharply. Yields then rose fairly steadily to the end of the decade. Despite some short periods of increasing yields, during the remainder of the period earnings yields were substantially reduced.

This reduction in yield throughout most of the 1980s reflects the buoyancy of Australian share markets. From December 1980 to March 1987 the all ordinaries index of Australian share prices had risen by nearly 250 per cent.

In general, when share prices are expected to rise shareholders will be expecting returns to rise, because the return to the shareholder includes the nominal capital gain on shares (which until recently, often went untaxed) - not just dividends received. The nominal cost to the firm is the earnings yield which, other things being equal, will fall as prices rise. Thus, during periods of rising prices this divergence may make it relatively easy for firms to raise funds on equity markets.

Figure 3.2



However, it is the expected real rate of return on equity - not the nominal earnings yield - which is the relevant cost of capital "hurdle" in any investment decision. This is because the expected real rate is the discount rate required to equilibriate the market value of equity in the current period (its present value) with expected future earnings, net of operating expenses and taxes. Among other things not included in the

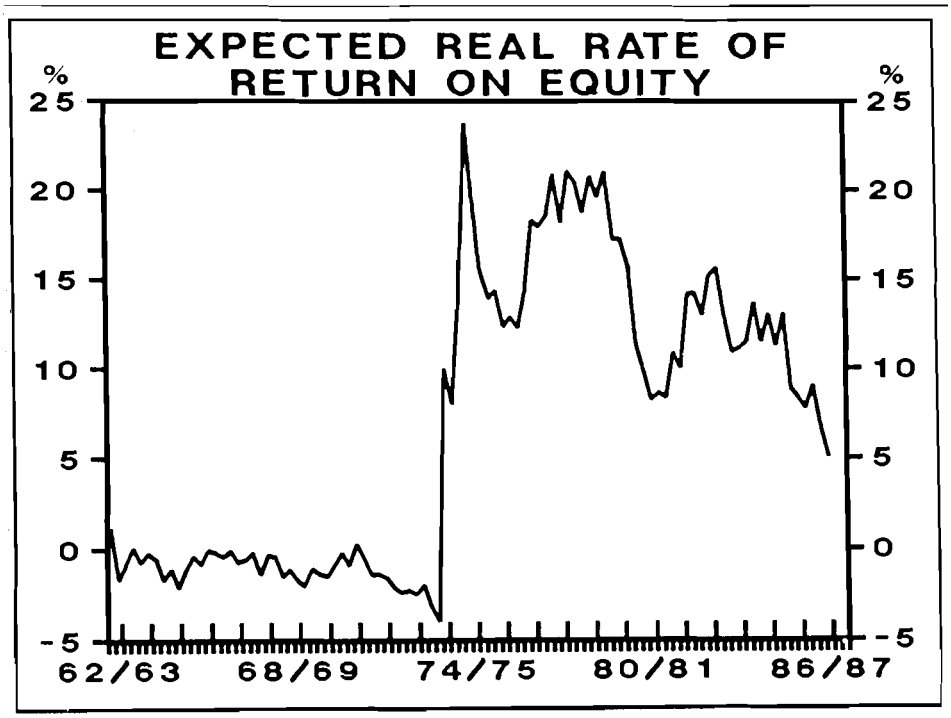
earnings yield, this takes into account risk and opportunity cost for equity holders.

Figure 3.3 shows such a theoretical real rate of return on equity calculated using a combination of stock market and national accounts data. It has been derived on the basis of the theory of the valuation of the firm. The methodology follows that outlined in appendix II, consistent with Carmichael and Stebbing (1981).

It takes into account tax considerations for the firm and the impact of the interaction of inflation and taxation on real earnings yields. In particular, an adjustment is made for loss of real income due to the difference between the value of the depreciation allowance permitted by tax law (based on historical cost, and eroded by inflation) and the true economic rate of depreciation.

Movements in this series have been quite different from those shown for the various measures of real after-tax cost of debt shown in figure 3.1. In fact, the pattern of movements is almost the inverse of that shown by real interest rates since the mid 1970s, although earnings yields appear to be more volatile.

Figure 3.3



The expected real rate of return on equity remained fairly flat until the early 1970s. It rose sharply, however, during the mid 1970s, with the surge in inflation at that time. Although falling a little in the period immediately following, it had returned to near record levels by the late 1970s and remained fairly constant for a few years. During the early 1980s, the rate of return fell, although the falls were short lived. However, since 1983 there has been a fairly steady decline in the rate of return on equity. It appears to be much lower than at any time since the early 1970s although it has still not returned to the levels of the early 1960s.

In many respects of the real cost of equity appears to reflect movements in the average earnings yield, which enters the calculation after tax considerations are taken into account. However, there are a number of important differences. The real rate of return on equity was more stable during the 1960s, and appears to have been more volatile during the second half of the 1970s and early 1980s. The oil price shock, and subsequent inflationary process during the 1970s also appear to have caused real earnings to increase much more substantially than nominal earnings. Also, in recent years, the nominal earnings yield appears to have fallen to levels lower than experienced during the 1960s, while the real rate of return is still a good deal higher.

c. The Debt-Equity Mix

Financial markets generally have fewer imperfections than other markets. Jonson and Rankin (1986) suggest that innovation and deregulation have reduced these imperfections still further. For this reason, it could be expected that the cost of raising capital using debt or equity markets might be similar. However, regulatory changes and the interaction between inflation and taxation tend to alter the preferred debt-equity ratio of firms.

Although a firm can vary its mix of debt and equity there are costs to adjustment and such adjustment takes time. Decisions regarding the method of raising funds also depend on a number of other factors apart from relative cost. These include:

. funding techniques available;
. use to which funds raised are to be put;
. the size, maturity and timing of an issue;

- the need to maintain a presence in the market;
- profit expectations;
- risk preferences of investors; and
- changes in the underlying industrial structure.

The real rate of return to debt and equity will be altered by a change in the rate of inflation, since nominal interest income from an investment is taxed and nominal interest costs can be deducted from taxable income. Given the lower after-tax cost to the firm of debt finance, it is not surprising that firms have tended to issue debt rather than equity as the rate of inflation increases.

Because the interest rate and the equity yield that a firm must pay are an increasing function of its debt equity ratio, the firm can choose an optimal ratio that minimises its total cost of capital. However, companies also have gearing ratios to comply with, and the procedures to reduce equity capital for a public company may involve delays and substantial costs. Funds may, thus, be "locked up" in some sense.

One theoretical view is that the cost of debt and equity finance rises with the debt-equity ratio in such a way that a unique cost minimising ratio is maintained. Modigliani and Miller (1958) put an alternative view that, in the absence of distortions, taxes and default risk, both firms and individuals will be indifferent to the financial mix. Myers (1977) showed that an optimal debt-equity ratio is one that trades off the tax advantages of debt and the costs of a suboptimal future investment strategy induced by debt.[5]

Figure 3.4 shows the debt to total funds (debt plus equity) ratio for a sample of 50-60 companies listed on the Sydney Stock exchange. The data suggest that the equilibrium debt-equity ratio rose with inflation in the early 1970s and again in the early 1980s. This relationship does not appear to hold so clearly in the second half of the 1970s when inflation fell, but levels of outstanding debt remained high. It appears that the level of debt accumulated may be "sticky downwards", with respect to inflation - at least to some extent.

In recent years, debt has become a smaller part of total funds raised by the sample of firms, despite some pick-up in inflation. This may be

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5. For a thorough survey of the literature covering the theoretical issues, see Carmichael and Stebbing (1981).

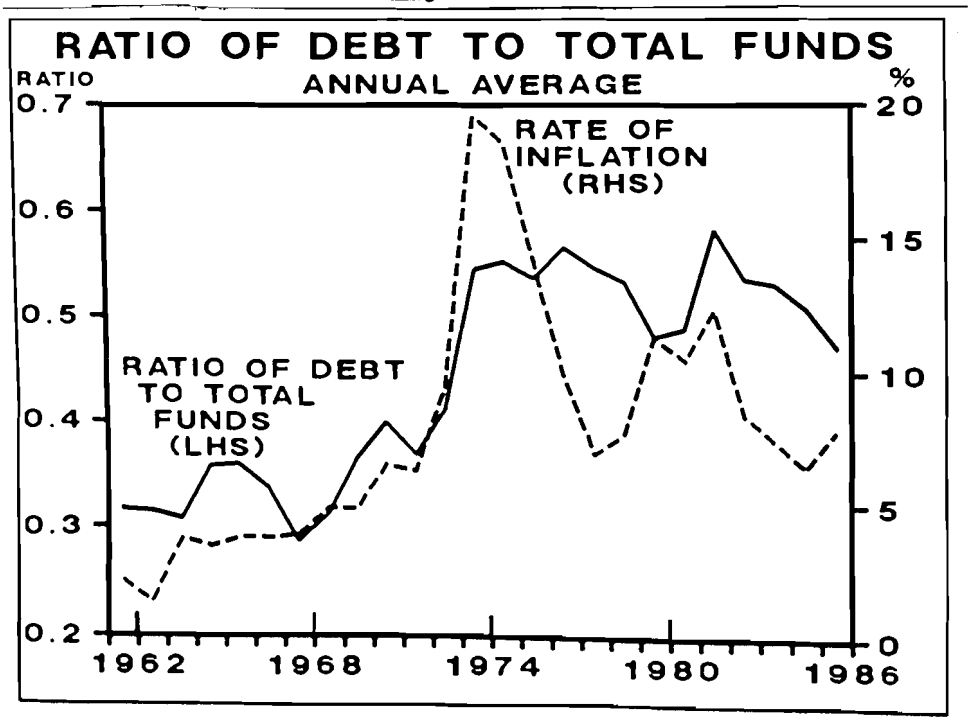
associated with the currently high cost of debt relative to equity and firms' perceptions of future inflation (for example, firms may expect the current rise in the inflation rate to be only temporary). It may also reflect preparation for the introduction of the new corporate tax system which reduces the incentive to adopt high gearing ratios.

4. Theory of the Cost of Capital

There is little agreement about how to measure the cost of capital. Clearly, the cost of both equity and debt finance should be taken into account. A weighted average measure of the cost of capital is constructed in this section.

A wide range of empirical work which includes estimates of the cost of capital has been undertaken in Australia. For example, see EPAC (1986), Whitelaw et al (1987), Kholi and Ryan (1985) and a number of works cited by Hawkins (1979). In most recent Australian studies, the cost of capital has been based on its opportunity cost, namely the rate of return on government securities. That is, the interest rate obtainable on relatively risk free debt. Carmichael and Dews (1986) based their measure on a five year industrial debenture yield. They also suggest that the relative cheapness of equity finance over the last few years might have resulted in a lower average real after-tax cost of capital than is illustrated by their debt based measure.

Figure 3.4



Studies undertaken in the U.S. have used a number of different estimates. For example, Tobin and Barnard (1977) use an estimated financial model, capable of explaining variations in a firm's total market value to derive their measure. Corcoran and Sahling (1982) on the other hand, used dividends and interest payments as the basis for estimating corporate income, assuming that the dividends which a company pays are a signal through which it indicates its longer-run earning potential to stockholders. They then solved for the internal rate of return which equated the present value of prospective total capital income to the observed market value of existing debt and equity. Results differ widely between alternative measures.

The method used in this paper to estimate the cost of capital for Australia was chosen largely on the basis of its simplicity and the availability of data. The approach was developed by Feldstein, Green and Sheshinski (1978) and first adapted for Australia by Carmichael and Stebbing (1981). The methodology is based on the simplifying assumption that the firm maximises its profits by investing up to the point at which the marginal product of capital equals the real after-tax cost of funds.

Since interest costs are deductible from profits for computing taxable income, the net cost of debt, i_n, can be represented by:

$$i_n = (1 - \tau)i$$

where: τ = corporate income tax rate
i = gross nominal interest cost to the firm, per unit of debt obligation

Also, the real value of this debt is falling at the rate of inflation, since the principle is denominated in nominal terms. Therefore, the real net cost of debt finance, r, is given by:

$$r = (1 - \tau)\, i - \pi$$

where: π = rate of inflation

Consistent with Carmichael and Stebbing (1981) the cost of equity finance, on the other hand, equals the value of dividends paid by firms plus retained earnings, per unit of equity (e). Since the nominal value of an equity holders claim on real capital already rises with the rate of

inflation, equity finance simply costs e. Unlike debt, there was, until recently, no tax deduction allowed for dividends paid on equity.

Therefore, if b equals the proportion of capital financed by debt, a unit of capital financed by b units of debt and (1 - b) units of equity has a real net-of-tax cost, h, of:

$$h = b\,(1 - \tau)i + (1 - b)e - b\pi$$

5. A Cost of Capital Series

The debt-equity weighted average expected real cost of capital to the firm is shown in figure 5.1. It is an estimate of the expected (or ex ante) real net-of-tax cost of funds to the firm based on the methodology described above. The exante measure of this variable (which simply replaces e with its expected value, $\hat{e}$, and π with its expected value, $\hat{\pi}$) has been chosen because fund raising decisions are essentially forward-looking. Further details of the construction of the measure and data used are contained in appendix II and III respectively.

Movements in the series reflect changes in:

- the real after-tax cost of debt;
- the real rate of return on equity; and
- the debt-equity ratio.

a. Movements in the Series

In aggregate, the cost of capital appears to have remained fairly flat throughout the 1960s; movements tend to mirror fluctuations in the cost of equity, while the real after-tax cost of debt remained fairly stable. The real costs of debt and equity financing appear to have been broadly similar during this period.[6]

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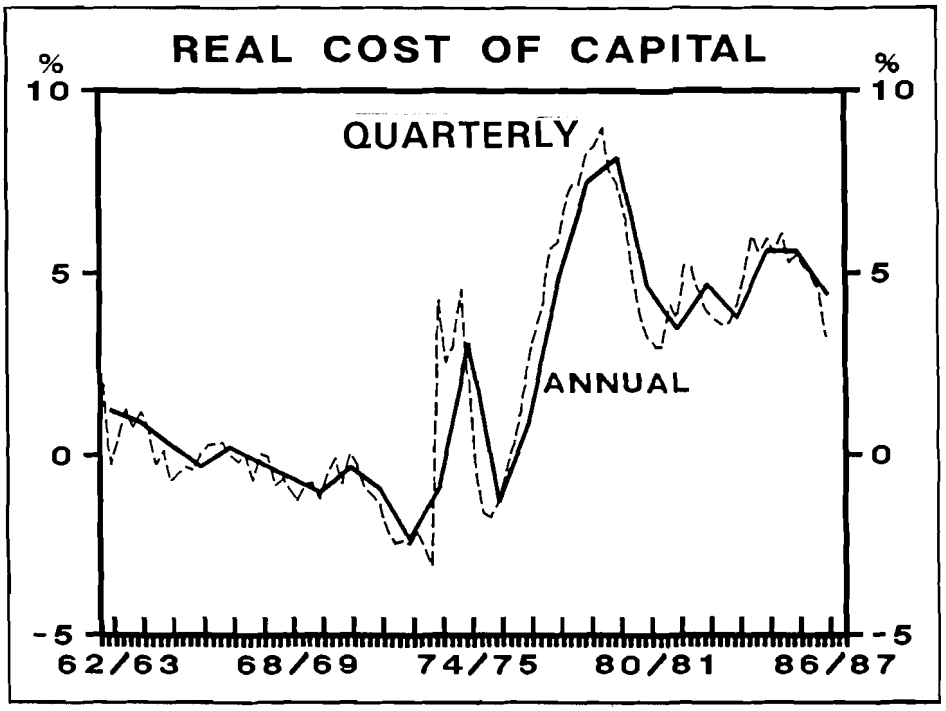
6. Results were particularly sensitive to the assumed average expected rate of retirement of debt. For this reason, the rate applied was the same as that used by Carmichael and Stebbing (1981) (2.2 per cent per quarter). The sensitivity of the level of the series to the rate assumed suggests caution should be applied when making comparisons between the level of interest rates and rates of return. However, broad trends in the movement of the series remain largely unaffected.

Figure 5.1



Following a moderate rise in the early 1970s, the average cost of capital fell substantially during the middle of the decade as firms moved towards relatively low cost debt, in a high inflation environment. However, towards the end of the 1970s the cost of capital rose quite strongly - reaching its highest level for at least a quarter of a century. This reflected an increase in the cost of both debt and equity costs as inflationary pressures moderated and the demand for investment funds picked-up.

The cost of equity fell substantially through the mid-1980s, along with the debt-equity ratio. For the last couple of years, this shift towards equity has contributed to a decline in the average cost of capital, although still remains well above its levels during the early 1970's.

In December 1980, interest rate controls over bank deposits were abolished, in accordance with the preliminary findings of the Committee of Inquiry into the Australian Financial System (Campbell Committee). This marked the onset of an era of unprecedented financial system deregulation.[7] The influence of deregulation on the cost of capital and subsequently, investment is difficult to gauge. Difficulties in identifying the causal relationships empirically place a thorough analysis of the issues well beyond the scope of this paper.[8] However the few points which follow attempt to highlight areas of possible influence of deregulation on the cost of capital.

In general terms changes to the competitive structure of financial markets, as a result of deregulation, are likely to influence the cost and availability of capital to firms. Efficiency considerations are also likely to be affected by changes in government regulations (among other things) which, in turn, alter the cost of funds. Appendix I summarises some of the regulatory changes since the mid 1960's which may have altered the cost and availability of capital to firms.

The view of the Campbell Committee was clearly " ... that various actions of government have had a significant distorting effect on the cost and availability of credit to business ..." (Final Report, 1981, pp608-9). They cited various aspects of taxation which bore heavily on business balance sheet structures and funding patterns. The report suggested that lending and interest rate controls may have resulted in higher bank interest charges for larger customers and rationing of funds to small businesses, including increased resort by firms to more costly (and often less efficient) sources of finance as part of the rationing process.

For example, portfolio restrictions on financial institutions, such as the "30/20 rule" and the fact that household sector deposits in certain types of institutions were not generally available for on-lending to the business sector as either debt or equity, were suspected of affecting the cost and availability of funds to the business sector. Exchange controls and restrictions on forward cover were thought to limit financial choice available to firms.

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7. For further details of the implementation of Campbell Committee recommendations, see Dews and Dwyer (1984).

8. For further details of the overseas experience see Corcoran and Sahling (1982), Atkinson and Chouraqui (1985) and Johnson and Scanlon (1985).

In line with the recommendations of the report, many of these regulatory obstructions have been removed. For example, exchange controls and most bank interest rates, maturity and qualitative lending controls have been removed. The 30/20 requirements have been relaxed. Savings banks also have more scope to determine their asset structure, and most recently, there has been greater integration of company and personal income tax system (see Appendix I).

The main differences evident in the cost of capital series since the onset of rapid deregulation appear to be that, following the big fluctuations of the 1970s, the series may have become more stable but at a higher average level than was evident during the 1960s.

b. Some Limitations

There are a number of conceptual limitations of this measure of the cost of capital. These include the simplifying assumption upon which it is based. That is, the firm invests to the point where the marginal product of capital equals its marginal cost. Although this assumption may hold in the long term, there appears to have been significant deviations from this competitive equilibrium in the shorter term.

Carmichael and Dews (1987) found that broad trends in factor prices were consistent with the maintenance of a reasonable level of competition, but there appears to have been a number of periods during which actual factor payments have deviated from the competitive solution. They suggest that the marginal product of capital would have been closely associated with its "true" factor cost in the late 1960s and early 1970s, and again during the 1980s. However, in the mid 1970s, when labour was apparently being paid in excess of its marginal product, the gap between the return to capital and its cost increased. This raises some doubts regarding the accuracy of the measure through this period.

The concept measured is also not entirely appropriate for the purpose to which it is being put. What is strictly relevant to the firm's investment decision is not a comparison of the expected average rate of return with the average cost of capital, but rather the expected marginal rate of return on the proposed investment compared with the cost of the last tranche of funds supplied. The average cost (as measured) will not always equal the relevant marginal cost.

There are numerous other difficulties inherent in using a single price to represent this heterogenous aggregate. The implicit assumption that all firms have identical production functions may be an additional limitation. In fact, the cost of capital figures should probably be regarded as applying to "average firms". Debt-equity ratios and earnings retention - divided payout decisions are taken as given, despite disparity amongst firms in practice. The cost of capital to firms of varying size and risk characteristics may be substantially different. For example, raising capital by selling equity is probably only a feasible proposition for the largest of small businesses or for those with obvious growth prospects. Also, while uncertainty exists, expectations tend to differ between firms so that the perceived cost of capital may also differ. No allowance is made for institutions with different tax treatments, and all firms are assumed to be profitable.

Short-run behaviour is heavily influenced by expectations which not only differ between firms but are also not fully captured in the measure. For example, institutional changes (such as the reforms to the tax system first announced in 1985) may be taken into account prior to their initiation, when decisions regarding the proportion of debt and equity financing to be undertaken are made. Although this measure is forward looking, these effects are not fully captured.

6. Summary and Conclusions

This paper has concentrated on measuring the real cost of capital to the firm, defined as the expected real after-tax cost of funds. Trends in its components both pre- and post-deregulation were examined. The cost of debt and equity and the relative importance of each have varied a great deal over time.

The relative influence of the cost of debt and equity finance on the incentive to invest appear to be reflected, at least partly, in the relative abilities of Tobin's q and the EPAC incentive ratio to pick turning points in investment at different points in time. Tobin's q, which is currently increasing, is based largely on stock market data and reflects the cost of equity. The EPAC variable, which remains low, is a debt based measure.

The average cost of capital appears to have risen in the mid 1970s and fallen substantially a little later in the decade. Large falls in the cost of debt as a result of high inflation and the tax deductability of

nominal interest payments appear to be the main cause. In the late 1970s, the cost of capital rose sharply. It seems to have fallen, however, in more recent years, although remaining at a high level relative to the early 1970s.

Although the net effect of deregulation on the cost of capital is difficult to isolate, it is likely to have reduced the distorting effects on the cost and availability of funds to firms.

A large amount of work still remains to be done in this area. Further work should involve including a cost of capital term which incorporates both the cost of equity and debt into investment incentive ratios, such as Tobin's q and the EPAC measure.

Appendix I: Some Regulatory Changes Relevant to the Cost of Capital

Mar. 1965	Banks were permitted to proceed with limited activities in the commercial bills field.
May 1968	Trading banks were given approval to undertake lease financings on a modest scale, outside the maximum overdraft interest rate arrangements.
Mar. 1969	Certificates of Deposit were introduced.
Sep. 1969	Extra borrowing rights on the domestic market were introduced for foreign companies which admitted some Australian equity.
Feb. 1972	Maximum overdraft rate no longer applied to loans of greater than $50,000.
Sep. 1972	Embargo imposed on borrowing from overseas of amounts with less than two years to maturity.
Oct. 1972	The Companies (Foreign Takeovers) Act was introduced, applying to foreign purchase of equity holdings in Australian companies with assets of more than $A1 million.
Dec. 1972	Variable Deposit Requirement imposed consisting of 25 per cent on borrowings from overseas exceeding two years. During 1973 it was extended.
Nov. 1974	Variable Deposit Requirement suspended. Embargo on borrowing from overseas reduced from two years or less to six months or less.
Feb. 1976	Size of overdraft subject to maximum interest rate controls increased from $50,000 to $100,000.
Apr. 1976	Foreign Investment Review Board created. New foreign investment had to yield a large net economic benefit to Australia. Where benefits were judged to be small, an effective partnership had to exist with Australian interests.
Jan. 1977	Embargos on foreign borrowing were extended and Variable Deposit Requirements reintroduced, although certain borrowing for mining and manufacturing investment was exempt from the VDR. VDR was suspended, once more, in July 1977.
June 1978	Embargo on Overseas Borrowing suspended.
Jan. 1979	Treasurer announced that the Government had no objection to the establishment of currency futures trading facilities, provided such facilities were established on the basis of existing exchange control policy. In June of that year, trading banks began operating a currency hedge market. In March 1980, trading in currency futures on the Sydney Futures Exchange began.
Dec. 1980	Ceilings on trading bank deposit interest rates were removed.
Nov. 1981	Trading banks were granted approval to offer line of credit facilities, with some restrictions.
June 1982	Reserve Bank withdrew quantitative lending guidelines on growth in trading bank advances.
Aug. 1982	Relaxation of Savings Banks required asset structure.
Sep. 1982	Approval, in principle, was granted to a bank to issue Eurobond floating rate notes. The first issue was made by an Australian bank in March 1973.
Dec. 1983	Treasurer and the Reserve Bank announced that the spot exchange rate would be determined by the market and that a major part of existing exchange controls would be abolished, effective 12 December.
Aug. 1984	Controls over current accounts abolished. All remaining controls over the maturity period for term deposits were removed.
Sep. 1984	Treasurer announced the abolition of the "30/20 rule" which provided for higher taxation of life offices and superannuation funds which did not hold at least 30 per cent of their assets in public securities, of which at least 20 per cent had to be Commonwealth Securities.
Feb. 1985	Treasurer announced that 16 foreign bank licences would be granted.
Sep. 1985	Treasurer announced that a full imputation system for company income tax will commence in the 1987/88 income year. The marginal personal income tax rate will equal the company tax rate (49 per cent) from the introduction of imputation. Other measures announced included a capital gains tax.
July 1986	Treasurer announced relaxations of foreign investment policy in respect of manufacturing and real estate.
Nov. 1986	Restrictions on investments at interest in $A-denominated securities by foreign governments and their agencies were removed.

Appendix II: Construction of the Cost of Capital Measure

In Section 4 a weighted average measure of the cost of capital was outlined. This appendix provides further details of the construction of the measure. The methodology used was developed by Carmichael and Stebbing (1981). Appendix III provides the data.

From Section 4 the ex ante real cost of funds to the firm (h) is defined as:

$$h = b\,(1 - \tau)i + (1 - b)\hat{e} - b\hat{\pi}$$

where: b = ratio of debt to total funds employed by the firm.

That is, $b = B/(B + E)$

and B = market value of debt for a sample of 50-60 companies listed on the Sydney Stock Exchange.

E = market value of equity for a sample of 50-60 companies listed on the Sydney Stock Exchange.

τ = corporate income tax rate.

i = gross nominal interest cost to the firm, per unit of debt obligation. In this case, assumed to equal the yield on industrial debentures with five or less years to maturity obtained from Melbourne Stock Exchange data.

$\hat{e}$ = ex ante real after-tax rate of return on equity. Derived using the methodology outlined in this paper and fully detailed in Carmichael and Stebbing (1981) Appendix 3.5, using GAUSS (NLSYS). Results were particularly sensitive to the assumed average expected rate of retirement of debt. For this reason, the rate applied was by 2.2 per cent per quarter, the same as that used by Carmichael and Stebbing (1981).

$\hat{\pi}$ = expected rate of change in prices. The measure of expected inflation used is the average change in the non-farm GDP deflator, over the previous four quarters (not including the current quarter) and is consistent with the approach taken by Atkinson and Chouraque (1985).

Appendix III: The Data

	Ex ante real pre tax rate of return on equity (annual rate)	Ratio of debt to total funds (percent)	Industrial debentures 5 years or less to maturity (annual rate)	Company Tax Rate	Expected Change in Prices (annual rate)
Mar-62	0.4	30.0	9.7	0.40	1.7
Jun-62	0.4	31.4	10.5	0.40	1.8
Sep-62	1.1	33.0	11.0	0.40	2.6
Dec-62	-1.7	32.2	8.1	0.40	2.2
Mar-63	-0.9	32.2	8.6	0.40	2.1
Jun-63	0.1	31.9	9.5	0.40	1.8
Sep-63	-0.7	31.4	8.5	0.40	1.0
Dec-63	-0.2	30.5	9.5	0.40	1.2
Mar-64	-0.5	30.4	8.5	0.40	1.2
Jun-64	-1.7	30.2	7.0	0.40	1.0
Sep-64	-1.1	31.1	8.2	0.43	1.8
Dec-64	-2.1	31.3	7.7	0.43	2.2
Mar-65	-1.1	34.2	7.4	0.43	3.6
Jun-65	-0.4	36.4	7.0	0.43	4.2
Sep-65	-0.8	37.1	7.2	0.43	3.9
Dec-65	0.0	35.5	7.6	0.43	4.1
Mar-66	-0.2	36.2	7.7	0.43	3.3
Jun-66	-0.4	35.5	8.2	0.43	3.1
Sep-66	0.0	36.7	7.9	0.43	3.5
Dec-66	-0.7	35.9	7.7	0.43	3.2
Mar-67	-0.6	37.3	7.2	0.43	3.6
Jun-67	-0.2	34.8	7.3	0.43	3.7
Sep-67	-1.4	32.0	7.2	0.43	3.4
Dec-67	-0.3	30.9	8.3	0.43	3.9
Mar-68	-0.4	30.1	7.8	0.43	3.6
Jun-68	-1.5	26.0	7.9	0.43	3.4
Sep-68	-1.1	30.1	7.9	0.45	4.0
Dec-68	-1.7	28.6	7.5	0.45	3.4
Mar-69	-1.9	29.1	7.5	0.45	3.8
Jun-69	-1.1	31.9	7.7	0.45	4.4
Sep-69	-1.3	33.0	8.3	0.45	4.1
Dec-69	-1.4	32.0	7.4	0.45	4.7
Mar-70	-0.9	35.2	9.0	0.45	4.8
Jun-70	-0.2	36.6	9.1	0.45	4.8
Sep-70	-0.9	36.2	8.5	0.48	5.1
Dec-70	0.3	39.3	9.4	0.48	5.2
Mar-71	-0.5	39.6	9.2	0.48	4.9
Jun-71	-1.4	39.7	9.0	0.48	4.9
Sep-71	-1.4	42.4	8.9	0.48	5.4
Dec-71	-1.6	39.1	8.8	0.48	5.7
Mar-72	-2.1	38.0	8.5	0.48	6.5
Jun-72	-2.4	36.3	8.1	0.48	6.8
Sep-72	-2.3	38.2	8.0	0.48	6.7
Dec-72	-2.5	36.4	7.7	0.48	6.5
Mar-73	-2.0	37.1	7.7	0.48	6.3
Jun-73	-3.2	38.2	8.2	0.48	5.9
Sep-73	-3.9	44.8	8.5	0.48	6.5
Dec-73	10.0	46.2	10.0	0.48	7.7
Mar-74	8.0	44.3	10.0	0.48	9.4

	Ex ante real pre tax rate of return on equity (annual rate)	Ratio of debt to total funds (percent)	Industrial debentures 5 years or less to maturity (annual rate)	Company Tax Rate	Expected Change in Prices (annual rate)
Jun-74	13.7	51.8	10.2	0.48	12.3
Sep-74	23.8	62.3	12.6	0.45	14.0
Dec-74	19.3	60.0	14.1	0.45	16.8
Mar-75	15.4	57.6	13.1	0.45	19.5
Jun-75	14.0	56.0	12.4	0.45	20.7
Sep-75	14.4	55.0	12.2	0.43	21.9
Dec-75	12.4	52.5	12.0	0.43	20.4
Mar-76	12.9	53.1	11.4	0.43	18.7
Jun-76	12.3	52.1	11.5	0.43	17.3
Sep-76	14.3	53.7	10.9	0.43	16.4
Dec-76	18.3	56.2	11.0	0.43	15.9
Mar-77	18.0	56.9	11.6	0.43	14.3
Jun-77	18.6	56.6	11.2	0.43	13.3
Sep-77	20.9	58.2	11.3	0.46	11.4
Dec-77	18.2	55.2	11.0	0.46	10.1
Mar-78	21.1	56.6	11.0	0.46	9.9
Jun-78	20.5	55.2	10.5	0.46	8.9
Sep-78	18.8	52.9	10.5	0.46	8.3
Dec-78	20.8	54.5	10.3	0.46	7.6
Mar-79	19.6	53.1	10.5	0.46	7.0
Jun-79	21.0	54.9	10.8	0.46	6.7
Sep-79	17.3	53.1	11.4	0.46	6.7
Dec-79	17.3	53.1	11.6	0.46	7.5
Mar-80	15.7	53.5	11.5	0.46	7.7
Jun-80	11.4	48.8	13.1	0.46	8.8
Sep-80	9.8	46.2	12.7	0.46	9.8
Dec-80	8.3	44.8	13.5	0.46	10.2
Mar-81	8.7	45.9	14.1	0.46	11.3
Jun-81	8.4	46.0	14.1	0.46	11.0
Sep-81	10.9	52.5	16.1	0.46	10.6
Dec-81	10.1	51.8	15.8	0.46	10.6
Mar-82	14.2	56.8	16.3	0.46	10.4
Jun-82	14.2	58.7	17.7	0.46	10.8
Sep-82	13.0	58.0	18.4	0.46	11.7
Dec-82	15.2	59.7	15.7	0.46	12.1
Mar-83	15.6	58.8	14.4	0.46	12.4
Jun-83	12.8	54.6	14.9	0.46	12.2
Sep-83	10.9	51.5	14.6	0.46	11.0
Dec-83	11.1	49.8	12.9	0.46	9.8
Mar-84	11.5	51.7	13.4	0.46	8.4
Jun-84	13.7	55.3	13.9	0.46	7.7
Sep-84	11.5	52.6	14.3	0.46	7.5
Dec-84	13.1	53.1	13.4	0.46	7.5
Mar-85	11.3	51.1	13.8	0.46	7.4
Jun-85	13.1	56.1	14.1	0.46	7.0
Sep-85	8.9	47.8	14.7	0.46	6.5
Dec-85	8.4	49.1	16.1	0.46	6.2
Mar-86	7.8	48.5	16.3	0.46	6.4
Jun-86	9.1	48.5	13.5	0.46	6.7
Sep-86	6.9	48.0	16.6	0.46	7.1
Dec-86	5.2	44.6	15.8	0.46	7.6

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