Taxes, Corporate Financial Policy and Investment Decisions in Australia

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All of the research reported in this thesis is original

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Abstract

The Australian full imputation reform has now been in place for a little over ten years. There is a very large literature analysing the effects of tax systems in other countries on corporate financial policy and investment decisions. Strangely, there has been almost no formal analysis of the effects of the Australian tax system.

The aim of this thesis is to make a step towards filling this gap. The thesis draws on previous literature which has analysed the effects of foreign tax systems and modifies it for Australian tax settings. It provides a formal model of a widely-held company which takes account of company and personal taxes and investigates how Australia's full imputation provisions and capital gains tax provisions can affect decisions for Australian firms aiming to maximise the wealth of their shareholders. It emphasises the way in which Australia's indexed capital gains tax provisions which were introduced the year before the full imputation reform can combine with the full imputation provisions to provide incentives which are not well understood.

The model is used to examine the way in which Australian tax provisions can bias decisions over whether investment is financed by debt, new equity, or two different possible methods of retained earnings. In contrast to previous studies, it is argued that Australian tax provisions can provide a bias *against* debt and *in favour* of new equity issues. The study also clarifies a number of other financial incentives created by Australian tax provisions and estimates magnitudes of financial policy biases.

The model is also used to derive a cost of capital expression which takes account of corporate and personal taxes. Costs of capital for companies and unincorporated enterprises would be identical in the absence of capital gains taxation. Capital gains taxation can drive a wedge between costs of capital for corporate and unincorporated enterprises. This means that the full imputation reform will not have eliminated biases over whether investment takes place in companies or unincorporated enterprises even though the Australian full imputation reform was designed to approximate the full integration 'ideal'. Costs of capital are examined under both idealised and actual capital write-off provisions in Australia.

The model is extended back to consider how financial policy biases and costs of capital have changed since the time of Australia's former classical company tax system. We find that there is some uncertainty over whether financial policy biases have been reduced as a consequence of the full imputation reform. If Australia's former classical company tax system is modelled in the way that proponents of the 'new view of dividends' would suggest, we find that Australia's full imputation may have had a relatively small effect in reducing biases concerning whether investment is undertaken by companies or unincorporated enterprises. Indeed, in the case of relatively tax-preferred forms of investment, the bias against corporate investment can be higher than would have arisen if a classical company tax system had been retained. Nonetheless, the reform appears to have had important effects in reducing biases between different forms of investment that companies can undertake.

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CHAPTER 1: INTRODUCTION

1.1 OVERVIEW

In 1986/87 Australia introduced a capital gains tax. One year later Australia's classical company tax system was abandoned and a full imputation system of company taxation was introduced. There is a very large international literature which has examined the incentive effects of tax systems in other countries. However, there has been very little formal analysis of the effects of the Australian full imputation company tax system. The aim of this dissertation is to derive a formal model to examine how Australia's full imputation company tax system and capital gains tax provisions can affect financial policy and investment decisions for *widely-held companies* owned by *Australian residents*. To do this the thesis draws on the work of King (1974*a* and 1977) and modifies it to take account of Australian tax provisions.

The broad structure of the thesis is as follows. The issues that will be analysed are outlined in this chapter. This chapter also provides some background information relevant to our study. It outlines key features of the Australian capital gains and full imputation provisions, discusses how this study departs from previous studies and provides some data on changes in investment, dividends and methods of corporate finance in recent years.

Chapter 2 presents the formal model of a company and uses it to investigate financial policy biases that can arise under Australia's full imputation provisions. King's work examined biases arising under a variety of company tax systems including imputation schemes but there are important differences in the Australian full imputation provisions from the imputation schemes that King analysed. King's work provided the underpinnings for the methodology of King and Fullerton (1984) which has been drawn on to analyse corporate financial policy biases in a number of countries including Australia. However, there are features of the Australian reform which have not been analysed clearly in Australian studies which have used the King-Fullerton methodology.

With the exception of Benge (1997) which draws on an early version of material from this thesis, there appear to have been no attempts to set down a formal model to consider financial policy biases under Australian tax settings or to estimate the magnitudes of these biases. In chapter 2 King's work is modified to take account of Australia's indexed capital gains tax provisions and the two different forms of dividends ('franked' and 'unfranked' dividends) that firms can pay. We examine financial policy biases for widely-held Australian companies as a result of Australian tax provisions.[1] This allows us to derive insights which differ in important ways from other studies. For example, there has been controversy over the extent to which the Australian reform has eliminated a tax bias favouring debt. Some other studies have argued that the bias has been only partially removed while some have argued that the bias has been completely removed. In contrast to other studies, we show that the indexation provisions of the capital gains tax together with full imputation can result in the tax bias in favour of debt being *more than completely removed.* We show that in times of inflation, new equity can be favoured relative to debt.

Other studies appear to have come to differing conclusions over whether or not retained earnings are tax preferred to new equity. In Australia incentives to retain profits depend on whether any dividends would be franked or unfranked if profits were distributed instead. Our study examines the conditions required for new equity to be tax preferred to each of these forms of retained earnings. Finally, we estimate the magnitude of financial policy biases under Australian tax settings.

King also examines how company and personal tax provisions can interact to affect investment decisions. In chapter 3 King's analysis is modified to investigate the cost of capital (i.e., the minimum pre-tax rate of return at which investment becomes profitable).

The effect of dividend taxation on corporate investment decisions is controversial. This thesis, in common with the 'new view of dividends' models of Auerbach (1979*a* and *b*) and Bradford (1981), assumes that equity investment in companies is financed

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[1] Throughout the thesis, the companies being referred to should be thought of as widely held. For closely-held companies it may be possible to reduce capital gains tax liabilities in ways which are not analysed. We assume that a fixed fraction of shares are sold in each period which means that if firms retain profits, shareholders will be subject to capital gains tax. For closely-held companies there is the option of retaining profits for a number of years and then paying dividends immediately before shares are sold. If a closely-held company has a single shareholder, this procedure could be used to eliminate any capital gains tax being levied on retained profits. While, in principle, widely-held companies could attempt to retain profits for a fixed number of years and then make a distribution to cater for a certain clientele of shareholders, this seems to be much less likely to be feasible and there is no evidence of this happening in practice. Our assumption that retention leads to taxable capital gains appears much more plausible for widely-held than closely-held companies.

in the least cost way.[2] Under a classical company tax system in which capital gains are taxed less heavily than dividends, retentions are a cheaper way of raising equity than new equity issues. Proponents of the new view of dividends assume that equity investment is financed at the margin by the retention of profits. In this case, for mature firms which are able to meet their equity requirements by the retention of profits, formal models suggest that the tax rate on dividends should affect neither investment nor dividend decisions. An interesting aspect of the Australian reform is that normally new issues will be tax preferred to the retention of frankable earnings (ie., the retention of profits which would be franked if paid as dividends). By modifying King's work for Australian tax settings, we derive a model where the tax treatment of dividends affects both investment and dividend decisions.

In chapter 3, cost of capital expressions are derived for both widely-held companies and unincorporated enterprises. In the absence of capital gains tax, costs of capital would be the same for these two types of firm.[3] We explore how capital gains taxation together with the Australian full imputation system can cause costs of capital for these two types of firms to diverge. Costs of capital are examined under idealised depreciation provisions: an immediate deduction for capital expenditure (expensing), deductions for falls in the real value of assets (real economic depreciation) and deductions for falls in the nominal value of assets (nominal economic depreciation). Reasons for costs of capital expressions in these three simple cases are discussed. This helps in developing an understanding of how full imputation can affect incentives to invest. Estimates of costs of capital are also made taking account of actual capital allowances available in Australia.

In chapter 4 the analysis in chapters 2 and 3 is extended backwards in time to consider how financial policy biases and investment biases have changed over the period since 1984/85 which was before the full imputation and capital gains tax reforms. This allows us to assess the overall effects of the capital gains tax and full imputation reforms and of other tax changes on financial policy and investment biases. It is sometimes argued (see, for example, Zodrow, 1992) that if the new view of dividends is the correct way of modelling a classical company tax system, the case for partial

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[2] The 'new view of dividends is also sometimes referred to as the 'trapped equity' model of the corporation.

[3] Costs of capital for closely-held companies would be the same as those of unincorporated enterprises if distribution policy could be manipulated to avoid any capital gains tax impost.

integration measures such as Australia's full imputation company tax system is substantially undermined. In chapter 4 we use a new view model to consider the effects of the classical company tax system. We show that even in this case the full imputation reform appears to have had important effects on investment biases. However, the main reason is not that full imputation has reduced biases influencing whether investment takes place in the corporate or unincorporated sectors. Instead it is because full imputation tends to reduce biases between different forms of investment a company can undertake.

An important goal of the thesis is to help open up analysis of Australian tax provisions and to allow insights from the international literature to be modified for Australian tax settings. This is a very large task and the thesis is little more than a first step in this direction. Some brief comments on directions for future research are provided in chapter 5.

1.2 AUSTRALIA'S CAPITAL GAINS TAX AND FULL IMPUTATION REFORMS

Before the set of tax changes initiated in the mid-1980s Australia had a classical company tax system. The company tax rate was 46 per cent and dividends could pass within the corporate sector free of tax as a result of the intercorporate dividend rebate. Tax rates levied on resident 'final shareholders' (ie., shareholders other than corporations able to make use of the intercorporate dividend rebate) varied between 0 per cent and 60 per cent. Over one-third of dividends received by individual shareholders were by those on the top personal marginal rate of 60 per cent. Superannuation funds which were major shareholders were normally untaxed. Life insurance companies were taxed at the company tax rate of 46 per cent on their non-superannuation business.

At that time Australia had no general capital gains tax although certain capital gains were taxed under specific provisions of the *Income Tax Assessment Act*, for example, profits made on the sale of assets within 12 months of purchase, (s. 26AAA), on property acquired for the purpose of making profits by sale (s. 25A) or on the trading profits of dealers in land, shares and securities (s. 25). Regulations prohibited companies from buying back their own shares and from purchasing shares in related companies.

Proposals for changing the system of company taxation had been analysed in the Australian Financial System Inquiry: Final Report (1981), (often referred to as the Campbell Report). This inquiry together with its commissioned studies had advocated a switch away from Australia's classical company tax system to a fully-integrated company tax system.

The first clear indication that the government was prepared to contemplate changing the company tax system was provided in the government's Draft White Paper (1985). The Draft White Paper proposed sweeping changes to the tax system including a general capital gains tax and indicated (somewhat tentatively) that the government was 'disposed to allow either partial (say 50 per cent) or full imputation credits on dividends received by resident individual shareholders, on a broadly revenue-neutral basis.'[4] This was followed by a statement by the Treasurer on 19 September 1985 (Keating, 1985) which announced a wideranging set of tax reforms. Importantly for our study they included a general capital gains tax and a switch to full imputation.

The Capital Gains Tax

The following key features of the capital gains tax which was introduced with effect from 1 July 1986 on assets acquired on or after 20 September 1985 are relevant for our study:

- as with capital gains taxes in other countries, gains are taxed on realisation (when assets are disposed of) rather than as the gains accrue;
- gains are taxed at ordinary rates of personal or company tax;[5]
- if an asset is sold which has risen in real value, tax is normally levied only on the real (inflation-adjusted) capital gain;[6]
- if an asset is sold which has fallen in nominal value, the nominal capital loss may be offset against real capital gains in the same year or be carried forward to be offset against future real capital gains;[7]
- if there is inflation and an asset is sold which has fallen in real value but risen in nominal value, there is neither a taxable gain nor a deductible loss.

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[4] See Draft White Paper (1985, *p*. 199).

[5] A proviso which we do not analyse is that for gains on assets held by individuals, there is a notional averaging provision to limit the "bunching" of capital gains.

[6] Exceptions arise if gains are realised within a year of the asset being acquired or if the asset is sold by a dealer in the asset. In either of these cases the nominal gain is taxable.

[7] The loss cannot be offset against income other than capital gains.

The somewhat peculiar indexation provisions reflect the government's desire to only tax real capital gains without moving to a tax system which was comprehensively indexed for inflation. For example, there were no moves to inflation index either depreciation provisions, deductions for trading stock or interest. If real capital losses were deductible, this would have provided a backdoor method of indexing depreciation provisions if firms buy and sell assets to realise real capital losses.

The capital gains tax rules are varied if the inflation rate becomes negative but for simplicity this complication will be ignored in the model presented in this thesis. The indexation provisions mean that there are a number of different possible cases to analyse when the inflation rate is positive. First, if it were known that shares would eventually all be sold for more than their real acquisition cost, only real gains would be taxable on realisation (provided the gain is not realised within 12 months or by a sharetrader). Second, if it were known that all shares would eventually be sold for less than their real but more than their nominal acquisition cost, at the margin any additional capital gain would be untaxed. Third, if it were known that all shares would ultimately be sold for less than their nominal acquisition cost, at the margin any nominal capital gain would be taxed (ie., reduce the nominal capital loss that can be set off against capital gains in that year or carried forward to be offset against such income in future years).[8]

Further complications arise for two reasons. First, even if the future profile of share prices were known, a capital gain could lead to a real gain for some shareholders, a real loss but nominal gain for others and a reduction of the nominal loss for others depending on when the shares were acquired. Second, in practice the future profile of share prices will be uncertain. For any one shareholder there will be the possibility of real gains or nominal gains being taxed or gains being untaxed. These further complications are ignored in our formal analysis where we treat the future profile of gains as being certain and assume that all shareholders either derive real gains, nominal losses or real losses but nominal gains.

The Full Imputation Scheme

In his 19 September 1985 announcement, the Treasurer also stated that a full imputation scheme would be introduced in the 1987/88 income year. The initial

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[8] As discussed in footnote 3, nominal gains would also be taxed where gains are realised within 12 months of an asset being acquired or when gains are realised by a sharetrader.

scheme was modified in a further statement by the Treasurer on 10 December 1986 (Keating, 1986) which, inter alia, included a decision to adopt a franked/unfranked dividend approach instead of the United Kingdom's ACT approach and (as is discussed further below) to allow firms to pass imputation credits to shareholders by issuing bonus shares as well as by paying dividends. Other key features of the scheme introduced in 1987/88 were as follows:

- the company tax rate was raised from 46 cents in the dollar and aligned with the top personal marginal tax rate of 49 cents in the dollar[9];
- imputation credits were made available to offset taxes on other income earned by resident individuals but not to give rise to cash refunds to individuals below the tax-free threshold, to tax-exempt bodies or to non-residents;
- imputation credits were made available only in respect of Australian tax paid by companies.

The franked/unfranked dividend approach works broadly as follows. Suppose that the company tax rate is τ. On each dollar of assessable income the company pays τ in the tax and the remainder $1 - \tau$ increases the company's 'franking account balance' which allows it to pay an additional $1 - \tau$ in franked dividends. If a company has a positive franking account balance, it can pay franked dividends and each dollar of franked dividends reduces the franking account balance by a dollar. On franked dividends, imputation credits can be claimed by Australian taxpaying shareholders including individuals, life insurance companies and superannuation funds.[10]

Suppose that a shareholder is a taxpaying resident taxed at rate $m > 0$. On each dollar of franked dividends the shareholder will be taxed on the grossed-up dividend of

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[9] This was not quite effective alignment for those on the top personal marginal tax rate because of the 1 per cent Medicare Levy which increased the top effective personal marginal tax rate to 50 per cent.

[10] Superannuation funds were nontaxpayers until 1988/89 and so were unable to claim imputation credits until that time. Up until 1988/89 dividends received by life insurance companies were effectively exempt due to the intercorporate dividend rebate and life insurance companies could not claim imputation credits. If a company earned $100, paid $49 in tax and distributed the remaining $51 as dividends to shareholders which were life insurance companies, the life insurance companies would have paid no further tax and have received $51 in after-tax dividends. In 1988/89 life insurance companies became able to claim imputation credits but were denied the intercorporate dividend rebate. This change has no effect on the tax liabilities of life insurance companies so long as life insurance companies are taxed at the same statutory rate as other companies.

$1/(1-\tau)$ but can claim an imputation credit of $\tau/(1-\tau)$ which results in a net tax liability of $(m-\tau)/(1-\tau)$ and an after-tax dividend of $(1-m)/(1-\tau)$. This means that if a company earns one dollar in taxable income, pays τ in tax and distributes the remainder as a franked dividend, its shareholder (assume a single shareholder for convenience) would pay a further $m-\tau$ in tax and receive $1-m$ after tax. This is in line with the imputation scheme's objective of ensuring that distributed corporate income is taxed once at a shareholder's marginal tax rate. If $m > \tau$, additional tax is payable when franked dividends are paid. If $0 < m < \tau$, franked dividends lower a shareholder's tax liability.

Once firms have reduced their franking account balance to zero by paying franked dividends, any further dividends are unfranked. A shareholder pays tax of m on each dollar of unfranked dividends and receives $1-m$ after tax. Thus, if a firm earns \$1 and fully distributes its after-tax profits to a taxpaying resident shareholder, the shareholder would end up with $1-m$ after tax irrespective of whether or not the income was taxed in the company's hands.

As imputation credits arise only when Australian tax is paid, the benefits of measures which reduce company tax can be clawed back in full or in part. Measures which reduce company tax may include intentional legislated tax preferences or unintended loopholes in the tax law. The benefit of a reduction in company tax can be clawed back in full if the reduction in company tax transforms a dividend which would have been franked to one which is unfranked.[11,12] The benefit can also be clawed back in part if the reduction in company tax reduces the level of franked dividends a company can pay and thus results in a firm retaining more profits than would otherwise be the case. This is because this will add to the value of shares which may result in a capital gains tax liability for shareholders when shares are sold.

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[11] The taxation of unfranked dividends may also at times wash away the benefits of the inflation indexation of capital gains. Suppose there is inflation and a company owns an asset which maintains its real value. If the firm sells the asset, it pays no capital gains tax. However, if the company has a zero franking account balance and distributes the proceeds to shareholders as dividends, the dividends will be unfranked and taxable. This may make it desirable for individuals to own assets which appreciate in nominal value such as rental property directly rather than through a private company.

[12] The way in which partial integration measures can claw back tax preferences when dividends are paid is well known (see, for example, McLure, 1979).

Imputation credits are not refundable and so cannot be claimed by a nontaxpayer. They also cannot be carried forward or back to offset tax in other years and so imputation credits in excess of those required to drive a shareholder's tax liability to zero or imputation credits received by shareholders who are temporarily in a tax-loss position are wasted.[13] Imputation credits are also not refunded to foreign shareholders and so foreign shareholders gain no direct benefit from the imputation scheme.[14] As a result of these provisions the value of franked dividends relative to unfranked dividends varies between shareholders. There are complex provisions aimed at preventing companies from streaming different forms of dividends to different groups of shareholders.

When full imputation was introduced, the intercorporate dividend rebate was preserved. As a result of this rebate, both franked and unfranked dividends received by Australian companies other than life insurance companies are effectively exempt. However, franked dividends add to the corporate shareholder's franking account balance allowing credit for underlying company tax to pass down a chain of companies.

At times firms may wish to retain profits while providing shareholders with imputation credits. Firms can do this by capitalising profits and issuing franked bonus shares which are taxed as dividends. Suppose, for example, that a company earns a dollar of assessable income and pays τ in tax which increases its franking account

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[13] Suppose, for example, that an superannuation fund which is taxed at 15 cents in the dollar has $100 of interest income and $64 of franked dividends. Assuming the current company tax rate of 36 per cent, the franked dividends correspond to $100 of grossed-up dividends. Tax on the grossed up income would be $30 (i.e., 15 per cent multiplied by $200) but the superannuation fund would have $36 of imputation credits. As the imputation credits exceed tax on the grossed up income, the superannuation fund would have no tax to pay. However, $6 of the imputation credits would be wasted.

[14] At the same time as the full imputation scheme was introduced, dividend withholding tax on franked dividend payments to non residents was terminated. Unfranked dividends paid to foreign shareholders continue to be subject to a withholding tax of 15 or 30 per cent of gross dividends depending respectively on whether payments are made to a DTA (double-tax-agreement) or non-DTA country. If $100 of gross unfranked dividends are paid by an Australian company to a resident of a DTA country, the Australian company would pay $15 in withholding tax and a net dividend of $85 to the foreign shareholder.

balance by $1-\tau$. The company can use the retained earnings to issue $1-\tau$ of franked bonus shares on which shareholders can claim an imputation credit of τ and pay net tax of $m-\tau$. Shareholders would be deemed to have acquired the shares at a cost of $1-\tau$ for capital gains tax purposes. The final position would be exactly the same as if the company had paid $1-\tau$ as a franked dividend and shareholders had bought new shares of this amount.

The bonus share provision was designed to allow the Australian full imputation scheme to approximate a fully-integrated company tax system. An important feature of the original reform was the alignment of the company tax rate with the top personal marginal tax rate. Even in the absence of any capital gains tax, this would have provided incentives for firms earned by domestic residents to pay the maximum level of franked dividends or issue franked bonus shares instead if they wished to retain profits. No domestic residents paid additional tax and some benefited from reductions in tax when franked dividends were paid. The capital gains tax reinforced these incentives as failing to distribute franked dividends or franked bonus shares leads to increased share values and a potential capital gains tax liability when shares are sold. If firms had a policy of either distributing franked dividends or issuing franked bonus shares so as to maintain a zero franking account balance from year to year, all corporate profits would be taxed at the marginal tax rates of shareholders. This would be true whether franked dividends were paid or profits retained and bonus shares issued. The Australian full imputation scheme was intended to operate like a fully-integrated company tax system without legally requiring firms to allocate profits to individual shareholders.

Evidence will be provided later that imputation credits declared by individuals are too low for firms to be maintaining a zero franking account balance from year to year so the full imputation system has not been as close an approximation to full integration in practice as the previous discussion might suggest. Part of the reason may be changes in the company tax rate. Since the initial reform the company tax rate was lowered from 49 per cent to 39 per cent in 1988/89 and further lowered to 33 per cent in 1993/94 before being increased to 36 per cent in 1995/96. As changes to personal marginal tax rates have been minor, this has fractured the alignment between the company tax rate and the top personal marginal tax rate which is currently 48.5 per cent (inclusive of the 1.5 per cent Medicare Levy).

New Zealand also announced a switch from a classical company tax system to full imputation at much the same time as Australia. Key design features of the full imputation schemes in the two countries are very similar. Important differences include the fact that New Zealand has no general capital gains tax and that New Zealand has kept the company tax rate and top personal marginal tax rate aligned. This means that incentives to distribute franked dividends or issue franked bonus shares have been preserved in New Zealand while these incentives may, in some cases, have been undermined in Australia.

1.3 RELATIONSHIP OF THESIS WITH OTHER LITERATURE

Many Australian studies have examined aspects of the incentives provided by the Australian tax system. Some have adopted variants of the effective tax rate methodology of King and Fullerton (1984) such as the Bureau of Industry Economics (1988, 1990*a*, 1990*b* and 1993), Jones (1993) and Pender and Ross (1993). In these studies the effective tax rate is defined as $(p-s)/p$ where p is the real pre-tax rate of return and s is the real post-tax rate of return to savers. There have also been a number of other studies including Freebairn (1990), Hamson and Ziegler (1990), Pender (1991) and Bourassa and Hendershott (1992). Most recently Sieper (1995) has examined the cost of capital for deferred-income projects. These studies have provided many useful insights into the incentives that the Australian tax system provides.

The effective tax rate studies have their analytical foundations in the work of King (1974*a* and 1977) which also forms the foundations for our study. These effective tax rate studies focus on how the King-Fullerton methodology should be modified to take account of Australian tax settings. However, unlike our study and the earlier work of King they do not write down a formal model from first principles and it is often difficult to identify key assumptions. Our formal model has the advantage of clarifying assumptions and provides insights about corporate financial policy and investment biases that differ in important ways from previous studies.

In King (1974*a*, *b* and 1977) and King and Fullerton (1984) it is assumed that under an imputation scheme *all* dividends provide imputation credits.[15] By contrast in Australia (as was outlined above), companies can pay either franked or unfranked dividends and only franked dividends qualify for imputation credits.[16] Our model

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[15] Bourassa and Hendershott (1992) also make this assumption.

[16] A number of other papers have analysed a parallel issue which can arise under an advance corporation tax, ACT, system. Under such system, if a firm pays a dividend of D, ACT of $cD/(1-c)$ is levied on the firm where c is the rate of imputation credit. However, ACT can be set off against

modifies King's work by allowing for both franked and unfranked dividends and allowing for the Australian indexed capital gains tax provisions. It is the first attempt at providing a formal model of the Australian full imputation company tax system which takes account of these two important tax provisions and which does not impose ad hoc assumptions about a firm's value. Our model follows King (1974*a* and 1977) and Auerbach (1979*a*) in allowing the value of a firm to be endogenous.

As is discussed further below, a number of other studies have assumed that firms pay a fixed fraction of their dividends franked. This is unattractive when examining the effects of interest deductibility and capital write-off provisions because these provisions affect company tax payments. Payments of company tax can have a shadow benefit to shareholders in increasing the level of franked dividends that firms can pay. In our model the level of franked dividends that a firm can pay depends on company tax payments and this allows us to examine corporate financial policy and investment incentives in a consistent manner.

Financial Policy Biases

It is well known that a classical company tax system can introduce a bias in favour of debt. One of the aims of the Australian full imputation reform was to ameliorate this bias.[17] King (1974*a* and 1977) analysed how any bias in favour of debt depends on whether equity is financed by the retention of profits or by the issuing of new equity and on the system of company taxation. King (1977, *p.* 100) concludes that under a full imputation scheme a firm would be indifferent between debt and new equity.

There has been considerable debate over this issue in Australia. Freebairn (1990, *p.* 16) concludes that 'for most investing situations, debt finance is favoured over equity finance'. Jones (1993, *p.* 70) concludes that his results 'appear to suggest a favouring of debt finance for the financing decisions of residents.' He acknowledges that an important cause is that the weighted tax rate on those who supply debt capital tends to be lower than that on those who supply equity and cites a study by the Bureau of Industry Economics (1990*a*). If a lower effective tax rate on debt merely reflects the

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mainstream corporation tax. Thus, if a firm pays additional mainstream corporation tax, this can increase the ACT offset. A number of papers have examined the effects of this provision and other tax asymmetries including Edwards and Keen (1985) in a certainty setting and Mayer (1986) and Keen and Schiantarelli (1991) in an uncertainty setting.

[17] See, for example, Keating (1986 and 1987).

fact that those supplying debt capital happen to be on lower tax rates, it appears difficult to argue that this implies a tax bias in favour of debt. The Bureau of Industry Economics study considered effective tax rates on a taxpayer by taxpayer basis assuming that suppliers of debt and equity were taxed at the same rate. It claims (*p. ix*) that the 'bias towards debt has been progressively reduced over time but probably not eliminated'. By contrast Hamson and Ziegler (1990) provide a numerical example to show that taxed resident individual shareholders will be indifferent between personal and corporate borrowing. Pender (1991, *p.* 64) also provides a numerical example to argue that 'there is no bias toward debt provided all dividends are paid franked and the attached franking credits can be used.'

In chapter 2 our formal model of the company is introduced and used to examine how full imputation and the capital gains tax provisions will affect leverage and dividend policy for widely-held companies owned by Australian residents. In contrast to the studies cited above, it is concluded that in times of inflation Australian tax provisions can go further than merely eliminating debt/equity biases and create a bias in favour of new equity issues. The formal model is also helpful in distinguishing two types of retained profits: those which would have resulted in franked dividends if distributed and those which would have resulted in unfranked dividends. Incentives to retain profits differ between the two cases. In chapter 2 we document the financial policy biases which can be created between debt, new equity and these two forms of retained earnings and consider magnitudes of these biases.

Our results on tax biases between other forms of finance and these two separate forms of retention are difficult to compare with studies which have used the King-Fullerton methodology to examine Australian tax provisions but which have not distinguished these two forms of retention. Such studies appear to have arrived at differing conclusions about which of retentions or new equity is the cheaper form of finance in Australia. Exact reasons are frequently difficult to identify because explanations of assumptions are often terse, as is perhaps not altogether surprising given the complexity of these models. For example, Jones (1993, *p.* 69) argues that using 1990 data '. . . retained earnings are generally the tax-favoured form of equity finance. This is clearly true for Australia.' In corroboration he estimates a total effective tax rate of 50.3 per cent for new issues and 40.4 per cent for retained earnings. In another paper in the same volume which provides an overview of effective tax rates across nine countries and which appears to use the same data, Jorgenson (1993, *p.* 19) finds a total effective tax rate of 31.2 per cent for new issues and 59.0 per cent for retained earnings for Australia in 1990. The only apparent difference in their assumptions is that Jones assumes 7 per cent annual inflation while Jorgenson assumes 5 per cent inflation which cannot explain the big difference in results.

If there are differences in assumptions about the franking of dividends in the two studies, this matter may resolve the apparent conflict. We show that the retention of profits which would be *unfranked* if paid as dividends is tax favoured relative to new issues but new issues tend to be tax favoured relative to the retention of profits which would be *franked* if paid as dividends.

Investment Decisions

It is common to analyse the effects of tax incentives on incentives to invest in terms of the cost of capital. Jorgenson (1963) proposed analysing investment incentives in terms of the 'user cost of capital'. Hall and Jorgenson (1967 and 1971) analysed how detailed provisions of the tax code including investment allowances and accelerated depreciation could affect the user cost of capital on a marginal investment. Their measure of the user cost of capital differs from our measure in being gross of depreciation. King (1974*a* and 1977) clarifies how different forms of finance can affect the cost of capital under a number of different company tax systems. Our measure of the cost of capital as being the minimum real pre-tax rate of return at which investment becomes profitable is equivalent to the financial cost of capital of King (1977).

In Chapter 3 we modify King's analysis to take account of detailed provisions of the Australian full imputation and capital gains tax provisions. In an Appendix to chapter 3 we following King (1974*a*) in allowing for interest rates, inflation rates and depreciation provisions which vary through time. We also allow for there to be differences in the relative prices of capital goods and output. In the Appendix, optimal investment decisions for unincorporated enterprises and widely-held companies owned by Australian shareholders are derived. In most of the analysis, however, it is assumed that there is a constant interest rate, inflation rate, constant depreciation provisions and a constant relative price of capital goods to output. This allows us to examine some important effects of taxes on incentives to invest as simply as possible.

Costs of capital for unincorporated enterprises and companies are compared and it is shown that costs of capital would be the same in the absence of any capital gains tax.[18] Capital gains taxation will cause costs of capital for corporate and unincorporated enterprises to diverge because measures which reduce company tax constrain the levels of franked dividends firms can pay. Other things equal, fewer franked dividends implies increased retentions which will boost the value of shares. This will normally increase capital gains tax liabilities for shareholders. Chapter 3 analyses the effects of this on costs of capital. The sensitivity of the estimates to a number of assumptions including tax rates of shareholders, the frequency of share turnover, rates of inflation and the proportion of debt finance are also explored.

Our conclusions are difficult to compare with Australian studies which have used the King-Fullerton methodology. First, a number of studies including the Bureau of Industry Economics (1988 and 1990*a*) assume a fixed ratio of franked to unfranked dividends. This is unsatisfactory when examining the effects of accelerated depreciation and investment allowances as tax payments affect a firm's ability to pay franked dividends. The second of these studies considers a closely-associated issue at one stage when it presents an 'alternative approach' (*pp*. 46*ff*.) which considers how interest deductions can affect a firm's ability to pay franked dividends. It does not, however, consider the identical problem of how to analyse the effect of capital write-off provisions when these affect the firm's ability to pay franked dividends. In a number of other studies including the Bureau of Industry Economics (1990*b*), Jones (1993) and Jorgenson (1993), it is difficult to identify assumptions about the proportion of dividends which are franked.

The Bureau of Industry Economics (1993) analyses the effects of providing a 150 per cent deduction for corporate R&D relative to that of a 100 per cent deduction. This study considers the clawback of tax preferences available at the company level. To do this, however, it examines two polar extreme possibilities. First, it considers the case of a firm paying unfranked dividends where the preference is fully clawed back. Second, it considers the case where there is no clawback. This requires that capital gains taxation be ignored.[19] The Bureau of Industry Economics study does not

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[18] Given that New Zealand has introduced a full imputation scheme which is very like Australia's but does not have a general capital gains tax, our analysis suggests that New Zealand may have largely removed investment biases between corporate and unincorporated enterprises. Australia's capital gains tax will, however, cause costs of capital to differ between corporate and unincorporated enterprises.

[19] The BIE's assumptions of how a 100 per cent deduction for R&D affects franked dividend payments are obscure which makes it difficult to compare our analysis with theirs more fully.

consider effective tax rates under less extreme assumptions or examine how an optimising firm might behave.

These studies have provided useful insights and have been more ambitious than this thesis in considering important issues such as the existence of foreign shareholders which this thesis neglects. However, the studies have seemed to ignore important issues or have not clearly specified all critical assumptions. Some of these studies are also open to other possible criticisms. As Bourassa and Hendershott (1992) note, not all measures which impact on effective tax rates need affect investment decisions. For example, at a given interest rate, tax rates on bondholders will influence effective tax rates but have no effect on investment decisions.[20]

More recent King-Fullerton studies have attempted to overcome this sort of difficulty by separately identifying an effective corporate tax rate and an effective personal tax rate on corporate-source income (see, for example, Jorgenson, 1993, and Jones, 1993). Jorgenson defines the effective corporate tax rate as being $(p-q)/p$ where q is the after-corporate but before-personal tax rate of return. Jorgenson argues (*p*. 9) that it is the effective corporate tax rate which measures incentives to invest. 'Differences among these tax rates indicate barriers to efficient allocation of capital among assets and industries, since corporations equalize rate of return *after* corporate taxes.'

Under the Australian full imputation scheme, however, it will not generally be optimal for companies to equalise rates of return after company tax. This is because it will normally be optimal for widely-held companies to distribute franked dividends (dividends with imputation credits) so shareholders can claim the imputation credits rather than retaining profits which can lead to a capital gains tax liability for shareholders. This means that paying company tax has a shadow benefit to shareholders which must be taken into account as company tax payments increase the franked dividends that companies can pay.

Suppose, for example, a company taxed at a rate of 36 per cent invested in a perpetuity which provided taxable income of \$100 per annum which yields \$64 per annum net of company tax. The \$64 per annum would yield $\$64(1-m)/(1-\tau)$ or $\$100(1-m)$ per annum in after-tax franked dividends assuming that dividends are fully distributed. If instead the company invested in a tax-free perpetuity which yielded \$64 per annum, this would not generally be as attractive to shareholders. If

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[20] Jorgenson (1993) provides a good discussion of other possible criticisms.

profits are distributed, dividends would be unfranked (taxable without imputation credits) and shareholders would gain only $\$64(1-m)$ from the stream of unfranked dividends. Instead the company might retain the profits. This would still be inferior to shareholders receiving a stream of $\$64(1-m)/(1-\tau)$ per annum in franked dividends if, as it is argued will normally be the case, shareholders have a preference for franked dividends to be distributed.

Similar issues can arise under an ACT imputation scheme where beyond some point dividends become taxable when ACT starts to exceed a company's mainstream corporate tax liability. Separating effective tax rates into effective corporate rates and effective personal rates does not seem sufficient to identify investment biases.

Pender and Ross (1993) modify the King-Fullerton methodology by assuming that marginal investments will be those which are only just attractive to shareholders. Effective tax rates are expressed in terms of the pre-tax rate of return on such an investment and the post-tax rate of return to *shareholders*. The interest rate is taken as given and tax rates on bondholders do not affect effective tax rates. Pender and Ross go beyond this thesis by allowing for risk and uncertainty but fail to do so in a consistent manner, discounting riskless interest payments at a risk-adjusted discount rate. They mention capital gains tax asymmetries but do not analyse how capital gains taxes depend on changes in the overall value of the firm. Perhaps most importantly, they assume that whenever a firm retains a dollar, its value rises by a dollar. By contrast in our study the value of the firm is endogenous.

Like King-Fullerton studies, Freebairn (1990) presents estimates of investment biases in Australia using 'effective tax rates'. However, Freebairn's methodology is very different from that of King and Fullerton (1984) and in our view can be misleading.

To understand his methodology, consider investment by an unincorporated business whose owner is taxed at rate, m. Assume, as Freebairn does, that an investment is a 'one-hoss shay' with a life of N years. Freebairn defines his effective tax rate as T/r where $T = m(r + DE - DT)$, DE is what Freebairn describes as the average annualised rate of economic depreciation, DT is the average annualised rate of tax depreciation and r is the real cost of funds which is assumed to be 5 per cent. Freebairn defines

$$DE = \frac{1}{N}\sum_{s=1}^{N}\frac{1}{N(1+r)^{s-1}}$$

and

$$DT = \frac{1}{N}Z$$

where Z is the present value of tax depreciation discounted at the real cost of funds.

For a specific example, consider the case of expensing (an immediate deduction for capital expenditure) when $Z = 1$ and so $DT = 1 / N$. Suppose that a taxpayer is on a 48.3 per cent marginal tax rate and finances investment with his own capital. Consider investment in either a one-year or a five-year investment. Freebairn analyses this case as 'repairs, promotion, etc.' in Table 1 (*p*. 32). The effective tax rate for the one-year investment is 48.3 per cent and the effective tax rate for the five-year investment is 30.7 per cent.

The conclusion that the reader is invited to take from this analysis is that the tax system favours investment in five-year relative to one-year expensible investments. Freebairn does not provide a rigorous justification for his methodology and this conclusion seems to contrast with conventional analysis. It is well known that with expensing, pre- and post-tax rates of return will be identical. Given the assumed tax rate, a taxpayer will finance 51.7 per cent of the cost of an investment and receive 51.7 per cent of the revenue. As tax reduces the cost of the investment and its revenues in the same proportion, the pre- and post-tax rates of return will be the same. Given that investments which generate the same pre-tax rate of return also generate the same post-tax rate of return, it appears difficult to see any reason for expensing to lead to a bias against shorter-lived investments.[21]

It is clear that Freebairn's analysis is also quite different from that of King and Fullerton. Given that pre- and post-tax rates of return are identical, the King-Fullerton measure of effective tax rates, $(p - s) / p$ will be zero and be independent of asset durability. By contrast, in this example, Freebairn's measure of effective tax rate is positive and declining with asset durability.

There appears to be another difficulty with the Freebairn study. In calculating effective tax rates, Freebairn (Appendix, *p. xiii*) assumes that equity shareholders are taxed like unincorporated investors. Our analysis clarifies the conditions required for this to be a reasonable assumption. We will argue that this would be reasonable if shares were held forever and so the effective rate of capital gains tax were zero. However, in general, capital gains taxation will cause costs of capital for companies and unincorporated enterprises to diverge.

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[21] The neutrality of expensing with respect to asset durability seems well accepted in the literature. See, for example, King (1977, Table 8.1), Harberger (1980) and Auerbach (1983).

It is easier to relate our results to those of Bourassa and Hendershott (1992) who also provide a cost of capital expression for Australian firms when examining how incentives to invest in the corporate sector compare with incentives to invest in housing. Bourassa and Hendershott compare costs of capital across three countries (Australia, Sweden and the United States). They also go beyond this thesis in examining owner-occupied housing and also in allowing for risk and uncertainty. However, in modelling Australian business tax provisions, these authors make a number of important abstractions. For example, they treat all dividends as being franked, ignore the fact that interest payments affect a firm's ability to pay franked dividends and abstract from important details of the Australian capital gains tax provisions by assuming nominal gains are taxed at a low rate instead of allowing for real gains to be taxed. These abstractions ignore a number of important properties of Australian tax provisions which we wish to analyse.

The only study which has carefully modelled detailed provisions of the Australian tax system and derived an expression for the cost of capital from first principles is Sieper (1995). One difference between our two approaches is that Sieper ignores inflation while the effect of inflation on corporate financial policy biases and investment decisions is an important issue we wish to analyse. A second difference is that Sieper formally models a realisation-basis tax while we adopt the more conventional simplification of modelling the tax as an accrual-equivalent tax. Appendix 2.1 shows that this simplification can be justified rigorously if (as Sieper assumes) a fixed fraction of shares are sold each period. The key difference between our approaches is that Sieper assumes that the value of a firm is the sum of its physical capital and retained earnings (assumed to be invested in financial assets). This makes the value of a firm independent of its stream of future deductions and biases his results. In our model the value of the firm is endogenous.

1.4 Key Assumptions and Possible Criticisms

The formal model of an optimising firm developed in chapters 2 and 3 rests on five key assumptions.[22]

First, we abstract from any signalling or agency benefits of dividends or debt. This assumption can be criticised. In the United States there has been an extended debate between proponents of the new view and proponents of the traditional view of

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[22] All of these assumptions were used in King (1974*a*).

dividends. For recent discussions see Sinn (1991*a*) or Zodrow (1992). Proponents of the traditional view argue that under a classical company tax system the retention of profits tends to be tax advantaged relative to distribution. For this reason they often argue that dividends must have some signalling function or provide agency benefits (by placing desirable constraints on corporate management) which balances their tax disadvantage.[23] Proponents of the new view have tended to argue that these functions may be provided in other ways and the debate is yet to be fully resolved.

In Australia the majority of firms do not pay unfranked dividends. For firms paying franked dividends only, our analysis suggests that the payment of these dividends will normally be tax preferred. For such firms it is not necessary to introduce signalling or agency benefits to explain why dividends might be paid. As the distribution of franked dividends is tax preferred, signalling or agency benefits would merely reinforce incentives for franked dividends to be fully distributed. Ignoring signalling and agency issues seems helpful at least in an initial attempt to investigate the incentive effects of the Australian full imputation scheme.

Ignoring signalling and agency issues may perhaps be a bigger problem when considering the minority of firms which pay unfranked dividends. Our analysis suggests that there will normally be incentives for firms to avoid paying unfranked dividends. The question of why firms pay unfranked dividends under Australian full imputation appears to provide a stronger puzzle than why firms pay dividends under the United States classical company tax system. In the United States people have been puzzled why firms do not repurchase shares or purchase equity in other firms as a way of providing shareholders with tax-preferred capital gains. Until recent years, however, there has been uncertainty over whether share repurchase would be taxed as dividends and there may be costs in mounting takeovers which provide impediments

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[23] Bhattacharya (1979), Miller and Rock (1985) and Bernheim (1991) provide examples of dividend signalling models. Jensen and Meckling (1976) emphasise that agency costs can have important effects on the financial structure of a firm and Jensen (1986) argues that dividends may provide beneficial constraints on managers by restricting free cash flow. Lang and Litzenberger (1989) provide empirical support for the free-cash-flow hypothesis and Bernheim and Wantz (1995) for dividend signalling. The last article also provides a much more comprehensive survey of the literature on this issue.

to firms using this as a way of rewarding shareholders.[24] In Australia firms have an important alternative to paying unfranked dividends which can provide shareholders with tax-preferred capital gains. By repaying a dollar of debt or lending a dollar, a company can provide shareholders with a stream of after-tax franked dividends with a present value of a dollar. Modelling signalling or agency issues may be important in understanding why firms pay unfranked dividends in Australia.

A second key assumption is that there is no risk or uncertainty.[25] Risk and uncertainty are likely to be important determinants of corporate financial and investment policy. In the United States there is a wealth of literature attempting to explain why firms are not fully debt financed when debt appears to be tax preferred. One explanation which requires no appeal to risk and uncertainty was suggested by Miller (1977) and formalised by DeAngelo and Masulis (1980*a*). This relies on some individuals having tax rates which exceed the company rate. If personal taxes on equity are negligible and there are short-sales constraints, Miller's analysis leads to an equilibrium where those on tax rates which exceed the company tax rate hold equity and those on lower tax rates hold debt. Under the new view, if firms are able to meet their equity requirements by retaining profits, dividend taxes can be ignored which makes a Miller equilibrium more plausible.

After the 1986 tax reforms in the United States, the top personal marginal tax rate fell below the company tax rate and a satisfactory explanation of why firms did not become fully debt financed may require some appeal to risk and uncertainty. A number of authors have argued that the possibility of insolvency explains why firms do not become fully debt financed. They argue that firms will issue debt until its marginal cost inclusive of the cost associated with a higher risk of insolvency is equal to the marginal cost of equity finance, (eg., Gordon and Malkiel 1981). If modelling risk and uncertainty is essential in explaining why United States firms are not fully debt financed, using a certainty model to explain corporate behaviour in Australia is clearly open to criticism. Under the current Australian tax system, however, to the extent that tax biases exist they favour new equity rather than debt. The possibility of

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[24] For data on the increasing use that United States firms have made of share repurchase and corporate acquisitions as a means of making distributions to shareholders see Bagwell and Shoven (1989).

[25] A minor qualification arises in Chapter 2 where we consider the possibility of a firm changing its financial policy in a way which was not previously predicted. We assume, however, that once financial policy is determined all agents in the economy take the policy as being certain.

insolvency merely reinforces biases favouring new equity. Important insights into these biases can be derived as simply as possible by ignoring risk and uncertainty.

Thirdly, apart from some brief comments in passing we restrict our attention to firms which are in a taxpaying situation. To this extent the analysis is more restrictive than papers cited in footnote 16 of this chapter which modelled the effects of the UK ACT imputation system which also consider the tax losses. While this the possibility of tax losses is an important case to consider, including it would lead to an unwieldy number of cases given Australian capital gains tax asymmetries. In our view, it is most helpfully left out of an initial study into corporate incentives in Australia.

Fourthly, we abstract from any costs of adjusting capital stock. A large literature has drawn on the work of Abel (1979), Summers (1981) and Hayashi (1982) to develop the 'q theory of investment'. In these models it is assumed that investment is slow to adjust in response to changes in tax policy because of convex adjustment costs. Such models have been used to analyse the short-run effects of changes in tax provisions in North America and Europe. No studies have sought to apply this literature to analyse the short-run effects on corporate investment of changes in tax policy in Australia which is not surprising given the lack of formal models analysing the effects of Australia's full imputation system. It would be a natural extension of the work in this thesis to consider the short-run effects of changes in tax policy in this framework but this is left for further work. This thesis focuses on biases which will be produced in the longer term if tax provisions are expected to remain stable through time.

Finally, it is assumed that shareholders are resident individuals or superannuation funds taxed at a *uniform* marginal rate, m.[26] This is an important abstraction. Even if a firm were solely owned by domestic individuals and superannuation funds, there will be conflicting objectives when shareholders are taxed at differing marginal rates and our assumption sidesteps the important issue of how these conflicting objectives are resolved.

Our assumption also abstracts from international equity flows which may be important when analysing the cost of capital in Australia. Moreover, we do not consider any capital flows explicitly. It would be a relatively straightforward matter to analyse international capital flows if debt were the only source of international

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[26] In Australia superannuation funds are taxed at a rate of 15 cents in the dollar. They are taxed on dividends on the same basis as an individual would be if he or she were taxed at that rate.

capital flow. If, under standard small country assumptions, Australia could borrow or lend as much as it wishes at a fixed world interest rate, r^*, if there were constant returns to scale (or a 100 per cent tax on pure profits) and if consumption goods were optimally taxed, it would be optimal for there to be no production distortion (see Diamond and Mirrlees, 1971, or Gordon, 1986). This would require that the cost of capital on all assets be r^* in the absence of any withholding tax paid on interest to foreigners. If there is a withholding tax at rate t_w which is creditable abroad and if (as is the case) Australia is a net capital importer, it would be optimal from an Australian perspective for the cost of capital to be $r^*(1-t_w)$ as this would be the cost of borrowed funds to the economy.[27] The existence of economic rents provides a case for higher taxes on capital income than otherwise (see Bruce, 1992).

In practice international capital flows can consist of both debt and equity. Modelling international equity flows is complex because of the way in which foreign tax credits may sometimes mean that any reduction in company tax in Australia is balanced by additional taxes abroad. How such crediting arrangements affect investment incentives is still a matter of some controversy. Hartman (1985) argues on parallel grounds to the new view of dividends that for 'mature' subsidiaries (ie., those which are able to finance marginal investment by retaining earnings) the presence or absence of a foreign tax credit should not affect subsidiaries' investment decisions. Leechor and Mintz (1993) argue that this result is undermined if the host country and home countries tax systems are not proportional to one another.

Allowing for international equity flows could potentially modify results in important ways. Boadway and Bruce (1992) argue that in a small open economy with perfect mobility of international equity the case for an imputation scheme can be overturned. If all international flows were equity, a switch from a classical company tax system to full imputation can have no effects on incentives for foreigners to invest and on corporate costs of capital if (as in Australia) imputation credits are denied to foreigners. Instead the reform would increase the after-tax returns to domestic savers in a way that is assumed to be undesirable and costs of capital for unincorporated enterprises would increase. An important issue which is only touched on briefly in the paper is how to extend the analysis to allow for international flows of both debt and equity. In this case Boadway and Bruce concluded that a dividend tax credit can

[27] This ignores any interdependence between the welfare of Australians and the welfare of residents of other countries and abstracts from any strategic issues which could arise if, for example, decisions on Australian tax policy changed tax policy in other countries.

remove financial non-neutralities and effects on investment distortions will depend on whether debt or equity is the marginal source of finance.

A further complication in analysing open economy aspects is that following the work of Feldstein and Horioka (1980), who showed a strong correlation between savings and investment across countries, there have been extended debates about how mobile international capital flows are in fact. Gordon and Varian (1989) argue that even small open economies may find that the cost of foreign capital is not fixed if returns from investments in their countries are not perfectly correlated with returns from investments in other countries. Gordon and Bovenberg (1996) provide a clear recent review of the literature and present a model where a correlation between savings and investment may be caused by informational asymmetries.

It is acknowledged that abstracting from these issues is an important simplification in this thesis. Some of our results may need modification in a fuller analysis. In particular, subsidiaries of foreign direct investors may pursue different financial policies from those we analyse and other firms may modify their policies to attract foreign portfolio investors or Australian corporate shareholders in ways we ignore.

1.5 Reasons for the Full Imputation Reform

Background data on changes in capital stock, forms of business enterprise and methods of corporate finance will be presented in section 1.6. To interpret the data it is helpful to document possible reasons for the full imputation reform. This allows us to comment on whether changes in the data appear compatible those that the reform was intended to achieve. Further analysis of the effects of Australia's former classical company tax system and of the switch to full imputation is provided in chapter 4.

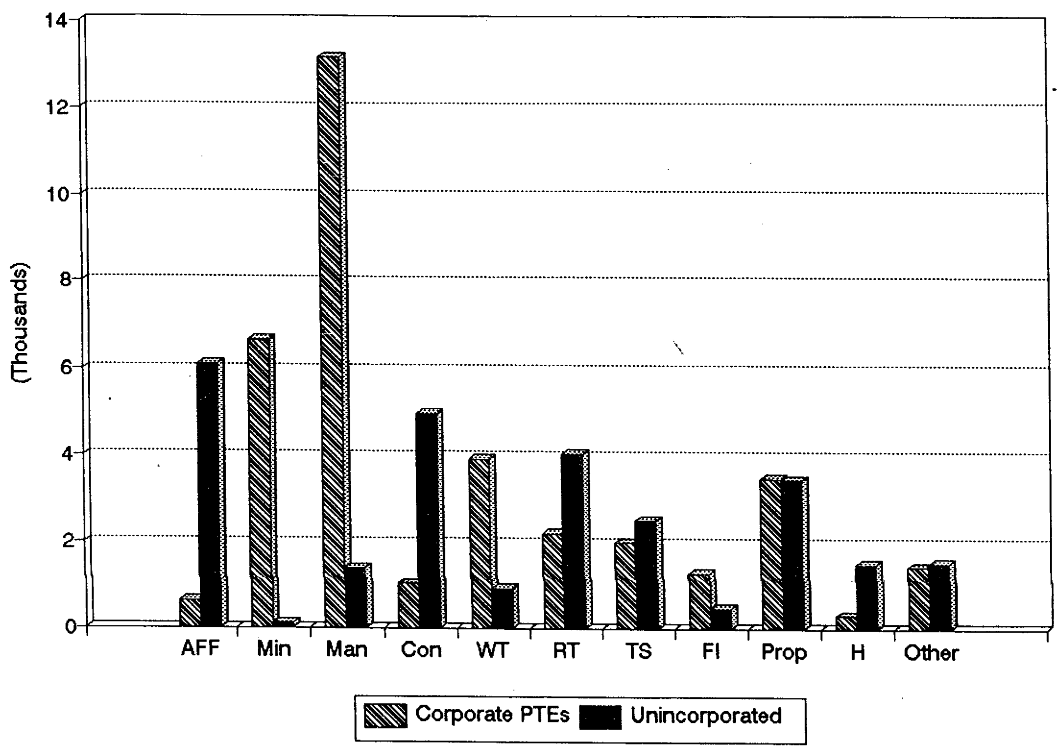
Key efficiency reasons for abandoning a classical company tax system in favour of full imputation can be can be grouped as concerns about the following three biases of a classical company tax system:

- biases to investment and choice of business organisation;
- biases to dividends and firm financial policy; and
- biases to portfolio decisions.

Biases to Business Investment Decisions and Choice of Organisational Form

Perhaps the most-cited concern about a classical company tax system in the United States has been that if corporate income is more heavily taxed than that of unincorporated enterprises, this can divert investment capital away from intrinsically more profitable investment opportunities in corporate sectors to unincorporated sectors. This issue was analysed initially by Harberger (1962 and 1966). This sort of bias would mean that the nation as a whole gets lower (risk-adjusted) pre-tax returns on its capital than it would if investment income were taxed more neutrally.

Figure 1.1



AFF	=	Agriculture, forestry and fishing
Min	=	Mining
Man	=	Manufacturing
Con	=	Construction
WT	=	Wholesale trade
RT	=	Retail Trade
TS	=	Transport and storage
FI	=	Finance and insurance
Prop	=	Property and business services
H	=	Health and community services
Other	=	Other industries

Figure 1.1 provides data on gross operating surplus from corporate trading enterprises and unincorporated enterprises in a number of sectors in 1985/86. It is clear that some sectors were predominantly corporate (such as mining, manufacturing and wholesale trade) while others were predominantly unincorporated (such as agriculture, construction and to a lesser extent retail trade). It would appear that differential taxation of corporate and unincorporated activities had the potential to bias investment between sectors of the economy which were predominantly corporate and those which were not.

Harberger analysed the classical company tax system as involving an additional layer of tax on corporate capital. There are many potential qualifications that can be made to Harberger's analysis. For example, if corporate investment is financed by debt at the margin, the corporate income tax can be non-distorting (Stiglitz, 1973). Even if corporate investment is equity financed, corporate income is normally less than fully double taxed because accruing gains on shares are not taxed. Instead tax is typically imposed on realisation which lowers the effective tax impost (Farrer and Selwyn, 1967).

As has been discussed briefly above, the question of whether dividend taxes affect corporate investment decisions has been a matter of some controversy. Proponents of the traditional view of dividends argue that taxes on dividends discourage corporate investment. Proponents of the new view generally argue that for firms which are able to meet their equity requirements without issuing new equity, dividend taxes will be non-distorting.

Even if taxes on dividends are non-distorting, there may still have been a bias against corporate investment in 1984/85 because most shares owned by Australian individuals or superannuation funds were held by those on tax rates below the company rate. This might appear to suggest that the tax system biased investment away from the corporate sector with the bias being greater under the traditional view than under the new view of dividends. Capital allowances also affect the analysis, however, as is discussed in chapter 4. Because of the generosity of capital write-off provisions in 1984/85, the cost of capital for corporate investment was not necessarily higher than that for unincorporated enterprises.

Not only can a classical company tax system bias investment between sectors it may bias decisions on organisational structure and investment within a sector. Gravelle and Kotlikoff (1989) argue that this intrasectoral distortion is likely to be much more important source of inefficiency than intersectoral investment distortions and estimate that in the United States the efficiency costs of the classical system of company taxation could exceed the tax revenue raised. There is, however, debate on the level of these costs with the United States Treasury (1992) and Gordon and MacKie-Mason (1994), for example, estimating very much smaller costs.

Investment biases were clearly identified as a key reason for Australia to introduce integration measures in a commissioned study for the Campbell Report (see Swan, 1982). The Draft White Paper (*p*.195) expressed concerns that the classical company tax system could provide incentives for investment to take place through businesses other than companies. It would seem that the way in which a classical company tax system could bias investment flows and choices of business structure were important reasons why Australia decided to adopt full imputation.

Biases to Corporate Financial Policy

One potential concern with the classical company tax system is that it may bias corporate finance in favour of debt rather than equity and this may be costly because of bankruptcy or because of additional constraints being placed on corporate managers. Jensen and Meckling (1976) and Gordon and Malkiel (1981) discuss possible agency costs associated with excessive levels of debt. Gordon and Malkiel estimate that the costs of debt/equity biases caused by a classical company tax system could be as high as 10 per cent of corporate tax revenues in the United States. Some other studies such as the United States Treasury (1992) have produced lower cost estimates and as we will discuss later, Australian experience appears to provide some indirect evidence that the Gordon and Malkiel methodology may produce excessive estimates. Concerns about debt/equity biases were voiced by the Campbell Committee and by Keating (1986 and 1987).

In Australia prior to 1986/87 the top personal marginal tax rate was 60 per cent which exceeded the company tax rate of 46 per cent and there was no capital gains tax. There need not be any general tax bias against debt if, as in the Miller equilibrium, there are two clienteles of capital owners, those who hold debt and those who hold equity with the marginal capital owner neutral between debt and equity because lower personal taxes on equity offset the benefits of interest deductibility. The extent of any tax bias in favour of debt depends on whether new equity or retentions are the marginal source of equity finance. The tax bias favouring debt over new equity is greater than that favouring debt over retentions.

As noted earlier, chapter 4 provides evidence that the average marginal tax rate of shareholders was significantly lower than the company tax rate. Even if all equity were financed by corporate retentions and so (as holders of the new view suggest) dividend taxes can be ignored, there would still appear to have been some general tax bias in favour of debt for companies owned by shareholders on the average marginal tax rate. Under the traditional view of dividends this bias would have been larger.

Both the Campbell Committee (*pp.* 212 - 213) and the Draft White paper (*p.* 195) expressed concerns that the classical company tax system might bias firms against paying dividends. Whether this is likely to be so depends on the uncertain effects of dividend taxes. Under the new view, dividend taxes do not distort dividend decisions for established firms which are able to meet all equity requirements through the retention of profits. Under the traditional view, dividend taxes tend to lower dividend payout ratios. In so doing they may inhibit the signalling or agency benefits of dividends. The Campbell Committee (*p.* 212) expressed concerns that this may also lock capital into existing firms rather and place impediments in the way of capital flowing to new and developing businesses. Holders of the new view of dividends have emphasised that this can happen as a result of a higher tax impost on investment financed by new equity issues than that financed by profit retentions.

Portfolio Biases

Finally, the classical company tax system provided portfolio biases in favour of those on lower marginal tax rates holding debt and those on higher marginal rates holding equities as is discussed by Miller (1977). Concerns about portfolio biases and especially low-marginal-rate individuals being locked out of the share market were expressed in both the Campbell Report and in Keating (1987).

1.6 EFFECTS OF FULL IMPUTATION

It is always difficult to be sure of the effects of any tax change because of uncertainties about what would have happened in the absence of the change. The system of company tax is only one out of a large number of factors which can affect business decisions. Nevertheless, as background for our study it is interesting to look at whether or not changes in available data seem consistent with the direction of changes that might have been predicted.

Investment and Forms of Business Organisation

Table 1.1 provides figures on the proportion of real net capital stock (measured in 1989/90 prices) in different sectors.[28] From 1985/86 (the year in which the move to full imputation was announced) until 1990/91 there was a steady increase in the corporate sector's share of net capital stock (from 33.7 to 36.1 per cent). Shares of both unincorporated enterprises and dwellings owned by persons fell. Since then the corporate sector's share of net capital stock has remained more or less constant except for a slight increase in 1994/95. There has been an increase in the share of dwellings and a further decrease in the share of unincorporated enterprises.

Table 1.1 Proportion of Real Net Capital Stock by Sector

	Corporate Enterprises	Unincorporated Enterprises	Dwellings Owned by Persons	Total
1982/83	33.4	14.0	52.6	100.0
1983/84	33.4	14.0	52.7	100.0
1984/85	33.3	14.0	52.6	100.0
1985/86	33.7	13.9	52.4	100.0
1986/87	34.3	13.6	52.1	100.0
1987/88	35.0	13.5	51.5	100.0
1988/89	35.3	13.5	51.2	100.0
1989/90	35.7	13.4	50.9	100.0
1990/91	36.1	13.1	50.8	100.0
1991/92	36.1	12.7	51.1	100.0
1992/93	36.2	12.4	51.4	100.0
1993/94	36.2	12.0	51.7	100.0
1994/95	36.6	11.8	51.7	100.0

This growth in the proportion of real net capital stock held by companies is what might be predicted if corporate enterprises were initially taxed more heavily than unincorporated enterprises as a result of the classical company tax system and this bias was reduced by the full imputation reform. As is discussed further in chapter 4,

[28] These data are from ABS Catalogue No. 5204.0 for real net capital stock in $1989/90 excluding financial enterprises and real estate transfer expense.

however, a complication in analysing this case is that there were negative effective tax rates on many forms of investment which means that higher statutory tax rates do not necessarily imply reduced investment incentives.

Table 1.2: Numbers of Taxpayers (000)

	Individuals	Companies	Partnerships	Trusts
1985/86				
Primary production	332.3	6.9	156.0	17.3
Mining	0.8	1.2	0.5	0.2
Manufacturing	16.1	23.1	20.2	9.5
Construction	117.5	19.7	78.8	15.3
Wholesale and retail trade	64.1	47.3	105.4	32.3
Transport, storage and communications	38.5	9.3	33.3	6.1
Finance, insurance, real estate and business services	100.0	126.5	35.5	42.6
Health, education, welfare, etc., services	35.0	10.3	7.0	2.6
1992/93				
Primary production	251.1	12.5	143.9	16.9
Mining	2.8	3.3	1.2	0.7
Manufacturing	38.4	33.3	26.0	10.7
Construction	157.4	38.9	83.0	15.6
Wholesale and retail trade	104.0	62.1	93.5	26.0
Transport, storage and communications	45.3	14.0	30.8	5.3
Finance, insurance, real estate and business services	132.7	203.9	52.6	76.5
Health, education, welfare, etc., services	46.7	20.5	7.7	6.4
Change: 1985/86 - 1992/93				
Primary production	-81.2	5.6	-12.2	-0.4
Mining	2.0	2.1	0.7	0.5
Manufacturing	22.3	10.2	5.8	1.2
Construction	39.9	19.2	4.2	0.3
Wholesale and retail trade	39.9	14.8	-11.9	-6.3
Transport, storage and communications	6.8	4.7	-2.5	-0.8
Finance, insurance, real estate and business services	32.7	77.4	17.1	33.9
Health, education, welfare, etc., services	11.7	10.2	0.7	3.8

Table 1.2 shows changes in numbers of entities between 1985/86 and 1992/93 in a number of sectors.[29] In all sectors other than primary production there has been growth in the total number of businesses. In most sectors the greatest growth has been in unincorporated enterprises owned by individuals. Often these may be small enterprises. For partnerships and trusts, there has been little overall increase or decrease in the number of entities except for strong growth in the number of trusts in finance, insurance, real estate and business services. Companies are the only form of business organisation whose numbers have increased in all sectors. In all sectors the number of companies has grown significantly relative to numbers in 1985/86. The smallest proportionate rise is in wholesale and retail trade where the number of companies increased by 31 per cent. Even in the primary sector the number of companies grew by 5,600 (81 per cent) despite declines in the numbers of other business entities. Overall, the figures perhaps provide some extremely tentative evidence that incorporation has become relatively more attractive especially in the primary sector and as an alternative to partnerships and trusts but comparisons are difficult given the differences in sizes of different entities.

Biases to Corporate Financial Policy

We have seen that one reason that was given for the full imputation reform was to remove the tax bias favouring corporate debt relative to equity. In chapter 2 we will see that in combination with Australia's indexed capital gains tax the full imputation reform has gone further than merely eliminating this bias and introduced a bias in favour of new equity relative to debt.

There are no official statistics available on debt as a fraction of the corporate capital stock and how this has changed since the introduction of full imputation. It is well known, however, that there was a build up of corporate debt in the 1980s despite the introduction of full imputation. Mills, Morling and Tease, 1994, extracted data on 80 large non-financial companies from the Australian Stock Exchange's STATEX service. Their ratios of debt to book-value of equity are reported in Table 1.3.[30]

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[29] These data are from the Australian Taxation Office publication 'Taxation Statistics' for 1985/86 and 1992/93.

[30] Mills, Morling and Tease also provide data on debt to market capitalisation although these figures are swamped by the volatility of the share market.

Table 1.3 Debt/Equity Ratios

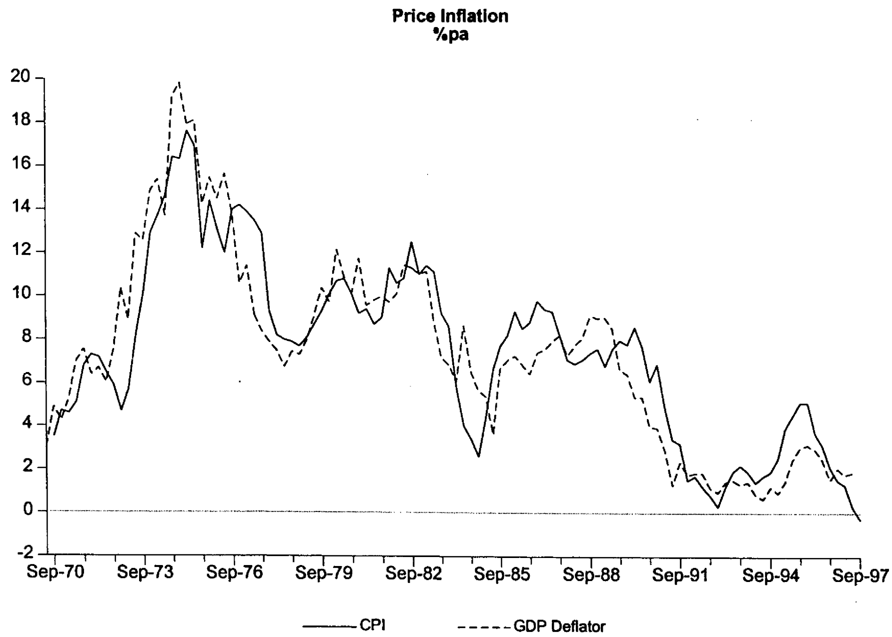
81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92
0.43	0.52	0.48	0.52	0.67	0.65	0.73	0.75	0.73	0.72	0.67

From these data it appears that levels of corporate debt which had had been building up prior to the introduction of full imputation in 1987/88 and there was an increase rather than a fall in the debt/equity ratio in this year. It seems difficult to argue on the basis of these data that full imputation had a significant effect in reducing debt-equity ratios unless it is believed that in the absence of the full imputation reform the upward trend in debt-equity ratios would have continued. Even though the imputation scheme has largely removed the tax bias in favour of corporate debt there seems little evidence of this in the data.

A better statistic for measuring corporate exposure to debt would be debt as a proportion of the replacement value of assets but data is not available. A disadvantage of using debt as a proportion of the book value of equity is that because firms do not revalue all assets annually, in times of accelerating inflation the book value of equity will tend to fall as a proportion of the replacement cost of assets. This might tend to lead to increasing recorded debt/equity ratios without there being any real increase in corporate exposure to debt. Conversely recorded debt/equity ratios may fall in times of falling inflation. Figure 1.2 shows that the increasing reported debt/equity ratios in the latter part of the 1980s cannot be attributed to rapidly increasing inflation. Inflation fell rapidly after 1989 or 1990. This may be part of the reason for the decline in reported the debt/equity ratio in 1991/92.

One reason why debt/equity ratios have not fallen despite the full imputation reform is that there may have been some other changes which have provided opposing incentives. DeAngelo and Masulis (1980*b*) argue that because measures such as investment allowances and accelerated depreciation (which tend to make corporate taxable income less than economic income) increase the probability of tax losses for companies generating economic profits, they will decrease the attractiveness of debt finance. This is because tax losses can only be carried forward without interest. Australia terminated its investment allowance at the end of 1984/85 and adopted a less-accelerated form of depreciation during 1987/88. Both of these moves may have tended to make debt more attractive. Australia also introduced a more-accelerated form of depreciation in 1991/92 when the debt/equity ratio appears to have declined.

Figure 1.2



Source of Data: RBA Bulletin via DXDATA service.

It is well known that under a classical company tax system there will be tax biases discouraging new equity relative to corporate retentions (see, for example, King, 1974*a* and 1977). This is discussed more fully with reference to Australian tax provisions prior to 1987/88 in Chapter 4. In chapter 2 it is argued that tax biases will continue to discourage new equity relative to the retention of unfrankable earnings (ie., the retention of earnings which would be unfranked if paid as dividends). The majority of firms (considerably more than 90 per cent) do not, however, pay unfranked dividends. For firms paying franked dividends only, new equity is now the tax-preferred method of finance.

Table 1.4 shows Australian Stock Exchange data on mainboard equity capital raisings since 1984/85. There was a substantial rise in new equity issues in 1985/86 and 1986/87 which may have been bolstered by the announcement of full imputation but probably had much more to do with the strength of the sharemarket at that time. The sharemarket crash in October 1987 occurred in the first year of the full imputation scheme and would have been expected to cut back new equity issues. As Table 1.4

shows new equity issues declined in nominal terms in each of the four years following the crash until 1990/91 before increasing once more.

Table 1.4 Total Mainboard Equity Capital Raisings[31]

	Dividend Reinvestment $ million	Total Excluding Dividend Reinvestment $ million	Total $ million
1984/85			3,583
1985/86			6,926
1986/87			16,081
1987/88	504	12,891	13,395
1988/89	1,551	9,409	10,960
1989/90	2,602	6,387	8,989
1990/91	2,155	4,441	6,596
1991/92	2,157	9,818	11,975
1992/93	2,609	8,042	10,651
1993/94	3,325	19,567	22,892
1994/95	3,343	8,438	11,781
1995/96	3,441	11,878	15,319

Even though we will argue that the full imputation reform has generally removed a tax impediment to firms issuing new equity, there appears to no evidence that this reform has led to an increase in new equity issues. The figures reported in Table 1.4 are much too volatile for the effects of the full imputation reform to be evident.

One noticeable feature of the data is the growth of reinvested dividends which may in part be a consequence of the full imputation reform. Dividend reinvestment plans allow firms to pay higher levels of dividends which can provide shareholders with imputation credits while retaining the capital. We will argue in chapter 2 that it will normally be desirable for firms to distribute the maximum level of franked dividends and dividend reinvestment plans may help firms to do this.

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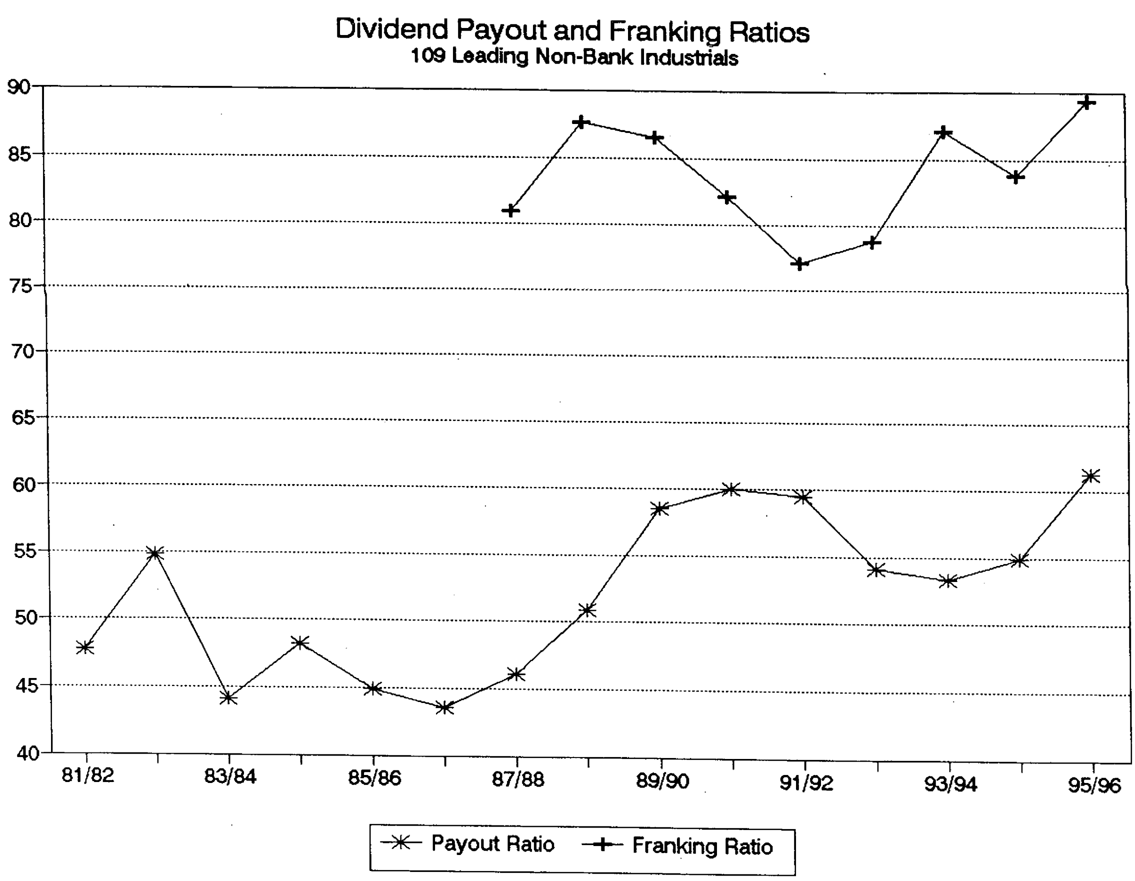
[31] Figures for 1987/88 and subsequent years come from various issues of the Australian Stock Exchange publication *Monthly Index Analysis*. Figures for previous years are contained in the Reserve Bank of Australia publication *Australian Economic Statistics* Occasional Paper No. 8.

Figure 1.3 reports data from J B Were and Son which suggest that dividend payout ratios increased markedly after the introduction of full imputation. There was a slight drop in 1992/93 before the payout ratio increased to its highest level in 1995/96. In the five years up until 1987/88 the ratio varied between 43 and 48 per cent whereas it climbed to 51 per cent in 1988/89 and has since varied between 53 and 61 per cent. There appears to be clear evidence that the dividend payout ratio has increased and this is likely to be at least in part as a result of incentives for firms to distribute franked dividends. However, Figure 1.3 also shows that between 10 and 23 per cent of dividends paid by the 109 leading non-bank industrials have been unfranked. Our analysis in chapter 2 suggests that the payment of unfranked dividends is a puzzle which needs to be explained.

Figure 1.3*



* Source of Data: JB Were and Son.

Portfolio Bias

Prior to the imputation system there was a substantial tax bias against individuals on tax rates lower than the company tax rate and tax-exempt organisations such as superannuation funds holding shares. For example, superannuation funds earned interest income tax free whereas equity income in domestic companies received by superannuation funds was taxed at the company tax rate because when dividends were paid there was no relief from company taxation. Full imputation largely removed the tax bias against individuals on low but positive tax rates holding shares. As imputation credits are not refundable and hence provide no tax benefits to nontaxpayers, however, the tax bias against shares initially continued for both superannuation funds and individuals below the tax-free threshold. This bias was removed for superannuation funds with sufficient other taxable income to fully utilise imputation credits, however, when superannuation funds were made taxable in 1988/89.

This reduction in portfolio bias is one possible advantage of the full imputation scheme. Unfortunately, it is difficult to find consistent data on portfolios and how they have change over time that cover the period in question. Addison (1993) notes that shares had declined as a proportion of the assets of life offices over the period 31 December 1986 to 31 December 1991 which is the reverse of what might be expected on tax grounds alone. Addison argues that other factors may have proved more important than imputation, notably the October 1987 sharemarket crash.

The Data: A Summary

There has been some growth in the corporate sector's share of net capital stock and consistent growth across sectors in the number of corporate enterprises despite declines in the numbers of individuals, partnerships and trusts in some sectors. There has also been a noticeable growth in dividend payments. These changes appear consistent with the effects which might conventionally be expected of the full imputation reform. The reform has not, however, had an obvious impact on the levels of corporate debt and new equity issues are much too volatile for the effects of the reform to be evident.

CHAPTER 2: CORPORATE FINANCIAL POLICY

2.1 INTRODUCTION

The formal model of the corporation is introduced in this chapter and used to examine how Australia's full imputation company tax system and capital gains tax provisions can affect financial policy for *widely-held* Australian companies owned by *Australian residents*.[1] As was outlined in chapter 1 a number of key assumptions will be employed. It is assumed that debt and dividends have no signalling or agency benefits, that there is no risk or uncertainty (other than possible one-off surprises when firms perturb financial policy), that firms are in a taxpaying position, that there are no costs of adjusting capital stock, and that shareholders are resident individuals or superannuation funds taxed at a uniform rate, m.

King analysed financial policy biases under a variety of company tax systems. He distinguished three methods of raising finance: new equity, debt and retained earnings. Our first modification of King's analysis is to note that under the Australian full imputation scheme the effects of retaining earnings depend on whether, if dividends had been paid instead, the dividends would have been franked or unfranked.[2] These two cases will be referred to as the retention of frankable earnings and the retention of unfrankable earnings. We distinguish four possible methods of financing investment, namely:

- new equity (NE);
- debt;
- the retention of frankable earnings (RFE); and
- the retention of unfrankable earnings (RUE).

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[1] Throughout the thesis, the companies being referred to should be thought of as widely held (see footnote 1 of chapter 1).

[2] As outlined in chapter 1, when a firm retains earnings in Australia it has the option of issuing bonus shares in which case the bonus shares will be treated as dividends and shareholders can claim imputation credits if the bonus shares are franked. This provision allows shareholders to claim imputation credits without the physical distribution of dividends. The treatment is as though the firm paid a dividend and then issued an equal value of shares. When analysing the retention of profits we assume that the bonus issue option is *not* used except when we explicitly indicate otherwise.

A second modification is to allow for the asymmetries in the Australian capital gains tax provisions outlined in section 1.2. As noted in that section, there are a number of ways in which gains may be taxed. At the margin real gains may be taxed, nominal gains may be taxed, or gains may be untaxed.

The structure of this chapter is as follows. Section 2.2 outlines the basic model of the corporation. Some modifications to King's general methodology used when estimating the magnitudes of financial policy biases are discussed in section 2.3. Section 2.4 examines corporate financial policy biases and makes qualitative conclusions on optimal financial policy. Corporate behaviour is at times inconsistent with our qualitative conclusions. This may either be because our analysis is incomplete or because the incentives identified are very weak. The remainder of the chapter examines the likely magnitudes of corporate financial policy biases in order to consider whether they are likely to be significant. Assumptions used in making numerical estimates of financial policy biases are outlined in section 2.5 and numerical estimates are presented in section 2.6. Section 2.7 confronts our analysis with some facts and section 2.8 concludes.

2.2. THE MODEL

The basic model of the company which will be used throughout the dissertation is outlined in this section. The model draws on King (1974*a* and 1977) and Auerbach (1979*a*). We consider the behaviour of firms in a discrete-time, infinite-horizon, certainty model. Firms finance investment through sales of stock, retention of earnings and sales of one-period bonds. At the end of each period, firms distribute dividends, pay interest and repay principal on the previous year's bonds, and sell new shares ex dividend. Key notation is provided in Table 2.1.

Table 2.1 Notation

τ_t = company tax rate in period t;

m_t = tax rate of shareholders in period t (assumed to be greater than zero);

c_t = rate at which accruing capital gains are taxed in period t;

V_t^0 = ex-dividend value of pre-existing shares at the end of period t;

V_t^N = ex-dividend value of new equity sold at the end of period t;

V_t = ex-dividend total value of equity at the end of period t;

W_t = the cum-dividend-and-shareholder-tax value of shares an instant before dividends are paid at the end of period t.

i_t = nominal interest rate from the end of period t-1 to the end of period t;

D_t^f = franked dividends paid at the end of period t;

D_t^u = unfranked dividends paid at the end of period t;

E_t = net of tax distribution from a firm at the end of period t;

K_t = capital stock installed at the end of period t which provides output at the end of period t+1;

$F(K_t)$ = output of the firm received at the end of period t+1;

p_t = price of output at the end of period t;

q_t = cost of investment goods at the end of period t;

I_t = real investment expenditure at the end of period t;

T_t = company tax paid at the end of period t;

B_t = one-year corporate bonds issued at the end of period t;

b_t = fraction of the capital stock at the end of period t which is debt financed;

π_t = general measure of inflation from the end of period t-1 to the end of period t used in calculating the indexed capital gain;

r_t = real interest rate from the end of period t-1 to the end of period t;

α = an index taking the value 1 if real and 0 if nominal gains are taxed;

ϕ_t = rate that a firm should use to discount nominal after-tax cash flows between the ends of periods t-1 and t. This will be $\phi_t = [i_t(1-m_t) - \alpha c_t \pi_t]/(1-c_t)$ for a company and $\phi_t = i_t(1-m_t)$ for an unincorporated enterprise;

k_t = rate of investment allowance on capital goods acquired at end of period t;

$\Delta_{t,u}$ = tax depreciation on a dollar of capital goods acquired at the end of period t, u periods later;

Z_t = present value of tax depreciation discounted at the rate ϕ_{t+s} on a dollar of capital goods acquired at the end of period t;

δ = exogenous geometric rate of depreciation of capital stock.

A key difference from King and Auerbach is that the tax treatment of dividends depends on whether dividends are 'franked' or 'unfranked'. For the time being, ignore any changes in tax rates between years.[3] As is discussed more fully in section 1.2, on each dollar of assessable income, a company pays τ in tax and the remainder, $1-\tau$, increases its 'franking account balance' which allows it to pay an additional $1-\tau$ in franked dividends. Each dollar of franked dividends reduces the franking account balance by a dollar and shareholders on marginal tax rate $m > 0$ receive $(1-m)/(1-\tau)$ in after-tax dividends. Once firms have reduced their franking account balances to zero by paying franked dividends, any further dividends are unfranked. Unfranked dividends are taxed and so if shareholders receive a dollar of unfranked dividends, they will receive $1-m$ after tax.

The ex-dividend value of pre-existing shares in period t is V_t^0 and new issues in period t are V_t^N.[4] Assuming that new equity is sold at its market value the total ex-dividend value of equity in period t is

$$V_t = V_t^0 + V_t^N \tag{2.1}$$

Pre-existing shares which continue to be owned in period t or shares which are acquired in period t will receive dividends one period later. Franked and unfranked dividends paid in period t+1 on shares which are owned or acquired in period t are denoted by D_{t+1}^f and D_{t+1}^u respectively.

Australia's capital gains tax provisions were outlined in section 1.2. We noted that if shares are eventually sold for more than their *real* inflation-indexed original cost of acquisition, the real capital gain will normally be taxed at a shareholder's full marginal tax rate. If shares are eventually sold for less than their *nominal* acquisition cost, the nominal loss can be used to offset other income from capital gains or be carried forward to be offset against such income in future years. Provided a taxpayer has other income from capital gains, at the margin a dollar of nominal gains will lower deductions by a dollar. In this case the tax is operating like a tax on nominal gains. If shares eventually depreciate in real terms but appreciate in nominal terms, at the margin capital gains will be untaxed.

The net-of-tax distribution that shareholders holding shares in period t receive in the next period depends on the treatment of capital gains. We consider the possibility that

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3 When ignoring changes in tax rates between years, time subscripts are dropped.

4 Here and elsewhere when "period t" is referred to this should be interpreted as the end of period t.

real gains are taxed, that nominal gains are taxed, and that capital gains are untaxed.[5] In year t capital gains tax is assumed to be levied at a rate c_t on accruing gains.[6] Denoting inflation from period t to period t+1 by π_{t+1}, the net-of-tax distribution that shareholders receive is

$$E_{t+1} = \left(\frac{1-m_{t+1}}{1-\tau_{t+1}}\right)D^f_{t+1} + (1-m_{t+1})D^u_{t+1} - c_{t+1}\left(V^0_{t+1} - (1+\alpha\pi_{t+1})V_t\right) \qquad (2.2)$$

where α is 1 if real gains are taxed and 0 if nominal gains are taxed. If capital gains are untaxed, $c_{t+1} = 0$.[7]

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[5] The case where nominal gains are taxed takes account of gains by sharetraders and gains on sales within 12 months of acquisition where nominal gains are taxable as well as the case where nominal losses accrue.

[6] In practice capital gains are taxed on realisation rather than accrual. On grounds of analytical tractability it is common to assume that gains are taxed on accrual at an accrual-equivalent tax rate $c_t < m_t$ where the lower rate of capital gains tax takes account of the benefits of tax deferral. Appendix 2.1 discusses the internal consistency of modelling a realisation-basis tax in this fashion. It confirms that treating a realisation-basis tax as though it were a tax on accrual at some rate, c_t, is internally consistent if, as in King (1977), a fixed fraction of shares are sold in each period. This is true irrespective of whether real or nominal gains are taxed. With time varying tax rates, it need not necessarily be valid to assume $c_t < m_t$ even if nominal gains are taxed. If tax rates are expected to rise in the future, the opposite case is possible. However, at least if tax rates remain constant, it will be appropriate to assume $c < m$ so long as less than 100 per cent of shares are sold in each period. If real gains are taxed, there is an extra complication. Even if tax rates remain constant through time, it will not necessarily be the case that $c < m$. The accrual-equivalent tax rate, c, will be less than m only if the *real* after-tax interest rate of shareholders is positive. At current nominal interest rates and inflation rates, real after-tax interest rates seem likely to be significantly positive even for those on the top personal marginal tax rate. Throughout later sections of this chapter when considering the case where tax rates remain constant through time, it will be assumed that $c < m$ even though the opposite case is theoretically possible when real gains accrue.

[7] Equation (2.2) assumes that imputation credits depend on the company tax rate *in the year that franked dividends are paid*. Each time the company tax rate has changed, franking credits that arose before the change have been treated differently. The company tax rate fell from 49 to 39 per cent in 1988/89 and from 1989/90 shareholders could only claim credit for 39/61 of franked dividends in line with (2.2). However, when the tax rate fell to 33 per cent in 1993/94 two separate franking accounts

In general, Australian companies are permitted to buy back up to 10 per cent of their share capital in any 12-month period (Lipton and Herzberg, 1995, *p*. 213). However, the tax rules applying to share repurchases are relatively complex and (unlike the United States) not very concessional.[8] To simplify the analysis it is assumed that shares are not repurchased, ie. $V_t^N \geq 0, \ \forall t$.[9]

In Australia nominal interest income is taxable and nominal interest expense on money borrowed to purchase shares is deductible. If i_{t+1} is the nominal interest rate from period t to t+1, in equilibrium

$$(1+i_{t+1}(1-m_{t+1}))V_t = E_{t+1} + V_{t+1}^0 \tag{2.3}$$

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were kept. Shareholders could claim credit for 39/61 of franked dividends paid from pre-1993/94 profits and 33/67 of franked dividends paid from subsequent profits. When the company tax rose to 36 per cent in 1995/96 the two account approach was scrapped and the franking account balance was imperfectly adjusted to take some account of the fact that company tax had been levied at different rates. Thus, in equation (2.2) we abstract from complications which have arisen on two of the three occasions when the company tax rate has changed.

[8] If shares are bought back by a company through 'off-market purchases' (ie., purchases which are not made in the ordinary course of business of a stock exchange), the difference between the purchase price and the issue price is treated as a dividend. 'On-market purchases', are not treated as dividends, but moneys spent on share repurchases give rise to franking account debits which reduce the level of franked dividends that firms can pay. For further details see Commerce Clearing House (1995, pp. 328-329). These provisions would normally not make share repurchase a tax-preferred form of distribution. A complication which has become evident recently and which we do not consider is that share repurchase can become tax favoured if, as in the recent repurchase by the Commonwealth Bank, shares are allowed to be repurchased at much below market value. There can be capital gains tax advantages in this case.

[9] The assumption that shares cannot be repurchased has been criticised in United States studies as a very important but unrealistic assumption in new-view models. The United States tax code provides incentives for firms to refrain from paying dividends and repurchase shares instead so this becomes a very important assumption. In modelling the Australian tax system it is likely to be less important because there are strong incentives created for firms to pay franked dividends. Indeed, in modelling investment decisions and the cost of capital in chapter 3 it is assumed in our base case that firms wish to pay the maximum possible level of franked dividends and the restriction on share repurchases is slack.

Equations (2.1), (2.2) and (2.3) jointly imply

$$\left(1+\phi_{t+1}\right)V_t = \frac{1-m_{t+1}}{(1-\tau_{t+1})(1-c_{t+1})}D^f_{t+1} + \frac{1-m_{t+1}}{1-c_{t+1}}D^u_{t+1} - V^N_{t+1} + V_{t+1} \tag{2.4}$$

where $\phi_{t+1} = (i_{t+1}(1-m_{t+1}) - \alpha c_{t+1}\pi_{t+1})/(1-c_{t+1})$. Thus,

$$V_0 = \sum_{t=1}^{\infty}\left(\frac{\frac{1-m_t}{(1-\tau_t)(1-c_t)}D^f_t + \frac{1-m_t}{1-c_t}D^u_t - V^N_t}{\prod_{s=1}^{t}\left(1+\phi_s\right)}\right) \tag{2.5}$$

provided the sum on the right-hand-side is defined.[10] It is assumed that $\phi_s > 0,\ \forall s$.[11]

The firm's revenue in period t is $p_t F(K_{t-1})$ where p_t is the price of output in that period and K_{t-1} is the firm's capital stock from the previous period. It is assumed that $F'(\,) > 0$ and $F''(\,) < 0$. Nominal investment expense in that period is $q_t I_t$ where q_t is the cost of capital goods and I_t is real investment expenditure. Denoting company tax paid in period t by T_t and one-year bonds issued in period t by B_t, the firm's cash flow constraint is

$$D^f_t + D^u_t = p_t F(K_{t-1}) - q_t I_t - T_t + B_t - (1+i_t)B_{t-1} + V^N_t \tag{2.6}$$

Tax revenue is

$$T_t = \tau_t\left(p_t F(K_{t-1}) - i_t B_{t-1} - k_t q_t I_t - \sum_{s=-\infty}^{t}\Delta_{s,t-s}q_s I_s\right) \tag{2.7}$$

where k_t is the rate of deductible investment allowance and $\Delta_{s,u}$ is the depreciation allowance on a dollar of capital goods acquired in period s, u periods later.

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[10] This requires the transversality condition that

$$\lim_{t^*\to\infty}\frac{V_{t^*}}{\prod_{s=1}^{t^*}\left(1+\phi_s\right)} = 0$$

[11] In the case where real capital gains are taxed, equation (2.5) potentially allows the discount factor in period t to be less than one if $i_t(1-m_t) < \alpha c\pi_t$. This would mean that a shareholder would prefer the firm to pay an additional nominal dollar of dividends in period t than in period t-1. This extreme case would require a very low real interest rate or high tax rates or both and it is ruled out by assumption.

The firm's capital stock is assumed to depreciate at a constant geometric rate δ so[12]

$$K_t = I_t + (1-\delta)K_{t-1} \tag{2.8}$$

In any period franked dividend payments must not exceed the maximum allowable amount. Thus,

$$\sum_{s=-\infty}^{t}\left[\frac{1-\tau_s}{\tau_s}T_s - D_s^f\right] \geq 0 \tag{2.9}$$

2.3 SOME PRELIMINARIES

Assuming that the firm sets out to maximise its value, in principle one could move directly to solving the firm's constrained optimisation problem. However, as King (1974*a*) points out, it can be more instructive to start by examining firm financial policy for a given investment policy. This is the approach adopted in this chapter.

With a given investment policy many elements in the firm's cash flow will be autonomous. Denoting the firm's autonomous cash flows by CF_t,

$$CF_t = (1-\tau_t)p_t F(K_{t-1}) - (1-\tau_t k_t)q_t I_t + \tau_t \sum_{s=-\infty}^{t}\Delta_{s,t-s}q_s I_s \tag{2.10}$$

In this chapter it is assumed that the firm takes CF_t as given and chooses D_t^f, D_t^u, B_t and V_t^N. Only three of these sets of variables can be chosen independently as is clear from (2.6) which can be rewritten as

$$D_t^f + D_t^u = CF_t + B_t - (1+i_t(1-\tau_t))B_{t-1} + V_t^N \tag{2.6'}$$

Given the choice variables, V_t will be determined recursively and V_t^0 will be determined residually from equation (2.1).

When analysing the effects of a perturbation in financial policy it is common to analyse how changes to dividend policy, debt policy and new equity issues affect the value of the firm as given by an equation equivalent to (2.5) eg., King (1974*a* and 1977) and Poterba and Summers (1985)[13]. This is the consequence of assuming

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[12] The assumption of geometric depreciation is unimportant in this chapter but will be drawn on in Chapter 3.

[13] Benge (1997) draws on an early version of material in this chapter and also adopts this approach.

perfect certainty. Any perturbation in financial policy is assumed to be known about in advance and affects the value of the firm in prior periods.

It seems somewhat confusing to attempt to quantify the gains from a firm perturbing its financial policy under these assumptions as a change in financial policy announced now changes the value of the firm in prior periods. This also makes it more difficult to provide intuitive explanations for the effects of a perturbation. Our assumption is that even though shareholders treat the future as certain, they can obtain a one-off surprise when a firm decides to perturb its financial policy. This assumption tends to reduce the magnitude but not the direction of any gains from perturbations in firm financial policy.

Suppose that a perturbation increases the value of a firm and capital gains are taxed. Under our assumption, this perturbation does not affect the value of the firm before the decision is made. An implication is that the gain from the perturbation is taxed at the capital gains tax rate. With perfect certainty, however, the capital gains tax impost would be reduced because the value of the firm would also have been higher in the previous period. In reality, a perturbation in financial policy cannot affect the value of the firm before a decision to perturb the policy is made so our assumption seems preferable when attempting to quantify any gains from perturbing financial policy.[14]

To simplify interpretation of our results it is also helpful to work in terms of the cum-dividend (and all shareholder taxes) value of equity (W_t). Define

$$W_t = E_t + V_t^0 \tag{2.11}$$

From (2.1) and (2.2)

$$W_0 = \left(\frac{1-m_0}{1-\tau_0}\right) D_0^f + (1-m_0) D_0^u + (1-c_0)(V_0 - V_0^N) + c_0 V_{-1}(1+\alpha\pi_0) \tag{2.12}$$

It will be assumed that decisions to perturb financial policy take place just before the end of year 0. Given that V_{-1} is fixed

$$dW_0 = \left(\frac{1-m_0}{1-\tau_0}\right) dD_0^f + (1-m_0) dD_0^u - (1-c_0) dV_0^N + (1-c_0) dV_0 \tag{2.13}$$

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[14] This modification is unimportant if, as in the studies by King, and Poterba and Summers, the focus is on the sign rather than the magnitude of the gain from a financial policy perturbation.

Finally, taking differentials of (2.5) and substituting

$$dW_0 = (1-c_0)\sum_{t=0}^{\infty}\left(\frac{\frac{1-m_t}{(1-\tau_t)(1-c_t)}dD_t^f + \frac{1-m_t}{1-c_t}dD_t^u - dV_t^N}{\prod_{s=1}^{t}(1+\phi_s)}\right) \tag{2.14}$$

using the convention (adopted throughout the thesis) that $\prod_{s=1}^{0}(1+\phi_s) = 1$.

Equation (2.14) can be used to examine the effects of changes in financial policy on the cum-dividend value of a firm when tax rates, inflation and the interest rate are changing through time. This allows a very wide range of different possibilities to be considered.

To confine the analysis, the remainder of the chapter abstracts from changes in these variables. In this case time subscripts can be dropped and (2.14) can be rewritten as

$$dW_0 = \sum_{t=0}^{\infty}\left(\frac{\frac{1-m}{1-\tau}dD_t^f + (1-m)dD_t^u - (1-c)dV_t^N}{(1+\phi)^t}\right) \tag{2.15}$$

Equation (2.15) will be the basic equation used to examine financial policy biases.

2.4 FINANCIAL POLICY BIASES

Four possible methods of financing investment have been identified, namely, the retention of unfrankable earnings (RUE), the retention of frankable earnings (RFE), new equity issues (NE) and debt. This section examines the effects of a firm replacing one form of finance with another.

One goal of our study is to provide some intuition for the gains from financial perturbations which we will derive formally. To assist intuition, it is helpful to start by considering the costs to shareholders of a firm raising a dollar of capital in each of these four possible ways and 'burning' the proceeds. This simplifies the analysis by allowing the capital raised to have no effects on either investment or other sources of finance. Perturbations in financial policy can then all be explained in terms of additions and subtractions of these primitive costs of finance. Suppose, for example, that relative to some base plan a firm retains a dollar of unfrankable earnings and issues a dollar less new equity. The net cost will be that of retaining a dollar of unfrankable earnings and burning the proceeds minus that of issuing a dollar of new equity and burning the proceeds.

This section starts by examining the costs of raising and burning a dollar of the four forms of capital. It then derives gains from financial perturbations more formally.

The Costs of Raising and Burning a Dollar of Finance

To boost retained unfrankable earnings by a dollar, a firm reduces unfranked dividends by a dollar. Provided the firm burns the dollar it retains, shareholders gain no benefit from this retention. The cost to them is the after-tax dividend forgone, viz., $1-m$.

To boost retained frankable earnings by a dollar, a firm must retain a dollar of franked dividends. If the dollar that is retained is burned, the cost to shareholders will be the after-tax dividend forgone, viz. $(1-m)/(1-\tau)$.

If a dollar of new equity is issued, new shareholders need to receive a flow of benefits from the shares with a present value of a dollar. This means that a dollar of new equity lowers the value of existing equity by a dollar. Assuming the dollar of new equity is burned, this costs existing shareholders $1-c$ net of capital gains tax.

The most complex case is that of debt. Suppose that a firm borrows a dollar and burns the proceeds. It will need to pay a stream of interest payments of i per annum and save $i\tau$ in tax. In order for there to be no effects on other forms of finance (in particular retained frankable earnings), it will be necessary for the firm to reduce franked dividends by $i(1-\tau)$ per annum and it will be assumed that this is what happens.

The cost of the dollar of debt is that shareholders forgo a stream of franked dividends of $i(1-\tau)$ per annum. Because shareholders receive $(1-m)/(1-\tau)$ on each dollar of franked dividends, this has an after-tax cost to shareholders of $i(1-m)$ per annum. An after-tax revenue stream of $i(1-m)$ has a present value of a dollar. In the absence of any capital gains tax, the cost to shareholders of the firms issuing a dollar of debt and burning the proceeds would be a dollar.

There are, however, two complications. First, with a nominal capital gains tax, this loss would reduce capital gains tax payments by c so the cost to shareholders would be $1-c$. With a nominal capital gains tax the cost of new equity and debt would be the same.

With a real capital gains tax and inflation, there is a further effect. Suppose that the value of the firm falls by v. This reduces the basis of shares for capital gains tax purposes which increases capital gains tax payments by $vc\pi$ per annum. Thus, shares will fall in value both because of the fall in franked dividends and because of the reduction of the basis for capital gains tax purposes.

In both the case of nominal gains being taxed ($\alpha = 0$) and real gains being taxed ($\alpha = 1$) the fall in the value of the firm is given by

$$v = \frac{i(1-m) + \alpha c \pi v}{i(1-m)}$$

Solving,

$$v = \frac{i(1-m)}{i(1-m) - \alpha c \pi}$$

Thus, the new cost to shareholders of a firm issuing a dollar of debt and burning the proceeds will be

$$v(1-c) = \frac{i(1-m)(1-c)}{i(1-m) - \alpha c \pi} = \frac{i(1-m)}{\phi}$$

Table 2.2 records the costs to shareholders of these four forms of finance.

Table 2.2: Costs of Raising a Dollar of Capital and Burning the Proceeds

Form of Finance	*Cost*
RUE	$1-m$
RFE	$(1-m)/(1-\tau)$
NE	$1-c$
Debt	$i(1-m)/\phi$

Perturbations in Financial Policy

It will be optimal for firms to perturb financial policy by replacing more expensive forms of finance recorded in Table 2.2 with less expensive forms of finance.

As there are four methods of financing investment in Australia, there are six possible pairs of financing options (which for convenience will be considered in the following order - RUE/NE, NE/Debt, RUE/Debt, Debt/RFE, NE/RFE and RUE/RFE).

i. RUE/NE

Proposition 2.1: *The retention of unfrankable earnings (ie., reducing unfranked dividend payments) dominates new equity issues provided $c < m$.*

Suppose that relative to some base plan a firm decides to increase unfrankable earnings and to reduce new equity issues by a dollar in period 0 keeping all the other choice variables (ie., unfranked dividends and new equity issues in other periods and bonds and franked dividend payments in all periods) unchanged.[15] This satisfies the firm's cash-flow constraint (2.6'). The changes in the variables appearing in (2.6') other than CF_t (which is assumed to be exogenous) are as follows:

Period	dD_t^f	dD_t^u	dB_t	dV_t^N	$(1+i(1-\tau))dB_{t-1}$
0	0	-1	0	-1	0
1	0	0	0	0	0
2 and future periods	0	0	0	0	0

That these changes satisfy (2.6') while leaving CF_t unchanged is easily checked. Assuming that this decision is made just before dividends are paid in period 0, the gain to its shareholders is found by substituting $dD_t^u = dV_t^N = -1$ into (2.15). The gain is

$$dW_0 = -(1-m) + (1-c) = m - c \tag{2.16}$$

The gain from reducing new equity issues by a dollar and increasing retained unfrankable earnings (reducing unfranked dividends) by a dollar is $m-c$. This is positive assuming $c < m$. As noted above, the intuition is clear if one compares the costs of raising of dollar of finance in these two primitive ways (issuing new equity

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15 Without loss of generality, perturbations will all be assumed to take place in period 0.

and retaining unfrankable earnings) and burning the proceeds. From Table 2.2, the cost to existing shareholders of a dollar of new equity is $1-c$ and the cost of retaining a dollar of unfrankable earnings is $1-m$.

Assuming $c<m$, unfranked dividends should not be paid in any period in which firms are issuing new equity. By reducing unfranked dividend payments and new equity issues the firm can add to the wealth of its current shareholders.[16]

ii. NE/Debt

Proposition 2.2: *Issuing new equity weakly dominates debt. Debt will never be preferred to new equity issues and at times new equity will be preferred to debt.*

One aim of Australia's move to full imputation was to remove distortions in corporate financing decisions between debt and new equity. In the absence of capital gains taxation, tax biases would be completely eliminated if both firms and their shareholders were in a taxpaying position and if firms were distributing the maximum level of franked dividends.[17]

The intuition is straightforward and follows from our earlier discussion of the cost of issuing a dollar of new equity or a dollar of debt and burning the proceeds. A dollar of new equity reduces the value of old equity by a dollar. A dollar of debt reduces the value of franked dividends a firm can pay by $i(1-\tau)$ which costs shareholders $i(1-m)$ per annum. The present value of this stream is also dollar.

Australia's capital gains tax provisions can, however, result in a tax bias in favour of new equity in times of inflation. If firms reduce debt and increase new equity leaving other sources of finance unchanged, this will add to shareholder wealth if real gains are taxed (i.e., if real gains accrue). It will leave shareholder wealth unchanged in other cases. As has been outlined in Section 1.3, this conclusion contrasts with those

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[16] Others have provided a similar line of argument to demonstrate that new equity should not be issued and dividends paid in the same period under a classical company tax system (see, for example, Poterba and Summers, 1985). One difference is that in Poterba and Summers the gain is $(m-c)/(1-c)$. This difference stems from their implicit assumption that the decision to perturb dividend policy was known about in the previous period.

[17] There also would be no distortion between these forms of finance and retained frankable earnings if firms availed themselves of the bonus issue option (see footnote 1 above).

of other Australian studies which have differed over whether Australia's tax provisions completely eliminate or only partially eliminate a bias in favour of debt finance.

To see this formally, suppose that relative to some base plan the firm decides to issue an additional dollar of new equity in period 0 and uses this to reduce debt by the same amount in all future periods. This reduces interest payments by i and tax payments by $i\tau$ per period. In order for this change to leave sources of finance other than new equity issues and debt unchanged (ie., leave RFE and RUE unchanged), franked dividends must rise by this amount in each future period. Changes can be summarised as follows:

Period	dD_t^f	dD_t^u	dB_t	dV_t^N	$(1+i(1-\tau))dB_{t-1}$
0	0	0	-1	1	0
1	$i(1-\tau)$	0	-1	0	$-[1+i(1-\tau)]$
2 and future periods	$i(1-\tau)$	0	-1	0	$-[1+i(1-\tau)]$

This implies

$$dW_0 = -(1-c) + \sum_{t=1}^{\infty} \frac{i(1-m)}{(1+\phi)^t} = -(1-c) + \frac{i(1-m)}{\phi} \tag{2.17}$$

Again, this can be explained by comparing the costs of issuing and burning a dollar of new equity and a dollar of debt (see Table 2.2).

Rearranging,

$$dW_0 = \frac{i(1-m) - \left(i(1-m) - \alpha c \pi\right)}{\phi} = \frac{\alpha c \pi}{\phi} \tag{2.18}$$

Thus, if the inflation rate is positive and $c > 0$, this policy of increasing new equity issues to retire debt will increase the value of the firm provided real gains are accruing (so $\alpha = 1$). If shares do not appreciate in real terms (so either α or c is zero), the value of the firm will be unchanged. The value of the firm would also be unchanged if all potential shareholders were sharetraders as in this case nominal gains are taxable so $\alpha = 0$. Thus, issuing new equity to replace debt and perturbing dividend payments in the manner outlined above to keep RFE and RUE unchanged never lowers the value of the firm and increases it if π is positive, $c > 0$ and real gains are accruing. This establishes Proposition 2.2.[18]

The intuition behind the preference for new equity finance is straightforward if one considers the case of a company owned by a single individual. If an individual puts a dollar of equity into a company which lends the proceeds, the firm's equity rises and net debt falls by a dollar. This is equivalent to a substitution from debt to equity.

In the absence of any capital gains tax the individual would be neutral between earning interest income on personal account or using his capital to set up a company which earns interest and pays after-tax interest as franked dividends. Given full imputation, in both cases the individual would earn the net-of-personal-tax interest rate on his capital.

Now suppose, however, that there is an indexed capital gains tax and a positive inflation rate. If the firm pays out its after-tax nominal interest as franked dividends, its nominal value will remain constant and its *real value will fall*. Clearly, if shareholders could deduct real capital losses, there would be an advantage to an individual in incorporation. By establishing a company an individual would be able to claim deductions for real capital losses on top of receiving the net-of-personal-tax interest rate on his capital. The end result would be that the individual would be taxed on real rather than nominal interest income.

In Australia real capital losses are not deductible but suppose that an individual owns some bonds as well as being the owner of a company which is appreciating in real terms. If the individual holds the bonds on personal account, he will be taxed on the nominal interest he receives. If, however, he sells the bonds and injects the funds into his company as additional equity capital, the company can use the capital to buy bonds and pay its nominal interest income as a franked dividend to the shareholder. At the same time the additional equity capital will lead to higher indexation

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[18] In the analysis above, it is assumed that the company is in tax profit. If one allows for the possibility of the company itself being in a tax-loss position, the tax preference for new equity becomes even stronger. Even if shares were not expected to appreciate in real value, issuing new equity would be tax preferred. An offsetting consideration is that imputation credits are not refundable and so if a shareholder is in a tax-loss position, imputation credits are wasted. Debt could be tax preferred if there is a possibility of those supplying capital being in a tax-loss position.

deductions when capital gains tax is computed on the shares. In effect this means that rather than the individual being taxed on nominal interest income, he is taxed on real interest income once more.[19]

It is worth noting that our analysis appears to lead to a somewhat troubling conclusion. In valuing the firm we have assumed that individuals could borrow or lend at the interest rate, i. Now, however, we have shown that individuals will not wish to lend so long as shares generate real capital gains. This raises the question of who the lenders will be. In our model's frictionless world, the conclusion would appear to be that all lending would be done by nontaxpayers, sharetraders, companies or foreigners.

Individuals should not lend on their own account but instead buy shares in companies which lend the capital or reduce debt instead so long as this can be used as a way of reducing capital gains on shares.[20] If this model is pushed to its logical limit, it would appear that individuals should continue to borrow to buy shares in companies which reduce their debt or lend the proceeds so long as these companies have any prospect of generating real capital gains. As companies reduce debt or lend, real capital gains become less likely. In theory, any prospect of capital gains might be eliminated if a company issues enough new equity and lends the proceeds.[21] In practice, some shares clearly do rise in real value. Companies might need to issue very large amounts of new equity and lend the proceeds in order to ensure that real gains are avoided in all possible states of the world. Issues not considered such as transactions costs and

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[19] If the individual who owns the appreciating company had no bonds initially, a variant of this strategy could be used. The individual could borrow money which he uses to purchase additional equity in the company. Nominal interest on the borrowings would be deductible but if the company acquires bonds and pays its interest income as a franked dividend, once again only real interest income would be taxed. This is a wealth pump with the individual deducting nominal interest but being taxed only on the real component of interest income.

[20] Note that this does not invalidate equation (2.3). Interest can be deducted on money used to acquire shares so (2.3) would continue to be valid for companies owned by individuals on tax rate m. The cost of investing in shares would be $i(1-m)$ as a consequence of the cost of borrowing individuals face.

[21] If real capital losses had been treated symmetrically with real capital gains and made deductible, in principle this process would continue until investors had bought sufficient shares to eliminate their tax liabilities.

possible concerns about corporate management's abilities to misappropriate large cash balances may be important constraints preventing firms from adopting a financial policy which eliminates real capital gains in all states of the world.

Finally, note that the conclusion that new equity is tax preferred relative to debt rests on the assumption of a single marginal tax rate on suppliers of capital. Multiple tax rates and depreciation provisions which do not correspond to economic depreciation introduce complications we have not analysed. This is true not only for companies but even for unincorporated enterprises. As is discussed further in section 3.3, accelerated depreciation reduces the cost of capital for unincorporated enterprises below the real interest rate by an amount which increases with the owner's marginal tax rate. This will provide incentives for unincorporated enterprises investing in tax-preferred activities to be owned by those on higher marginal rates, possibly borrowing the capital from those on lower marginal rates. If there are limited areas of investment where depreciation is not accelerated, this will tend to provide incentives for those on lower marginal rates to hold debt rather than an equity share in an unincorporated enterprise. The cost of capital for companies will also tend to be bid down below the real interest rate by an amount which increases with the marginal tax rate of shareholders. Again if depreciation is accelerated this may provide a bias in favour of those on lower marginal rates holding debt rather than equity in companies.

iii. RUE/Debt

Proposition 2.3: *The retention of unfrankable earnings (ie., reducing unfranked dividends) dominates debt as a method of financing investment provided $c < m$.*

This follows directly from propositions 2.1 and 2.2. The retention of unfrankable earnings dominates new equity which weakly dominates debt and so the retention of unfrankable earnings must dominate debt.

Suppose that relative to some base plan a firm reduces unfranked dividends by a dollar in period 0, uses the proceeds to reduce bonds and pays out the increase in after-tax profits as a dividend each period to keep RFE unchanged. Changes can be summarised as follows:

Period	dD_t^f	dD_t^u	dB_t	dV_t^N	$(1+i(1-\tau))dB_{t-1}$
0	0	-1	-1	0	0
1	$i(1-\tau)$	0	-1	0	-$[1+i(1-\tau)]$
2 and future periods	$i(1-\tau)$	0	-1	0	-$[1+i(1-\tau)]$

The change in the cum-dividend value of the firm would be

$$dW_0 = -(1-m) + \frac{i(1-m)}{1+\phi} + \frac{i(1-m)}{(1+\phi)^2} + \ldots = -(1-m) + \frac{i(1-m)}{\phi}$$

This is the cost of issuing a dollar of debt and consigning this to the fire (viz., $i(1-m)/\phi$) minus the cost of retaining a dollar of unfrankable earnings and consigning this to the fire (viz., $1-m$). Observing the similarity of the right-hand side of this expression to that of (2.17) it is straightforward to see that

$$dW_0 = m - c + \frac{\alpha c \pi}{\phi} \tag{2.19}$$

This will be positive if $\alpha \geq 0$, assuming $m > c$.

In the absence of inflation the gain from replacing debt with retained unfrankable earnings would be the same as that from replacing new equity with retained unfrankable earnings. If real gains are taxed and $\pi > 0$, there is an additional benefit in replacing debt with retained unfrankable earnings brought about by the higher value of shares and greater stream of indexation deductions that retentions produce.

Thus, not only should firms refrain from paying unfranked dividends in any year where they are issuing new equity (Proposition 2.1), they should also refrain from paying unfranked dividends if they can thereby reduce corporate borrowing or increase corporate lending. As this would always seem possible, the strong conclusion would appear to be that unfranked dividends should never be paid.

The proposition that firms should refrain from paying unfranked dividends may at first seem surprising to those familiar with the new view of dividends. Proponents of the new view have argued with reference to a classical company tax system that if firms cannot reward their shareholders with tax-preferred capital gains (by share repurchase or the acquisition of shares in other companies) it may be optimal to pay dividends.

There is a key difference between a classical company tax system and Australia's full imputation provisions. Under a classical company tax system, not only will the retained earnings be taxed when eventually distributed as a dividend, any earnings on these earnings also will be taxed as dividends. This means that if a company retains a dollar and uses this to purchase bonds, it will generally not be able to pay shareholders a stream of dividend payments with an after-tax present value of a dollar. Under full imputation, however, if a firm retains a dollar of unfrankable earnings and uses this to purchase bonds, it will be able to provide shareholders with an after-tax dividend stream of $i(1-m)$ per annum which has a present value of a dollar. Why some firms pay unfranked dividends under full imputation seems, if anything, more puzzling than the conventional dividend puzzle of why firms pay dividends under a classical company tax system.

iv. Debt/RFE

Proposition 2.4: *Debt dominates the retention of frankable earnings (ie., reduced payments of franked dividends) if and only if* $(\tau + c(1-\tau) - m)i > \alpha c\pi$.

Consider a perturbation in which relative to some base plan a company issues an additional dollar of debt in period 0 to increase franked dividend payments in that year. The additional debt leads to a stream of interest payments in future periods. As before, it is assumed that the rise in debt is permanent so interest payments increase by i per annum, tax payments fall by $i\tau$ per annum and franked dividends fall by $i(1-\tau)$ per period leaving retained frankable earnings one dollar lower in all future periods.[22] *NE* and *RUE* are unchanged. Changes are assumed to be as follows:

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[22] It might be objected that if the franking account balance would have been zero in some future year, this perturbation would not be possible. The additional dollar of franked dividends in period 0 necessitates a dollar less franked dividends in that period. This means that rather than there being a permanent rise in debt and fall in equity, the change would only be temporary. This would reduce the size but not the direction of the changes analysed in this section.

Period	dD_t^f	dD_t^u	dB_t	dV_t^N	$(1+i(1-\tau))dB_{t-1}$
0	1	0	1	0	0
1	$-i(1-\tau)$	0	1	0	$[1+i(1-\tau)]$
2 and future periods	$-i(1-\tau)$	0	1	0	$[1+i(1-\tau)]$

In this case

$$dW_0 = \frac{1-m}{1-\tau} - \sum_{t=1}^{\infty} \frac{i(1-m)}{(1+\phi)^t} = \frac{1-m}{1-\tau} - \frac{i(1-m)}{\phi} \tag{2.20}$$

This is the cost of retaining a dollar of frankable earnings and burning it (viz., $(1-m)/(1-\tau)$) minus the cost of issuing a dollar of debt and burning it (viz., $i(1-m)/\phi$).

Expanding (2.20) yields

$$dW_0 = \frac{(1-m)}{(1-\tau)\phi}\left(\frac{i(1-m)-\alpha c\pi}{1-c} - i(1-\tau)\right)$$

or

$$dW_0 = \frac{1-m}{(1-\tau)\phi}\left[\frac{i(\tau+c(1-\tau)-m)-\alpha c\pi}{1-c}\right]$$

In order for this expression to be positive, the numerator of the expression in square brackets must be positive which establishes proposition 2.4.

v. NE/RFE

Proposition 2.5: *New equity issues dominate the retention of frankable earnings (ie., reduced payments of franked dividends) if and only if* $\tau + c(1-\tau) > m$.

Consider a firm which increases new equity issues to increase franked dividend payments by a dollar in year 0 relative to some base plan. Assume that the franking account balance is not zero in any future year and that in year *t* franked dividends and new equity issues increase by the same amounts, leaving choice variables unchanged in future years.[23] For each dollar of additional franked dividends and new equity issues, changes would be as follows:

Period	dD_t^f	dD_t^u	dB_t	dV_t^N	$(1+i(1-\tau))dB_{t-1}$
0	1	0	0	1	0
1	0	0	0	0	0
2 and future years	0	0	0	0	0

The change in the value of the firm would be

$$dW_0 = \frac{1-m}{1-\tau} - (1-c) = \frac{\tau + c(1-\tau) - m}{1-\tau} \tag{2.21}$$

This is the cost of retaining a dollar of frankable earnings and burning it minus the cost of issuing a dollar of new equity and burning it. Thus, increasing new equity issues to increase franked dividend payments raises the value of the firm if and only if $\tau + c(1-\tau) - m > 0$.

vi. RUE/RFE

Proposition 2.6: *The retention of unfrankable earnings (ie., reduced payments of unfranked dividends) always dominates the retention of frankable earnings (ie., reduced payments of franked dividends).*

Consider a firm which is paying unfranked dividends in period 0 while paying less than the maximum possible level of franked dividends in that period. It increases franked dividends by a dollar in that period and reduces unfranked dividends by the same amount. Assume that under the base plan it is not paying the maximum level of franked dividends in any future period and that it can leave all other choice variables unchanged. Changes in choice variables would be as follows:

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[23] Again, if under the base plan the franking account balance would be zero in some future year, boosting franked dividends in year 0 implies a reduction in franked dividends in some future year. Once again this affects the size but not the direction of changes analysed in this section.

Period	dD_t^f	dD_t^u	dB_t	dV_t^N	$(1+i(1-\tau))dB_{t-1}$
0	1	-1	0	0	0
1	0	0	0	0	0
2 and future periods	0	0	0	0	0

The change in the value of the firm would be

$$dW_0 = \frac{1-m}{1-\tau} - (1-m) = \frac{(1-m)\tau}{1-\tau} \tag{2.22}$$

This will always be positive. This is the cost of retaining a dollar of frankable earnings and burning the proceeds minus the cost of retaining a dollar of unfrankable earnings and burning the proceeds. As shareholders gain imputation credits on franked dividends but not unfranked dividends, it makes sense for firms to pay franked dividends before paying any unfranked dividends.[24]

Optimal Financial Policy: A Summary

Table 2.3 summarises optimal financial policy and how this depends on tax rates and capital gains on shares. The preferred ordering of financial policy is read from left to right. For example if shares are rising in real value and if $\tau + c(1-\tau) - m > c\pi / i$, retained unfrankable earnings dominates new equity issues which dominates debt which dominates retained frankable earnings. The symbol '/' indicates that changing between two methods of financing leaves the value of the firm unchanged. Thus, unless shares are rising in real value changing between new equity and debt leaves the value of the firm unchanged.

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[24] In Australia there are rules preventing firms from paying unfranked dividends if they have a positive franking account balance and so this optimal policy is enforced by regulation (see Commerce Clearing House, 1995, *p*. 101). The regulation is intended to place impediments in the way of different types of dividends being streamed to shareholders in different tax positions. This complication cannot be analysed in our simple model which treats all shareholders as being taxed at the same marginal rate.

Table 2.3: Optimal Financial Policy in Year *t*

Shares rising in real value		*Optimal Financial Policy (Left to Right)*
	$\tau + c(1-\tau) - m > c\pi / i > 0$	RUE, NE, Debt, RFE
	$0 < \tau + c(1-\tau) - m < c\pi / i$	RUE, NE, RFE, Debt
	$\tau + c(1-\tau) - m < 0$	RUE, RFE, NE, Debt
Shares falling in real & rising in nominal value		
	$\tau > m$	RUE, NE/Debt, RFE
	$\tau < m$	RUE, RFE, NE/Debt
Shares falling in nominal value		
	$\tau + c(1-\tau) > m$	RUE, NE/Debt, RFE
	$\tau + c(1-\tau) < m$	RUE, RFE, NE/Debt

Irrespective of the precise values of m and τ, our analysis appears to lead to two strong conclusions. First, firms should pay no unfranked dividends. RUE is always the cheapest source of finance. Rather than paying unfranked dividends, firms should pay franked dividends, reduce new equity issues or reduce corporate debt. As corporate debt can always be made negative (the company can lend), no unfranked dividends should be paid.

Our second conclusion is that if there is a positive probability of real gains and $\pi > 0$, firms should issue new equity instead of debt. If real gains accrue, new equity is preferred to debt and if real gains do not accrue, whether new equity or debt is issued is a matter of indifference. Some qualifications are in order. We have noted that sharetraders will be indifferent between debt and new equity and shareholders in tax loss may prefer debt. On the other hand, if the company itself has any prospect of being in tax loss, this will increase the bias in favour of it issuing new equity instead of debt.

If $\tau + c(1-\tau) > m$, a third conclusion emerges. Increasing new equity to increase franked dividends (reduce RFE) adds to the value of the firm. It will be argued below that this inequality appears likely to hold under plausible rates of share turnover for any plausible value of m. Thus, firms should pay as many franked dividends as possible, replacing the capital by issuing new equity.

2.5 ASSUMPTIONS USED IN DERIVING NUMERICAL ESTIMATES

As will be discussed more fully in section 2.7, not all firms appear to distribute the maximum level of franked dividends, some unfranked dividends are paid and firms are partially debt financed. Part of the explanation could be that tax incentives we have identified encouraging the payment of franked dividends and discouraging both debt finance and the payment of unfranked dividends may be very weak. It is important to attempt to quantify the financial biases outlined above. The remainder of this chapter aims to do this.

In order to estimate the extent of financial policy biases it is necessary to make assumptions about the marginal tax rate of shareholders, m, and the accrual-equivalent rate of capital gains tax.

The Value of *m*

There is no particularly satisfactory way of compressing a range of marginal tax rates of shareholders into a single value of m. A common approach is to use the mean marginal tax rate on shareholders but there seems to be little good reason for choosing this rate. A problem in using this rate in Australia is that most domestic final shareholders are on one of two tax rates. Superannuation funds are taxed at a rate of 15 per cent and individuals on the top marginal tax rate of 48.5 per cent (inclusive of the 1.5 per cent Medicare Levy) hold the large majority of shares owned by individuals. Choosing the mean marginal tax rate ensures that m is chosen between these two extreme marginal tax rates. In practice more shares are held by superannuation funds and by individuals taxed at the top marginal tax rate than by taxpayers close to the mean marginal rate and it seems at least possible that some companies are attempting to act in the interests of shareholders taxed at these more extreme rates. For this reason as well as making the conventional assumption that m is the mean marginal tax rate of shareholders, we also consider the possibility that m is the marginal tax rate of superannuation funds and that m is the top personal marginal tax rate.

The most recent data which would allow a mean marginal tax rate to be calculated are from the Australian Taxation Office publication 'Taxation Statistics 1994/95'. The data is recorded in Table 2.4.

Table 2.4 Total Dividend Income of All Individuals 1994/95

Taxable Income ($)	*Actual Number with*	*Actual Amount ($m)*
Under 10,000	30,953	10
10,000 - 14,999	84,255	71
15,000 - 19,999	91,327	123
20,000 - 24,999	108,156	149
25,000 - 34,999	191,482	322
35,000 - 49,999	209,535	538
50,000 and over	210,100	2,747
Non-taxable	152,424	171

Table 2.5 shows marginal tax rates by income in 1994/95 and estimates of dividend receipts by income class. Shareholding by income class is assumed to be the same as dividend receipts by income class. Dividend receipts by marginal tax rate group are derived from Table 2.4 with prorating across income ranges.

In 1994/95 there was a 1.4 per cent Medicare Levy. This levy was not payable if an individual had income of less than $12,688 or a family had income of less than $21,366 if they had no children, with amounts increasing with dependent children. Once these income ranges were reached, the Medicare Levy was shaded in at a rate of 20 per cent. As shading-in provisions vary with family circumstance in a complex way, our calculations of marginal tax rates for dividend recipients abstract from these complications and treat the levy as a proportional 1.4 per cent levy on all income. Given that the very large majority of dividends are received by those on incomes above the shading-in range, this simplification is unlikely to have much effect on estimates of the average marginal tax rate.

The data in Table 2.5 imply an average marginal tax rate on taxpaying individual dividend recipients of 44.6 per cent and an average marginal tax rate on all individuals of 42.7 per cent.

Table 2.5 Dividends Received by Marginal Tax Rate 1994/95

Taxable Income ($)	*Assumed Marginal Tax Rate Inclusive of Medicare Levy* (%)	*Estimated Dividends Received ($m)*
0 - 5,399	1.4	5.4
5,400 - 20,699	21.4	219.5
20,700 - 37,999	35.4	557.7
38,000 - 49,999	44.4	430.4
50,000 and over	48.4	2747.0
Non-taxable		171.0

As well as individuals receiving dividends, the unincorporated sector derives dividends through partnerships and trusts. The Australian Taxation Office's publication 'Taxation Statistics' indicates that individuals declared $4,132 million in dividends in 1994/95 and partnerships and trusts declared $1,785 million. The taxation of trust income depends on whether or not it is taxed as income of the trustee or beneficiaries' income. Income of the trustee is taxed at the top personal marginal rate and beneficiaries' income is taxed at the marginal tax rates of beneficiaries. There are no data which would allow us to calculate the marginal tax rates applying to dividend income earned by partnerships and trusts. We assume that this income is taxed at the average marginal tax rate of individual shareholders of 42.7 per cent.

Superannuation funds and life insurance offices are other important groups of shareholders. Assumptions on the proportions of shares held by households and by life offices and superannuation funds are based on ABS figures.[25] ABS data indicate that while households derived $5,807 million in dividends in 1994/95, life insurance companies and superannuation funds received $3,517 million. Superannuation funds were normally taxed at a rate of 15 per cent and life offices at a rate of 39 per cent on their non-superannuation business.

[25] See ABS Catalogue No. 5204.0.

In June 1995, domestic shares and units in unit trusts which were superannuation fund assets totalled \$71.8 billion.[26] Those which were assets of life offices but not superannuation fund assets totalled \$11.0 billion.[27] This implies that 86.7 per cent of shares owned by life offices and superannuation funds were superannuation fund assets. Accordingly, 86.7 per cent of dividends received by life offices and superannuation funds are assumed to be taxed at a rate of 15 cents in the dollar and the remainder at 39 cents in the dollar. This implies an overall average marginal tax rate for individual and institutional final domestic shareholders of approximately 33 per cent for 1994/95.

Apart from some very small adjustments to the rate of Medicare Levy, there have been no changes to marginal tax rates since that time. As the bulk of dividends received by individuals on the top marginal tax rate in 1994/95 and there has been little inflation since then, it is unlikely that the mean marginal tax rate has changed much since that time. It is assumed that the mean marginal tax rate of shareholders continues to be 33 per cent.

Accrual-Equivalent Rate of Capital Gains Tax

The most common way of estimating an accrual-equivalent rate of capital gains tax is that of King (1977). King assumes that a fraction, a, of shares are sold each year. If the value of shares rises by a dollar, shareholders would be taxed on a immediately, $a(1-a)$ after one year, $a(1-a)^2$ after two years and so forth. If there were a constant interest rate of i per annum, and nominal gains were taxed, the present discounted value would be

$$c = ma\sum_{t=0}^{\infty}\left(\frac{1-a}{1+i(1-m)}\right)^t = \frac{ma\left(1+i(1-m)\right)}{i(1-m)+a} \qquad (2.23)$$

This is equation (3.14) of King (1977).

If instead real gains were taxed, the accrual equivalent tax rate would be

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[26] See Table 3 of the Insurance and Superannuation Commission Bulletin, September 1995.

[27] ABS 5655.0 Table 3 indicates that life insurance offices owned \$38.7 billion and Table 6 of the Insurance and Superannuation Commission Bulletin, September 1995 indicates that \$27.7 billion of these were superannuation assets.

$$c = ma\sum_{t=0}^{\infty}\left(\frac{(1-a)(1+\pi)}{1+i(1-m)}\right)^t$$

Simplifying,

$$c = \frac{ma(1+i(1-m))}{i(1-m)+a-\pi(1-a)} \tag{2.24}$$

In our calculations, (2.24) is used to calculate c when real gains accrue and (2.23) is used when nominal losses accrue. This approach is justified more fully in Appendix 2.1.

To compute c, assumptions must also be made about the proportion of shares sold in any year, a. It is commonly assumed (e.g., King and Fullerton, 1984, *p*. 24) that a is approximately 0.1. This seems low relative to average rates of share turnover in Australia. In Australia shares in listed companies turn over approximately once every two years although this may involve traders turning over shares very rapidly while many shareholders hold shares for longer periods.[28] In our base case it is assumed that $a = 0.2$ although rates of 0.1 and 0.5 are also used.

2.6 NUMERICAL ESTIMATES OF FINANCIAL POLICY BIASES

Estimates of the magnitudes of financial policy biases are presented below under a variety of assumptions about m, a and π. It is assumed that the company tax rate is 36 per cent as is currently the case. For simplicity, the decisions to perturb financial policy examined in this section are assumed all to involve a dollar change in financial policy and to take place in period 0 just before dividends are paid. The equations used in deriving the effects of perturbations on shareholder wealth are (2.16), (2.18), (2.19), (2.20), (2.21) and (2.22).

Table 2.6 summarises the expressions derived earlier for the change in shareholder wealth as a result of one dollar perturbations in financial policy. For example we saw earlier that the gain from replacing a dollar of new equity with a dollar of RUE is $m-c$, the gain from replacing a dollar of debt with a dollar of new equity was $\alpha c\pi / \phi$ and so forth.

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[28] The Australian Stock Exchange publication 'Monthly Index Analysis: June 1997' reports a turnover of 48.0 per cent in 1995/96 and 54.9 per cent in 1996/97. These figures comprise the (average daily turnover x trading days in the year) / average market capitalisation.

Table 2.6 Effects on Shareholder Wealth of Permanent Perturbations in Financial Policy

	Raise RUE by $1	*Raise NE by $1*	*Raise Debt by $1*	*Raise RFE by $1*
Reduce RUE by $1	0	$c-m$	$c-m-\frac{\alpha c\pi}{\phi}$	$\frac{-(1-m)\tau}{1-\tau}$
Reduce NE by $1	$m-c$	0	$\frac{-\alpha c\pi}{\phi}$	$1-c-\frac{1-m}{1-\tau}$
Reduce Debt by $1	$m-c+\frac{\alpha c\pi}{\phi}$	$\frac{\alpha c\pi}{\phi}$	0	$\frac{i(1-m)}{\phi}-\frac{1-m}{1-\tau}$
Reduce RFE by $1	$\frac{(1-m)\tau}{1-\tau}$	$\frac{1-m}{1-\tau}-(1-c)$	$\frac{1-m}{1-\tau}-\frac{i(1-m)}{\phi}$	0

To quantify the financial policy biases, it is initially assumed that $a=0.2$, $m=0.33$ (the average marginal rate of shareholders), $\tau=0.36$ (the current company tax rate) the real interest rate is 5 per cent per annum, and that there is a constant inflation rate of 2 per cent per annum[29]. This implies that the nominal interest rate is $i=0.071$. It is also assumed that real gains accrue (so real gains are taxed) which implies that $c=0.299$ and $\phi=0.059$. Changes in the value of the firm under these assumptions are recorded in Table 2.7.

These figures can be explained in terms of the costs of raising a dollar of finance in different ways and burning the proceeds. The cost of raising and burning a dollar of *RUE, RFE, NE* and Debt are under these assumptions, respectively, $1-m=0.67$, $(1-m)/(1-\tau)=1.047$, $1-c=0.701$ and $i(1-m)/\phi=0.802$. The gain from replacing a dollar of new equity with a dollar of retained earnings is $0.031=0.701-0.67$, the gain from replacing a dollar debt with a dollar of new equity is $0.101=0.802-0.701$ and so forth.

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[29] These assumed rates are broadly consistent with actual inflation and interest rates in recent years. The average rate of CPI inflation between June 1995 and June 1997 was 1.7 per cent. The inflation is at the low end of the Reserve Bank's long-run target for inflation of 2 - 3 per cent per annum. Interest rates on three-year government stock issued in varied between 8.5 and 5.9 per cent.

Table 2.7 Effects on Shareholder Wealth of Permanent Perturbations in Financial Policy when Real Gains Accrue, $a = 0.2, r = 0.05, \pi = 0.02, i = 0.071$

	Raise RUE by $1	*Raise NE by $1*	*Raise Debt by $1*	*Raise RFE by $1*
Reduce RUE by $1	0	-0.031	-0.132	-0.377
Reduce NE by $1	0.031	0	-0.101	-0.345
Reduce Debt by $1	0.132	0.101	0	-0.245
Reduce RFE by $1	0.377	0.345	0.245	0

Table 2.8 enlarges Table 2.7 to consider not only the case when real gains are accruing ($\alpha = 1$) but also the case where real losses but nominal gains accrue ($c = 0$) and the case where nominal losses accrue ($\alpha = 0$). In the case where real losses but nominal gains accrue, $i(1-m)/\phi = 1$. In the case where nominal losses accrue, $i(1-m)/\phi = 1-c$. As discussed earlier, this implies that there is no gain from replacing debt with new equity in either of these last two cases.

If, as before, it is assumed that a, r, π and i are 0.2, 0.05, 0.02 and 0.071 respectively and $m = 0.33$, from (2.23) $c = 0.279$ if nominal losses accrue. The middle three columns of Table 2.8 present results when m is assumed to be 0.33. As mentioned earlier, there is no strong reason for assuming that m can be approximated by the average marginal tax rate of shareholders and Table 2.8 also considers the possibility of m being 0.15 (the tax rate of superannuation funds) or 0.485 (the top marginal tax rate in 1997/98). In Table 2.8 *RUE/NE* is the gain to shareholders from replacing a dollar of new equity with a dollar of retained unfrankable earnings (i.e., paying a dollar less unfranked dividends), *RUE/Debt* is the gain from replacing a dollar of debt with a dollar of retained unfrankable earnings and so forth.

Table 2.8 allows us to estimate the magnitudes of financial policy biases under a variety of different possible assumptions. The intermediate case where $m = 0.33$ has figures shown in bold type. Figures for the fourth column (ie., the first bold-face column) where $m = 0.33$ and entitled *RG* (real gains) are derived from Table 2.7.

Table 2.8 Effects on Shareholder Wealth of Permanent Perturbations in Financial Policy, a = 0.2, r = 0.05, π = 0.02, i = 0.071

	m = 0.15			m = 0.33			m = 0.485		
	RG	*RLNG*	*NL*	*RG*	*RLNG*	*NL*	*RG*	*RLNG*	*NL*
RUE/NE	0.020	0.15	0.028	**0.031**	**0.330**	**0.051**	0.029	0.485	0.060
RUE/Debt	0.059	0.15	0.028	**0.132**	**0.330**	**0.051**	0.210	0.485	0.060
RUE/RFE	0.478	0.478	0.478	**0.377**	**0.377**	**0.377**	0.290	0.290	0.290
NE/Debt	0.039	0.000	0.000	**0.101**	**0.000**	**0.000**	0.181	0.000	0.000
NE/RFE	0.458	0.328	0.450	**0.345**	**0.047**	**0.326**	0.261	-0.20	0.230
Debt/RFE	0.419	0.328	0.450	**0.245**	**0.047**	**0.326**	0.080	-0.20	0.230

Incentive to Replace Debt With New Equity

The figures in Table 2.8 suggest that the benefit from a firm replacing debt with new equity may not be trivial even at an inflation rate as low as 2 per cent per annum. If real gains are expected to accrue and m = 0.33, shareholders gain 10.1 cents from a firm replacing a dollar of debt with a dollar of new equity assuming as we do in all cases that the change in financial policy is permanent (the stock of debt falls by a dollar and the stock of equity rises by a dollar in perpetuity). As the benefits of inflation indexation increase with the marginal tax rate, this benefit is larger (18.1 cents) if m = 0.485 and smaller (3.9 cents) if m = 0.15.

In practice real gains are not certain to accrue and if real gains do not accrue, there is no benefit from replacing debt with new equity. Thus, in practice the benefit from replacing a dollar of debt with a dollar of new equity is likely to be somewhere between the value recorded when real gains accrue and zero.

Incentive to Avoid Paying Unfranked Dividends

Table 2.8 shows that there are gains from using *RUE* to replace any of the three other forms of finance irrespective of m and of whether real gains, real losses but nominal gains or nominal losses are expected to accrue. Incentives to replace *RFE* with *RUE* (ie., to pay franked rather than unfranked dividends) are of little practical interest given the provision requiring firms to pay franked dividends before unfranked dividends (see footnote 24). Incentives to retain unfrankable earnings ahead of issuing new equity appear to be small (no more than 6.0 cents in the dollar even if $m = 0.485$) unless real losses but nominal gains are expected to accrue.

If real gains are expected to accrue, there can be a more significant gain from retaining a dollar of unfrankable earnings rather than issuing this amount of debt (5.9, 13.2 or 21.0 cents depending on whether m is 0.15, 0.33 or 0.485 respectively). This suggests that the question of why firms pay unfranked dividends rather than reducing debt or lending seems an important puzzle at least in the case of firms with a reasonable prospect of generating at least nominal capital gains. If $m = 0.33$, paying a dollar of unfranked dividends rather than reducing debt by a dollar is estimated to cost shareholders 13.2, 33.0 or 5.1 cents depending, respectively, on whether real gains, real losses but nominal gains or nominal losses are expected to accrue.

Incentives to Distribute Franked Dividends

Provided the possibility of real losses but nominal gains is not considered to be very significant, much the strongest financial bias appears likely to be for firms to pay as many franked dividends as possible (or, equivalently, issue franked bonus shares) and to issue new equity or (less favourably) debt to replace the firm's capital. The possibility of real losses but nominal gains seems likely to be small at present given recent low rates of inflation. Clearly, as inflation tends to zero, the probability of this case becomes zero.

Suppose for the moment that we ignore the possibility of real losses but nominal gains. If $m = 0.33$, retaining a dollar of frankable earnings is estimated to cost shareholders between 24.5 and 34.5 cents depending on whether it is assumed that debt or new equity would have been issued instead and on whether real gains or nominal losses are expected to accrue on shares. The gains would be even higher (41.9 to 45.8 cents) if superannuation funds were marginal taxpayers. The gain from issuing new equity ahead of *RFE* would still be significant (8.0 to 26.1 cents) even if those on the top personal marginal rate were marginal shareholders. This raises the puzzle of why some firms fail to pay the maximum level of franked dividends or franked bonus shares.

One possible reason for firms not paying too many franked dividends is that if firms need to issue new equity to replace their capital, this may involve important transactions costs. In principle, the bonus share provision appears likely to be a way of allowing franking credits to flow to shareholders without firms needing to issue new equity and without undue transactions costs. Shareholders can claim imputation credits without firms relinquishing their capital. Even if there were impediments standing in the way of firms issuing franked bonus shares or paying franked dividends and issuing new equity in replacement, our analysis suggests that there are likely to be large gains from paying franked dividends and issuing debt in replacement. Our analysis suggests that there are strong incentives for firms to maintain a more-or-less zero franking account balance.

Capital Gains Taxation and the Value of *a*

The financial biases identified are very dependent on the capital gains tax. It is of some interest to ask how these biases would have been affected if Australia, like New Zealand, had not introduced a capital gains tax and if all other tax parameters in Australia were unchanged.

This case can be analysed by examining the real loss but nominal gain (*RLNG*) columns in Table 2.8 as if shares rise in real but not in nominal value, there is no capital gains tax impost. In the absence of any capital gains there would be no benefits from inflation indexation and there would be no bias between debt and new equity. With no capital gains tax, the cost of retaining unfrankable or frankable earnings relative to issuing new debt or equity falls. This increases the bias favouring the retention of unfrankable earnings over debt or new equity. It decreases the positive bias favouring debt or new equity relative to retained frankable earnings if m is 0.15 or 0.33 and changes the sign of this bias if $m = 0.485$. For example, if $m = 0.33$, the gain from retaining a dollar of unfrankable earnings instead of issuing a dollar of debt or new equity is 33 cents whereas the gain from issuing a dollar of new equity or debt rather than retaining a dollar of frankable earnings is only 4.7 cents. Here the biggest bias would seem to be for firms to avoid paying unfranked dividends with incentives to pay franked dividends being relatively weak.

Given uncertainty about the most appropriate value of a, Table 2.9 modifies Table 2.8 by allowing for two different possible values of a, namely, 0.1 and 0.5. The direction of results is as would be expected. With a smaller value of a, values of c fall and this boosts the gains from using retained unfrankable earnings to replace new equity or debt and reduces the gains from using debt or new equity to replace retained frankable earnings. There is also a slight reduction in the gain from using new equity in lieu of debt when real gains accrue because with a lower rate of capital gains tax the benefits from inflation indexation fall. With a higher value of a the adjustments are in the opposite direction.

It is worth noting that if the chance of real losses but nominal gains is ignored, even if $a = 0.1$ and $m = 0.485$, there continues to be a gain to shareholders from paying a dollar of franked dividends and issuing new equity or debt.[30] Thus, our analysis suggests that firms will face incentives to distribute franked dividends and new equity or even debt in replacement under a wide range of possible assumptions.

Table 2.9 Effects on Shareholder Wealth of Permanent Perturbations in Financial Policy, $r = 0.05, \pi = 0.02, i = 0.071$

	$m = 0.15$			$m = 0.33$			$m = 0.485$		
	RG	*RLNG*	*NL*	*RG*	*RLNG*	*NL*	*RG*	*RLNG*	*NL*
$a = 0.1$									
RUE/NE	0.038	0.150	0.051	**0.063**	**0.330**	**0.096**	0.061	0.485	0.117
RUE/Debt	0.072	0.150	0.051	**0.156**	**0.330**	**0.096**	0.235	0.485	0.117
RUE/RFE	0.478	0.478	0.478	**0.377**	**0.377**	**0.377**	0.290	0.290	0.290
NE/Debt	0.034	0.000	0.000	**0.093**	**0.000**	**0.000**	0.174	0.000	0.000
NE/RFE	0.440	0.328	0.427	**0.314**	**0.047**	**0.281**	0.229	-0.20	0.173
Debt/RFE	0.406	0.328	0.427	**0.221**	**0.047**	**0.281**	0.055	-0.20	0.173
$a = 0.5$									
RUE/NE	0.005	0.150	0.008	**0.008**	**0.330**	**0.014**	0.008	0.485	0.017
RUE/Debt	0.049	0.150	0.008	**0.115**	**0.330**	**0.014**	0.192	0.485	0.017
RUE/RFE	0.478	0.478	0.478	**0.377**	**0.377**	**0.377**	0.290	0.290	0.290
NE/Debt	0.043	0.000	0.000	**0.106**	**0.000**	**0.000**	0.185	0.000	0.000
NE/RFE	0.473	0.328	0.470	**0.368**	**0.047**	**0.363**	0.282	-0.20	0.273
Debt/RFE	0.430	0.328	0.470	**0.262**	**0.047**	**0.363**	0.097	-0.20	0.273

[30] Indeed there continues to be a gain from paying franked dividends and issuing new equity in replacement even if a is as low as 0.025 and there continues to be a gain from paying franked dividends and issuing debt in replacement even if a is as low as 0.05.

Sensitivity to Inflation Rate Assumptions

The assumed inflation rate of 2 per cent per annum is low compared to average inflation rates up until comparatively recently. Average CPI inflation over the 10 years to 1995/96 was 4.9 per cent per annum. Table 2.10 shows gains from financial perturbations with an assumed inflation rate of 5 per cent per annum. It is assumed that inflation has no effect on the real interest rate which is assumed as before to be 5 per cent per annum (i.e., it is assumed that the unmodified Fisher effect holds).[31] Thus, the nominal interest rate, i, becomes 10.25 per cent. As in Table 2.8, it is assumed that $a = 0.2$.

Table 2.10 Effects on Shareholder Wealth of Permanent Perturbations in Financial Policy, a = 0.2, r = 0.05, π = 0.05, i = 0.1025

	$m = 0.15$			$m = 0.33$			$m = 0.485$		
	RG	*RLNG*	*NL*	*RG*	*RLNG*	*NL*	*RG*	*RLNG*	*NL*
RUE/NE	0.018	0.150	0.036	**0.022**	**0.330**	**0.067**	0.005	0.485	0.081
RUE/Debt	0.089	0.150	0.036	**0.222**	**0.330**	**0.067**	0.439	0.485	0.081
RUE/RFE	0.478	0.478	0.478	**0.377**	**0.377**	**0.377**	0.290	0.290	0.290
NE/Debt	0.071	0.000	0.000	**0.200**	**0.000**	**0.000**	0.433	0.000	0.000
NE/RFE	0.460	0.328	0.442	**0.355**	**0.047**	**0.309**	0.285	-0.20	0.209
Debt/RFE	0.389	0.328	0.442	**0.155**	**0.047**	**0.309**	-0.15	-0.20	0.209

At 5 per cent inflation the gain from replacing a dollar of debt with a dollar of new equity would rise to 20.0 cents if $m = 0.33$ and real gains accrue (compared with 10.1 cents at 2 per cent inflation). The gain increases with higher inflation because the benefit of inflation indexation rises. The gain is less than proportional because changes in inflation also affect c and ϕ. Higher inflation has little effect on incentives for firms to issue new equity rather than paying unfranked dividends. However, the

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[31] King and Fullerton (1984, *p.* 291) assume a modified Fisher Effect where nominal interest rates rise more than point for point with inflation. As Jorgenson (1993) discusses, a number of other authors have assumed an unmodified Fisher Effect. Hansson and Stuart (1986) provide theoretical support for an unmodified Fisher Effect and Summers (1983) provides empircal evidence which strongly rejects the idea of interest rates rising more than point for point with inflation.

increased cost of debt relative to new equity increases tax biases encouraging firms to repay debt ahead of paying unfranked dividends. If $m = 0.33$ and real gains accrue, the cost of issuing a dollar of debt to pay a dollar of unfranked dividends is now 22.2 cents (compared to 13.2 cents at 2 per cent inflation). Higher inflation has little effect on incentives for firms to pay franked dividends and to issue new equity instead. However, the increased cost of debt relative to new equity reduces incentives for firms to distribute franked dividends and issue debt instead. In particular if $m = 0.33$ and real gains accrue, the benefit from issuing a dollar of debt to boost franked dividends by a dollar is only 15.5 cents (compared to 24.5 cents at 2 per cent inflation) if real gains accrue. If $m = 0.485$, the benefit is -15.0 cents (compared with 8.0 cents at 2 per cent inflation). Thus, the main effect of higher inflation is to increase the cost of debt relative to other sources of finance if real gains accrue.

2.7 RECONCILIATION WITH THE DATA

The analysis in section 2.6 suggests that under a wide range of possible assumptions firms aiming to maximise the wealth of their shareholders should:

- pay the maximum possible level of franked dividends issuing new equity or (less favourably) debt in replacement;
- pay no unfranked dividends using the capital to reduce debt or (less favourably) new equity issues; and
- replace debt with new equity with these incentives being stronger the greater the likelihood of real gains accruing on shares.

This section examines actual corporate behaviour in Australia. Our analysis may provide an explanation for some of the trends in financial policy which have become evident since the introduction of full imputation. It is clear, however, that corporate behaviour is often inconsistent with what our model would predict. This section outlines where our analysis appears to conflict with the facts and offers some possible explanations.

Payments of Franked Dividends

Section 1.6 provided data on corporate financial policy in recent years. Figure 1.3 showed that there was a significant increase in the corporate payout ratio for the 109 leading non-bank industrials following the switch to full imputation. Over the five years to 1987/88 this ratio varied between 44 and 48 per cent. Over the seven years between 1989/90 and 1995/96 the ratio has varied between 53 and 61 per cent. This very clear increase in payout ratios is likely to have been driven in large part by the shift to full imputation and the incentives created for firms to distribute as many franked dividends as possible. As noted in chapter 1, some have argued that a classical company tax system discourages the payment of dividends. If this were so, the surge in dividend payments could also reflect the removal of this barrier to firms paying dividends.

While our analysis may explain the reason for the direction of the change in dividend policy, it is clear that not all widely-held companies are paying the maximum level of franked dividends (or franked bonus shares). There are no published data on accumulated levels in franking account balances. However, both anecdotal comments in the press and data on company tax payments and on imputation credits claimed by shareholders suggest that franking account balances are significantly positive for some firms. Data are available on imputation credits claimed by individuals (but not by superannuation funds and life insurance companies). These data on imputation credits claimed by individuals indicate that imputation credits claimed are too low for companies to all be paying the maximum possible level of franked dividends.

Data are presented in Table 2.10.[32] In 1994/95 company tax paid by resident non-life companies was $12,769 million.[33] If all companies followed the policy of distributing the maximum level of franked dividends and any Australian companies receiving franked dividends passed these on to their shareholders instantaneously, final shareholders would have received $12,769 million of imputation credits. These credits could have been used by households, superannuation funds and life offices but not by foreigners.

Data are available only on imputation credits received by households. Households claimed imputation credits of $2,838 million (22.2 per cent of company tax payments) but received 31.5 per cent of dividends to final shareholders. If firms were all paying the maximum possible level of franked dividends, household imputation credits should have been approximately 31.5 per cent not 22.2 per cent of company tax

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[32]This is from ABS Catalogue 5204.0 and Australian Taxation Office 'Taxation Statistics', for various years.

[33] Mutual life insurance companies are not permitted to maintain a franking account balance and so tax paid by these companies will not give rise to imputation credits. ATO data does not separately identify tax paid by mutual and non-mutual life insurance companies and the data reported subtracts tax payments by all life insurance companies. This may slightly understate the level of company tax which could potentially give rise to imputation credits.

payments. On face value, these data seem to suggest that franked dividend payments are slightly more than 70 per cent of the amount that would be required for firms to be following a policy of fully distributing franked dividends. Table 2.10 shows that in previous years, imputation credits claimed by households were often less than 50 per cent of the level that would be compatible with firms all paying the maximum level of franked dividends.

Table 2.10 Company Tax and Imputation Credits Claimed by Households

	1990/91	*1991/92*	*1992/93*	*1993/94*	*1994/95*
Company Tax Paid by Resident Non-Life Companies ($m)	11,319	10,993	11,410	12,786	12,769
Imputation Credits Claimed by Households	1,580	1,493	1,724	2,045	2,838
Household Imp Credits as Percentage of Comp Tax	14.0	13.6	15.1	16.0	22.2
Dividends Received by Households ($m)	2,781	2,752	3,328	3,812	4,250
Total Dividends Payments to Final Shareholders ($m)	10,382	9,438	10,196	10,954	13,478
Household Dividends as Percentage of Total Dividends	26.7	29.2	32.6	34.8	31.5

These data are puzzling. They are difficult to reconcile both with anecdotal comments from the business sector about how important it is for firms to be able to pay franked dividends and with the strong incentives for firms to pay franked dividends that we have identified.

Part of the explanation may be that the data in Table 2.10 relate to all companies and not just those that are widely held. As was discussed in footnote 1 of chapter 1, for closely-held companies capital gains taxation may often be much easier to avoid than for widely-held firms. Closely-held companies owned by those on tax rates greater than the company tax rate may find it optimal to retain profits up until the time when any shares will be sold rather than paying franked dividends.

This is not, however, a full explanation. Some closely-held companies will pay franked dividends. The majority of company tax paid in Australia is by public companies (60 and 65 per cent in 1993/94 and 1994/95 respectively). Closely-held companies retaining profits may be an important part of the explanation why in 1994/95 franked dividends reported by individuals were only a bit over 70 per cent of the level required for firms to be following a policy of paying the maximum level of franked dividends. However, it is clearly inadequate as an explanation of why franked dividends reported by individuals in the previous year were less than 50 per cent of such a level. The data suggest some widely-held companies have been paying less than the maximum possible level of franked dividends in some years despite our analysis suggesting that there will normally be strong incentives for them to do so.

One possible reason for corporate behaviour being inconsistent with our model is that we may have ignored important classes of shareholder. One possible class is Australian corporate shareholders. However, Australian corporate shareholders receive franked dividends tax free because of the intercorporate dividend rebate but are taxed on capital gains. Distribution of franked dividends appears to be in their interest especially as the receipt of franked dividends by Australian companies increases their franking account balances which increases their ability to pay franked dividends. A second important class of shareholder is foreign shareholders. It is difficult to say whether foreign shareholders would generally prefer full distribution of frankable earnings or not because of complex interactions between Australian and foreign tax provisions.

There are other possible explanations of why firms do not pay as many franked dividends or franked bonus shares as possible. Some companies may be attempting to establish a reservoir of imputation credits so that they can maintain a policy of constantly paying franked dividends. If firms were aiming to create reservoirs of franking credits, it might be expected that the ratio of household imputation credits to company tax would have increased more rapidly over time than the ratio of household dividends to total dividends. In early years of the imputation scheme firms may have been reluctant to pay too many franked as they were attempting to establish their desired reservoirs. However, as reservoirs are established, it might be expected that firms should become more amenable to increasing payments of franked dividends. While there is no evidence of this being the case prior to 1994/95, there was a large increase in imputation credits claimed by households as a fraction of company tax payments in 1994/95 despite the decline in household dividends as a fraction of total dividends. Whether the reservoir story is a good explanation will only become evident in the future. Data on dividend payout ratios for the 109 leading non-bank industrial companies reported in Figure 1.3 indicate a significant rise in the payout ratio in 1995/96 which may give further tentative support for the reservoir story. Unless company tax also rose markedly in this year, it is possible that this the rise in dividend payout is because of firms becoming more inclined to pay franked dividends rather than having ever-increasing franking account balances.

There are other possible reasons for why firms may be retaining frankable earnings. First, some firms owned by those on higher marginal tax rates may retain some frankable earnings because of a lack of understanding by shareholders of the way that corporate retentions can affect their capital gains tax liabilities. If this lack of understanding is being rectified over time, this might be a second reason for the full distribution of frankable earnings to be becoming more common. Second, capital gains taxes are notoriously easy to avoid because of timing deficiencies inherent in a realisation-basis capital gains tax. If capital gains tax can easily be avoided or evaded, the capital gains tax impost and the benefits from paying franked dividends may both be much lower than we have analysed. Third, it is possible that some companies building up large franking account balances may be aiming at a clientele of shareholders on high marginal tax rates with very low rates of share turnover. Fourth, it is possible that some companies may be controlled by shareholders who are temporarily in tax loss and who see benefits in the company retaining profits until franking credits can be utilised.

A final reason why firms may not fully distribute frankable earnings and issue new equity in replacement is the transactions costs of issuing new equity which this study (along with much of the literature) ignores. Bishop, Crapp, Faff and Twite (1993, p. 443) report relatively small transactions costs for issuing new equity in Australia. They suggest total flotation costs of about 3.5 per cent of issue value, of which 2.5 per cent is an underwriters' fee. If the underwriters' fee merely compensates underwriters for the true cost of the risk of the issue being undersubscribed, it is solely a source of insurance and should be excluded from the calculation of transactions costs of issuing new shares. When shares are undersubscribed, existing shareholders gain by having the underwriters acquire shares at more than true market value. This would suggest transactions costs of as little as one per cent of the value of new issues. King (1977, pp. 105-106) cites two studies which suggest transactions costs (inclusive of underwriters' fees) varying between 1.33 per cent and 10.24 per cent of the value of the issue. Moreover, the figures show a strong inverse relationship between the size of the issue and transactions costs as a proportion of equity raised.

Transactions costs may be an important reason why firms do not fully distribute frankable earnings and issue new equity each year in replacement. The transactions costs of small issues of new equity may be excessive. It is less clear, however, why transactions costs would prevent firms from passing imputation credits to shareholders by issuing franked bonus shares. Moreover, the transactions costs of issuing debt are likely to be small compared with those of issuing new equity and our analysis suggests that it would normally seem optimal for frankable earnings to be fully distributed even if debt rather than new equity were used as a replacement source of finance.

Payments of Unfranked Dividends

Despite our prediction that firms should not pay unfranked dividends, it is clear that some do. This is evident from data presented on the 109 leading nonbank industrials in Figure 1.3. Australian Taxation Office data show that unfranked dividends paid by all companies are a significant percentage of total dividend payments (ie., 30.0, 23.6, 26.4, 32.3 and 21.4 per cent in 90/91 to 94/95 respectively).[34] Relatively small proportions of firms pay these unfranked dividends. In 1992/93, 36,598 firms paid franked dividends and only 3,118 paid unfranked dividends. In 1993/94 the figures were 42,262 and 3,229 respectively. In 1994/95 the figures were 58,585 and 3,843 respectively. Thus, unfranked dividends appear to be paid by a small and declining proportion of dividend-paying firms. Nonetheless, these data are clearly incompatible with the conclusion that no unfranked dividends should be paid.

Part of the answer may be that firms paying unfranked dividends may be controlled by superannuation funds facing low rates of tax which often turn shares over quickly. If this is the case, any penalty on paying unfranked dividends may be very slight. A second possibility is that some companies paying unfranked dividends may be controlled by classes of shareholder we have ignored. Australian corporate shareholders for whom dividends are effectively exempt (under the provisions of Australia's intercorporate dividend rebate) but for whom capital gains are taxed may have a preference for the distribution of unfranked dividends. It is difficult to predict whether foreign shareholders would generally prefer the distribution or retention of unfrankable earnings because of the complexity of interactions between Australian and foreign tax provisions. If superannuation funds face a very small tax penalty on the payment of unfranked dividends and Australian corporate shareholders and

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[34] See Australian Taxation Office, 'Taxation Statistics', various volumes, AGPS.

possibly some foreign shareholders can gain a positive tax benefit, it might be suspected that companies paying unfranked dividends would tend to be owned predominantly by shareholders other than taxpaying individuals. A third possible reason why firms may pay unfranked dividends is that some shareholders may be unaffected by the tax penalty we have analysed because they fail to declare these unfranked dividends as income.

Any or all of these three explanations may be important in explaining why individuals reported only 8.9, 8.7, 9.0, 9.0 and 9.1 per cent of dividends received in 1990/91 to 1994/95, respectively, as being unfranked in spite of firms declaring that the percentages of dividends that were paid unfranked were 30.0, 23.6, 26.4, 32.3 and 21.4 per cent respectively.

A final possible reason for payments of unfranked dividends is that they may have important signalling or agency benefits in constraining free cash flow. Of these two possibilities, signalling benefits seem hard to justify. It is difficult to see why firms could not signal profitability by reducing corporate debt rather than paying unfranked dividends. It may be more difficult, however, for firms to reduce corporate debt without this increasing free cash flow.

Debt versus New Equity Issues

The third implication of our analysis is that full imputation provides incentives to issue new equity instead of debt. Some US commentators have suggested that in the absence of any tax preference for debt, firms might be fully equity financed because increasing debt increases the possibility of bankruptcy. For example Gordon and Malkiel (1981) make this assumption while expressing appropriate qualifications. The assumption is critical in the high deadweight losses they estimate for the United States classical company tax system.

No official statistics are kept on corporate debt/equity ratios but data from Mills, Morling and Tease (1994) were presented in Table 1.3. Their figures demonstrate that firms did not become fully equity financed with the introduction of full imputation in 1987/88. Indeed the figures suggest that debt/equity ratios climbed in the year that full imputation was introduced despite the fact that one of the goals of the full imputation reform was to reduce the tax bias favouring debt. The fact that Australia's switch to full imputation has not been accompanied by a large reduction in debt/equity ratios provides some indirect evidence that the Gordon and Malkiel estimates of deadweight losses are likely to be too high. It is clear that the absence of a tax bias in favour of debt has not caused companies to become fully equity financed.

It would appear that other factors may be much more important than tax considerations in determining debt/equity ratios.[35] One reason why firms may not become fully equity financed is because of the transactions costs of issuing new equity discussed above. Increased payout ratios may also have put upward pressure on debt/equity ratios by reducing retentions.

2.8 CONCLUDING COMMENTS

In this chapter we have set out a formal model to investigate the financial policy incentives faced by widely-held companies as a result of Australia's full imputation scheme and capital gains tax provisions. The model has been drawn on to analyse financial policy biases.

Four ways of financing corporate investment have been identified: the retention of profits which would have been unfranked if paid as dividends (RUE); the retention of profits which would have been franked if paid as dividends (RFE); new equity and debt. We have examined optimal corporate financial policy and how this depends on tax rates, inflation and the nominal interest rate.

At recent low rates of inflation, widely-held companies appear to face strong incentives to distribute the maximum possible level of franked dividends issuing new equity or (less favourably) debt in replacement. Even if shares could only be owned by individuals on the top marginal tax rate, it would seem likely that it would normally be optimal for widely-held companies to distribute the maximum possible level of franked dividends at plausible rates of share turnover so long as the possibility of real losses but nominal gains is not viewed as being very significant. This is likely to be an important part of the explanation of why dividend payments rose after the full imputation scheme was introduced.

Some firms do not appear to have followed a policy of distributing the maximum level of franked dividends. To the extent that some such firms are widely-held companies owned and controlled by domestic residents this is a puzzle. A number of

[35] Australia was not alone in experiencing a build up in levels of corporate debt in the 1980s. For a discussion of a similar build up in the United States see United States Treasury (1992). The reasons for the build-up in corporate debt levels in both the United States and Australia are poorly understood, although Mills, Morling and Tease (1994) provide a helpful review of the literature and examine some possible causes.

possible explanations have been discussed. Data for 1994/95 may very tentatively suggest a tendency for payments of franked dividends to be increasing.

Full imputation also provides incentives for unfrankable earnings to be retained. This raises the puzzle of why firms pay unfranked dividends when there appear to be preferable ways of rewarding shareholders especially reducing corporate debt or increasing corporate lending. This may be a more difficult puzzle to answer than the conventional puzzle of why firms pay dividends under a classical company tax system. Under a classical company tax system if a dollar of dividends are not paid, firms cannot typically invest the dollar in bonds and finance a dividend stream with a present value of a dollar to shareholders. However, this is what full imputation allows. The payment of unfranked dividends may lend support to those who argue that dividends provide signalling or agency benefits. Another possibility is that unfranked dividend payments are influenced by the demands of corporate or foreign shareholders, or that firms paying unfranked dividends tend to be controlled by superannuation funds. For companies controlled by superannuation funds, any penalty on the payment of unfranked dividends is likely to be extremely mild.

A number of authors have discussed whether Australia's full imputation scheme eliminates or only partially eliminates any bias *in favour of* debt relative to new equity issues. Our study suggests that in the absence of inflation the full imputation scheme would have eliminated any tax bias in favour of debt, provided companies and their shareholders were in a taxpaying position. Perhaps the most important conclusion of this chapter is that with inflation, a bias in favour of new equity relative to debt can arise as a result of the capital gains tax provisions if real gains are expected to accrue. Thus, rather than merely eliminating any bias in favour of debt, the direction of the bias has been reversed. While in the United States studies have tried to explain why firms are not fully debt financed, the puzzle in Australia is why firms are not fully equity financed.

APPENDIX 2.1 MODELLING THE AUSTRALIAN REALISATION-BASIS CAPITAL GAINS TAX AS A TAX ON ACCRUAL

In the text the capital gains tax is modelled as an accrual-basis capital gains tax. In practice gains are taxed on realisation. This Appendix explores how allowing for a realisation-basis capital gains tax affects the analysis if, as in King (1977), it is assumed that shareholders liquidate a fixed fraction, a, of their share portfolio each year.

King assumes that if shares rise by a dollar, the fraction a is taxed immediately, $a(1-a)$ after one year, $a(1-a)^2$ after two years and so forth. Suppose that there is a contant interest rate of i per annum and constant marginal tax rate of m each year. King treats the accrual-equivalent rate of capital gains tax as being the present discounted value of future capital gains tax payments. Thus,

$$c = ma\sum_{t=0}^{\infty}\left(\frac{1-a}{1+i(1-m)}\right) = \frac{ma\left(1+i(1-m)\right)}{i(1-m)+a}$$

This is effectively equation (3.14) of King (1977).

It was not immediately obvious (at least to the author) that this was necessarily a consistent way of modelling a realisation-basis capital gains tax. At first sight, this derivation appears to assume that any capital gain is permanent. Moreover, it was not immediately obvious how this analysis should be extended to an indexed capital gains tax.

The results in this Appendix may not be surprising to some readers as they merely support King's formulation in the case of an unindexed capital gains tax. However, the results were helpful at least to the author in clarifying the robustness of King's formulation under his assumption of a constant rate of share turnover.

Unindexed Capital Gains Tax

Initially suppose that the capital gains tax is not indexed. In chapter 2 where capital gains tax is assumed to be on an accrual basis, equations (2.2) and (2.3) imply

$$i_{t+1}(1-m_{t+1})V_t = \left(\frac{1-m_{t+1}}{1-\tau_{t+1}}\right)D^f_{t+1} + (1-m_{t+1})D^u_{t+1} + (1-c_{t+1})(V^0_{t+1} - V_t) \qquad (2.25)$$

This is the Fundamental Equation of Yield. The opportunity cost of capital must equal the net-of-tax cash flow plus the net-of-tax capital gain.

With a realisation-basis capital gains tax the Fundamental Equation of Yield becomes

$$i_{t+1}(1-m_{t+1})V_t = \left(\frac{1-m_{t+1}}{1-\tau_{t+1}}\right)D^f_{t+1} + (1-m_{t+1})D^u_{t+1} + (V^0_{t+1} - V_t) - PV\Delta CGT \qquad (2.26)$$

where $PV\Delta CGT$ is the present value of the additional capital gains tax liability (evaluated in period t+1 terms) incurred because the shares were purchased at a cost V_t in period t rather than the fraction $1-a$ of these shares being purchased at a cost $(1-a)V^0_{t+1}$ in period t+1. Here V^0_{t+1} measures the value of period t shares to a new purchaser who buys all of these shares in period t+1. Shares need not be worth the same in period t+1 to a person who acquired the shares in the previous period because of differences in capital gains tax payments.

An individual who acquired all shares in period t and sells the fraction a each year would gain a stream of revenue from selling shares. Denote this by R_{t+1} in period t+1, R_{t+2} in period t+2, R_{t+3} in period t+3 and so forth. This revenue would be taxable. Tax on this revenue stream would be offset by deductions of aV_t in period t+1, $a(1-a)V_t$ in period t+2, $a(1-a)^2V_t$ in period t+3 and so forth.

If instead the fraction $1-a$ of these shares were purchased in period t+1, a purchaser who sell the fraction a of his portfolio at the end of each year would also receive taxable revenue of R_{t+2} in period t+2, R_{t+3} in period t+3 and so forth. Tax on this revenue would be offset by deductions of $a(1-a)V_t$ in period t+2, $a(1-a)^2V_t$ in period t+3 and so forth.

This means that the additional capital gains tax paid by a person who acquires the shares in period t would be

$$PV\Delta CGT = a\left(\sum_{u=1}^{\infty}\frac{m_{t+u}(1-a)^{u-1}}{\prod_{s=2}^{u}\left(1+i_{t+s}(1-m_{t+s})\right)}\right)\left(V^0_{t+1} - V_t\right) \qquad (2.27)$$

Note that s starts from period 2 because the present value of the additional capital gains tax is being evaluated in period t+1 terms. The additional stream of capital gains tax payments depends on $(V^0_{t+1} - V_t)$ but not on capital gains in future years and so in King's formulation there is no implicit assumption of permanent gains in the value of shares.

Define the accrual-equivalent rate of capital gains tax as being

$$c_{t+1} = a\sum_{u=1}^{\infty}\frac{m_{t+u}(1-a)^{u-1}}{\prod_{s=2}^{u}\left(1+i_{t+s}(1-m_{t+s})\right)} \tag{2.28}$$

Then

$$PV\Delta CGT = c_{t+1}(V_{t+1}^{0}-V_t) \tag{2.29}$$

Substituting into (2.26) yields (2.25). Thus, under the assumptions of a constant rate of share turnover it is consistent to treat the capital gains tax as though it were a tax on accrual.

In the special case where m and i are constant through time,

$$c = ma\left(1+\frac{1-a}{1+i(1-m)}+\left(\frac{1-a}{1+i(1-m)}\right)^{2}+\ldots\right)=\frac{ma\left(1+i(1-m)\right)}{i(1-m)+a} \tag{2.30}$$

This is King's formulation under these assumptions. This is equation (2.23) of Chapter 2. It is the accrual-equivalent tax formula we use when nominal gains are taxed.

Note that if $a = 1$, $c = m$. The realisation basis tax is equivalent to a full accrual-basis tax because all shares are sold each year. At the other polar extreme if $a = 0$, $c = 0$. Shares are never sold so there is indefinite deferral and it is as though there were no taxation of capital gains. As a rises from 0 to 1, c rises monotonically

$$\frac{\partial c}{\partial a}=\frac{m\left(1+i(1-m)\right)i(1-m)}{\left(i(1-m)+a\right)^{2}}>0$$

Finally, note that in the more general case when m and i are not constant through time, c_{t+1} depends on the stream of future values of m. If $a < 1$ and m is rising through time, it is possible that $c_{t+1} > m_{t+1}$.

Indexed Capital Gains Tax

In the presence of an accrual-basis indexed capital gains tax equations (2.2) and (2.3) lead to the Fundamental Equation of Yield

$$i_{t+1}(1-m_{t+1})V_t = \left(\frac{1-m_{t+1}}{1-\tau_{t+1}}\right)D_{t+1}^{f} + (1-m_{t+1})D_{t+1}^{u} + V_{t+1}^{0} - V_t - c_{t+1}\left(V_{t+1}^{0} - (1+\pi_{t+1})V_t\right) \tag{2.31}$$

With a realisation-basis capital gains tax, the Fundamental Equation of Yield is once more (2.26). Now a purchaser who acquires the company in period t and sells the fraction a of shares in each period would have a stream of deductions of $a(1+\pi_{t+1})V_t$ in period t+1, $a(1-a)(1+\pi_{t+1})(1+\pi_{t+2})V_t$ in period t+2, $a(1-a)^2(1+\pi_{t+1})(1+\pi_{t+2})(1+\pi_{t+3})V_t$ in period t+3 and so forth. A person who acquires the fraction $(1-a)$ of these shares in period t+1 would acquire a stream of deductions of $a(1-a)(1+\pi_{t+2})V_{t+1}^0$ at the end of period t+2, $a(1-a)^2(1+\pi_{t+2})(1+\pi_{t+3})V_{t+1}^0$ at the end of period t+3 and so forth.

Thus, the additional capital gains tax paid by the individual acquiring the shares in period t would be

$$PV\Delta CGT = a\left(\sum_{u=1}^{\infty} m_{t+u}(1-a)^{u-1}\prod_{s=2}^{u}\left(\frac{1+\pi_{t+s}}{1+i_{t+s}(1-m_{t+s})}\right)\right)\left(V_{t+1}^0-(1+\pi_{t+1})V_t\right) \quad (2.32)$$

In this case define the accrual-equivalent rate of capital gains tax as being

$$c_{t+1} = a\left(\sum_{u=1}^{\infty} m_{t+u}(1-a)^{u-1}\prod_{s=2}^{u}\left(\frac{1+\pi_{t+s}}{1+i_{t+s}(1-m_{t+s})}\right)\right) \quad (2.33)$$

Then

$$PV\Delta CGT = c_{t+1}\left(V_{t+1}^0-(1+\pi_{t+1})V_t\right) \quad (2.34)$$

Substituting (2.34) into (2.26) yields (2.31). Thus, with an indexed capital gains tax it is also consistent to treat a realisation-basis tax as though it were an accrual-basis tax so long as a constant fraction of shares are sold in each period.

When i, m and π remain constant through time

$$c = am\left(1+\frac{(1-a)(1+\pi)}{1+i(1-m)}+\left(\frac{(1-a)(1+\pi)}{1+i(1-m)}\right)^2+\ldots\right)=\frac{ma\left(1+i(1-m)\right)}{i(1-m)+a-\pi(1-a)} \quad (2.35)$$

Alternatively, c can be expressed as

$$c = am\left(1+\frac{1-a}{1+r'}+\left(\frac{1-a}{1+r'}\right)^2+\ldots\right)=\frac{ma(1+r')}{r'+a}$$

where r' is the real after-tax interest rate, $r'=\left(i(1-m)-\pi\right)/(1+\pi)$.

Once again if $a = 0, c = 0$ and if $a = 1, c = m$. This time

$$\frac{\partial c}{\partial a}=\frac{m(1+r')r'}{(r'+a)^2}$$

If $r' > 0$, $\partial c / \partial a > 0$ as in the case where nominal gains are taxed. As a rises from 0 to 1, c rises monotonically from 0 to m.

If, on the other hand $-1 < r' < 0$, $\partial c / \partial a < 0$. As a rises from 0 to 1, c falls monotonically except for a discontinuity when $r' + a = 0$. This means that for values of a in the range $-r' < a < 1$, $c > m$. It is theoretically possible for the accrual-equivalent rate of capital gains tax to exceed m.

CHAPTER 3: OPTIMAL INVESTMENT DECISIONS AND THE COST OF CAPITAL

3.1 INTRODUCTION

This chapter extends the analysis of chapter 2 to consider optimal investment decisions and the cost of capital. As was discussed in chapter 1, there has been a very large international literature examining the effects of tax provisions on investment decisions via the cost of capital. However, there has been very little analysis of this issue in Australia. Of the studies analysing investment decisions under the Australian full imputation provisions, there are two, those by Bourassa and Hendershott (1992) and Sieper (1995), which provide formal cost of capital expressions.

As was also mentioned in Chapter 1, the Bourassa and Hendershott study abstracts from a number of key features of the Australian tax system including the fact that only some dividends are franked and that the capital gains tax is inflation indexed. Sieper ignores inflation and explicitly models realisation-basis capital gains taxation. By contrast our model allows for inflation while being more conventional in treating the capital gains tax as though it were a tax on accrual. This treatment has been justified in Appendix 2.1.

In the absence of inflation there are differences between Sieper's and our estimates of costs of capital in many cases. Appendix 3.2 shows that this is because of a source of bias in Sieper's approach stemming from his assumption that the value of a firm is the sum of its physical capital and its retained earnings. This makes the value of a firm independent of its stream of future tax deductions. In our model the value of the firm is endogenously set by shareholders discounting future cash flows.[1]

In chapter 2 it was shown that the tax system provides incentives for firms to issue no debt and instead be fully equity-financed if there is any possibility of real capital gains accruing. As documented in chapter 2, however, the bias in favour of new equity relative to debt appears to be relatively mild at least when compared with the bias

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[1] In commenting on this paper Sieper has shown that if this source of bias is corrected, his results become equivalent to ours under the baseline assumptions reported in the body of this chapter. In addition to correcting this bias, our approach has the attraction of being simpler and being easily adapted to allow for differing assumptions, some of which are explored in Appendix 3.1.

favouring the distribution of franked dividends or franked bonus shares. Moreover, the data presented in chapter 1 showed that Australian debt/equity ratios have changed little since the introduction of full imputation. In this chapter the analysis is modified to allow for the possibility of firms being partly debt financed.

This chapter provides estimates of the cost of capital (i.e., the minimum real pre-tax rate of return at which investment becomes profitable) for unincorporated enterprises and for widely-held companies. It examines how costs of capital can vary between different assets owned by both of these forms of business organisation.

The structure of this chapter is as follows. Assumptions underlying cost of capital expressions for corporate and unincorporated enterprises are discussed in section 3.2. Formal derivations under our baseline assumptions and a discussion of additional possible cases is provided in Appendix 3.1. In section 3.3 costs of capital are analysed under some idealised depreciation provisions. This is helpful in obtaining some intuition for the effects of full imputation on costs of capital. It also clarifies how incentives to invest can differ between companies and unincorporated enterprises. Key assumptions underlying numerical estimates of costs of capital are outlined in section 3.4 and numerical estimates are presented in section 3.5. Section 3.6 concludes.

3.2 Costs of Capital for Widely-Held Companies and Unincorporated Enterprises

There are a number of reasons why firms might issue debt in spite of the tax costs outlined in Chapter 2. These include differences in transactions costs or that debt and equity may provide different incentives to management. Value-maximising firms will choose the least-cost method of finance which implies that if firms are financing investment with both debt and new equity at the margin, the marginal cost of each form of finance should be the same.

A full analysis would attempt to capture differences in transactions costs or managerial incentives formally and make leverage endogenous. However, this is a complex task. In this chapter we abstract from this complication by assuming that corporate debt is an exogenously set fraction b_t of the value of the capital stock in period t. Thus,

$$B_t = b_t q_t K_t \tag{3.1}$$

Suppose that a company maximises V_0 as given in equation (2.5) subject to the equality constraints (2.6), (2.7), (2.8) and (3.1), the inequality constraint (2.9) and the constraints that franked and unfranked dividends and new issues in any period must be nonnegative. The Lagrangian for the firm's optimisation problem and the first-order conditions are set out in Appendix 3.1.

Optimal investment decisions for a widely-held company will depend on the nonnegativity constraints assumed to be slack and a large number of possible cases can be considered. Appendix 3.1 works through three possible cases.

One case is where firms pay unfranked dividends. In chapter 2 it was argued that firms should never pay unfranked dividends. They should issue less new equity if this is feasible or repay debt or lend instead. In line with this chapter's assumption of an exogenous ratio of debt to capital stock, we assume that companies do not lend. This means that if firms wish to undertake less investment than could be financed by them retaining unfrankable earnings, they will pay some unfranked dividends.[2]

As noted in section 2.7, only a relatively small minority of firms pay unfranked dividends (numbers of firms paying unfranked dividends as a proportion of those paying franked dividends were 7.6 per cent and 6.6 per cent in 1993/94 and 1994/95 respectively). A relatively small percentage of dividends declared by individuals (9.0 per cent in 1993/94 and 9.1 per cent in 1994/95) are unfranked. A greater percentage of dividends paid by Australian companies are unfranked (32.3 per cent in 1993/94 and 21.4 per cent in 1994/95) but these may largely flow to corporate or foreign shareholders. Because the case of firms paying unfranked dividends appears to apply only to a relatively small number of firms, discussion of this case is relegated to Appendix 3.1.

In the other two cases, it is assumed that the firm wishes to equity finance more investment than its level of untaxed profits. Retained unfrankable earnings are always the cheapest source of finance so unfranked dividends should not be paid by such a firm. Whether remaining equity should be financed by retaining frankable earnings or new equity depends on tax rates.

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[2] In principle, firms may pay unfranked dividends in some periods but not in others. Our model can be extended to consider this case but when examining firms paying unfranked dividends the Appendix focuses solely on firms paying unfranked dividends in all periods.

If $\tau + c(1-\tau) \geq m$ or, equivalently, $c \geq (m-\tau)/(1-\tau)$, it will be optimal for such a firm to maintain a zero franking account balance, paying the maximum level of franked dividends and financing marginal equity investment by issuing new shares. This will be assumed to be the 'normal' or 'base case' discussed in the text of this chapter. It is the case which is effectively assumed in both Freebairn (1990) and Sieper (1995). These inequalities are more likely to hold the lower is *m*. For them not to hold, *m* must be large. However, given the current company tax rate of $\tau = 0.36$ even if *m* were approximated by the *top* personal marginal tax rate ($m = 0.485$), these inequalities would hold under plausible rates of share turnover if either real gains or nominal losses accrue.[3]

Chapter 1 provided evidence showing that some and possibly many widely-held firms are not maintaining a zero franking account balance. One possibility is that some firms may be attempting to maintain a positive franking account balance so that they can maintain a consistent policy of paying franked dividends. This would be very similar to the base case analysed in the text of this chapter. Reductions in company tax would have a shadow cost in depleting a firm's reservoir of franking credits which is similar to their shadow cost in the base case. In the extreme case where a firm maintained a fixed but positive franking account balance, costs of capital would be identical to those in the base case.

However, another possibility is that firms see no benefit in paying franked dividends and issuing new equity in replacement. As a final case, Appendix 3.1 analyses the case where the constraint (2.9) limiting the level of franked dividends a firm can pay is slack in all periods. This would be optimal only if $\tau + c(1-\tau) \leq m$.

While Appendix 3.1 considers more general cases, if that all tax rates and r, π, i, b, ϕ, k and Z remain constant through time and that all prices appreciate at the same rate, π, the cost of capital for a widely-held company is given in equation (3.22) of Appendix 3.1 and is repeated here for convenience. The cost of capital is

$$\text{Company:}\rho = \frac{pF'}{q} - \delta = \frac{\big(1-c-(m-c)(k+Z)\big)\big(\phi - \pi + \delta(1+\pi)\big) + b\alpha c\pi}{(1-m)(1+\pi)} - \delta \quad (3.2)$$

where $$\phi = \frac{i(1-m) - \alpha c\pi}{1-c}$$

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[3] These inequalities would hold even if as few as 2.5 per cent of shares were sold each year assuming a 5 per cent real interest rate and 2 per cent inflation.

As follows from the derivation in the Appendix, Z is the present value of depreciation deductions discounted at the rate ϕ.

Note that the cost of capital is independent of τ. This is because these firms find it optimal to pay the maximum level of franked dividends, $D_t^f = (1-\tau)T_t / \tau, \ \forall t$. Increases in the company tax rate increase company tax and reduce personal tax payments by equal and offsetting amounts leaving shareholders unaffected. Also note that if real gains are taxed ($\alpha = 1$) and c and π are both positive, the cost of capital rises with b. This follows from chapter 2 which discussed how new equity can be tax-preferred to debt in times of inflation. As debt is more costly, the cost of capital rises with leverage.

Appendix 3.1 also derives the cost of capital for an unincorporated enterprise. An unincorporated enterprise may be a sole proprietorship or a partnership. With a few exceptions (such as the 125 per cent deduction for R&D which is available only for companies), the tax base for an unincorporated enterprise is the same as for a company. However, rather than being taxed at the company tax rate, the taxable income of an unincorporated enterprise is taxed directly as the income of the owners. In the case of a sole proprietorship the income is taxed at the owner's marginal tax rate and in the case of a partnership it is split between the partners and taxed at their marginal rates.

A major difference between a company and an unincorporated enterprise is that if a company receives tax-free income, the income cannot be passed through to shareholders as tax-free income. If paid as an unfranked dividend, the income will be taxed. If firms do not pay unfranked dividends as is assumed in the base case discussed in this chapter, retention of the untaxed income will add to the value of shares. This will result in a tax liability for shareholders when shares are sold. This means that taking account of how reductions in company tax affect retentions and the price of shares is essential when examining the effects of the Australian full imputation system on incentives to invest. By contrast, untaxed income can be taken directly out of an unincorporated enterprise and spent on consumption goods by the owners of the firm without any further layer of tax.

We assume that unincorporated enterprises, like companies, are infinitely lived and never sell used assets. A potential complication is that (unlike the sale of shares in a company) if an interest in a partnership is sold, the partnership will normally be dissolved. This can affect the tax liabilities of the partners as a result of provisions governing the tax treatment of trading stock, depreciable property and capital gains.[4] However, this complication is likely to be of relatively minor importance and is ignored by assuming that ownership of unincorporated enterprises does not change. Unlike a company, there need be no general clawing back of the benefits of measures which have reduced the taxable income of the unincorporated enterprise when an interest is such an enterprise is sold.

The cost of capital for an unincorporated enterprise is derived formally in equation (3.28) of Appendix 3.1. Assuming that all prices inflate at the constant rate of π per annum and that the values of r, π, i, m, k and Z remain constant through time, the cost of capital is

$$\text{Unincorp. Ent. } \rho = \frac{pF'}{q} - \delta = \frac{(1-m(k+Z))(i(1-m)-\pi+\delta(1+\pi))}{(1-m)(1+\pi)} - \delta \qquad (3.3)$$

The cost of capital for an unincorporated enterprise is independent of b because $i(1-m)$ is the nominal opportunity cost of both the owner's own capital and of borrowed funds. In general the cost of capital for corporate and unincorporated enterprises will differ. The size of the difference will depend on the value of c.

If c were zero, the expression on the right-hand side of (3.2) collapses to equal the right-hand side of (3.3). The tax system provides incentives for all frankable earnings to be distributed and so all taxable income ends up being taxed at the tax rate of shareholders. This is the case in New Zealand which operates a similar imputation system to the Australian scheme but where the company tax rate and top personal marginal tax rate are aligned and where there is no capital gains tax.

3.3 COST OF CAPITAL UNDER IDEALISED DEPRECIATION PROVISIONS

Equations (3.2) and (3.3) can be used to estimate costs of capital under any capital write-off provisions. In section 3.5 costs of capital will be examined under actual capital write-off provisions in Australia. However, in interpreting estimates of costs of capital under actual capital write-off provisions, it is helpful to start by comparing the cost of capital for a company with that of an unincorporated enterprise under three idealised sets of depreciation provisions:

- *nominal economic depreciation* under which a deduction is allowed for the fall in the nominal value of an asset;

[4] See Commerce Clearing House (1995, *p*. 122).

- *real economic depreciation* under which a deduction is allowed for the fall in the real value of an asset; and
- *expensing* under which an immediate deduction is allowed for the acquisition cost of an asset.

Each of these idealised depreciation schemes would be weakly neutral in the sense of Auerbach (1983). The cost of capital would be independent of δ.

To explain the meanings of nominal and real economic depreciation, it may be useful to provide some examples. Consider first the case where there is no investment allowance ($k = 0$) and *nominal economic depreciation* is deductible. Suppose, for example, a taxpayer acquires an asset costing $100,000 at the end of year 0. The taxpayer rents this asset out for a year and receives a rental payment of $35,000 at the end of year 1. Assume that immediately after the rental payment is received, the money value of the asset is $80,000. The nominal value of the asset would have fallen by $20,000 over the year so nominal economic depreciation is $20,000. If nominal economic depreciation were deductible, the taxpayer would be taxed on $15,000 (rental income of $35,000 less depreciation of $20,000). In this case the owner of an unincorporated enterprise would be taxed on the full nominal income generated by the asset on the same basis as interest is currently taxed.[5]

Now suppose instead that *real economic depreciation* is deductible. Assume that in the example above, there is 5 per cent inflation. In year 1 terms the real value of the asset in year 0 would be $105,000, ie., $\$100,000(1+\pi)$. This means that the fall in the real value of the asset (or real economic depreciation) would be $25,000 ($105,000 minus $80,000). The taxpayer would be taxed on $10,000 (rental revenue of $35,000 less depreciation of $25,000).[6]

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[5] To see the resemblance to interest, consider a second person who places $100,000 in a bank in year 0, receives $15,000 in taxable nominal interest one year later and who withdraws $20,000 at that time. The two people are in identical positions. Both have $35,000 in 'revenue', an asset worth $80,000 and a tax liability of $15,000*m*.

[6] This would be equivalent to the tax treatment of interest if interest income were inflation indexed for tax purposes. To see this, suppose that a second person places $100,000 in a bank, earns $15,000 in interest, withdraws $20,000 and is taxed on only the real interest income of $10,000 (again assuming a 5 per cent inflation rate). This second person would be in an equivalent position to the person who

If an asset provides cash flows which decay at the geometric rate δ, the nominal value of an asset costing a dollar would be $(1+\pi)(1-\delta)$ after one year, $[(1+\pi)(1-\delta)]^2$ after two years and so forth. This implies that nominal economic depreciation would be $\delta(1+\pi)-\pi$ in the first year, $[\delta(1+\pi)-\pi](1+\pi)(1-\delta)$ in the second and so forth. The present value of nominal economic depreciation would be

NED $$Z=\frac{\delta(1+\pi)-\pi}{1+\phi}\sum_{j=0}^{\infty}\left(\frac{(1-\delta)(1+\pi)}{1+\phi}\right)^j=\frac{\delta(1+\pi)-\pi}{\phi-\pi+\delta(1+\pi)} \quad (3.4a)$$

if ϕ is the rate at which nominal cash flows are discounted.[7]

Real economic depreciation would be $\delta(1+\pi)$ in the first year, $\delta(1+\pi)[(1+\pi)(1-\delta)]$ in the second year and so forth. The present value of real economic depreciation would be

RED $$Z=\frac{\delta(1+\pi)}{1+\phi}\sum_{j=0}^{\infty}\left(\frac{(1-\delta)(1+\pi)}{1+\phi}\right)^j=\frac{\delta(1+\pi)}{\phi-\pi+\delta(1+\pi)} \quad (3.4b)$$

Finally, under expensing capital expenditure would be deductible immediately. This means that the present value of depreciation would be

Expensing $$Z=1 \quad (3.4c)$$

Costs of capital for an unincorporated enterprise can be derived by noting that in this case $\phi=i(1-m)$, substituting (3.4*a*), (3.4*b*) and (3.4*c*) into equation (3.3) and using the fact that the real interest rate, *r*, is $(i-\pi)/(1+\pi)$. If k = 0, costs of capital in the three cases will be as follows:

Unincorporated Enterprise: Nominal Economic Depreciation

$$\rho=\frac{\left[1-\frac{m(\delta(1+\pi)-\pi)}{i(1-m)-\pi+\delta(1+\pi)}\right]\left(i(1-m)-\pi+\delta(1+\pi)\right)}{(1-m)(1+\pi)}-\delta$$

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invested in the real asset on which real economic depreciation was deductible. Both have 'revenue' of \$35,000, an asset worth \$80,000 and a tax liability of \$10,000*m*.

[7] Note that under nominal economic depreciation, firms would not necessarily be able to claim a net deduction. If $\delta(1+\pi)<\pi$, the present value of depreciation deductions would be negative. A taxpayer would be taxed on inflationary gains in the value of an asset.

Simplifying,

$$\rho = \frac{i - \pi}{1 + \pi} = r \tag{3.5a}$$

Unincorporated Enterprise: Real Economic Depreciation

$$\rho = \frac{\left[1 - \frac{m\delta(1+\pi)}{i(1-m) - \pi + \delta(1+\pi)}\right]\left(i(1-m) - \pi + \delta(1+\pi)\right)}{(1-m)(1+\pi)} - \delta$$

Simplifying,

$$\rho = \frac{i(1-m) - \pi}{(1-m)(1+\pi)} = r - \frac{m\pi}{(1+\pi)(1-m)} \tag{3.5b}$$

Unincorporated Enterprise: Expensing

$$\rho = \frac{(1-m)\left(i(1-m) - \pi + \delta(1+\pi)\right)}{(1-m)(1+\pi)} - \delta$$

Simplifying,

$$\rho = r(1-m) - \frac{m\pi}{1+\pi} \tag{3.5c}$$

Equation (3.5a) says that the real pre-tax rate of return on a marginal investment equals r. If nominal economic depreciation were deductible, an investment would be taxed on the same basis as interest. Thus, an investment with a real pre-tax rate of return of r provides the same after-tax yield as bonds.

Before interpreting the other two cost of capital expressions, note that as nominal interest is taxable, the real after-tax interest rate an individual on rate m receives will be

$$r' = \frac{i(1-m) - \pi}{1+\pi} = \frac{[r(1+\pi) + \pi](1-m) - \pi}{1+\pi} = r(1-m) - \frac{m\pi}{1+\pi} \tag{3.6}$$

Equation (3.5c) says that, under expensing, the cost of capital is equal to the after-tax real interest rate, r'. This result is well known and can be explained in two steps. First, in order for an investment to be just profitable, its real *after-tax* rate of return must be equal to real opportunity cost of funds, r'.[8] Second, with expensing the government by giving an immediate deduction effectively finances the fraction m of the investment as well as taking the fraction m of its revenues. As tax reduces costs and revenues in the same proportion, the *pre- and post-tax rates of return will be identical*. Together, this means that the cost of capital will equal r'. For a marginal project the value of the tax deduction will equal the present value of future taxes and so the project is effectively untaxed.

Finally, consider the case of real economic depreciation. Equation (3.5*b*) says that in this case the cost of capital is $\rho = r'/(1-m)$. This is because real economic income from an investment is taxed and so the real after-tax rate of return on a marginal investment is $\rho(1-m) = r'$. After the real return from the investment is taxed, investors end up with the same after-tax yield they would derive if they had earned interest income.

While these depreciation provisions are clearly idealised, each of these sets of depreciation provisions is of some relevance in Australia. Trading stock is taxed on a 'first-in first-out' basis. If trading stock is valued at cost and turns over quickly, the treatment approximates nominal economic depreciation. For assets which are viewed as being nondepreciating, no depreciation deductions are allowed as would be appropriate if real economic depreciation were deductible. A number of forms of capital expenditure can be expensed including equipment with an economic life of less than three years, staff training, advertising and, for unincorporated enterprises, research and development.

For investment in most forms of equipment and buildings, depreciation allowances are accelerated but not as accelerated as expensing. Thus, nominal economic depreciation and expensing put helpful bounds on likely costs of capital for most forms of investment.

A final point to note is that the combined effect of taxing nominal interest and allowing expensing is to reduce costs of capital for unincorporated enterprises below the real interest rate by an amount which increases with m. While the thesis abstracts from differences in tax rates these may be important. Accelerated depreciation can provide incentives for unincorporated enterprises to be owned by those on higher

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[8] An investment will have a zero net present value if its real after-tax cash flows discounted at the rate r' have a zero net present value.

marginal tax rates with those on lower marginal rates being debt rather than equity participants. As was noted in chapter 2, this may affect the degree of leverage in ways we have not analysed.

For a company the expressions for $k+Z$ will be the same as for an unincorporated enterprise although in this case $\phi = [i(1-m) - \alpha c\pi]/(1-c)$. Once more assuming $k = 0$, the cost of capital for a company under these three depreciation regimes can be derived by substituting ϕ and the values of $k + Z$ from equations (3.4*a*), (3.4*b*) and (3.4*c*) into equation (3.2). Costs of capital in the three cases are as follows:

Companies: Nominal Economic Depreciation

$$\rho = \frac{i(1-m) - \alpha c\pi - (1-m)\pi + b\alpha c\pi}{(1-m)(1+\pi)}$$

Simplifying,

$$\rho = r - \frac{\alpha c\pi(1-b)}{(1-m)(1+\pi)} \qquad (3.7a)$$

Companies: Real Economic Depreciation

$$\rho = \frac{i(1-m) - \alpha c\pi - \pi(1-c) + b\alpha c\pi}{(1-m)(1+\pi)}$$

Simplifying,

$$\rho = r - \frac{\pi\left(m - c(1-\alpha(1-b))\right)}{(1-m)(1+\pi)} \qquad (3.7b)$$

Companies: Expensing

$$\rho = \frac{(\phi - \pi)(1-m) + b\alpha c\pi}{(1-m)(1+\pi)}$$

Simplifying,

$$\rho = r\left(\frac{1-m}{1-c}\right) - \frac{\pi\left(m - c\left(1-\alpha\left(1-b\left(\frac{1-c}{1-m}\right)\right)\right)\right)}{(1-c)(1+\pi)} \qquad (3.7c)$$

Costs of capital for unincorporated enterprises and companies are summarised and compared in Table 3.1.

Table 3.1 Costs of Capital

	Unincorp. Ent.	Company
Nominal Economic Depreciation	r	$r-\frac{\alpha c\pi(1-b)}{(1-m)(1+\pi)}$
Real Economic Depreciation	$r-\frac{m\pi}{(1+\pi)(1-m)}$	$r-\frac{\pi\left[m-c\left(1-\alpha(1-b)\right)\right]}{(1-m)(1+\pi)}$
Expensing	$r(1-m)-\frac{m\pi}{1+\pi}$	$r\left(\frac{1-m}{1-c}\right)-\frac{\pi\left[m-c\left(1-\alpha\left(1-b\left(\frac{1-c}{1-m}\right)\right)\right)\right]}{(1+\pi)(1-c)}$

To interpret the cost of capital expressions, start by considering costs of capital for companies and unincorporated enterprises for equity-financed investment ($b = 0$) in the absence of inflation ($\pi = 0$). For simplicity, consider non-depreciating assets which are effectively perpetuities although the same results would hold irrespective of depreciation rates.

In the absence of inflation, real and nominal economic depreciation are identical. If the asset were nondepreciating, under real or nominal economic depreciation no depreciation deductions would be allowed. Suppose that an asset costs a dollar and generates ρ per annum in each subsequent year. With no depreciation deductions the owner of an *unincorporated enterprise* would pay tax of ρm in each subsequent year and receive $\rho(1-m)$ after tax. This will be a zero net present value investment if and only if the present value of the after-tax revenue stream, $\rho(1-m)/r(1-m)$, is equal to a dollar, so $\rho = r$. This accords with the first two entries in the 'Unincorporated Enterprise' column of Table 3.1 given the assumption $\pi = 0$.

Suppose instead that the investment were undertaken by a company which finances it by issuing a dollar of new equity. The company would earn ρ in each subsequent year, pay $\rho\tau$ in tax and $\rho(1-\tau)$ in franked dividends. Shareholders would receive $\rho(1-m)$ per annum in after-tax dividends and again the investment would have a zero net present value if and only if $\rho = r$. This accords with the first two entries in the corporate column of Table 3.1 in the case where $\pi = 0$. *Thus, in the absence of inflation, the cost of capital for both an unincorporated enterprise and a company would be r if economic depreciation were deductible.* In this case full imputation would have removed any bias over whether investment was undertaken by companies or unincorporated enterprises.

Now suppose that the investment can be expensed. For an unincorporated enterprise the after-tax cost in the initial year would be $1-m$ and the after-tax revenue in subsequent years would be $\rho(1-m)$. This will be a zero net present value investment if $1-m=\rho(1-m)/r(1-m)$ or if $\rho=r(1-m)$.

If instead the investment were undertaken by a company, the cost to shareholders is a little more complex. Company tax would fall by τ in the initial year which would lower the after-tax dividends that the firm could pay by $1-\tau$. As a result shareholders would forgo $1-m$ in after-tax dividends. In addition they would face a capital gains tax because of the retention-financed investment. This is the key difference between the company and the unincorporated enterprise. The increase in the value of the firm would be the present value of the additional after-tax dividends, namely $\rho(1-m)/r(1-m)=\rho/r$. This will be a zero net present value investment for shareholders if $1-m-c\rho/r=\rho/r$ or if $\rho=r(1-m)/(1-c)$.

Thus, if $c=0$, the cost of capital for a company would be $r(1-m)$ just as for an unincorporated enterprise. This is because the after-tax cost of the investment to shareholders would be $1-m$ which is the same as the cost of the investment to the owners of an unincorporated enterprise. If at the other extreme, $c=m$, then $\rho=r$. In this case the capital gains tax claws back the benefits of accelerated depreciation completely when an investment is undertaken by a company.

Thus, in the absence of inflation, capital gains taxation can drive a wedge between costs of capital for companies and unincorporated enterprises. Capital gains tax claws back the benefits of measures which accelerate depreciation allowances relative to economic depreciation from companies but not from unincorporated enterprises. If at the extreme $c=m$, then accelerated depreciation has no effects on corporate incentives to invest.

In the presence of inflation, in order to interpret the corporate cost of capital expressions in Table 3.1, it is helpful to consider some polar cases: no capital gains tax or a full accrual-basis capital gains tax ($c=0$ or m) and no debt finance or 100 per cent debt finance ($b=0$ or 1). These polar cases are examined below for the case where real gains are taxed ($\alpha=1$) and where nominal gains are taxed ($\alpha=0$).

First, consider the case where a company can deduct nominal economic depreciation. If $\alpha=0$ or $c=0$ or $b=1$, then $\rho=r$ as can be checked by substitution into the first expression in the 'Company' column of Table 3.1. This is the same as the cost of capital for an unincorporated enterprise when nominal economic depreciation is deductible. In these cases, we will say that nominal economic income is effectively being taxed. If instead $c = m$, and both $\alpha = 1$ and $b = 0$, then $\rho = r - m\pi / (1+\pi)(1-m)$. This is the same as the cost of capital for an unincorporated enterprise if real economic depreciation is deductible. Effectively real economic income is being taxed.

Now suppose that a company can deduct real economic depreciation. If $c = 0$ or if $\alpha = 1$ and $b = 0$, the cost of capital for a company would be $\rho = r - m\pi / (1+\pi)(1-m)$. This is the same as that for an unincorporated enterprise if real economic depreciation is deductible. Effectively real economic income (RY) is effectively being taxed. If instead $c = m$ and $\alpha = 0$ or $b = 0$, then for a company the cost of capital is $\rho = r$. Effectively nominal economic income (NY) is being taxed.

Finally, consider the case of expensing, if $c = 0$, $\rho = r(1-m) - m\pi / (1+\pi)$. As for an unincorporated enterprise subject to expensing, investment income is effectively untaxed. If instead $c = m$, there are two polar cases to consider. If $\alpha = 0$ or $b = 1$, $\rho = r$ and nominal economic income is effectively being taxed. If $\alpha = 1$ and $b = 0$, $\rho = r - m\pi / (1+\pi)(1-m)$ and real economic income is effectively being taxed.

Table 3.2 below summarises these results. When $\rho = r$, nominal economic income is effectively being taxed. This is denoted by 'NY'. When $\rho = r - m\pi / ((1+\pi)(1-m))$, real economic income is effectively being taxed. This is denoted by 'RY'. If $\rho = r(1-m) - m\pi / (1+\pi) = r'$, the return from a marginal investment is effectively exempt. This is denoted by 'Nil'.

Costs of capital are the same for companies as for unincorporated enterprises if $c = 0$. In the absence of any capital gains tax, the shareholders of companies which distribute the maximum possible level of franked dividends and pay no unfranked dividends would be taxed on the same basis as if they were partners in an unincorporated enterprise. This is true whether investment is debt or equity financed. If a company borrows a dollar and pays i in interest, this will lower company tax by $i\tau$ and the level of franked dividends that the firm can pay by $i(1-\tau)$ which will reduce after-tax franked dividends by $i(1-m)$. The cost to shareholders would be the same whether they borrow or the company borrows.

Table 3.2 Form of Income Taxation

	Unincorp Ent	*Companies*					
		$c = 0$		$c = m$			
		$b = 0$	$b = 1$	$b = 0$		$b = 1$	
				$\alpha = 0$	$\alpha = 1$	$\alpha = 0$	$\alpha = 1$
NED	NY	NY	NY	NY	RY	NY	NY
RED	RY	RY	RY	NY	RY	NY	NY
Exp	Nil	Nil	Nil	NY	RY	NY	NY

"Nil" $\Rightarrow$ investment is effectively untaxed, "NY" $\Rightarrow$ nominal income is taxed and "RY" $\Rightarrow$ real income is taxed.

Now consider the case when $c = m$ and there is full equity finance so $b = 0$. If no company tax were paid, a company could pay no franked dividends and so would be forced to retain profits. This would lead to a rise in share values which would be taxed under the capital gains tax provisions. If $\alpha = 0$ (nominal gains are taxed), the nominal economic income from an investment ends up being taxed and if $\alpha = 1$ (real gains are taxed), real economic income ends up being taxed. To the extent that some company tax is paid, the company will pay franked dividends and shareholders will pay tax on the profits at their marginal rates as a result of imputation credits. However, this will have no effect on the overall tax liability because capital gains taxes will fall by an offsetting amount. Thus, if $b = 0$, $c = m$ and $\alpha = 0$, nominal income is taxed irrespective of depreciation provisions. If $b = 0$, $c = m$ and $\alpha = 1$, real income is taxed irrespective of depreciation provisions.

The most complex case is where $c = m$ and investment is fully debt financed. This case is most easily explained by considering an investment which costs a dollar and which produces nominal revenue of $1 + \rho(1 + \pi) + \pi$ one year later and then expires. This provides a real pre-tax rate of return of ρ.

Start by assuming that revenue is untaxed. If a firm borrows a dollar to invest in the asset in year 0, this leaves its after-tax cash flow unaltered in year 0. In the next year revenue rises by $1 + \rho(1 + \pi) + \pi$, interest plus principal payments rise by $1 + i$, tax falls by $i\tau$ and franked dividends fall by $i(1-\tau)$. This means that shareholders lose $i(1-m)$ in after-tax franked dividends in year 1 but the firm ends up with additional retained earnings of $\rho(1+\pi)+\pi$. This lowers the amount of new equity needed to be issued and increases the value of existing equity by $\rho(1+\pi)+\pi$. Shareholders will be indifferent about the investment if the loss of after-tax dividends is equal to the net-of-capital-gains-tax capital gain, ie., if

$$i(1-m)=(1-m)(\rho(1+\pi)+\pi)$$

This implies that $i=\rho(1+\pi)+\pi$ so $\rho=r$. Whether capital gains tax is indexed or not is irrelevant because with debt-financed investment, there is no increase in the firm's equity base and hence no increase in inflation deductions. Again, if income were partly or fully taxed in the company's hands, this would have no effect on tax payments. To the extent that company tax is paid, the company will be able to pay more franked dividends. Taxable corporate profits will be taxed in shareholders' hands as a result of the imputation system but capital gains taxes will fall by an offsetting amount.

3.4. ASSUMPTIONS UNDERLYING NUMERICAL ESTIMATES

Numerical estimates of costs of capital under actual tax provisions applying in 1997/98 will be presented in section 3.5. Key assumptions are outlined below.

Assumptions on the marginal tax rates of shareholders were outlined in Chapter 2. We consider the possibilities of m being the tax rate of superannuation funds (15 per cent), the average marginal tax rate of shareholders (estimated as being approximately 33 per cent) and the top personal marginal tax rate (48.5 per cent).

For estimates of *economic depreciation* of plant and equipment the starting point is the Commissioner of Taxation's estimates of economic lives of assets. These estimates are used to calculate basic rates of prime cost depreciation. Taxpayers have long been given an option of using prime cost depreciation or diminishing value depreciation at 150 per cent of prime cost rates. It is assumed that δ is 150 per cent of the prime cost rate implied by the Commissioner of Taxation's estimates of economic lives. Any differences between true rates of economic depreciation and those implied by the Commissioner's estimates are ignored. This is likely to understate differences in costs of capital.

For buildings a rate of economic depreciation of 2.5 per cent per annum is assumed. This is within the range of the rates calculated for the United States by Hulten and

Wykoff (1981) which included industrial structures (3.6 per cent), commercial buildings (2.5 per cent), educational buildings (1.9 per cent), hospitals and institutions (2.3 per cent) and other (4.5 per cent). It is similar to the 2.3 per cent rate used by Bourassa and Hendershott (1992).

For research and development, two possible cases are considered: an economic life of 3 years ($\delta = 0.5$) and an economic life of 10 years ($\delta = 0.15$).

Firms are allowed to deduct the cost of trading stock acquired or produced during a year. However, the difference between the value of trading stock on hand at the end of the year and trading stock on hand at the beginning of the year is taxable. Stock can be valued at cost price, at market value or at replacement value. If cost is used, this means that the cost of acquiring trading stock is only effectively deductible when the stock is sold. We treat trading stock as being acquired in one period and sold one period later with a net deduction for the cost of the stock at that time. This means that for the purposes of calculating the cost of capital, $\delta = 1$ and $Z = 1/(1+\phi)$. This is effectively nominal economic depreciation.

We consider investment in equipment with economic lives of 3 years, 5 years, 10 years, 20 years and 30 years for which *tax depreciation* is, respectively immediate deduction, and dv rates of 0.6, 0.3, 0.2 and 0.2. Buildings are allowed prime cost deductions of 2.5 per cent for 40 years unless used for 'eligible industrial activities' or for 'short-term traveller accommodation' where a higher 4 per cent deduction applies. It is assumed that the lower 2.5 per cent deduction applies. Corporate research and development qualifies for a 125 per cent deduction and unincorporated research and development for a 100 per cent deduction.

In the initial case examined in section 3.5 it is assumed that r is 5 per cent per annum, π is 2 per cent per annum, b is 0.4 and a is 0.2 per annum. The effects of varying some of these assumptions are also discussed.

3.5. Numerical Estimates

Initially assume $m = 0.33, r = 0.05, \pi = 0.02, i = 0.071$ and $i(1-m) = 0.0476$. Under these assumptions, ϕ for an unincorporated enterprise is $i(1-m) = 0.0476$. For shareholders $c = 0.2986$ and $\phi = 0.0593$ if real gains accrue; $c = 0$ and $\phi = 0.0476$ if real losses but nominal gains accrue; and $c = 0.2793$ and $\phi = 0.066$ if nominal losses accrue.

In 1997/98 no investment allowance is available so $k = 0$ in all cases. For 3-year equipment, capital expenditure can be expensed so $Z = 1$. For 5-year, 10-year, 20-year and 30-year equipment, depreciation is deductible on a diminishing-value basis so

$$Z = \frac{\delta *}{1+\phi}\sum_{t=0}^{\infty}\left(\frac{1-\delta *}{1+\phi}\right)^{t} = \frac{\delta *}{\phi + \delta *}$$

where δ* is the rate of dv depreciation allowed for tax purposes outlined in section 3.4.

For trading stock $Z = 1/(1+\phi)$ and for research and development (R&D), $Z = 1$ in the case of an unincorporated enterprise or $Z = 1.25$ in the case of a company. Finally for buildings deductions are allowed on a prime cost basis. Let *d** be the rate of prime cost depreciation and $T = 1/d*$. Provided *T* is an integer,

$$Z = d*\sum_{t=1}^{T}(1+\phi)^{-t} = d*\left(1-(1+\phi)^{-T}\right)/\phi$$

Using these expressions, the values of $k + Z$ are presented in Table 3.3.

Table 3.3 Values of $k + Z$

$m = 0.33,\ r = 0.05,\ \pi = 0.02,\ a = 0.2$

	3 Yr	*5 Yr*	*10 Yr*	*20 Yr*	*30 Yr*	*Trdg Stock*	*3 Yr R&D*	*10 Yr R&D*	*Bldgs*
Unincorp Ents	1.000	0.927	0.863	0.808	0.808	0.955	1.000	1.000	0.444
Companies									
Real Gains	1.000	0.910	0.835	0.771	0.771	0.944	1.250	1.250	0.380
Real Loss but Nom Gain	1.000	0.927	0.863	0.808	0.808	0.955	1.250	1.250	0.444
Nom Losses	1.000	0.901	0.820	0.752	0.752	0.938	1.250	1.250	0.349

It is worth noting that with the exception of R&D (where the tax base for companies and unincorporated enterprises differ) the values of $k + Z$ for unincorporated enterprises are the same as those for companies in the case where real losses but nominal gains are assumed to accrue. This is because in both of these cases $\phi = i(1-m) = 0.0476$. Except for 3-year equipment and R&D where deductions are immediate, values of $k + Z$ for companies are lower if nominal losses accrue than if real gains accrue. This is because of the higher value of ϕ if nominal losses accrue (0.066 rather 0.0593). Similarly, values of $k+Z$ for companies are lower if real gains accrue than if real losses but nominal gains accrue because of the higher value of ϕ in the former case.

Estimates of costs of capital under 1997/98 tax provisions can be found by substituting these values of $k+Z$ into equation (3.2) for companies and (3.3) for unincorporated enterprises. Results are provided in Table 3.4.

Table 3.4 Costs of Capital: Base Case

$m = 0.33 \; r = 0.05, \; \pi = 0.02, \; a = 0.2$

	3 Yr	*5 Yr*	*10 Yr*	*20 Yr*	*30 Yr*	*Trdg Stock*	*3 Yr R&D*	*10 Yr R&D*	*Bldgs*
Unincorp Ents	2.7	3.9	3.9	3.7	3.4	5.0	2.7	2.7	4.1
Companies									
Real Gains	4.2	4.3	4.3	4.3	4.3	4.5	3.6	4.0	4.4
Real Loss but Nom Gain	2.7	3.9	3.9	3.7	3.4	5.0	-3.8	0.5	4.1
Nom Losses	4.5	4.8	4.8	4.7	4.7	5.0	3.5	4.1	4.9
Wtd. Average (0.6, 0.1, 0.3)	4.1	4.4	4.4	4.4	4.3	4.7	2.8	3.7	4.5

Table 3.4 records, for example, that under the assumptions outlined above costs of capital for an unincorporated enterprise investing in 3-year equipment and in trading stock are 2.7 per cent and 5.0 per cent respectively. This means that these forms of investment need to generate real pre-tax rates of return of 2.7 per cent and 5.0 per cent respectively to be marginally profitable.

Conventional economic analysis would suggest that, possible externalities aside, it would be desirable for different forms of possible investment to be taxed as neutrally as possible. This was Harberger's argument against the double-taxation of corporate income under a classical company tax system discussed in chapter 1. If costs of capital vary for different forms of investment undertaken by companies or unincorporated enterprises or for investment occurring in the corporate or unincorporated sectors, there is a prima facie case that investment will be diverted away from the areas where it will provide highest returns for the nation as a whole.

Biases between types of investment goods that a given firm might purchase will be referred to as an *inter-asset* bias. Biases between whether investment takes place in the unincorporated or corporate sectors will be referred to as an *intersectoral* bias. The tax system creates both of these types of investment biases although the figures suggest that with the exception of R&D, inter-asset biases within the corporate sector tend to be very small.

Consider first the case of an unincorporated enterprise. Table 3.4 indicates that investments in equipment with real pre-tax rates of return of between 2.7 per cent and 3.9 per cent will provide the same after-tax return to investors as investment in trading stock and buildings generating real pre-tax rates of return of 5.0 and 4.1 per cent respectively. Thus, investment in equipment can generate between 54 and 78 per cent of the pre-tax rate of return from investing in trading stock while being as attractive on an after-tax basis.

In two recent papers De Long and Summers (1991 and 1992) have argued on the basis of cross sectional studies that there are positive externalities from equipment investment which could provide grounds for a tax subsidy to such investment. However, whether there is any such externality is controversial with Auerbach, Hassett and Oliner (1994) finding no evidence of externalities for OECD countries or even for the entire sample of countries analysed by De Long and Summers if one country (Botswana) is excluded. Even if externalities exist, the appropriate course of action would be to identify forms of equipment investment that generate externalities rather than providing an across-the-board subsidy. As Gravelle (1993) notes, equipment investment is heterogeneous including items as diverse as computers, trucks, coffee machines and moveable room dividers. Even if some forms of equipment generate significant positive externalities, it seems difficult to believe that this will provide a strong case for subsidising all forms of equipment. In Australia the government (at least to the author's knowledge) has not ever announced that as a policy goal it wishes to promote investment in equipment relative to investment in trading stock and buildings or suggested externalities as being a possible reason for doing so. In commenting on investment biases, we will ignore the possibility of externalities for equipment investment. In the absence of externalities, the tax bias in favour of equipment and against trading stock and buildings appears to be of potential policy concern.

For companies, the capital gains tax has attenuated inter-asset distortions unless real losses but nominal gains are deemed certain to accrue. These inter-asset distortions are identified separately for the cases where real gains are believed to be certain to occur (RG), where real losses but nominal gains are believed to be certain to occur (RLNG) and where nominal losses are believed to be certain to occur (NL). The last case also covers the case of sharetraders who are taxed on nominal gains. In reality, for shareholders other than sharetraders there will be some prospect of each of these cases arising. While obviously moving outside the certainty model used to generate cost of capital estimates, the final line provides a weighted average of these three cases assuming fairly arbitrary weightings of 0.6, 0.1 and 0.3 for RG, RLNG and NL respectively. In practice over extended periods of time shares have tended to increase in real value and the high weighting on real gains reflects this. The low weighting given to RLNG reflects the fact that at least at the low rates of inflation experienced in recent years, this case seems relatively unlikely.

With the exception of R&D (where the tax bases for companies and unincorporated enterprises differ because the 125 per cent deduction is limited to companies), the directions of inter-asset biases are the same for companies as for unincorporated enterprises. Costs of capital for companies tend to be lower for equipment (especially short-lived equipment) than trading stock and buildings. However, differences in weighted average costs of capital are very small (4.1 to 4.4 per cent for equipment) compared with 4.7 per cent for trading stock and 4.5 per cent for buildings. These differences are very much smaller than for unincorporated enterprises because of the way in which capital gains taxation claws back the benefits of accelerated depreciation.

For companies the lowest costs of capital are for R&D because of the 125 per cent deduction. This is a deliberate concession explicitly aimed at encouraging companies to undertake R&D. A possible justification is that R&D may generate positive externalities if the benefits from R&D can be appropriated in part by other firms. On the other hand, R&D may at times create negative externalities if a firm's R&D allows it to gain a patent which prevents other firms from being able to create and develop the same innovation. As the level of positive (or negative) externalities are unknown it is impossible to comment on whether this tax concession is likely to increase economic efficiency. However, there are undoubtedly some odd aspects to this concession because of its restriction to companies. Companies are encouraged to invest in R&D with a lower pre-tax rate of return than 3-year equipment whereas unincorporated enterprises are not.[9] Companies are also encouraged to invest in

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[9] The value of the concession can also vary between companies. It is of no immediate benefit to firms in a tax-loss position. For taxpaying firms, the value of the concession will depend on the marginal tax

shorter-lived R&D with a lower pre-tax rate of return than longer-lived R&D while unincorporated enterprises are not.

Estimates of costs of capital for buildings in Table 3.4 assume that the capital cost of a building is deducted on a straight-line basis over 40 years at a rate of 2.5 per cent per annum. It was noted earlier that the cost of buildings used for 'eligible industrial activities' or 'short-term traveller accommodation' can be deducted at the higher rate of 4 per cent per annum. This increases the present value of depreciation deductions. This has a small effect on costs of capital but changes are sufficient to bring costs of capital for buildings within the range of those for equipment. At this higher rate the cost of capital for buildings acquired by unincorporated enterprises would fall from 4.1 to 3.8 per cent and the weighted average cost of capital for buildings acquired by companies would fall from 4.5 to 4.4 per cent.

There appears to have been a general bias in favour of investment by unincorporated enterprises relative to widely-held companies. The capital gains tax increases corporate costs of capital above those for unincorporated enterprises for all forms of investment other than trading stock.[10] Especially for assets where depreciation is substantially accelerated, there can be important differences between costs of capital for widely-held companies and unincorporated enterprises. For example, the cost of capital for investment in 3-year equipment (where capital expenditure can be expensed) is 2.7 per cent for unincorporated enterprises whereas the weighted average cost of capital for such in vestment by companies is 4.1 per cent. This means that capital invested in an unincorporated enterprise can generate a 34 per cent lower real pre-tax rate of return while being as attractive on an after-tax basis. The magnitude of the biases in favour of unincorporated enterprises are sensitive to assumptions about the effective rate of capital gains tax. As is analysed further in Table 3.6, higher rates of capital gains tax would tend to compress inter-asset distortions within the corporate sector but increase intersectoral biases while lower rates of capital gains tax would do the opposite.

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rates of its shareholders. It will provide a bigger incentive the higher the marginal tax rates of shareholders.

[10] It is of interest that despite the higher rate of deduction for corporate R&D, costs of capital for R&D undertaken by widely-held companies are higher than that for unincorporated enterprises.

Differences in Assumed Value of *m*

As was noted in chapter 2 there is no compelling theoretical reason for using the average marginal tax rate of shareholders to approximate m. Table 3.5 examines costs of capital for $m = 0.15$ and $m = 0.485$ with other assumptions being the same as in Table 3.4. Note that because of different values of m the values of $k + Z$ will differ from those presented in Table 3.3 but the basis of calculation is the same.

Table 3.5 Costs of Capital if m = 0.15 or m = 0.485
r = 0.05, π = 0.02, a = 0.2

	3 Yr	*5 Yr*	*10 Yr*	*20 Yr*	*30 Yr*	*Trdg Stock*	*3 Yr R&D*	*10 Yr R&D*	*Bldgs*
$m = 0.15$									
Unincorp Ents	4.0	4.5	4.5	4.4	4.3	5.0	4.0	4.0	4.7
Companies									
Real Gains	4.7	4.7	4.8	4.7	4.7	4.8	4.4	4.6	4.8
Real Loss but Nom Gain	4.0	4.5	4.5	4.4	4.3	5.0	1.6	3.1	4.7
Nom Losses	4.8	4.9	4.9	4.9	4.9	5.0	4.3	4.6	4.9
Average (0.6, 0.1, 0.3)	4.6	4.8	4.8	4.7	4.7	4.9	4.1	4.4	4.8
$m = 0.485$									
Unincorp Ents	1.6	3.3	3.3	3.0	2.6	5.0	1.6	1.6	3.6
Companies									
Real Gains	3.7	3.8	3.8	3.8	3.8	4.0	2.9	3.4	3.9
Real Loss but Nom Gain	1.6	3.3	3.3	3.0	2.6	5.0	-10.5	-2.3	3.6
Nom Losses	4.3	4.7	4.7	4.6	4.5	5.0	2.7	3.7	4.8
Average (0.6, 0.1, 0.3)	3.7	4.0	4.0	4.0	3.9	4.4	1.5	2.9	4.1

Results are qualitatively are very similar to those reported for the case where $m = 0.33$.[11] For both unincorporated enterprises and widely-held companies, equipment appears to be tax preferred relative to trading stock and buildings. Under both assumptions about *m*, there is a tax bias favouring investment by unincorporated enterprises relative to widely-held companies in equipment and buildings. The main effects of differences in *m* is that a lower value of *m* tends to compress (and a higher value of *m* tends to amplify) both inter-asset and intersectoral distortions. Thus, uncertainties about the most appropriate value of *m* may lead us to be cautious about arriving at conclusions about the sizes and importance of investment biases. However, the direction of changes required to reduce investment biases appears to be to a large extent independent of the assumed rate of *m*.

Differences in Assumed Value of *a*

There is also considerable uncertainty about the most appropriate assumption about the rate of share turnover, *a*. As was discussed in section 2.5, it is often assumed (e.g., King and Fullerton, 1984, *p*. 24) that *a* is 0.1 while on average shares in listed companies appear to change hands about once every two years. Table 3.6 presents estimates of costs of capital for $a = 0.1$ and $a = 0.5$. Differences in assumed values of *a* affect assumed values of *c*. Once again this affects the magnitude of investment biases but has very little effect on the directions of these biases.

The effects of different assumed values of *a* on costs of capital are described in Table 3.6. Costs of capital for unincorporated enterprises are unaffected by these changes in assumption and are as in Table 3.5. For both the case where $a = 0.1$ and the case where $a = 0.5$ corporate costs of capital continue to be lower for equipment than trading stock and buildings except that when $a = 0.5$ there is so little variation in corporate costs of capital that rounded to one decimal the figures reported for buildings are identical to those for 5- and 10-year equipment. For all forms of investment other than R&D a lower value of *a* tends to reduce and a higher value of *a* increase intersectoral biases. With R&D there is an additional complication because of the 125 per cent deduction which is available to companies but not unincorporated enterprises. With $a = 0.1$, corporate investment in 3-year R&D tends to be favoured

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[11] There is one minor qualitative difference in the three cases. The cost of capital for 3-year R&D is slightly lower for widely-held companies than for unincorporated enterprises if *m* is 0.485 but not if *m* is 0.15 or 0.33.

relative to unincorporated investment. With $a = 0.2$ or 0.5 the direction of this bias is reversed.

Table 3.6 Costs of Capital if $a = 0.1$ or $a = 0.5$

$m = 0.33,\ r = 0.05,\ \pi = 0.02$

	3 Yr	*5 Yr*	*10 Yr*	*20 Yr*	*30 Yr*	*Trdg Stock*	*3 Yr R&D*	*10 Yr R&D*	*Bldgs*
Unincorp Ents	2.7	3.9	3.9	3.7	3.4	5.0	2.7	2.7	4.1
Companies									
$a = 0.1$									
Real Gains	4.0	4.3	4.3	4.2	4.2	4.5	2.7	3.6	4.4
Real Loss but Nom Gain	2.7	3.9	3.9	3.7	3.4	5.0	-3.8	0.5	4.1
Nom Losses	4.1	4.6	4.6	4.5	4.4	5.0	2.2	3.4	4.7
Average (0.6, 0.1, 0.3)	3.9	4.3	4.3	4.3	4.2	4.7	1.9	3.2	4.4
$a = 0.5$									
Real Gains	4.4	4.4	4.4	4.4	4.4	4.4	4.2	4.3	4.4
Real Loss but Nom Gain	2.7	3.9	3.9	3.7	3.4	5.0	-3.8	0.5	4.1
Nom Losses	4.9	4.9	4.9	4.9	4.9	5.0	4.6	4.7	5.0
Average (0.6, 0.1, 0.3)	4.3	4.5	4.5	4.5	4.4	4.7	3.5	4.1	4.5

Differences in Assumed Value of π

It was noted in chapter 2 that a 2 per cent inflation rate is low when compared to average rates of inflation over the last decade. Over this more lengthy time period the average rate of inflation has been approximately 5 per cent per annum. Table 3.7 explores how costs of capital would change with a 5 per cent rate of inflation assuming that this has no effect on r which as in Table 3.4 is assumed to be 5 per cent per annum. Thus, i becomes 10.25 per cent. Other assumptions are as in Table 3.4.

For unincorporated enterprises, the higher rate of inflation tends to reduce costs of capital for 3-year and longer-lived equipment more than short-lived equipment and trading stock. Differences between costs of capital with 5 per cent and 2 per cent inflation are shown in italics. Thus, inflation tends to increase the bias in favour of 3-year and longer-lived equipment relative to these other assets. At the same time inflation lowers the cost of capital for buildings more than equipment. Investment in buildings becomes tax preferred relative to investment in 5-year and 10-year equipment.[12]

Table 3.7 Costs of Capital, $\pi = 0.05$

$m = 0.33,\ r = 0.05,\ a = 0.2$

	3 Yr	*5 Yr*	*10 Yr*	*20 Yr*	*30 Yr*	*Trdg Stock*	*3 Yr R&D*	*10 Yr R&D*	*Bldgs*
Unincorp Ents	1.8	3.4	3.3	2.9	2.6	5.0	1.8	1.8	3.2
*Difference**	*-0.9*	*-0.5*	*-0.6*	*-0.7*	*-0.8*	*0.0*	*-0.9*	*-0.9*	*-1.0*
Companies									
Real Gains	3.4	3.6	3.6	3.5	3.5	3.7	3.0	3.3	3.6
Real Loss but Nom Gain	1.8	3.4	3.3	2.9	2.6	5.0	-4.6	-0.3	3.2
Nom Losses	4.1	4.6	4.6	4.5	4.4	5.0	2.7	3.6	4.6
Wtd. Average (0.6, 0.1, 0.3)	3.5	3.8	3.8	3.8	3.7	4.2	2.2	3.0	3.8
*Difference**	*-0.7*	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.5*	*-0.6*	*-0.6*	*-0.7*
Wtd. Average (0.6, 0.25, 0.15)	3.1	3.7	3.7	3.5	3.4	4.2	1.1	2.5	3.6
*Difference**	*-1.0*	*-0.8*	*-0.8*	*-0.9*	*-0.9*	*-0.5*	*-1.7*	*-1.2*	*-0.9*

*Differences in costs of capital are expressed relative to Table 3.4

[12] By comparison, the higher 4 per cent deduction for certain types of buildings would have a relatively minor effect reducing the cost of capital for buildings acquired by unincorporated enterprises from 3.2 to 3.0 per cent.

For companies costs of capital also fall more for 3-year and longer-lived equipment and buildings than for 5-year or 10-year equipment and trading stock. When examining changes in weighted average costs of capital, two different cases are examined. In the first case, unchanged weightings are assumed. However, higher inflation will tend to increase the chance of real losses but nominal gains accruing. The final two rows of Table 3.7 examine this possibility by assuming, arbitrarily, that the higher rate of inflation increases the weighting given to real losses but nominal gains from 0.1 to 0.25 and reduces the weighting given to nominal losses from 0.3 to 0.15. As the probability of there being no capital gains tax rises, costs of capital fall.

Assumed Rate of *b*

Debt finance tends to increase the cost of capital for corporate investment if $\pi > 0$ and real gains are accruing. It follows from (3.2) that $\partial\rho / \partial b = \alpha c\pi / (1-m)(1+\pi)$. If $m = 0.33, r = 0.05, \pi = 0.02, i = 0.071$ and $a = 0.2$, $c = 0.299$ if real gains accrue so $\partial\rho / \partial b = 0.0088$. This means that the cost of capital is not very sensitive to b at modest rates of inflation. If b were 0 rather than 0.4 and if there were a 60 per cent probability of real gains accruing, weighted average costs of capital would fall by approximately 0.2 percentage points (ie., 0.6 times -0.4 times $\partial\rho / \partial b$) relative to figures reported in Table 3.4. This would clearly have no effect on the direction of inter-asset biases within the corporate sector but would tend to reduce the tax bias favouring investment by unincorporated enterprises relative to companies.

3.6 CONCLUDING COMMENTS

This chapter has examined costs of capital for a number of corporate and unincorporated investments under both idealised depreciation provisions and under recent and current Australian tax rules. In the absence of any capital gains tax, costs of capital for the companies considered in the text which pay no unfranked dividends and for which $\tau + c(1-\tau) \geq m$ would be the same as those for unincorporated enterprises. New Zealand has no capital gains tax and its full-imputation reform may have largely removed biases concerning whether investment is undertaken by companies or unincorporated enterprises.

However, when depreciation is accelerated relative to economic depreciation or when there are other capital allowances, capital gains taxation can result in the benefits of these tax preferences being clawed back from companies but not unincorporated enterprises. This can bias investment in favour of unincorporated enterprises. If accelerated depreciation and other capital allowances are prevalent, it cannot necessarily be concluded that Australia's full imputation reform is an important step towards removing intersectoral investment biases. On the other hand the capital gains tax will tend to compress inter-asset biases in the corporate sector.

Under current tax rules and at low rates of inflation, costs of capital for unincorporated enterprises tend to be lower for 3-year equipment and longer-lived equipment than for other shorter-lived equipment, buildings and trading stock. This will bias investment decisions for these firms. The direction of inter-asset biases is similar for widely-held companies. This conclusion is robust to different possible assumptions about the marginal tax rate of shareholders and rate of share turnover. Under possible cases examined in this chapter, inter-asset biases for widely-held companies appear to be much smaller than those for unincorporated enterprises. Under our central case assumptions of Table 3.4 costs of capital for forms of investment other than R&D varied between 2.7 and 5.0 per cent for unincorporated enterprises but between 4.1 per cent and 4.7 per cent for companies. There can be quite large differences in costs of capital for unincorporated enterprises and widely-held companies in the case of some assets. For example, in the case of 3-year equipment the cost of capital was 2.7 per cent for unincorporated enterprises but 4.1 per cent for companies under the assumptions of Table 3.4.

Our methodology is extended to consider other possible firms in Appendix 3.1. For firms paying unfranked dividends, costs of capital will be independent of deductions available at the company level. This means that accelerated depreciation and investment allowances will not distort decisions about which forms of investment such firms undertake but will introduce biases concerning whether investment is undertaken by these or other firms. Some firms are paying less than the maximum level of franked dividends. If this is merely to maintain a reservoir in their franking account balances so they can pay franked dividends consistently, investment incentives would appear to be similar to those for the base case companies analysed in the text of this chapter. Some, however, may envisage that the balance in their franking account will never constrain their ability to pay franked dividends. In this case the constraint on the maximum level of franked dividends which can be paid will be slack in all periods. In this case full imputation will not claw back the benefits of tax preferences available at the company level. For such firms, inter-asset distortions may tend to be greater than for unincorporated enterprises.

APPENDIX 3.1 OPTIMAL INVESTMENT DECISIONS AND THE COST OF CAPITAL

Suppose that a company maximises V_0 as given in equation (2.5) subject to the equality constraints given in equations (2.6), (2.7), (2.8) and (3.1), inequality constraint (2.9) and the constraints that franked dividends, unfranked dividends and new equity issues be nonnegative in each period. The Lagrangian is

$$L=\sum_{t=1}^{\infty}\left(\frac{\frac{1-m_t}{(1-\tau_t)(1-c_t)}D_t^f+\frac{1-m_t}{1-c_t}D_t^u-V_t^N}{\prod_{s=1}^{t}(1+\phi_s)}\right.$$
$$+\lambda_t^1\left[\frac{p_tF(K_{t-1})-q_tI_t-T_t+b_tq_tK_t-(1+i_t)b_{t-1}q_{t-1}K_{t-1}+V_t^N-D_t^f-D_t^u}{\prod_{s=1}^{t}(1+\phi_s)}\right]$$
$$+\lambda_t^2\left[\frac{T_t-\tau_t\{p_tF(K_{t-1})-k_tq_tI_t-i_tb_{t-1}q_{t-1}K_{t-1}-\sum_{s=-\infty}^{t}\Delta_{s,t-s}q_sI_s\}}{\prod_{s=1}^{t}(1+\phi_s)}\right]$$
$$\left.+\frac{\lambda_t^3(I_t+(1-\delta)K_{t-1}-K_t)+\lambda_t^4D_t^f+\lambda_t^5D_t^u+\lambda_t^6V_t^N+\lambda_t^7\sum_{s=-\infty}^{t}\left[\frac{1-\tau_s}{\tau_s}T_s-D_s^f\right]}{\prod_{s=1}^{t}(1+\phi_s)}\right) \tag{3.8}$$

The first-order conditions are given by

$$\frac{\partial L}{\partial K_t}=\frac{(\lambda_{t+1}^1-\tau_{t+1}\lambda_{t+1}^2)(p_{t+1}F'(K_t)-i_{t+1}b_tq_t)-b_t(\lambda_{t+1}^1-\lambda_t^1(1+\phi_{t+1}))q_t+\lambda_{t+1}^3(1-\delta)-\lambda_t^3(1+\phi_{t+1})}{\prod_{s=1}^{t+1}(1+\phi_s)}=0 \tag{3.9}$$

$$\frac{\partial L}{\partial T_t}=\frac{-\lambda_t^1+\lambda_t^2}{\prod_{s=1}^{t}(1+\phi_s)}+\frac{1-\tau_t}{\tau_t}\left[\frac{\lambda_t^7}{\prod_{s=1}^{t}(1+\phi_s)}+\frac{\lambda_{t+1}^7}{\prod_{s=1}^{t+1}(1+\phi_s)}+\ldots\right]=0 \tag{3.10}$$

$$\frac{\partial L}{\partial I_t}=\frac{q_t\left(-\lambda_t^1+\tau_t(k_t+\Delta_{t,0})\lambda_t^2+\frac{\tau_{t+1}\Delta_{t,1}\lambda_{t+1}^2}{(1+\phi_{t+1})}+\frac{\tau_{t+2}\Delta_{t,2}\lambda_{t+2}^2}{(1+\phi_{t+1})(1+\phi_{t+2})}+\ldots\right)+\lambda_t^3}{\prod_{s=1}^{t}(1+\phi_s)}=0 \tag{3.11}$$

$$\frac{\partial L}{\partial D_t^f} = \frac{\frac{1-m_t}{(1-\tau_t)(1-c_t)} - \lambda_t^1 + \lambda_t^4}{\prod_{s=1}^{t}(1+\phi_s)} - \left[\frac{\lambda_t^7}{\prod_{s=1}^{t}(1+\phi_s)} + \frac{\lambda_{t+1}^7}{\prod_{s=1}^{t+1}(1+\phi_s)} + \ldots \right] = 0 \qquad (3.12)$$

$$\frac{\partial L}{\partial D_t^u} = \frac{\frac{1-m_t}{1-c_t} - \lambda_t^1 + \lambda_t^5}{\prod_{s=1}^{t}(1+\phi_s)} = 0 \qquad (3.13)$$

$$\frac{\partial L}{\partial V_t^N} = \frac{-1 + \lambda_t^1 + \lambda_t^6}{\prod_{s=1}^{t}(1+\phi_s)} = 0 \qquad (3.14)$$

To derive expressions for the cost of capital it is necessary to make further assumptions about which nonnegativity constraints are slack.

(*i*) *Companies Where Nonnegativity Constraints on New Equity Issues and Payments of Franked Dividends are Slack*

In the case analysed in the body of the text of this chapter, it is assumed that firms are willing to issue new equity and pay franked dividends in all periods and so the nonnegativity constraints on both V_t^N and D_t^f will be slack. As discussed in chapter 2, this would appear to be the normal case in the absence of changes in tax rates if firms wish to undertake more investment than can be financed merely by retaining unfrankable earnings. If $\tau + c(1-\tau) > m$, it will be optimal for firms to pay the maximum level of franked dividends and to raise any equity over and above retained unfrankable earnings by issuing new equity. If the nonnegativity constraints on both V_t^N and D_t^f are slack, $\forall t$

$$\lambda_t^4 = \lambda_t^6 = 0, \ \forall t \qquad (3.15)$$

Equations (3.14) and (3.15) imply

$$\lambda_t^1 = 1, \ \forall t \qquad (3.16)$$

This is intuitive. λ_t^1 measures the shadow value at time t of an additional dollar of corporate cash flow. A dollar of additional cash flow saves shareholders a dollar.

Equations (3.12), (3.15) and (3.16) imply

$$\frac{\tau_t + c_t(1-\tau_t) - m_t}{(1-\tau_t)(1-c_t)} = \lambda_t^7 + \frac{\lambda_{t+1}^7}{1+\phi_{t+1}} + \frac{\lambda_{t+2}^7}{(1+\phi_{t+1})(1+\phi_{t+2})} + \ldots \qquad (3.17)$$

The $\lambda_t^7, \lambda_{t+1}^7, \ldots$ terms must all be nonnegative. A necessary but not sufficient condition for firms to find it optimal to pay franked dividends and issue new equity in each period is $\tau_t + c_t(1-\tau_t) \geq m_t$.

Equations (3.10), (3.16) and (3.17) imply

$$\lambda_t^2 = \frac{m_t - c_t}{\tau_t(1-c_t)} \tag{3.18}$$

Equations (3.11), (3.16) and (3.18) imply

$$\lambda_t^3 = q_t\left(1 - \frac{m_t - c_t}{1-c_t}k_t - \Omega_t^1\right) \tag{3.19}$$

where

$$\Omega_t^1 = \sum_{u=0}^{\infty} \frac{\Delta_{t,u}\left(\dfrac{m_{t+u} - c_{t+u}}{1-c_{t+u}}\right)}{\prod_{s=t+1}^{t+u}(1+\phi_s)} \tag{3.20}$$

Finally, by substituting equations (3.16), (3.18) and (3.19) into equation (3.9) we find

$$\begin{aligned}\left(\frac{1-m_{t+1}}{1-c_{t+1}}\right)\frac{p_{t+1}F'(K_t)}{q_t} &= (1+\phi_{t+1})\left[1-\frac{m_t - c_t}{1-c_t}k_t - \Omega_t^1\right] \\ &\quad -(1-\delta)\frac{q_{t+1}}{q_t}\left[1-\frac{m_{t+1}-c_{t+1}}{1-c_{t+1}}k_{t+1} - \Omega_{t+1}^1\right] + \frac{b_t\alpha c_{t+1}\pi_{t+1}}{1-c_{t+1}}\end{aligned} \tag{3.21}$$

This is the Australian full imputation equivalent of an expression derived in King (1974*a*). Equation (3.21) provides the required value of the marginal product per dollar of capital outlay, $p_{t+1}F'(K_t)/q_t$, in terms of various exogenous parameters. The intuition behind (3.21) will be discussed in the slightly simpler case of investment by an unincorporated enterprise shortly.

In the special case analysed in the body of the text, changes in r, π, i, m, c, b, k and Z are ignored and it is assumed that these variables remain constant through time. It is also assumed that p and q both increase at the general rate of inflation, π, so $p_t = p(1+\pi)^t$ and $q_t = q(1+\pi)^t$. This allows an expression to be derived which has the same general form as standard Hall-Jorgenson cost of capital expressions but which takes account of Australian taxes on both companies and their shareholders. Under these assumptions the real pre-tax rate of return on a marginal investment or the cost of capital would be

$$\rho = \frac{pF'}{q} - \delta = \frac{(1-c-(m-c)(k+Z))(\phi - \pi + \delta(1+\pi)) + b\alpha c\pi}{(1-m)(1+\pi)} - \delta \quad (3.22)$$

where
$$\phi = \frac{i(1-m) - \alpha c\pi}{1-c}$$

and
$$Z = \sum_{u=0}^{\infty} \frac{\Delta_{t,u}}{(1+\phi)^u} \quad (3.23)$$

Z is the present value of depreciation deductions discounted at the rate ϕ. Provided $m \neq c$, $Z = \Omega^1(1-c)/(m-c)$.

(ii) Unincorporated Enterprises

To interpret (3.21) further, it is also useful to derive the cost of capital expression if a firm is unincorporated. In that case the value of the firm would be

$$V_0 = \sum_{t=1}^{\infty} \left(\frac{(1-m_t)p_t F(K_{t-1}) - q_t I_t + b_t q_t K_t - (1+i_t(1-m_t))b_{t-1}q_{t-1}K_{t-1} + m_t(k_t q_t I_t + \sum_{s=-\infty}^{t} \Delta_{s,t-s} q_s I_s)}{\prod_{s=1}^{t}(1+i_s(1-m_s))} \right)$$

(3.24)

Maximise (3.24) subject to (2.8). Denote the associated Lagrangian by L. Taking $\partial L / \partial K_t$ and $\partial L / \partial I_t$ and substituting yields

$$(1-m_{t+1})\frac{p_{t+1}F'(K_t)}{q_t} = (1+i_{t+1}(1-m_{t+1}))(1-m_t k_t - \Omega_t^2) - (1-\delta)\frac{q_{t+1}}{q_t}(1-m_{t+1}k_{t+1} - \Omega_{t+1}^2) \quad (3.25)$$

where
$$\Omega_t^2 = \sum_{u=0}^{\infty} \frac{m_{t+u}\Delta_{t,u}}{\prod_{s=t+1}^{t+u}(1+i_s(1-m_s))} \quad (3.26)$$

Equation (3.25) is perhaps slightly simpler to interpret than (3.21) although both have similar interpretations. The left-hand side of (3.25) is the after-tax revenue received in period $t+1$ per dollar of capital outlay in period t. The cost of acquiring a dollar of capital goods to a taxpayer is the dollar less the present value of capital write offs $(1-m_t k_t - \Omega_t^2)$. If the asset were worthless at the end of the year, the revenue required to meet the opportunity cost of capital would be $(1+i_{t+1}(1-m_{t+1}))(1-m_t k_t - \Omega_t^2)$. The remainder of the right-hand side measures the value at the end of the year of the depreciated capital. If the dollar of capital had not been acquired in year t, the shareholder would have to spend an additional $(1-\delta)q_{t+1}/q_t$ in year $t+1$ for the firm's capital stock to be as high as when the dollar of capital is acquired in year t. This would have had an after-tax cost of $(1-\delta)\frac{q_{t+1}}{q_t}(1-m_{t+1}k_{t+1}-\Omega^2_{t+1})$.

In the special case examined in the text of chapter 3 where r, π, i, m, k and Z remain constant through time and where $p_t = p(1+\pi)^t$ and $q_t = q(1+\pi)^t$, the cost of capital for an unincorporated enterprise is

$$\rho = \frac{pF'}{q} - \delta = \frac{(1-m(k+Z))(i(1-m)-\pi+\delta(1+\pi))}{(1-m)(1+\pi)} - \delta \tag{3.27}$$

where Z is the present value of depreciation deductions discounted at the opportunity cost of capital, ie.,

$$Z = \sum_{u=0}^{\infty} \frac{\Delta_{t,u}}{(1+i(1-m))^u} \tag{3.28}$$

From (3.21) and (3.25) it is clear that changes in capital write-off provisions can have an important effect on investment decisions. The Tables in Chapter 3 consider the effects on the cost of capital of unchanging capital write-off provisions and abstract from this issue.

(iii) Companies Paying Unfranked Dividends in Each Period

Some companies pay unfranked dividends. Consider the case of a firm paying unfranked dividends in all periods.

As was discussed in chapter 2, it will generally be desirable for firms to pay franked dividends before unfranked dividends. Thus, if a firm is paying unfranked dividends in all periods, $\forall t$

$$\lambda^4_t = \lambda^5_t = 0, \tag{3.29}$$

Substituting yields, $\lambda^1_t = (1-m_t)/(1-c_t)$, $\lambda^2_t = 0$, and $\lambda^3_t = q_t(1-m_t)/(1-c_t)$, $\forall t$.

The fact that $\lambda^2_t = 0, \forall t$ means that tax paid by the company does not affect the value of the firm to shareholders. This means that the cost of capital will not depend on depreciation provisions or tax incentives for investment. Further substitution yields

$$\frac{p_{t+1}F'(K_t)}{q_t} = (1+\phi_{t+1})\left(\frac{(1-m_t)(1-c_{t+1})}{(1-c_t)(1-m_{t+1})}\right)(1-b_t)+b_t(1+i_{t+1}) - \frac{q_{t+1}(1-\delta)}{q_t} \tag{3.30}$$

If b, i and ϕ remain constant through time and that p and q grow at a constant rate of π per annum, a parallel expression to equation (3.22) can be developed for firms paying unfranked dividends. For these firms, the cost of capital would be

$$\rho = \frac{pF'(K_t)}{q} - \delta = \frac{\phi(1-b)+bi-\pi}{1+\pi} \tag{3.31}$$

If $b = 0$, $\rho = r'$, the real after-tax interest rate. This means that the return from a marginal investment is effectively exempt. In terms of Table 3.3 this situation would be described as 'Nil'. If $b = 1$, $\rho = r$ and nominal economic income is effectively taxed. This means that for such firms debt can have a very powerful effect in reducing incentives to invest. This is the 'mirror image' of our conclusion in chapter 2 that if the ratio of debt to capital stock is not fixed, these firms face strong incentives to repay debt ahead of paying unfranked dividends.

Our discussion of this case is open to criticisms that have been levelled at new view models of a classical company tax system. We have equity trapped in a company. A dollar of capital in a company is worth less than a dollar. Not only do regulations have to make share repurchase unattractive (which they may do in Australia), there needs to be some impediment to companies rewarding their shareholders by buying shares in other firms. Moreover, given our analysis in chapter 2 showing that a company can reduce the present value of taxes on unfranked dividends by retaining profits and lending the proceeds, our assumption of a fixed debt/capital ratio clearly has powerful effects on our results. An alternative approach for modelling this case would be to assume as in Poterba and Summers (1985) that dividends provide signalling or agency benefits. In the absence of such a model it may be difficult to provide a plausible reason for why firms pay unfranked dividends.

There is also the important question of investment incentives facing firms which are issuing new equity while expecting to pay unfranked dividends in the future. Here the analysis would appear to be very similar to that of Sinn (1991*b*) who analyses investment incentives facing firms in three different stages under a classical company tax system. In the first stage firms issue new equity and pay no dividends, in the second firms retain earnings but pay no dividends and in the third stage firms pay dividends and issue no new equity. Sinn shows that a classical company tax system can have very powerful effects in discouraging investment in initial stages. A similar result is derived in a simpler two period model in Edwards and Keen (1984).

(*iv*) *Firms Paying Less than the Maximum Level of Franked Dividends*:

Some firms are paying less than the maximum possible level of franked dividends in each period. Assuming that this is not merely a matter of firms wishing to maintain a positive franking account balance to ensure that they can maintain a policy of constantly paying franked dividends, the constraint on the maximum level of franked dividends that can be paid will be slack. Here two possible subcases can be considered. In the first, it is assumed that firms wish to undertake less equity investment in each period than would be financed if the firm retained all unfrankable and frankable earnings. In this case firms will pay some franked dividends in each period and $\forall t$

$$\lambda_t^4 = \lambda_t^7 = 0 \tag{3.32}$$

In this case straightforward substitutions into the first-order conditions yield

$$\left(\frac{1-m_{t+1}}{1-c_{t+1}}\right)\frac{p_{t+1}F'(K_t)}{q_t} = (1+\phi_{t+1})\left(\frac{(1-m_t)(1-\tau_t k_t)}{(1-\tau_t)(1-c_t)} - \Omega_t^3\right) - \frac{q_{t+1}}{q_t}(1-\delta)\left(\frac{(1-m_{t+1})(1-\tau_{t+1}k_{t+1})}{(1-\tau_{t+1})(1-c_{t+1})} - \Omega_{t+1}^3\right)$$
$$+ b_t\left(\frac{(1-m_{t+1})(i_{t+1}(1-\tau_{t+1}) - \phi_{t+1} - 1)}{(1-\tau_{t+1})(1-c_{t+1})} + \frac{1-m_t}{(1-\tau_t)(1-c_t)}\right) \tag{3.33}$$

where

$$\Omega_t^3 = \sum_{u=0}^{\infty} \frac{\tau_{t+u}\Delta_{t,u}\left(\dfrac{1-m_{t+u}}{(1-\tau_{t+u})(1-c_{t+u})}\right)}{\prod_{s=t+1}^{t+u}(1+\phi_s)} \tag{3.34}$$

A second subcase is where firms wish to undertake more equity investment in each period than could be financed by retaining all unfrankable and frankable earnings. In this case, $\forall t$

$$\lambda_t^6 = \lambda_t^7 = 0 \tag{3.35}$$

Straightforward substitutions into the first-order conditions imply

$$(1-\tau_{t+1})\frac{p_{t+1}F'(K_t)}{q_t} = (1+\phi_t)(1-\tau_t k_t - \Omega_t^4) + b_t\left(i_{t+1}(1-\tau_{t+1}) - \phi_{t+1}\right)$$
$$- \frac{q_{t+1}}{q_t}(1-\delta)(1-\tau_{t+1}k_{t+1} - \Omega_{t+1}^4) \tag{3.36}$$

where

$$\Omega_t^4 = \sum_{u=0}^{\infty} \frac{\tau_{t+u}\Delta_{t,u}}{\prod_{s=t+1}^{t+u}(1+\phi_s)} \tag{3.37}$$

If tax rates remain constant through time (3.33) simplifies to

$$(1-\tau)\frac{p_{t+1}F'(K_t)}{q_t} = (1+\phi_t)(1-\tau k_t - \Omega_t^4) + b_t\left(i_{t+1}(1-\tau) - \phi_{t+1}\right)$$
$$-\frac{q_{t+1}}{q_t}(1-\delta)(1-\tau k_{t+1} - \Omega_{t+1}^4)$$

which is equivalent to (3.36) in the case where tax rates remain constant. If, in addition it is assumed that r, π, i, ϕ, k and Z remain constant through time and all prices increase at the rate π for firms paying less than the maximum level of franked dividends

$$\rho = \frac{pF'}{q} - \delta = \frac{[1-\tau(k+Z)][\phi - \pi + \delta(1+\pi)] + b[i(1-\tau)-\phi]}{(1+\pi)(1-\tau)} - \delta \qquad (3.38)$$

(*v*) *Weighted-Average Costs of Capital Under Current Tax Provisions*: Table A3.1.1 below extends Table 3.4 to allow for costs of capital for firms paying unfranked dividends and less than the maximum level of franked dividends as well as our base-case firms. Other assumptions are as in Table 3.4 including weightings of 0.6, 0.1 and 0.3 for real gains, real losses but nominal gains, and nominal losses respectively. It is assumed that m is 33 per cent. The same tax rate is used to allow costs of capital to be compared across our three different types of company as simply as possible but it should be noted that this last assumption is inconsistent with firms paying less than the maximum level of franked dividends pursuing an optimal financial policy.

Table A3.3.1 1997/98 Weighted Average Costs of Capital

$m = 0.33,\ r = 0.05,\ \pi = 0.02,\ a = 0.2$

	3 Yr	*5 Yr*	*10 Yr*	*20 Yr*	*30 Yr*	*Trdg Stock*	*3 Yr R&D*	*10 Yr R&D*	*Bldgs*
Unincorp Ents	2.7	3.9	3.9	3.7	3.4	5.0	2.7	2.7	4.1
Companies									
Base Case	4.1	4.4	4.4	4.4	4.3	4.7	2.8	3.7	4.5
Paying UDs	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Paying < Maximum FDs	3.0	4.8	4.8	4.5	4.2	6.4	-4.6	0.4	5.3

For companies paying unfranked dividends in all periods, the cost of capital is 4.4 per cent in all cases. It is independent of depreciation provisions or tax incentives for investment. The benefits of such measures to companies are completely clawed back by additional taxes on shareholders.

Now consider firms paying less than the maximum level of franked dividends in each period which treat as slack the constraint limiting the maximum level of franked dividends in each period. For these firms, inter-asset biases tend to be somewhat larger than for unincorporated enterprises. This reflects the fact that taxable income is being taxed at the rate of $\tau + c(1-\tau)$ rather than at the lower rate m.

APPENDIX 3.2: COMPARISON WITH SIEPER'S COST OF CAPITAL EXPRESSION

This appendix reworks cost of capital expressions in continuous time to allow a comparison with the expression derived in Sieper (1995). It provides numerical estimates showing how the two expressions agree in the polar cases of no share turnover or shares turning over infinitely fast, but disagree in other cases.

In his study Sieper provides a major step forward on other Australian literature by providing a formal model of the effects of full imputation on investment decisions taking account of detailed provisions of Australia's company tax provisions. He also goes beyond this thesis in considering deferred-income projects (projects which start to produce revenue T years after the initial investment). However, a simplification Sieper has made has led to inconsistencies which biases his estimates of costs of capital. Our formulation avoids these inconsistencies.

Sieper's analysis of the cost of capital is heterodox in explicitly modelling a realisation-basis capital gains tax. However, as in King (1977) and Appendix 2.1 Sieper assumes a constant rate of share turnover. Appendix 2.1 has shown that under this assumption it is consistent to treat a realisation-basis capital gains tax as though it were a tax on accrual (albeit at less than the statutory rate to allow for the benefits of tax deferral). This means that our measures of the cost of capital will be internally consistent.

The inconsistency in Sieper's approach stems from two assumptions. First, he assumes (*p.* A3-xiv) that share prices follow the value of a firm's assets (i.e., the sum of its physical capital which is assumed to depreciate at an exogenous rate, δ, and retained earnings). Second, he assumes that the initial value of a company in which a dollar of capital is contributed will be a dollar (*p.* A3-iii). Together these assumptions imply that the value of a firm will be the sum of its physical capital (measured in dollars) and its retained earnings. In particular, this means that the value of a firm will be independent of its stream of future tax deductions. By contrast our model allows the value of a firm to be set endogenously.

Sieper analyses the cost of capital for deferred-income projects. If our analysis were compatible with Sieper's, our results should be a special case of his as the period until revenue comes on stream tends to zero. In his Appendix 3, Sieper derives the following expression for the cost of capital in this case:

$$\hat{\rho} = \frac{(r+\delta^*)\{r(1-m)+\delta\}}{r(1-m)+\delta^*} + \frac{mra(\delta^*-\delta)}{\{r(1-m)+a\}\{r(1-m)+\delta^*\}} - \delta \tag{3.39}$$

where δ^* is the exponential rate of depreciation allowed for tax purposes. Other notation is consistent with that in this chapter except that Sieper's analysis is set in continuous time so, for example, r is the continuously compounding rate of interest.

Sieper's analysis differs from ours in the following key ways:

- It works in continuous rather than discrete time;
- It ignores inflation;
- It explicitly allows for a realisation-basis capital gains tax;
- It assumes that there is no investment allowance and treats tax depreciation as being at a constant exponential rate.

The first of these differences is trivial. As discussed in chapter 2 in the absence of inflation there would be no bias against corporate borrowing. For simplicity ignoring borrowing, the continuous-time equivalents of equations (2.6) and (2.7) are

$$D_t^f + D_t^u = p_t F(K_t) - q_t I_t - T_t + V_t^N \tag{3.40}$$

and

$$T_t = \tau\{p_t F(K_t) - k_t q_t I_t - \int_{-\infty}^{t} \Delta_{s,t-s} q_s I_s ds\} \tag{3.41}$$

Together these imply

$$D_t^f + D_t^u = (1-\tau)p_t F(K_t) - q_t I_t(1-\tau k_t) + \tau\int_{-\infty}^{t} \Delta_{s,t-s} q_s I_s ds + V_t^N \tag{3.42}$$

Consider the case discussed in the text of this chapter where $\tau + c(1-\tau) > m$ and nonnegativity constraints on new issues and franked dividends are assumed to be slack. In this case firms pay the maximum possible level of franked dividends (ie., $D_t^f = T_t(1-\tau)/\tau$) and no unfranked dividends. This is Sieper's assumption. It follows that

$$V_t^N = (1-k_t)q_t I_t - \int_{-\infty}^{t} \Delta_{s,t-s} q_s I_s ds \tag{3.43}$$

Substituting this into the continuous-time equivalent of (2.5) yields

$$V_0 = \int_0^\infty \left[\left(\frac{1-m}{1-c}\right)p_t F(K_t) + q_t I_t\left(-1 + \frac{m-c}{1-c}(k+Z)\right)\right]e^{-\phi t}dt + \frac{m-c}{1-c}\int_{-\infty}^{0} q_s I_s\left(\int_0^\infty \Delta_{t-s} e^{-\phi t}dt\right)ds \tag{3.44}$$

where the last term is the present value of tax deductions on past investments which is pre-determined for the firm at time 0.

The firm chooses to maximise (3.44) subject to the constraint

$$\dot{K}_t = I_t - \delta K_t \tag{3.45}$$

where $\dot{K}_t = dK_t / dt$.

The Hamiltonian for the problem is

$$H = \left(\frac{1-m}{1-c}\right) p_t F(K_t) e^{-\phi t} + q_t I_t \left(-1 + \frac{m-c}{1-c}(k_t + Z_t)\right) e^{-\phi t} + \lambda(t)(I_t - \delta K_t)$$

and for the optimal trajectory

$$\frac{\partial H}{\partial I_t} = q_t \left(-1 + \frac{m-c}{1-c}(k_t + Z_t)\right) e^{-\phi t} + \lambda(t) = 0 \tag{3.46}$$

$$\dot{\lambda}(t) = \frac{-\partial H}{\partial K_t} = -\left(\frac{1-m}{1-c}\right) p_t F'(K_t) e^{-\phi t} - \lambda(t)\delta \tag{3.47}$$

$$\dot{K}_t = \frac{\partial H}{\partial \lambda} = I_t - \delta K_t \tag{3.48}$$

Suppose as in section 3.2. that there is a constant continuous rate of growth of both p and q (ie., $p_t = p_0 e^{\pi t}$ and $q_t = q_0 e^{\pi t}$) and that k and Z remain constant through time. Solving (3.46) for λ, differentiating and substituting into (3.47) yields

$$\rho = \frac{p_0 F'(K_t)}{q_0} - \delta = \frac{[1-c-(m-c)(k+Z)](\phi+\delta)}{1-m} - \delta \tag{3.49}$$

which is the continuous-time equivalent of (3.2) in the absence of inflation.

Following the methodology of King (1977) but working in continuous time, the accrual equivalent rate of tax, c, given that shares turn over at the rate a is

$$c = m\int_0^\infty a e^{-at} e^{-r(1-m)t} dt = \frac{ma}{a + r(1-m)} \tag{3.50}$$

Note that as $a \to 0$, $c \to 0$ and as $a \to \infty$, $c \to m$. Finally, for consistency with Sieper we set $\pi = 0$, $\phi = r(1-m)/(1-c)$, $k = 0$ and $Z = \delta^* / \left(r(1-m)/(1-c) + \delta^*\right)$.

Thus, $$\rho = \frac{\left[1 - c - \dfrac{(m-c)\delta *}{r\left(\dfrac{1-m}{1-c}\right) + \delta *}\right]\left(r\left(\dfrac{1-m}{1-c}\right) + \delta\right)}{1-m} - \delta \tag{3.51}$$

Note that both formulations for the cost of capital, equations (3.39) and (3.51), are equivalent in the limiting cases:

$$a = 0 \Rightarrow c = 0 \Rightarrow \rho = \frac{(r + \delta *)(r(1-m) + \delta)}{r(1-m) + \delta *} - \delta$$

and $$a \to \infty \Rightarrow c \to m \Rightarrow \rho \to r.$$

In other cases the expressions will differ. Table A3.2.1 provides numerical estimates of costs of capital for $r = 10\%$ and $m = 33\%$ for five possible assets which Sieper analyses. These are items of equipment with the following assumed effective lives, rates of true economic depreciation and rates of tax depreciation:

- effective life = 3 years, $\delta = 0.5$, $\delta^* \to \infty$;
- effective life = 5 years, $\delta = 0.3$, $\delta^* = 0.6$;
- effective life = 10 years, $\delta = 0.15$, $\delta^* = 0.3$;
- effective life = 20 years, $\delta = 0.075$, $\delta^* = 0.2$;
- effective life = 30 years, $\delta = 0.05$, $\delta^* = 0.1$.

Table A3.2.1

	Share Turnover Zero		**Share Turnover 5% pa**		**Share Turnover 10% pa**	
Effective Life (years)	Sieper	Benge	Sieper	Benge	Sieper	Benge
3	6.70	6.70	8.11	7.80	8.68	8.35
5	8.52	8.52	9.15	9.03	9.40	9.28
10	8.65	8.65	9.23	9.13	9.46	9.35
20	8.46	8.46	9.12	9.01	9.38	9.27
30	9.01	9.01	9.43	9.38	9.60	9.55

As $a \to \infty$, costs of capital for both Sieper and Benge converge to $r = 10.0\%$. However, costs of capital can differ by noticeably different amounts when $0 < a < \infty$. This is because of internal inconsistencies in Sieper's assumptions about firm valuation.

This is most easily illustrated with a simple example. Sieper assumes that a project involves a single outlay at time 0. Consider the case where the asset does not depreciate so $\delta = 0$ but where the rate of depreciation allowed for tax purposes, $\delta^* > 0$.

Sieper assumes that if after-tax profits are greater than the level of franked dividends a firm can pay, the firm builds up financial assets which are assumed to be interest bearing bonds. We will denote the value of such bonds at time t to be A_t.

In this case the firm's pre-tax revenue stream at time t will be

$$R_t = \rho + rA_t \tag{3.52}$$

Company tax will be

$$T_t = \tau[\rho + rA_t - \delta^* e^{-\delta^* t}] \tag{3.53}$$

After-tax franked dividends will be

$$D_t^f = (1-\tau)(\rho + rA_t - \delta^* e^{-\delta^* t}) \tag{3.54}$$

The firm's retained earnings will be

$$\dot{A}_t = R_t - T_t - D_t^f = \delta^* e^{-\delta^* t} \tag{3.55}$$

Imposing the boundary condition that the firm starts off with no financial assets implies

$$A_t = 1 - e^{-\delta^* t} \tag{3.56}$$

Note that as $t \to \infty$, $A_t \to 1$ and $D_t^f \to (1-\tau)(\rho + r)$ so after-tax franked dividends $\to (1-m)(\rho + r)$. This implies that as $t \to \infty$, the value of the company $\to (1-m)(\rho + r)/r(1-m) = 1 + \rho/r$. *Note that this must be less than 2 if* $\rho < r$.

Sieper finds that $\rho < r$ if $\delta^* > \delta$. In our example, $\delta^* > 0$ and $\delta = 0$ so $\delta^* > \delta$. However, he assumes that the value of the firm in this case is the sum of its physical capital, 1, and its financial assets. Thus, according to Sieper

$$V_t = 2 - e^{-\delta^* t}$$

This means that as $t \to \infty$, Sieper assumes that $V_t \to 2 > 1 + \rho / r$. This is inconsistent.

Sieper's assumption that a dollar of retentions adds a dollar to the value of a firm is true in one sense. As retained earnings approach a dollar, the value of these retained earnings will tend to a dollar. The value of such a firm would be expected to be a dollar higher than an identical firm with a dollar less of retained earnings. A dollar of retained earnings adds a dollar to the value of a firm relative to the counterfactual of a firm being in an identical position without the retained earnings.

The inconsistency in Sieper's approach arises because this does not mean that the value of such a firm rises through time in line with its retained earnings. If a nondepreciating asset qualifies for tax depreciation, this will lower the cost of capital below r to some level, say, ρ^*. An asset costing a dollar and generating a pre-tax rate of return $\rho^* < r$ is marginal only because of its stream of future depreciation deductions. As time passes and future depreciation deductions become negligible, the asset becomes identical to a perpetuity paying ρ^* per annum which will be valued at ρ^* / r. Thus, as depreciation deductions are being claimed the firm's value will tend to grow by a smaller amount than the level of earnings it is retaining.

In order for the formation of a company which costs a dollar to be a zero net present value investment, the present value of the after-tax dividend stream plus revenue from share sales to an initial investor must equal a dollar. Thus,

$$1 = \int_0^\infty \left(\frac{1-m}{1-\tau} D_t^f + a[(1-m)V_t + m] \right) e^{-[a+r(1-m)]t} dt \tag{3.57}$$

Substituting yields

$$1 = G(a, \rho, r, m, \delta^*) + a(1-m) \int_0^\infty V_t e^{-[a+r(1-m)]t} dt \tag{3.58}$$

where $$G(\;) = \frac{(1-m)(\rho + r)}{a + r(1-m)} - \frac{(1-m)(\rho + \delta^*)}{a + \delta^* + r(1-m)} \tag{3.59}$$

The difference between Sieper's and our approach revolves around differences in V_t in (3.58). If V_t did follow the path assumed by Sieper, $V_t = 2 - e^{-\delta^* t}$. In this case the present value of cash flows from the project (ie., the right-hand side of (3.57)) becomes

$$PV = G(\;) + \frac{2a(1-m)}{a + r(1-m)} - \frac{a(1-m)}{a + \delta^* + r(1-m)} \tag{3.60a}$$

In our approach the value of the firms is endogenous and its is assumed that

$$V_t = \int_t^{\infty} \frac{1-m}{(1-\tau)(1-c)} D_u^f e^{-\phi(u-t)} du$$

where c is given by (3.50) and $\phi = r(1-m)/(1-c)$. In this case the present value of the cash flows from the project becomes

$$PV = G(\ ) + \frac{a(1-m)(1+\rho/r)}{a+r(1-m)} - \frac{\left(\frac{1-m}{1-c}\right)\frac{r+\delta^*}{\phi+\delta^*}a(1-m)}{a+r(1-m)+\delta^*} \qquad (3.60b)$$

Table 3.2.1 presents values of the present values of future cash flows from the projects under Sieper's and our assumptions. The cost of capital is calculated using (3.39) under Sieper's assumptions and using (3.51) under ours. In each case it is assumed that $r = 0.1$ and $m = 0.33$.

Table 3.2.2 Present Values of Future Cash Flows

	$\delta^* = 0.00$	$\delta^* = 0.01$	$\delta^* = 0.02$	$\delta^* = 0.05$	$\delta^* = 0.10$	$\delta^* = 0.20$
Benge						
$a = 0.00$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
$a = 0.05$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
$a = 0.10$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
$a = 0.20$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
$a \to \infty$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Sieper						
$a = 0.00$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
$a = 0.05$	1.0000	1.0008	1.0027	1.0103	1.0223	1.0382
$a = 0.10$	1.0000	1.0006	1.0019	1.0078	1.0178	1.0324
$a = 0.20$	1.0000	1.0003	1.0010	1.0042	1.0101	1.0199
$a \to \infty$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Our measure of the cost of capital is consistent because the present value of the after-tax cash flows from a marginal project costing a dollar equals a dollar whereas Sieper's measure of the cost of capital is inconsistent.

CHAPTER 4: FINANCING AND INVESTMENT BIASES SINCE 1984/85

4.1 INTRODUCTION

Financial and investment biases for widely-held Australian companies were investigated in chapters 2 and 3. The analysis took account of Australia's full imputation company tax system and its capital gains tax provisions.

In chapter 2, corporate financial policy biases were examined under 1997/98 tax settings under a variety of different possible assumptions about the marginal tax rate of shareholders, m, the rate of turnover of shares, a, and inflation, π. It was noted that under reasonable assumptions there appear to be strong incentives for firms aiming to maximise the wealth of their shareholders to ensure that frankable earnings are fully distributed (or, equivalently, the maximum possible level of franked bonus shares are issued). Firms should pay the maximum level of franked dividends, replacing any capital by using new equity issues or (less favourably) debt. There are also incentives for firms to avoid paying unfranked dividends. By reducing unfranked dividends and reducing new equity issues or (more favourably) debt, a company can increase shareholder wealth. Finally, if there is a prospect of real gains accruing, there is a tax bias in favour of firms issuing new equity rather than debt.

In practice debt/equity ratios have not declined markedly since the full imputation reform and the model was modified in chapter 3 by assuming that debt was an exogenous proportion of capital stock. Investment biases were examined in that chapter under 1997/98 tax settings. In the text of the chapter the case that was discussed was of widely-held companies which were paying the maximum level of franked dividends, issuing new equity and paying no unfranked dividends in each period. Given the incentives that had been identified for the full distribution of frankable earnings, this would normally appear optimal for firms which wish to undertake more equity investment than can be achieved merely by retaining unfrankable earnings.

There appear to be investment biases which encourage both widely-held companies and unincorporated enterprises to invest in plant and equipment ahead of both trading stock and structures at least at recent low rates of inflation. There are normally tax biases favouring unincorporated investment relative to investment by widely-held companies because of the way the taxation of unfranked dividends and capital gains claws back tax preferences available at the company level. At times, however, corporate investment may be tax preferred. This may happen as a result of tax preferences which are available to companies only, such as the 125 per cent deduction for research and development, provided the rates of share turnover are sufficiently slow. It can also happen as a result of the inflation-indexed capital gains tax making the cost of capital for heavily-taxed forms of investment lower when undertaken by companies than when undertaken by unincorporated enterprises. For example, the cost of capital for investment in trading stock can be lower for companies than for unincorporated enterprises.

Over the period since 1987/88 when the full imputation reform was introduced there have been falls in rates of inflation and a number of changes to tax rates. These may have affected both financial policy biases and costs of capital. Costs of capital may have also been affected by a number of reforms to the tax bases including changes in rates of depreciation and a temporary investment allowance. Moreover, the full imputation reform itself may have had important effects on financial policy biases and costs of capital. As was discussed in chapter 1, the full imputation reform was aimed, inter alia, at reducing tax distortions to corporate financial policy and to the form of business through which investment takes place. This chapter extends the analysis of chapters 2 and 3 to investigate biases that arose under the former classical company tax system and to examine how these biases have been affected by the full imputation reform, other tax changes and changes in the rate of inflation.

An important issue when extending the analysis back to consider the classical company tax system is how best to model such a tax system. As was outlined in chapter 1 proponents of the new view and proponents of the traditional view of dividends differ on this issue. Proponents of the new view have noted that traditional view models assume that new equity is the marginal source of equity finance. At least in the United States new equity provides a very minor proportion of the capital of firms. As Jorgenson (1993, *p*. 33) notes, the King-Fullerton methodology is based on the actual distribution of equity finance from new issues and retentions. This turns out to be more or less equivalent to adopting the new view because of the way the retentions dominate new equity issues as a source of finance. The suggestion of Sinn (1991*a*) that firms choose between new equity issues and retentions to minimise the cost of equity finance was discussed in chapter 1. This is effectively the approach that has been adopted in this thesis when analysing the effects of full imputation. When analysing a classical company tax system, this is also equivalent to the new view if the accrual-equivalent rate of capital gains tax, c, is assumed to be less than the marginal tax rate of shareholders, m.[1]

Proponents of the traditional view have, however, pointed out that new view models typically assume that dividends are the only way of rewarding shareholders. In practice there may be a number of ways for firms to reward their shareholders, including share repurchase or by the firm undertaking corporate acquisitions. These result in shareholders being rewarded with more lightly-taxed capital gains. In the United States there has been an increasing trend for firms to reward their shareholders in these more lightly-taxed ways (see Bagwell and Shoven, 1989). Some of these forms of rewarding shareholders may have been more difficult in Australia when Australia had a classical company tax system. At that time, firms were prohibited from repurchasing their own shares or shares in related companies although companies could still have rewarded their shareholders with capital gains by buying shares in unrelated companies.

While new view models tend to assume that dividends are the only way in which companies reward their shareholders, identical cost of capital expressions can be derived under other assumptions as well. As Sinn (1991*a*) notes, if equity is financed at the margin by issuing new shares and shareholders are rewarded by share repurchases (or equivalently corporate acquisitions), costs of capital would be the same as if, as in the new view, retentions are the marginal source of finance and shareholders are rewarded with dividends.

Whether the new view or the traditional view of dividends is the better way of modelling a classical company tax system is yet to be resolved. Gerardi, Graetz and Rosen (1990) and Zodrow (1992) make the assessment that the majority of empirical studies support the traditional view. However, which view yields the better explanation of corporate behaviour continues to be controversial.

The approach adopted in chapter 3 where firms are assumed to minimise the cost of equity finance sits most naturally with a new view model of a classical company tax system. In this chapter we restrict our attention to analysing the effects of Australia's former classical company tax system under new view assumptions. It would be of interest to extend our analysis by considering traditional view models of a classical

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[1] With a real capital gains tax it is theoretically possible that c exceeds m even if tax rates remain constant through time for the reasons discussed in Appendix 2.1.

company tax system as well but this is left for future work. It should be noted that modelling the classical company tax system under new view assumptions does not mean that the switch to full imputation has left investment incentives unaffected for established firms which are able to finance equity investment by the retention of profits. These incentives would have been unaffected if retentions had continued to be the least-cost form of equity finance. It has been seen, however, that Australia's full imputation scheme has made new equity a lower-cost form of equity finance than the retention of frankable earnings. This results in the shift to full imputation having important effects on investment decisions even if the classical company tax system is modelled under new-view assumptions.

When examining financial policy biases we find that there is more uncertainty about the direction of these biases under Australia's former classical company tax system than appears to be the case under current tax provisions. In chapter 2 it was noted that incentives to pay franked dividends, to refrain from paying unfranked dividends and to replace debt with new equity seemed to apply for all possible values of m under plausible rates of share turnover. Under the classical company tax system the direction of some biases will depend on the assumed rate of m. If m is approximated by the average marginal rate of shareholders, we find that the full imputation reform appears to have reversed many of the financial policy biases which arose under Australia's former classical company tax system. It is not clear, however, that the biases are smaller than those which would have arisen if a classical company tax system had been retained.

As was discussed in chapter 3, the full imputation reform could have eliminated any intersectoral investment biases if (as in New Zealand) capital gains on shares were not taxed. In practice, Australia's capital gains tax can produce important intersectoral biases especially if depreciation allowances are substantially accelerated or investment allowances are available. While it seems likely that in the last few years full imputation has provided a smaller bias against corporate investment than would be the case if a classical company tax system had been retained, this need not be the case especially if depreciation allowances are substantially accelerated or investment allowances are available. However, full imputation has a very marked effect on reducing inter-asset distortions in the corporate sector relative to a classical company tax system. If it is believed that difficulties in measuring economic depreciation mean that inter-asset investment distortions are inevitable, an attraction of the Australian full imputation reform may be that it helps to minimise these distortions. However, it does so for domestically-owned companies only and not for foreign-owned firms or unincorporated enterprises.

The structure of this chapter is as follows. Details on changes in key tax parameters since 1984/85 are provided in section 4.2. Financial policy biases which arose under the classical company tax system are examined in section 4.3. The question of how financial policy biases have changed over the period since 1984/85 is explored in section 4.4. An expression for the cost of capital under Australia's former classical company tax system is presented in section 4.5 assuming that retained earnings are the marginal source of equity finance. In section 4.6 the issue of how the cost of capital has changed over the period since 1984/85 is discussed. Finally, section 4.7 concludes.

4.2 MAJOR TAX PARAMETERS SINCE 1984/85

In chapters 2 and 3 a variety of different possible values of m were considered. In this chapter we consider some different possible values of m when considering financial policy biases. However, to constrain the set of possible cases, we will use only mean marginal tax rates on domestic resident final shareholders to estimate m when considering costs of capital. These estimates are derived from Australian Taxation Office and Australian Bureau of Statistics data on the same basis as was outlined for 1994/95 in section 2.5. For later years it is assumed that the average marginal tax rate of shareholders has remained constant at 33 per cent.[2] Estimates of economic depreciation are as outlined in section 3.4.

The capital gains tax was introduced in 1986/87 in respect of gains on assets acquired on or after 20 September 1985. Assets acquired prior to 20 September 1985 were 'grandfathered' (gains on these assets are not taxable). Grandfathering makes the effects of the capital gains tax difficult to analyse because for the first few years only a relatively small percentage of shares would have generated taxable gains. We abstract from this issue and treat all shareholders as being subject to capital gains tax from 1986/87 onwards.

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[2] A key parameter used in estimating the average marginal tax rate of shareholders is the percentage of shares held by superannuation funds and life offices on which income is taxed at the lower rate of superannuation funds. A method for estimating this was outlined in section 2.5 but published data only goes back to 1989/90. The ABS has kindly provided some additional data which allows estimates to be made for 1987/88 and 1988/89 and which yields estimates of 77.8 per cent for 1987/88 and 77.7 per cent for 1988/89 compared with 78.0 per cent for 1989/90. The ratio appears to have been very stable over the period 1987/88 to 1989/90 and we assume a ratio of 78 per cent in earlier years as well. Minor differences in this ratio are unlikely to have much effect on our estimates.

Other key tax changes over this period included:

- the termination of the 18 per cent investment allowance at the end of 1984/85;
- the introduction of the 150 per cent deduction for corporate R&D from the beginning of 1985/86;
- the introduction of full imputation together with an increase in the company tax rate from 46 per cent to 49 per cent in 1987/88;
- the repeal of 5/3 accelerated depreciation and its replacement by a less-accelerated system of depreciation based on the economic lives of assets from 26 May 1988;
- a reduction in the company tax rate to 39 per cent in 1988/89;
- the introduction of a more-accelerated system of depreciation from 26 February 1992;
- the temporary introduction of a 10 per cent investment allowance for capital expenditure incurred after 8 February 1993 and before 1 July 1994;
- a further reduction in the company tax rate to 33 per cent in 1993/94 and then an increase in this rate to 36 per cent in 1995/96.
- a scaling back to 125 per cent of the deduction for corporate R&D from 21 August 1996.

The key tax provisions applying at the end of the years 1984/85 to 1996/97 are summarised in Table 4.1. In this chapter we consider financial policy biases and costs of capital only up until 1996/97. There have been no changes in relevant tax provisions in 1997/98 and so results for 1997/98 would merely replicate those for 1996/97.

Depreciation rates for plant and equipment with economic lives of 3, 5, 10, 20 and 30 years are on a diminishing value basis unless indicated by an asterisk (*). Those marked with an asterisk are on a straight-line (prime-cost) basis. 'Exp' stands for expensing. If an asset has an economic life which lands on a borderline used by the Commissioner of Taxation (eg., assets with an economic life of 5 years lie on the borderline between those with lives of 3-5 years and those with lives of 5-10 years) it is assumed that the faster depreciation rate applies. Deductions allowed for capital expenditure on buildings are deductible on a straight-line (prime-cost) basis and for clarity are also indicated with an asterisk.

Another factor which is likely to have affected financial policy and investment biases is that superannuation funds became taxable only in 1988/89 normally at the rate of 15 per cent. It was only from that time that they were able to claim imputation credits. It is unclear how to allow for this complication without a major alteration of the model to allow for different groups of taxpayers being taxed in different ways. It affects only one year's results and the complication is ignored . Superannuation funds are effectively treated as though they could claim imputation credits in 1987/88 which means that in this year figures should be read with particular caution.

Table 4.1 Australian Tax Provisions

	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95	95/96	96/97
τ	0.46	0.46	0.46	0.49	0.39	0.39	0.39	0.39	0.39	0.33	0.33	0.36	0.36
m	0.30	0.31	0.31	0.29	0.35	0.32	0.31	0.31	0.31	0.31	0.33	0.33	0.33
π (%)	6.6	8.5	9.3	7.1	7.6	7.7	3.4	1.2	1.9	1.7	4.5	3.1	0.3
Dep. Rates													
3 yr	0.59	0.59	0.59	0.6	0.6	0.6	0.6	Exp	Exp	Exp	Exp	Exp	Exp
5 yr	0.333*	0.333*	0.333*	0.36	0.36	0.36	0.36	0.6	0.6	0.6	0.6	0.6	0.6
10 yr	0.2*	0.2*	0.2*	0.18	0.18	0.18	0.18	0.3	0.3	0.3	0.3	0.3	0.3
20 yr	0.2*	0.2*	0.2*	0.09	0.09	0.09	0.09	0.2	0.2	0.2	0.2	0.2	0.2
30 yr	0.2*	0.2*	0.2*	0.06	0.06	0.06	0.06	0.2	0.2	0.2	0.2	0.2	0.2
Bldgs	0.04*	0.04*	0.04*	0.025*	0.025*	0.025*	0.025*	0.025*	0.025*	0.025*	0.025*	0.025*	0.025*
R&D	1.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.25
k	0.18	0	0	0	0	0	0	0	0.1	0.1	0	0	0
Tax System	Class	Class	Class	Imp	Imp	Imp	Imp	Imp	Imp	Imp	Imp	Imp	Imp
CGT	No CGT	No CGT	CGT	CGT	CGT	CGT	CGT	CGT	CGT	CGT	CGT	CGT	CGT

Inflation rates reported in Table 4.1 are the rate of growth in CPI inflation over the 12 months to the end of the relevant years.

4.3 The Classical Company Tax System and Financial Policy Biases

The financing and investment incentives provided by a classical company tax system have been analysed by a number of authors including King (1974*a* and 1977) and Auerbach (1979*a*). Our formal analysis provides at most a very minor extension. We consider incentive effects in a framework which allows for the Australian indexed capital gains tax provisions introduced in 1986/87 and which is consistent with that used earlier in analysing Australia's full imputation company tax system.

Under a classical company tax system all dividends are taxed. Denoting dividends paid in period t by D_t, the firm's net of tax distribution becomes

$$E_{t+1} = (1-m_{t+1})D_{t+1} - c_{t+1}\left(V_{t+1}^{0} - (1+\alpha\pi_{t+1})V_t\right) \tag{4.1}$$

This replaces (2.2). Equations (2.1), (2.3) and (4.1) jointly imply that the ex-dividend value of the firm in period zero will be

$$V_0 = \sum_{t=1}^{\infty} \frac{\dfrac{1-m_t}{1-c_t} D_t - V_t^N}{\prod_{s=1}^{t}(1+\phi_s)} \tag{4.2}$$

provided, as in chapter 2, it is assumed that the transversality condition is satisfied. As in chapter 2, financial policy biases are explained more intuitively if we work in terms of the cum-dividend-and-shareholder-tax value of the firm. Using (2.11)

$$W_0 = E_0 + V_0^0 = (1-m_0)D_0 + (1-c_0)(V_0 - V_0^N) + c_0(1+\alpha\pi_0)V_{-1} \tag{4.3}$$

Substituting (4.2) into (4.3) yields

$$W_0 = (1-c_0)\sum_{t=0}^{\infty} \frac{\dfrac{1-m_t}{1-c_t} D_t - V_t^N}{\prod_{s=1}^{t}(1+\phi_s)} + c_0(1+\alpha\pi_0)V_{-1} \tag{4.4}$$

The firm's cash-flow constraint is given by

$$D_t = p_t F(K_{t-1}) - q_t I_t - T_t + B_t - (1+i_t)B_{t-1} + V_t^N \tag{4.5}$$

which replaces (2.6). Taxes continue to be given by (2.7) and the firm's capital stock by (2.8).

Initially, as in chapter 2, we focus on the firm's financial policy taking investment policy as given. If investment policy is given, the firm's autonomous cash flows, CF_t, will once more be given by (2.10) and we can rewrite (4.5) as

$$D_t = CF_t + B_t - \left(1 + i_t(1-\tau_t)\right)B_{t-1} + V_t^N \tag{4.6}$$

The firm takes CF_t as given in each period and chooses levels of dividends, bonds and new equity issues in each period. Because of the cash-flow constraint, only two of D_t, B_t and V_t^N can be chosen independently.

When considering financial policy perturbations, as in chapter 2, we will consider the effects on the value of the firm at time 0 of a one-off unexpected change in financial policy where dividends and new equity issues change by dD_0, dD_1, dD_2, ..., and dV_0^N, dV_1^N, dV_2^N, ..., respectively.

With a classical company tax system, the change in the shareholder wealth as a result of a firm announcing an unexpected change in financial policy in period 0 will be

$$dW_0 = (1-c_0)\sum_{t=0}^{\infty}\frac{\frac{1-m_t}{1-c_t}dD_t - dV_t^N}{\prod_{s=1}^{t}(1+\phi_s)} \tag{4.7}$$

This follows because V_{-1} is independent of any subsequent change in financial policy. Equation (4.7) replaces equation (2.16).

Equation (4.7) allows gains from financial policy perturbations to be analysed with time varying tax rates and values of ϕ. As in chapter 2, to simplify exposition and constrain the number of possible cases to consider, we will focus on the case where tax rates, the system of company tax and the value of ϕ are expected to remain constant through time.[3] In this case (4.7) becomes

$$dW_0 = \sum_{t=0}^{\infty}\frac{(1-m)dD_t - (1-c)dV_t^N}{(1+\phi)^t} \tag{4.8}$$

Equation (4.8) is the equation used in this chapter to evaluate gains to shareholders from financial policy perturbations under a classical company tax system.

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[3] This allows us to compare the effects of a classical company tax system which is assumed to be permanent with the results derived in chapter 2 for a permanent system of full imputation. An important interest in this chapter when analysing the classical company tax system is to examine how incentives under a classical company tax system and full imputation differ. Treating tax systems as permanent seems reasonable in this context. There may, however, be some important financial policy biases in the period 1984/85 to 1986/87 that this analysis overlooks because of anticipated changes in tax provisions.

Under the classical company tax system there were three ways in which a company could finance investment, namely, retained earnings (i.e., reduced dividends), new equity and debt. To provide some intuition for the effects on shareholders of various perturbations in corporate financial policy, it is helpful to start (as in chapter 2) by examining the costs to shareholders of the firm raising a dollar of finance in each of these three possible ways and burning the proceeds.

The cost to shareholders of a firm retaining a dollar and burning the proceeds is the after-tax dividend forgone, $1-m$. This is the same as the cost of retaining and burning a dollar of unfrankable earnings under a full imputation scheme discussed in section 2.4. If a dollar of new equity is issued, new shareholders must receive a flow of benefits with a present value of a dollar. If the dollar of new equity is burned, this means that the value of existing equity must fall by a dollar which costs existing shareholders $1-c$ net of capital gains tax. This is the same as the cost of issuing and burning a dollar of new equity under a full imputation system as discussed in section 2.4.

The most complex case is that of debt finance. If a firm borrows a dollar and then burns this dollar, the cost will be the interest payments on this debt. Assuming no change to retained earnings or new issues in any future period, interest payments will rise by i, company tax will fall by $i\tau$ and dividends will fall by $i(1-\tau)$ in each period. Shareholders will forgo an after-tax dividend stream of $i(1-\tau)(1-m)$ per period. This will lower the value of shares by an amount, say v, where v takes account of both the reduction in after-tax dividends and the reduction in the value of shares for the purpose of indexing the capital gains tax.

$$v = \frac{i(1-\tau)(1-m) + \alpha c \pi v}{i(1-m)}$$

Solving

$$v = \frac{i(1-\tau)(1-m)}{i(1-m) - \alpha c \pi}$$

The cost to shareholders of the firm issuing and burning a dollar of debt is the net-of-capital-gains-tax capital loss

$$v(1-c) = \frac{i(1-\tau)(1-m)}{\phi}$$

Table 4.2 records the costs to shareholders of these three primitive forms of finance.

Table 4.2: Costs of Raising a Dollar of Capital and Burning the Proceeds

Form of Finance	*Cost*
RE	$1-m$
NE	$1-c$
Debt	$i(1-m)(1-\tau)/\phi$

By comparing Table 4.2 with Table 2.2 on page 48, it is clear that a key difference between a classical company tax system and full imputation is that the cost of issuing and burning a dollar of debt is $i(1-m)(1-\tau)/\phi$ under a classical company tax system but $i(1-m)/\phi$ under full imputation.

There are three types of pairwise perturbations RE/NE, Debt/RE and Debt/NE. The effects on shareholder wealth can be derived either by comparing the primitive costs of the three forms of finance or, more formally, using equation (4.8).

RE/NE

Suppose that immediately before dividends are paid at the end of period 0 the firm announces that, relative to market anticipations, it will issue one dollar less of new equity in period 0 and pay one dollar less dividends in that period. Thus,

$$dV_0^N = dD_t = -1$$

New issues and dividends in other periods and bonds in all periods are left unchanged. Changes in the variables appearing in (4.6) are as follows.

Period	dD_t	dB_t	dV_t^N	$\left(1+i(1-\tau)\right)dB_{t-1}$
0	-1	0	-1	0
1	0	0	0	0
2 and subsequent periods	0	0	0	0

It is straightforward to check that this perturbation satisfies the firm's cash-flow constraint, equation (4.6). From (4.8), the change in shareholder wealth is

$$dW_0 = -(1-m)+(1-c) = m-c \tag{4.9}$$

This is just the cost of issuing a dollar of new equity and burning it minus the cost of retaining a dollar of dividends and burning it. The analysis is formally identical to that of a firm retaining a dollar of unfrankable earnings and issuing one dollar less of new equity under full imputation. Provided $m > c$, reducing dividends and new equity issues increases shareholder wealth.

Debt/RE

Now suppose that immediately before dividends are paid at the end of period 0 it is announced that, relative to market expectations, the firm will increase dividends and borrow an additional dollar in that period. This reduces retained earnings and increases the stock of debt by a dollar in all subsequent periods. Changes in the variables appearing in (4.6) are assumed to be as follows:

Period	dD_t	dB_t	dV_t^N	$(1+i(1-\tau))dB_{t-1}$
0	1	1	0	0
1	$-i(1-\tau)$	1	0	$(1+i(1-\tau))$
2 and subsequent periods	$-i(1-\tau)$	1	0	$(1+i(1-\tau))$

This satisfies (4.6) in all periods. The change in shareholder wealth is

$$dW_0 = (1-m)\left(1-\frac{i(1-\tau)}{\phi}\right) \tag{4.10}$$

This is the cost to shareholders of the firm retaining and burning a dollar minus that of the firm borrowing and burning a dollar of debt.

Debt/NE

Finally, consider the case where the firm announces just before the end of period 0 that, relative to market expectations, it will reduce new equity issues by a dollar and borrow an additional dollar in that period. This is assumed to increase the stock of debt and reduce the stock of equity by a dollar in each future period. Changes in the variables in (4.6) are assumed to be as follows:

Period	dD_t	dB_t	dV_t^N	$(1+i(1-\tau))dB_{t-1}$
0	0	1	-1	0
1	$-i(1-\tau)$	1	0	$(1+i(1-\tau))$
2 and subsequent periods	$-i(1-\tau)$	1	0	$(1+i(1-\tau))$

The change in the value of the firm will be

$$dW_0 = 1 - c - \frac{i(1-m)(1-\tau)}{\phi} \quad (4.11)$$

This is the cost to shareholders of the firm issuing and burning a dollar of new equity minus the cost of it borrowing and burning a dollar. Table 4.3 summarises these results from equations (4.9), (4.10) and (4.11).

Table 4.3 Effects on Shareholder Wealth from One Dollar Perturbations in Financial Policy Under Classical Company Tax System

	dW_0
RE/NE	$m-c$
Debt/RE	$1-m-\frac{i(1-m)(1-\tau)}{\phi}$
Debt/NE	$1-c-\frac{i(1-m)(1-\tau)}{\phi}$

Key Financial Policy Biases: 1984/85 to 1986/87

In 1984/95 and 1985/86 there was no capital gains tax so $\phi = i(1-m)$. Average marginal tax rates of shareholders (see Table 4.1) were 30 per cent in 1984/85 and 31 per cent in 1985/86. In the absence of any capital gains tax, the gain in shareholder wealth of the three perturbations RE/NE, Debt/RE and Debt/NE are, respectively, *m*, $\tau - m$ and τ. Gains to shareholders from these three perturbations are reported in Table 4.4 using the average marginal rate of shareholders as the value of *m*. The only difference between figures reported for 1984/85 and 1985/86 is as a result of the increase in the assumed value of *m* from 0.30 in 1984/85 to 0.31 in 1985/86.

Table 4.4 Effects of Permanent Perturbations in Financial Policy
$r = 0.05$, $a = 0.2$, $\pi = 0.093$

	Real Gains	*Real Losses & Nominal Gains*	*Nominal Losses*	*Wtd. Average (0.6,0.1,0.3)*
1984/85				
RE/NE	0.300	0.300	0.300	0.300
Debt/RE	0.160	0.160	0.160	0.160
Debt/NE	0.460	0.460	0.460	0.460
1985/86				
RE/NE	0.310	0.310	0.310	0.310
Debt/RE	0.150	0.150	0.150	0.150
Debt/NE	0.460	0.460	0.460	0.460
1986/87				
RE/NE	0.010	0.310	0.084	0.062
Debt/RE	0.169	0.150	0.272	0.198
Debt/NE	0.179	0.460	0.356	0.260

As there was no capital gains tax in 1984/85 and 1985/86, the gains to shareholders from perturbations in financial policy in these two years are independent of whether real gains, real losses but nominal gains or nominal losses accrue. By contrast gains in 1986/87 gains from these perturbations will depend on the type of expected future capital gain. The final column of the table reports weighted average gains assuming (as in chapter 3) a 60 per cent weighting for real gains, a 10 per cent weighting for real losses but nominal gains, and a 30 per cent weighting for nominal losses.

In the absence of a capital gains tax (i.e., in 1984/85 and 1985/86), gains to shareholders from perturbations in financial policy are independent of the values of the real interest rate, r, the rate of inflation, π, and the rate of turnover of shares, a. In

1986/87 it is assumed that r is 5 per cent per annum and a is 20 per cent per annum. The best assumption for π is an open question. Throughout this chapter it will be assumed that shareholders expect inflation over the past 12 months to continue in the future. Thus, in 1986/87 π is assumed to be the rate of increase of the CPI over the 12 months to the end of that financial year reported in Table 4.1 (viz., 9.3 per cent).

Table 4.4 suggests that if companies were owned solely by shareholders on the average marginal rate, under 1984/85 and 1985/86 tax provisions there was a tax bias favouring debt over both retained earnings and new equity for companies. For example, in 1985/86, the gain from replacing a dollar of retained earnings with a dollar of debt forever would have been 15 cents and the gain from replacing a dollar of new equity issues with a dollar of debt forever would have been 46 cents. There was also a tax bias in favour of retentions relative to new equity. In the absence of a capital gains tax, the cost of replacing a dollar of retentions with a dollar of new equity is m, which was 31 cents in 1985/86 under the assumptions we have made. As noted in chapter 1, concerns about these two biases were part of the reason for Australia introducing full imputation.

First consider the bias favouring retentions relative to new equity. The Treasurer, Mr Keating (1986) argued 'It [ie., the change to full imputation] will mean entrepreneurs and others trying to get new businesses off the ground should find it easier to raise equity finance.' The concern that a classical company tax system impedes entrepreneurs from getting new businesses started because of the high cost of new equity relative to retained earnings is a standard criticism of a classical company tax system. Note that in the absence of any capital gains tax, the gain to shareholders from replacing a dollar of new equity with a dollar of retentions, m, will be positive for any $m > 0$. Thus, the direction of this bias is not sensitive to assumptions about m.

Much of the bias favouring retentions relative to new equity appears to have been removed by the introduction of the capital gains tax. In particular, if real gains are expected to accrue, the bias against new equity issues relative to retained earnings becomes negligible. This is because this bias depends on the difference between m and c and $c \to m$ as the real after-tax interest rate, $r' \to 0$ as discussed in Appendix 2.1. In 1986/87 inflation was high (9.3 per cent) and $r' = 0.008$ was very low for shareholders on the average marginal rate.

In Keating (1986) the Treasurer also argued '. . . the new system will greatly reduce the existing bias in the tax system favouring debt over equity (this bias came about because interest income was taxed once while dividends were taxed twice).' Again, so long as we can approximate m by the average marginal tax rate of shareholders, our analysis supports the Treasurer's concern about a bias in favour of debt as debt tended to be preferred to retentions and new equity issues. It should be noted, however, that in the absence of any capital gains tax, the tax bias between debt and *retentions* has nothing to do with the double taxation of dividends. It reflects the difference between the company tax rate, τ, and the personal tax rate, m, at which interest is taxed. Exactly the same bias would arise if dividends were exempt.

Table 4.4 suggests that, under the assumptions outlined above, the introduction of the capital gains tax in 1986/87 tended to increase the Debt/RE bias but only by a relatively minor amount while decreasing the Debt/NE bias. If nominal gains are taxed (nominal losses accrue), the gain to shareholders from a firm replacing a dollar of retained earnings with a dollar of debt increases substantially from 15 cents to 27.2 cents. If debt is increased, future dividend payments fall and shares fall in value. The cost of this to shareholders is cushioned by the capital gains tax. However, if real gains are taxed, with the 9.3 per cent inflation rate there ends up being only a very minor increase in the Debt/RE bias. The gain to shareholders from a firm replacing a dollar of retentions with a dollar of debt climbs from 15 cents to only 16.9 cents. There is only a very minor increase in this case because replacing retentions with debt lowers the stream of future inflation deductions. Under our assumed weightings there is a relatively small increase in the weighted average gain from 15 cents to 19.8 cents.

These results are quite sensitive to the assumed inflation rate. To gain an impression of biases which would arise under more recent inflation rates, an inflation rate of 2 per cent per annum was assumed. In this case, gains to shareholders from the firm replacing a dollar of retentions with a dollar of debt would be 25.1, 15.0 or 29.1 cents depending, respectively, on whether real gains, real losses but nominal gains or nominal losses accrue. With unchanged weightings, the weighted-average gain would increase to 25.3 cents. The larger gain if real gains accrue is mainly because the benefits of the inflation-indexation of capital gains have fallen. The minor increase when nominal gains accrue arises because of a slightly different value of c.

The Debt/NE bias moves in the opposite direction. The explanation is as follows. In the absence of any capital gains tax, increasing debt by a dollar costs shareholders a stream of after-tax dividend payments of $i(1-\tau)(1-m)$ per annum which has a present value of $1-\tau$. The benefit is that the reduction of new equity issues by a dollar increases the value of old equity by a dollar. The overall capital gain is $\tau = 46$ cents. If nominal gains are taxed, shareholders still benefit from a capital gain of τ but this provides a net-of-tax capital gains of $\tau(1-c) = 35.6$ cents. Thus, the taxation of nominal gains tends to reduce the benefit of issuing debt relative to new equity. If instead real gains are taxed (real gains accrue), there is an additional cost in switching from new equity issues to debt. This is because of the loss of a stream of inflation deductions.

In Table 4.4 the overall weighted average gain to shareholders from replacing a dollar of new equity falls from 46.0 cents to 26.0 cents as a result of the introduction of the capital gains tax in 1986/87. This bias is also sensitive to inflation and increases as the inflation rate falls. If the assumed rate of inflation were 2 per cent per annum rather than 9.3 per cent, the gain to shareholders from a firm replacing a dollar of new equity with a dollar of debt would be 31.7 cents.

Financial policy perturbations has been analysed assuming that all shareholders are taxed at the average marginal rate. In practice in the years 1984/85 to 1986/87 shareholders were taxed at varying marginal rates which varied from 0 per cent (superannuation funds) to 61, 61 and 58.2 per cent in 1984/85, 1985/86 and 1986/87 respectively (the top marginal tax rates inclusive of the Medicare Levy). To put some bounds on financial policy biases, Table 4.5 examines the effects of perturbations if companies could solely be owned by nontaxpayers and if companies could solely be owned by those on the top marginal rate.

In 1986/87 there are no changes in financial policy biases relative to the previous two years if $m = 0$. Shareholders are nontaxpayers and are unaffected by the introduction of the capital gains tax.

The case where m is approximated by the top personal marginal tax rate is intriguing. If $m = 0.582$ and real gains accrue, the gain to shareholders from a firm issuing a dollar less new equity and retaining an additional dollar (RE/NE) is negative. This is because with the high rate of inflation in this year the real after-tax interest rate, $r' = -0.029 < 0$ and $c = 0.660 > m$. Appendix 2.1 explained how c can exceed m if the real after-tax interest rate is negative. This means that with a high enough weighting being given to real gains accruing, it is possible for new equity to be preferred to retentions if m is assumed to be the top personal marginal tax rate.

Perhaps the most intriguing result is the very large negative numbers in the final two rows of Table 4.5 when real gains accrue. These are not typographical errors. For example, the cost to shareholders from reducing new equity issues and increasing debt by a dollar is \$39.08 if real gains are expected to accrue. The reason for this extreme result is that the very high rate of inflation in 1986/87 together with the high top marginal tax rate makes $\phi = [i(1-m) - c\pi]/(1-c)$ very close to zero. Indeed, if π were 9.4 rather than 9.3 per cent per annum, ϕ would be negative. As $\phi \to 0^{+}$, the cost to shareholders of a firm reducing new equity issues or retentions and increasing debt by a dollar $\to \infty$. To see why, it is helpful to consider the opposite of experiment where a firm issues a dollar of new equity and lends the proceeds so net debt falls by a dollar. If $i(1-m) = c\pi$, a shareholder can borrow a dollar to purchase the dollar of new equity meeting the after-tax cost of interest with the stream of inflation deductions. Accordingly the net after-tax cost of funds is zero and the present value of the future dividend stream becomes infinite.

Table 4.5 Effects of Permanent Perturbations in Financial Policy as Function of Marginal Tax Rate of Shareholders $r = 0.05$, $a = 0.2$, $\pi = 0.093$

	m = 0				*Top Marginal Tax Rate*[a,b]			
	RG	*RLNG*	*NL*	*Wtd. Avg.*	*RG*	*RLNG*	*NL*	*Wtd. Avg.*
1984/85 and 1985/86[a]								
RE/NE	0.000	0.000	0.000	0.000	0.610	0.610	0.610	0.610
Debt/RE	0.460	0.460	0.460	0.460	-0.150	-0.150	-0.150	-0.150
Debt/NE	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460
1986/87[b]								
RE/NE	0.000	0.000	0.000	0.000	-0.078	0.582	0.110	0.044
Debt/RE	0.460	0.460	0.460	0.460	-38.999	-0.122	0.133	-23.372
Debt/NE	0.460	0.460	0.460	0.460	-39.077	0.460	0.243	-23.328

[a] The top marginal tax rate in 1984/85 and 1985/86 was 0.61. [b] The top marginal tax rate in 1986/87 was 0.582.

To summarise, provided *m* can be approximated by the average marginal tax rate of shareholders there are a number of general conclusions that can be made. There were tax biases favouring retentions relative to new equity and debt relative to both retentions and new equity prior to Australia's full imputation reform. Concerns about these were part of the reason for the reform. By itself, Australia's capital gains tax tended to reduce the tax bias favouring retentions relative to new equity which may have resulted in new and existing firms being taxed more neutrally. It is more difficult to assess the effects of the capital gains tax on debt/equity biases. Provided once more that *m* can be approximated by the average marginal tax rate of shareholders, the capital gains tax tended to increase the tax bias favouring debt relative to retentions but reduced the bias favouring debt relative to new issues.

These results are very sensitive to the assumed rate of m which suggests that there must be considerable uncertainty about financial policy biases which may have arisen at that time.[4] If m were approximated by the top marginal rate in 1986/87 and real gains were deemed certain to accrue, we have seen that new equity would be preferred to retentions. More generally, the combination of high rates of inflation and high marginal tax rates can lead to some extreme financial policy biases. These arise because of the indexation of capital gains but not of other forms of income. For example, there could have created an extreme pro-equity bias in firms where there was a significant prospect of real gains accruing.

4.4 CHANGES IN FINANCIAL POLICY BIASES: 1984/85 TO 1996/97

This section combines the analysis of chapter 2 and section 4.3 to analyse how financial policy biases are likely to have changed over time and, in particular, how they are likely to have been affected by the introduction of Australia's full imputation scheme. It is assumed throughout this section that m can be approximated by the average marginal tax rate of shareholders as given in Table 4.1.

Table 4.6 presents estimates of how the permanent perturbations in financial policy examined in Chapter 2 and section 4.3 affect shareholder wealth. In deriving these estimates it is assumed that 20 per cent of shares turn over each year, and that the real interest rate is 5 per cent per annum. The company tax rate, τ, and the inflation rate, π, are as given in Table 4.1. As previously, we provide a weighted average of gains assuming fairly arbitrary weightings of 0.6, 0.1 and 0.3 for real gains, real losses but nominal gains, and nominal losses respectively. This could be criticised on the grounds that in times of higher inflation, real losses but nominal gains are more likely to accrue but any attempt to take account of this seems similarly arbitrary.

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[4] This contrasts with conclusions about financial policy biases under full imputation discussed in chapter 2. There we saw that under current tax rates and levels of inflation which have occurred in recent years, incentives to replace *RUE* with debt or new equity, incentives to replace debt with new equity and incentives to pay franked dividends arise not only if m is approximated by the average marginal tax rate of final shareholders but also if it is approximated by the tax rate of superannuation funds or the top personal marginal tax rate.

The first row of Table 4.6 entitled RUE/NE shows the gain in cents of permanently replacing a dollar of new equity with a dollar of unfrankable earnings. Likewise, the second row entitled RUE/Debt measures the gain from permanently replacing a dollar of debt with a dollar of unfrankable earnings and so forth. The Table records five of the six perturbations considered in chapter 2. We omit the gain from replacing RFE with RUE as this switch is merely a matter of accounting and, in any case, firms paying dividends are compelled to pay them franked if they have positive franking account balances. The numbers are calculated using equations (2.16), (2.18), (2.19), (2.20), (2.21), (4.9), (4.10) and (4.11).

Table 4.6 Effects of Permanent Perturbations in Financial Policy for Companies Owned by Shareholders on the Average Marginal Rate*

$a = 0.2$, $r = 0.05$, m, π Varying

	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95	95/96	96/97
Full Imp													
RUE/NE				0.061	0.066	0.064	0.064	0.064	0.064	0.064	0.066	0.067	0.067
RUE/Debt				0.183	0.241	0.214	0.148	0.100	0.118	0.113	0.178	0.152	0.078
NE/RFE				0.621	0.349	0.371	0.377	0.377	0.377	0.276	0.264	0.310	0.310
NE/Debt				0.122	0.175	0.150	0.084	0.036	0.053	0.049	0.112	0.085	0.011
Debt/RFE				0.499	0.175	0.221	0.293	0.341	0.324	0.227	0.152	0.225	0.299
Classical													
RE/NE	0.300	0.310	0.062	0.061	0.066	0.064	0.064	0.064	0.064	0.064	0.066	0.067	0.067
Debt/RE	0.160	0.150	0.198	0.255	0.107	0.135	0.179	0.208	0.197	0.152	0.102	0.144	0.191
Debt/NE	0.460	0.460	0.260	0.315	0.173	0.198	0.243	0.272	0.262	0.216	0.168	0.211	0.258

*A key assumption is that when frankable earnings are retained the company does not issue franked bonus shares.

It is assumed as in chapter 2 that if franked earnings are retained, franked bonus shares are not issued. This assumption will be varied later in this section. In order to compare financial policy biases arising under full imputation with those which would have arisen had a classical company tax system been retained, the classical company tax system series is extended beyond 1986/87.

In all years since the introduction of full imputation, the greatest gain to shareholders appears to be from firms to paying franked dividends and issuing new equity instead. The second largest gain in all but two years is the from firms paying franked dividends and issuing debt instead. As has been discussed previously, dividend payout rates increased significantly after the full imputation reform probably because of these incentives. Throughout the period there have been incentives for firms to reduce debt and issue new equity instead although this incentive is very small in 1996/97 because of the low inflation rate in this year. For firms paying unfranked dividends, there are also incentives to retain unfrankable earnings to reduce debt. These have been highest in periods of higher inflation such as 1987/88 to 1990/91 and 1994/96 and 1995/96. These biases contrast with those favouring corporate debt in 1984/85 to 1986/87 when the classical company tax system was in place. As has been discussed previously, there is little evidence of a significant fall in debt/equity ratios following the full imputation reform. Part of the reason may be that some firms which have increased dividend payments as a result of incentives to pay franked dividends have (possibly because of transactions costs associated with issuing new equity) issued additional debt. Finally, there are incentives for firms to retain unfrankable earnings (refrain from paying unfranked dividends) ahead of issuing new equity.

As one of the objectives of the full imputation reform was to reduce financial policy biases, it is of interest to examine how these biases compare with those which would have arisen if a classical company tax system had been retained. The extension of the series for a classical company tax system to 1987/88 and subsequent years allows biases to be compared. It is assumed that if a classical company tax system were retained that inflation rates and tax rates would have been the same as under full imputation.

It is somewhat difficult to compare financial biases under full imputation with those which would have arisen under a classical company tax system. This is because there are two different forms of retained earnings with different tax consequences under full imputation but only a single form of retained earnings under a classical company tax system. Five pairs of perturbations are examined under full imputation but only three pairs under a classical company tax system. To make comparisons, it is helpful to distinguish three types of possible companies under full imputation. First, some firms (possibly including firms attempting to create a reservoir of franking credits) pay less than the maximum level of franked dividends. For them, at the margin, financial policy can be adjusted by altering NE, debt or RFE. Biases involving RUE are irrelevant. Second, some firms pay unfranked dividends. For them, at the margin, financial policy can be adjusted by altering NE, debt or RUE. Biases involving RFE are irrelevant. Thirdly, some firms may be paying the maximum level of franked dividends and no unfranked dividends. For them there will be an asymmetry in costs of adjusting retained earnings. Increasing retained earnings means retaining frankable earnings while decreasing retained earnings means retaining less unfrankable earnings. For them, all five biases will be relevant.

In 1996/97 the most powerful financial policy biases under full imputation are to ensure that franked dividends are distributed. This bias will be relevant for the majority of firms which are not paying unfranked dividends. The gains from reducing *RFE* and boosting new equity or debt by a dollar (31.0 or 29.9 cents respectively) are large relative to any of the financial policy biases which would have arisen under a classical company tax system. Apart from this gains under full imputation seem relatively small in 1996/97 and other years when inflation rates were low (e.g., 1991/92 to 1993/94). Whether full imputation has reduced the cost of financial policy biases or not seems to be very dependent on the costs associated with incentives to pay franked dividends. The most obvious potential cost is that this may lead firms to pay excessive levels of franked dividends and to incur unnecessary transactions costs in gaining replacement capital.

As was discussed in chapter 1, concerns about this potential bias led to the bonus share provision whereby firms can stream franking credits to shareholders by issuing franked bonus shares in lieu of dividends. This allows firms to pass franking credits to shareholders while retaining earnings. If the bonus share provision is adopted when firms retain frankable earnings, there is no bias between retained frankable earnings and new equity. Gains to shareholders from financial policy perturbations would be as shown in Table 4.7.

In Table 4.7 figures are identical to those in Table 4.6 with the exception of the third, fourth and fifth rows. The biases favouring the retention of unfrankable earnings identified in Table 4.6 remain but any biases favouring the distribution of frankable earnings are much reduced. If when firms retained frankable earnings, they passed imputation credits to shareholders by issuing franked bonus shares, Table 4.7 would appear to suggest that full imputation had gone some way to reducing financial policy biases especially at low rates of inflation.

Table 4.7 Effects of Permanent Perturbations in Financial Policy for Companies Owned by Shareholders on the Average Marginal Rate Making Use of Bonus Share Provision

	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95	95/96	96/97
Full Imp													
RUE/NE				0.061	0.066	0.064	0.064	0.064	0.064	0.064	0.066	0.067	0.067
RUE/Debt				0.183	0.241	0.214	0.148	0.100	0.118	0.113	0.178	0.152	0.078
*NE/RFE**				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NE/Debt				0.122	0.175	0.150	0.084	0.036	0.053	0.049	0.112	0.085	0.011
RFE/Debt*				0.122	0.175	0.150	0.084	0.036	0.053	0.049	0.112	0.085	0.011
Classical													
RE/NE	0.300	0.310	0.062	0.061	0.066	0.064	0.064	0.064	0.064	0.064	0.066	0.067	0.067
Debt/RE	0.160	0.150	0.198	0.255	0.107	0.135	0.179	0.208	0.197	0.152	0.102	0.144	0.191
Debt/NE	0.460	0.460	0.260	0.315	0.173	0.198	0.243	0.272	0.262	0.216	0.168	0.211	0.258

* A key assumption is that whenever a firm retains frankable earnings it issues franked bonus shares.

There appear to be no publicly available statistics on the extent to which firms make use of the bonus share provision. However, a casual reading of company reports suggests that this provision is used very infrequently. Moreover, this does not appear to be because firms are all paying out the maximum level of franked dividends making the provision redundant. Evidence was provided in section 2.7 that imputation credits being claimed by individual shareholders were too low for all companies to be issuing the maximum possible level of franked dividends or franked bonus shares. The reason why this provision is not more widely used appears to be a puzzle. One possible reason is that shareholders may be as clear-sighted as our model assumes. Some higher-marginal-tax rate shareholders (on tax rates above the company tax rate) may object to issues of franked bonus shares because they result in the shareholders being required to pay additional tax immediately without receiving any dividends. The benefit of these bonus shares in reducing capital gains taxes when shares are sold may not be widely understood. In addition, corporate managers who gain much of their remuneration through stock options may have weak incentives to promote issues of bonus shares.

The intention behind the bonus share provision was to allow companies to pass franking credits to shareholders without paying dividends to minimise incentives for excessive distribution. If this provision worked well, the figures in Table 4.7 would suggest that the full imputation reform was likely to have reduced financial policy biases especially at low rates of inflation. Given that bonus shares appear to be issued very infrequently it seems impossible to be confident that the full imputation reform has reduced financial policy biases. However, more work is required in attempting to ascertain the likely efficiency costs of firms paying excessive levels of dividends before very much can be said about this issue.

4.5 THE CLASSICAL COMPANY TAX SYSTEM AND THE COST OF CAPITAL

Appendix 4.1 derives a formal expression for the cost of capital under Australia's former classical company tax system. As in chapter 3 it is assumed that firms have a fixed ratio of debt to capital stock. It is also assumed that the firm is paying dividends in all periods so marginal equity investment is financed by the retention of profits. This is a new-view or trapped-equity model of the corporation.

Even if a new view model was relevant for most firms under Australia's former classical company tax system which were able to finance investment by retaining profits, it will not be relevant for new firms which raise equity finance by issuing new equity. Thus, our model in which firms finance marginal equity investment by the retention of profits is likely to have been applicable to at most a subset of firms.

Assuming a constant rate of inflation of all prices, a constant nominal interest rate, constant rates of k and Z, and a constant ratio of debt to capital stock, b, Appendix 4.1 shows that the cost of capital for a firm paying dividends in the year in which investment takes place and in all future years becomes

$$\rho = \frac{pF'}{q} - \delta = \frac{\left(1-\tau(k+Z)\right)\left(\phi - \pi + \delta(1+\pi)\right) + b\left(i(1-\tau) - \phi\right)}{(1+\pi)(1-\tau)} - \delta \qquad (4.12)$$

This is the expression for the cost of capital derived in Appendix 3.1 for firms under full imputation which do not pay the maximum level of franked dividends where the constraint on the maximum level of franked dividends that can be paid is assumed to be slack. The reason that cost of capital expressions are the same is that in both cases marginal equity investment is financed by the retention of profits. Under a classical company tax system, the opportunity cost of a dollar of equity investment to shareholders is $1-m$ and shareholders get the fraction $1-m$ of the net-of-company tax proceeds. Under full imputation in this case, the opportunity cost of a dollar of equity investment is $(1-m)/(1-\tau)$ and shareholders get the fraction $(1-m)/(1-\tau)$ of the net-of-company tax proceeds. As dividend taxes have the same proportionate effect on the benefits and opportunity cost of an investment, they do not affect investment decisions. This insight goes back to King (1974*a* and *b*).

If the cost of capital were unchanged as a result of the full imputation reform, the reform would appear to have some unattractive features. The reform would have reduced the cost of issuing new equity which would have reduced the bias against new and rapidly-expanding companies. However, it would have reduced the government's tax collections by providing a lump-sum gain to shareholders without affecting investment incentives for mature dividend-paying firms. As replacement taxes will almost inevitably impose deadweight losses, this is likely to be inefficient. Any investment efficiency gains from the full imputation reform would be limited to reducing investment biases for new and rapidly-expanding firms which are unable to finance marginal investment by the retention of profits. At the same time as discussed in section 2.5, the large bulk of shares owned by individuals appear to be held by those on higher incomes and higher marginal tax rates. It would also appear difficult to defend a lump-sum reduction in tax on shareholders on equity grounds.

The intention behind Australia's full imputation reform was to go further than merely giving dividend relief and to provide incentives for full distribution of frankable earnings. If, as we have argued, full distribution is still optimal from the point of the large majority of domestic final shareholders, the reform can have important effects in compressing biases between different forms of investment that companies can undertake as was analysed in chapter 3. This suggests that it is important that the financial bias we have identified favouring the distribution of frankable earnings (or, equivalently, franked bonus shares) *not* be eliminated.

It is helpful to consider the cost of capital for widely-held companies under the three idealised depreciation regimes considered in section 3.2. In each of these regimes (expensing, nominal economic depreciation, and real economic depreciation) it is assumed that there is no investment allowance so $k = 0$. The values of k+Z are as given in Table 3.1. Substituting these into (4.12) yields the cost of capital expressions provided in Table 4.8. To provide some brief intuition for these expressions, assume that there is no inflation.

With expensing, income on a marginal investment is effectively untaxed at the company level just as such an investment was at the personal level when undertaken by an unincorporated enterprise. If the investment is fully equity financed (ie., $b = 0$), the first expression in Table 4.8 becomes $\rho = r(1-m)/(1-c)$. This is because the only layer of tax on retention-financed investment is as a result of the capital gains tax. In equilibrium the after-tax return on corporate investment, $\rho(1-c)$ must equal the opportunity cost of investment, $r(1-m)$. Suppose instead that $b = 1-\tau$. This avoids the need for any equity finance. Each dollar of capital expenditure reduces a firm's tax liability by τ requiring further finance of $1-\tau$ which is met solely by debt. If investment is fully debt financed, a marginal investment needs to just cover the after-tax cost of interest, $r(1-\tau)$. As investment income is effectively untaxed at the company level, the cost of capital is equal to the after-tax interest rate, $\rho = r(1-\tau)$.

Table 4.8 Cost of Capital with Classical Company Tax System

	Cost of Capital
Expensing	$(1-\frac{b}{1-\tau})\left[\frac{r(1-m)-\frac{\pi(m-c(1-\alpha))}{1+\pi}}{1-c}\right]+\frac{b}{1-\tau}\left[r(1-\tau)-\frac{\pi\tau}{1+\pi}\right]$
Nominal Economic Depreciation	$(1-b)\frac{r(1-m)-\frac{\pi}{1+\pi}(m-\tau(1-c)-c(1-\alpha))}{(1-c)(1-\tau)}+br$
Real Economic Depreciation	$(1-b)\left[\frac{r(1-m)-\frac{\pi(m-c(1-\alpha))}{1+\pi}}{(1-c)(1-\tau)}\right]+b\left[r-\frac{\tau\pi}{(1-\tau)(1+\pi)}\right]$

In the absence of inflation the cost of capital would clearly be the same whether nominal or real economic depreciation were deductible as there would be no difference between the depreciation schemes in this case. If investment is fully equity financed, $\rho = r(1-m)/(1-\tau)(1-c)$. In this case corporate investment is being double taxed first at the company level and second as a result of the capital gains tax. The after-tax return on corporate investment $\rho(1-\tau)(1-c)$ is equal to the opportunity-cost of investment, $r(1-m)$. If instead investment is fully debt financed, $\rho = r$ because income would be taxed on the same basis as interest is deducted.

4.6 CHANGES IN THE COST OF CAPITAL BETWEEN 1984/85 AND 1996/97

This section provides estimates of costs of capital in Australia over the period 1984/85 to 1996/97. Estimates are presented for three possible cases. The first is the case discussed in the text of chapter 3 which will be referred to as the 'base case' where from 1987/88 onwards companies pay franked dividends, issue new equity and pay no unfranked dividends. The second is where from 1987/88 companies pay unfranked dividends in all periods. As discussed in Appendix 3.1 this implies costs of capital will be the same for all possible investments. Finally, we consider the classical company tax system. This last case shows how costs of capital would have changed if other tax changes had taken place but Australia's classical company tax system had been retained. As noted earlier, it would also be relevant in some case under full imputation if there are firms for which the constraint on the maximum level of franked dividends that can be paid is not binding.

Incentives to invest will have changed through time for a number of reasons. These include changes to tax rates and inflation rates as well as more general reforms to the tax base. To isolate the effects of the more general reforms to the tax base it is helpful to start by considering how costs of capital would have changed through time if tax rates on shareholders and inflation had remain constant. Table 4.9 provides estimates of the cost of capital assuming m remains constant at 33 cents in the dollar and that r and π remain constant at rates of 5.0 and 2.0 per cent per annum respectively. It is also assumed that $b = 0.4$ and 20 per cent of shares are sold each year. Given that tax rules have not changed between 1996/97 and 1997/98, this makes estimates of costs of capital in 1996/97 identical to those presented for 1997/98 in Table A3.3.1 in Appendix 3.1 so, for simplicity, 1997/98 costs of capital are omitted. For companies, the cost of capital will depend on whether real gains, real losses but nominal gains or nominal losses are expected to accrue. As in section 4.4 the three possible cases are combined by assuming weightings of 0.6, 0.1 and 0.3 respectively.

For unincorporated enterprises, under these settings there would have been a significant rise in the cost of capital for all types of equipment in 1985/86 because of the termination of the 18 per cent investment allowance. There would have been a more minor rise for most types of equipment in 1987/88 because of the termination of 5/3 accelerated depreciation. In the same year the cost of capital for buildings would have risen as a result of the reduction in the rate of deductible allowance. The cost of capital for all types of equipment would have fallen in 1991/92 because of the more-accelerated depreciation provisions announced in the 'One Nation' Statement. There would have been a further temporary fall in 1992/93 and 1993/94 because of the temporary investment allowance. Over the period the cost of capital for trading stock would have remained constant at 5.0 per cent (ie., the assumed real interest rate) because the full nominal economic income from trading stock is taxable. The cost of capital for unincorporated R&D would have remained constant at the real after-tax interest rate of 2.7 per cent because for unincorporated enterprises such expenditure can be expensed.

Table 4.9 Costs of Capital, $r = 0.05$, $a = 0.2$, $m = 0.33$, $\pi = 0.02$, $b = 0.4$

	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95	95/96	96/97
UEs													
3-Yr Eqpt	0.0	4.6	4.6	4.6	4.6	4.6	4.6	2.7	0.1	0.1	2.7	2.7	2.7
5-Yr Eqpt	1.2	4.1	4.1	4.6	4.6	4.6	4.6	3.9	2.3	2.3	3.9	3.9	3.9
10-Yr Eqpt	2.3	3.8	3.8	4.5	4.5	4.5	4.5	3.9	3.0	3.0	3.9	3.9	3.9
20-Yr Eqpt	2.4	3.3	3.3	4.4	4.4	4.4	4.4	3.7	3.2	3.2	3.7	3.7	3.7
30-Yr Eqpt	2.5	3.2	3.2	4.4	4.4	4.4	4.4	3.4	3.1	3.1	3.4	3.4	3.4
Trdg Stock	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
3-Yr R&D	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
10-Yr R&D	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Buildings	3.8	3.8	3.8	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Comps: Base Case													
3-Yr Eqpt				4.6	4.6	4.6	4.6	4.1	3.6	3.6	4.1	4.1	4.1
5-Yr Eqpt				4.6	4.6	4.6	4.6	4.4	4.1	4.1	4.4	4.4	4.4
10-Yr Eqpt				4.6	4.6	4.6	4.6	4.4	4.2	4.2	4.4	4.4	4.4
20-Yr Eqpt				4.6	4.6	4.6	4.6	4.4	4.3	4.3	4.4	4.4	4.4
30-Yr Eqpt				4.5	4.5	4.5	4.5	4.3	4.2	4.2	4.3	4.3	4.3
Trdg Stock				4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
3-Yr R&D				1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.8
10-Yr R&D				3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.7
Buildings				4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Comps: UDs													
All				4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Comps: Classical													
3-Yr Eqpt	-2.6	5.4	6.6	6.8	6.0	6.0	6.0	2.9	-0.6	0.5	3.2	3.0	3.0
5-Yr Eqpt	-0.4	4.5	5.5	6.8	6.0	6.0	6.0	4.8	2.7	3.1	4.7	4.8	4.8
10-Yr Eqpt	1.3	4.0	4.9	6.7	5.9	5.9	5.9	4.9	3.7	3.8	4.8	4.8	4.8
20-Yr Eqpt	1.6	3.1	3.9	6.5	5.8	5.8	5.8	4.5	3.8	3.9	4.5	4.5	4.5
30-Yr Eqpt	1.7	2.9	3.6	6.4	5.7	5.7	5.7	4.2	3.6	3.8	4.2	4.2	4.2
Trdg Stock	6.2	6.0	7.4	7.8	6.6	6.6	6.6	6.6	6.6	6.1	6.1	6.4	6.4
3-Yr R&D	2.1	-20.4	-20.6	-23.8	-14.4	-14.4	-14.4	-14.4	-14.4	-10.1	-10.1	-12.1	-4.6
10-Yr R&D	2.1	-5.5	-5.7	-7.0	-3.2	-3.2	-3.2	-3.2	-3.2	-1.5	-1.5	-2.3	0.4
Buildings	4.0	3.9	5.0	6.0	5.4	5.4	5.4	5.4	5.4	5.2	5.2	5.3	5.3

For companies in 1984/85 (taxed under the classical company tax system) it is interesting to note that the cost of capital for forms of investment other than trading stock and buildings would have been *lower* than for unincorporated enterprises despite the company tax rate being greater than the assumed marginal tax rate of shareholders. At first sight this might seem counterintuitive. There are two reasons.

First, companies were partly debt financed. Second, the combined effect of the 18 per cent investment allowance and 5/3 accelerated depreciation was, under these assumptions, to make $k + Z > 1$ for all forms of equipment investment. For R&D capital expenditure could be expensed so $k + Z = 1$.

Suppose $k + Z = 1$ and corporate investment is fully equity financed ($b = 0$). In 1984/85 there was no capital gains tax. Substituting $b = c = 0$, into the cost of capital expression in Table 4.7 for the case of expensing, the cost of capital becomes $\rho = r(1-m) - m\pi/(1+\pi)$. This is the same expression as the cost of capital for an unincorporated enterprise when $k + Z = 1$ (i.e., with expensing) recorded in Table 3.1. In both cases for a marginal investment the value of the deduction is equal to the present value of future taxes so a marginal investment is effectively untaxed. In this case, the cost of capital equals shareholders' real after-tax interest rate, $\rho = r' = r(1-m) - m\pi/(1+\pi) = 2.7\%$.

Now suppose, however, that $b = 1 - \tau$. Substituting this into the expression in Table 4.7, the cost of capital for corporate investment becomes $\rho = r(1-\tau) - \tau\pi/(1+\pi)$ or 1.8%. The after-tax interest rate for a company is less than the real opportunity cost of funds to shareholders if $m < \tau$ and there is no capital gains tax. This means that the cost of capital for corporate debt-financed investment is less than that for equity financed investment. As b increases from 0 to 0.54, the cost of capital for corporate investment falls from 2.7 to 1.8 per cent. For R&D in 1984/85 capital expenditure could be expensed. The estimated cost of capital for corporate R&D is 2.1 per cent under the assumption that $b = 0.4$. Thus, partial debt financing is one reason why the cost of capital could be lower for corporate enterprises than for unincorporated enterprises in 1984/85.

The second reason is the present value of capital deductions. As was noted earlier, in 1984/85 $k + Z > 1$ for all forms of equipment investment. Even if corporate investment were fully equity financed, the cost of capital would be lower for companies than unincorporated enterprises in this case because the present value of tax collections on a marginal investment is negative. The pre-tax rate of return for these investments will be *less* than post-tax rates of return by an amount which would increase with the statutory rate at which income is taxed. Investment in companies was taxed at the statutory rate of 46 per cent whereas investment in unincorporated enterprises on our assumptions was taxed at 33 per cent. The higher company tax rate tends to *reduce* the cost of capital for companies relative to unincorporated enterprises.[5] The combined effect of $k+Z$ being greater than 1 and corporate investment being assumed to be partly debt financed means that costs of capital for many forms investment are estimated to be significantly lower for companies than for unincorporated enterprises in 1984/85.

For trading stock nominal economic income is fully taxed under our assumptions. From Table 3.1 this means that the cost of capital for an unincorporated enterprise will be r. Table 4.8 shows that this would also be the cost of capital for corporate investment under a classical company tax system if $b=1$. If on the other hand $b=0$, the cost of capital for companies would be $\rho = r(1-m)/(1-\tau)$. This exceeds r if, as is assumed to be the case in 1984/85, $m<\tau$. The higher cost of capital for corporate than unincorporated investment in trading stock in 1984/85 arises because it is assumed that $m<\tau$ and $b<1$.

Now consider changes in corporate costs of capital over the period under these settings. Many changes reflect alterations in the tax base which were described for unincorporated enterprises. In 1985/86 the cost of capital for investment in corporate equipment rises markedly because of the termination of the investment allowance. Changes in corporate costs of capital tend to be even larger than for unincorporated costs of capital because of the higher company tax rate. The cost of capital for corporate R&D fell dramatically in this year especially for short-lived investment because of the 150 per cent deduction. Increases in the cost of capital in 1986/87 for most forms of investment were a consequence of the introduction of the capital gains tax.

In 1987/88 when full imputation was introduced, the effect on costs of capital depend on the type of company being analysed. For base case companies (paying the maximum level of franked dividends and no unfranked dividends), Table 4.9 records falls in costs of capital for all forms of investment other than R&D. This is despite lower capital allowances for buildings and the termination of 5/3 accelerated depreciation. For base case companies, the most noticeable changes in later years are

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[5] It is worth noting that under a traditional view model of a classical company tax system, these effects would be magnified. The extreme case is when the company is assumed to pay 100 per cent of its after-tax profits as dividends in each period. In this case under a traditional view model, corporate profits would be taxed at the rate $\tau + m(1-\tau)$ which would be 63.8 per cent assuming m is 0.33. This case would be equivalent to a new-view model in which c is zero and the rate of company tax is 63.8 per cent.

to equipment as a result of the introduction of more accelerated depreciation provisions in 1991/92 and the temporary investment allowance in 1992/93 and to R&D in 1996/97 as a result of the scaling back of the deduction for corporate R&D from 150 to 125 per cent. However, changes in costs of capital for corporate R&D in 1996/97 appear small compared to those that took place in 1987/88. For example, for 3-year R&D the cost of capital rose from -20.6% to 1.5% in 1987/88 but from 1.5% to only 2.8% in 1996/97. This suggests that full imputation may have had a much bigger effect on incentives for widely-held companies to invest in R&D than the much more controversial scaling back of the rate of deduction.

For companies paying unfranked dividends in all periods costs of capital for all types of equipment would have changed with the introduction of full imputation and remained constant at 4.4 per cent in subsequent years under these settings.

These estimates are sensitive to assumed values of b. As discussed in section 4.4 both base case companies and companies paying unfranked dividends have tax incentives to reduce debt. For base case companies, $\partial \rho / \partial b = \alpha c \pi / (1-m)(1+\pi)$. If real gains accrue, $c = 0.299$ under the assumption of Table 4.8 which means that if b were 0.0 rather than 0.4, costs of capital would fall by approximately 0.2 percentage points (assuming a 0.6 weighting for real gains). For firms paying unfranked dividends $\partial \rho / \partial b = (i - \phi) / (1+\pi)$. Under our assumptions on weightings, costs of capital would fall by approximately 0.4 percentage points if b were 0.0. Under the classical company tax system costs would have risen by amounts which depend on τ. The maximum effect is in 1987/88 when the company tax rate was highest and costs of capital would have risen by 1.8 percentage points.

Table 4.10 explores the effects of allowing m and π to vary through time as recorded in Table 4.1. Important influences on costs of capital because of changes in the income tax base have been discussed above and include the elimination of the 18 per cent investment allowance in 1984/85, the introduction of the 150 per cent deduction for corporate R&D in 1985/86, the introduction of the capital gains tax which affects corporate costs of capital in 1986/87, termination of 5/3 accelerated depreciation and the introduction of full imputation in 1987/88, the introduction of more accelerated depreciation provisions in 1991/92 and the temporary investment allowance in 1992/93 and 1993/94. The effects of these changes are qualitatively the same as was discussed when explaining Table 4.9.

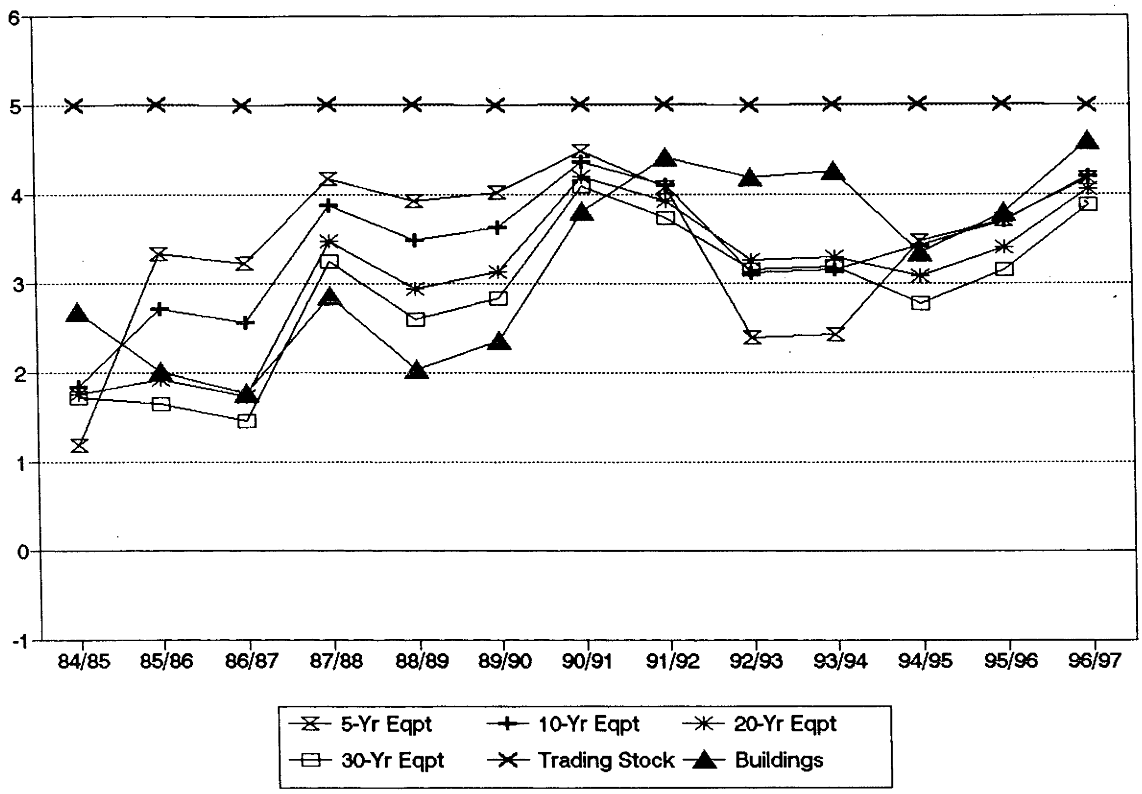
At the same time inflation rose from 6.6 per cent in 1984/85 to 9.3 per cent in 1986/87 and has since fallen to 0.3 per cent. This fall in inflation has tended to increase costs of capital over time for assets other than trading stock (especially for longer-lived assets and R&D). Increases in the assumed rate of m tend to reduce costs of capital except for unincorporated R&D and to increase the spread of costs of capital.

Table 4.10 Costs of Capital: $r = 0.05$, $a = 0.2$, $b = 0.4$, m and π Varying

	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95	95/96	96/97
UEs													
3-Yr Eqpt	0.4	4.2	4.2	4.3	4.1	4.2	4.5	3.1	0.3	0.4	1.9	2.4	3.3
5-Yr Eqpt	1.2	3.3	3.2	4.2	3.9	4.0	4.5	4.1	2.4	2.4	3.5	3.7	4.2
10-Yr Eqpt	1.8	2.7	2.6	3.9	3.5	3.6	4.4	4.1	3.1	3.1	3.4	3.7	4.2
20-Yr Eqpt	1.8	1.9	1.7	3.5	2.9	3.1	4.2	3.9	3.3	3.3	3.1	3.4	4.1
30-Yr Eqpt	1.7	1.7	1.5	3.2	2.6	2.8	4.1	3.7	3.1	3.2	2.8	3.1	3.9
Trdg Stock	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
3-Yr R&D	1.6	1.0	0.8	1.6	0.8	1.1	2.4	3.1	2.8	2.9	1.9	2.4	3.3
10-Yr R&D	1.6	1.0	0.8	1.6	0.8	1.1	2.4	3.1	2.8	2.9	1.9	2.4	3.3
Buildings	2.7	2.0	1.8	2.9	2.0	2.4	3.8	4.4	4.2	4.2	3.3	3.8	4.6
Comps: Base Case													
3-Yr Eqpt				3.9	3.5	3.7	4.4	4.4	3.7	3.7	3.6	3.9	4.5
5-Yr Eqpt				3.9	3.4	3.6	4.4	4.6	4.1	4.2	3.9	4.2	4.8
10-Yr Eqpt				3.8	3.4	3.5	4.4	4.6	4.3	4.3	3.9	4.2	4.8
20-Yr Eqpt				3.7	3.3	3.4	4.3	4.6	4.3	4.4	3.9	4.2	4.7
30-Yr Eqpt				3.7	3.2	3.4	4.3	4.5	4.3	4.3	3.8	4.1	4.7
Trdg Stock				4.1	3.7	3.8	4.5	4.8	4.7	4.7	4.3	4.5	5.0
3-Yr R&D				1.0	0.1	0.5	1.4	1.9	1.6	1.7	1.0	1.2	3.2
10-Yr R&D				2.5	1.9	2.2	3.1	3.5	3.3	3.3	2.7	3.0	4.1
Buildings				3.6	3.1	3.3	4.3	4.7	4.5	4.6	3.9	4.3	4.9
Comps: UDs													
All				3.6	3.1	3.3	4.2	4.6	4.4	4.4	3.9	4.1	4.7
Comps: Classical													
3-Yr Eqpt	-2.1	5.7	6.7	7.3	5.4	5.7	6.0	3.2	-0.6	0.6	2.4	2.7	3.6
5-Yr Eqpt	-0.6	4.0	4.7	6.9	5.1	5.4	5.9	5.0	2.7	3.1	4.3	4.6	5.1
10-Yr Eqpt	0.7	2.8	3.4	6.1	4.6	4.9	5.8	5.1	3.7	3.9	4.2	4.6	5.1
20-Yr Eqpt	0.5	1.3	1.7	5.2	3.9	4.2	5.5	4.8	3.9	4.0	3.9	4.2	4.9
30-Yr Eqpt	0.5	0.8	1.1	4.7	3.6	3.8	5.4	4.4	3.7	3.9	3.5	3.9	4.7
Trdg Stock	7.0	7.1	8.4	9.0	6.6	6.9	6.8	6.6	6.7	6.1	6.1	6.4	6.3
3-Yr R&D	0.3	-22.1	-22.5	-25.3	-15.7	-15.8	-14.7	-14.2	-14.4	-10.0	-10.7	-12.4	-4.0
10-Yr R&D	0.3	-7.2	-7.6	-8.5	-4.6	-4.6	-3.5	-3.0	-3.2	-1.4	-2.1	-2.6	0.9
Buildings	2.4	1.5	2.1	3.8	2.9	3.2	5.0	5.8	5.5	5.3	4.3	4.9	5.8

Figure 4.1 examines how the cost of capital for unincorporated enterprises has changed over time. Six types of investment are considered: 5-year, 10-year, 20-year and 30-year equipment, trading stock and buildings.

Figure 4.1 Costs of Capital: Unincorporated Enterprises
$r = 0.05$, m and π Varying

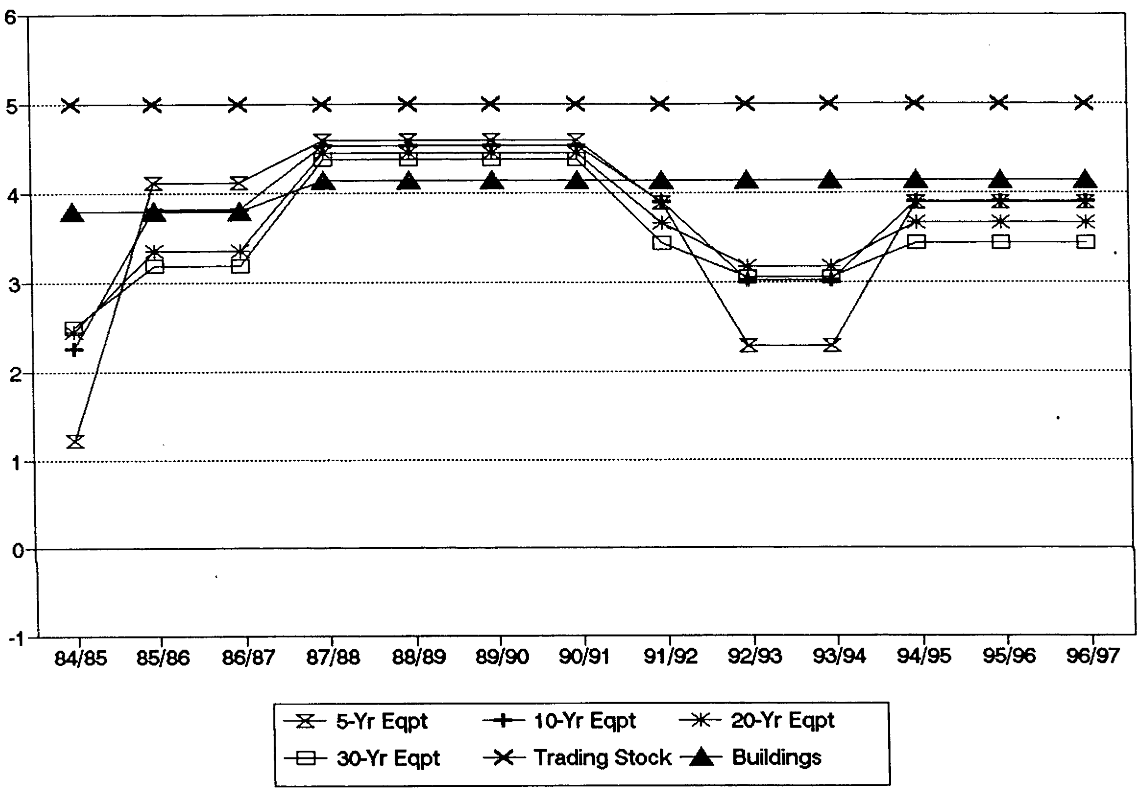


For buildings there was a minor increase in the cost of capital in 1987/88 as a consequence of the reduction in allowed deductions. This was almost reversed in the following year by increases in m and the assumed inflation rate. Over the next few years the cost of capital for buildings rose as a consequence of reductions in inflation. The reduction of the cost of capital in 1994/95 and 1995/96 was the consequence of higher inflation. For equipment the major changes are attributable to the changes in capital write-off provisions which we have discussed and especially over the period from 1988/89 to 1990/91 the reduction in inflation. Over the period, there has been some rise in costs of capital for both equipment and buildings and some narrowing in differences in costs of capital. Inter-asset investment biases for unincorporated enterprises appear smaller than those at the beginning of the period although they are probably larger than was the case in 1990/91.

Reductions in inflation are an important part of the reason for reductions in inter-asset biases. To isolate the effect of changes in the tax base, Figure 4.2 presents estimates of costs of capital for unincorporated enterprises assuming a constant marginal tax rate of 33 per cent and constant inflation of 2 per cent per annum.

Figure 4.2 Costs of Capital: Unincorporated Enterprises

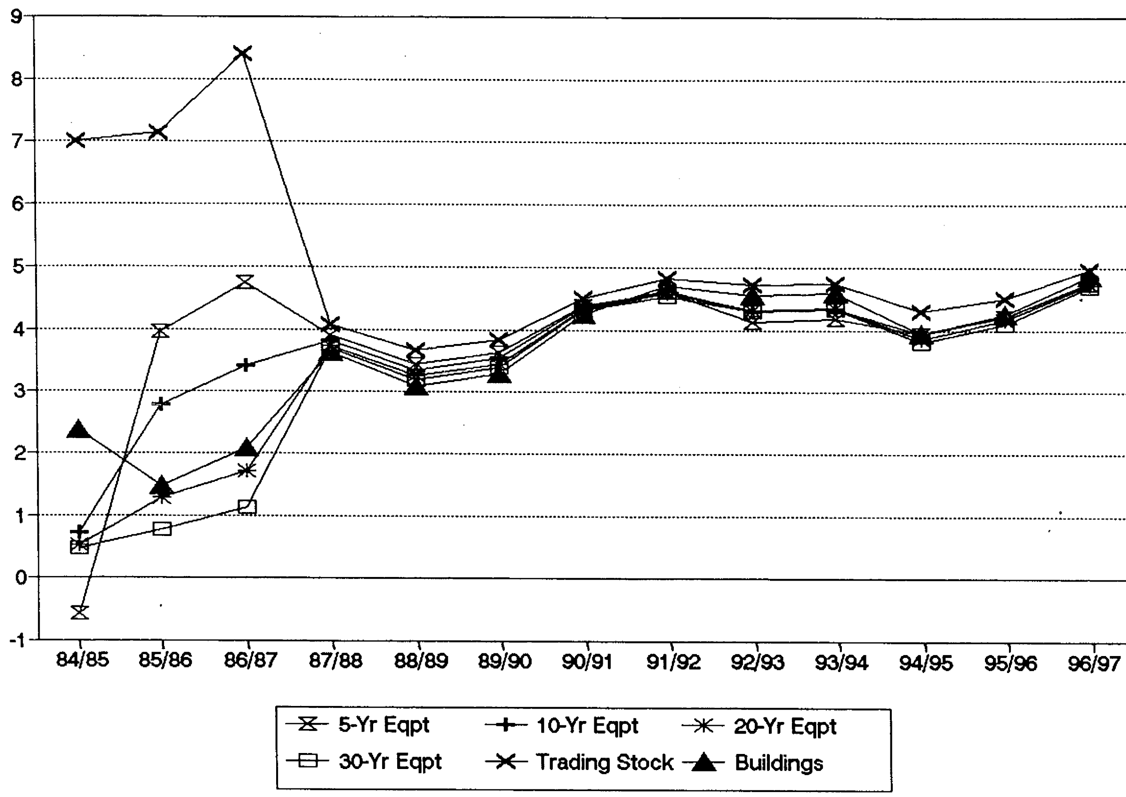
$r = 0.05$, $m = 0.33$, $\pi = 0.02$



Under these assumptions inter-asset biases would appear to have been minimised in the period 1987/88 to 1990/91 after 5/3 depreciation had been abolished and before the introduction of the more accelerated system of depreciation in February 1992. Figure 4.2 makes clear that the reductions in the spread of unincorporated costs of capital over the period 1988/89 to 1990/91 and over the period 1994/95 to 1996/97 are attributable to reductions in inflation and (for the first period) reductions in the assumed rate of *m*.

Figure 4.3 presents data on costs of capital for different types of corporate investment assuming that from the introduction of full imputation the companies have been base case companies.

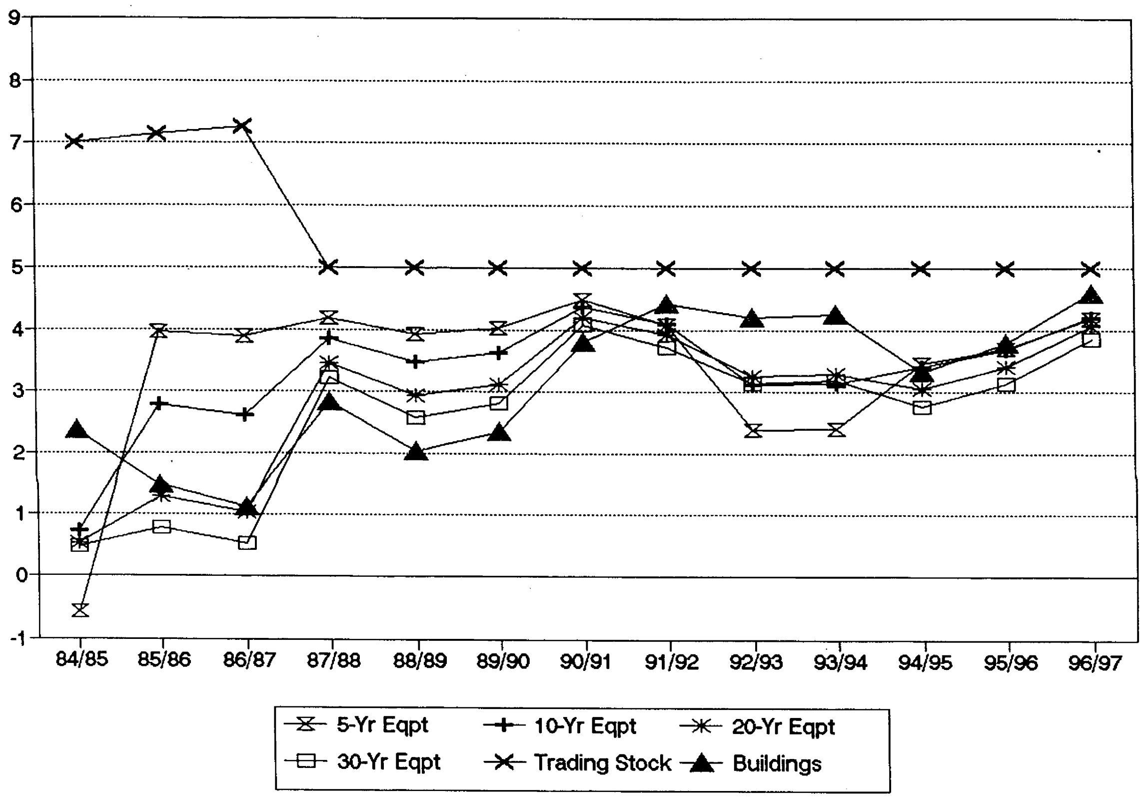
Figure 4.3 Costs of Capital: Companies (Base Case)
$r = 0.05$, m, π Varying, $a = 0.2$, $b = 0.4$



The most striking feature of this diagram is the very marked compression in costs of capital from 1987/88 onwards. Inter-asset biases are much reduced by the introduction of full imputation. Changes in costs of capital since 1987/88 are qualitatively similar to those that arose for unincorporated enterprises. Inter-asset biases were largest in 1992/93 and 1993/94 when the 10 per cent investment allowance was available.

An important reason why full imputation has reduced the spread of corporate costs of capital is the way in which the capital gains tax can claw back the benefits of tax preferences available at the company level as was analysed in chapter 3. To isolate this effect, Figure 4.4 examines how costs of capital would have changed if there had been no capital gains tax ($a = 0.0$). There would have been a reduction in the spread of costs of capital in this case as well although it appears far less dramatic than in Figure 4.3 ($a = 0.2$). In this case the reason for the reduction in the spread of costs of capital in 1987/88 is because corporate income ends up being taxed at the average marginal tax rate of shareholders rather than the higher company tax rate. From 1987/88 onwards, this graph is identical to Figure 4.1.

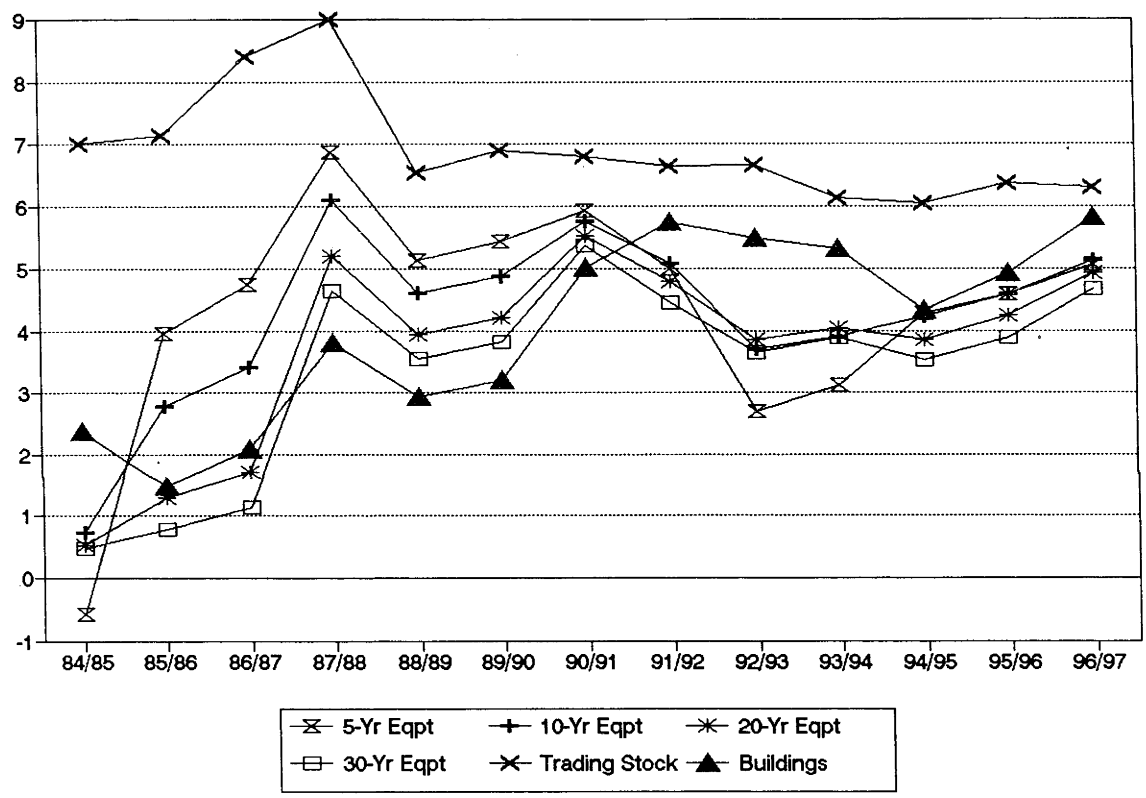
Figure 4.4 Costs of Capital: Companies (Base Case)
$r = 0.05$, m, π Varying, $a = 0.0$, $b = 0.4$



Reforms to the tax base, and reductions in inflation and the company tax rate would have led to some reduction in inter-asset biases even if a classical company tax system had been retained. Figure 4.5 analyses costs of capital under this assumption. The large reduction in inter-asset biases in 1988/89 is largely due to the fall in the company tax rate from 49 per cent to 39 per cent. Reductions between 1988/89 and 1990/91 are mainly due to reduced inflation. While there would have been some reduction in inter-asset biases even under a classical company tax system over the period, the reduction would have been much smaller than under full imputation. In 1996/97 under full imputation costs of capital for these assets are estimated to have been in the range 4.5 to 5.0 per cent whereas under a classical company tax system costs of capital would have been in the range 3.6 to 6.3 per cent. The full imputation scheme appears to have a very important part of the reason why inter-asset biases for companies have been reduced.

Figure 4.5 Costs of Capital: Companies (Classical)

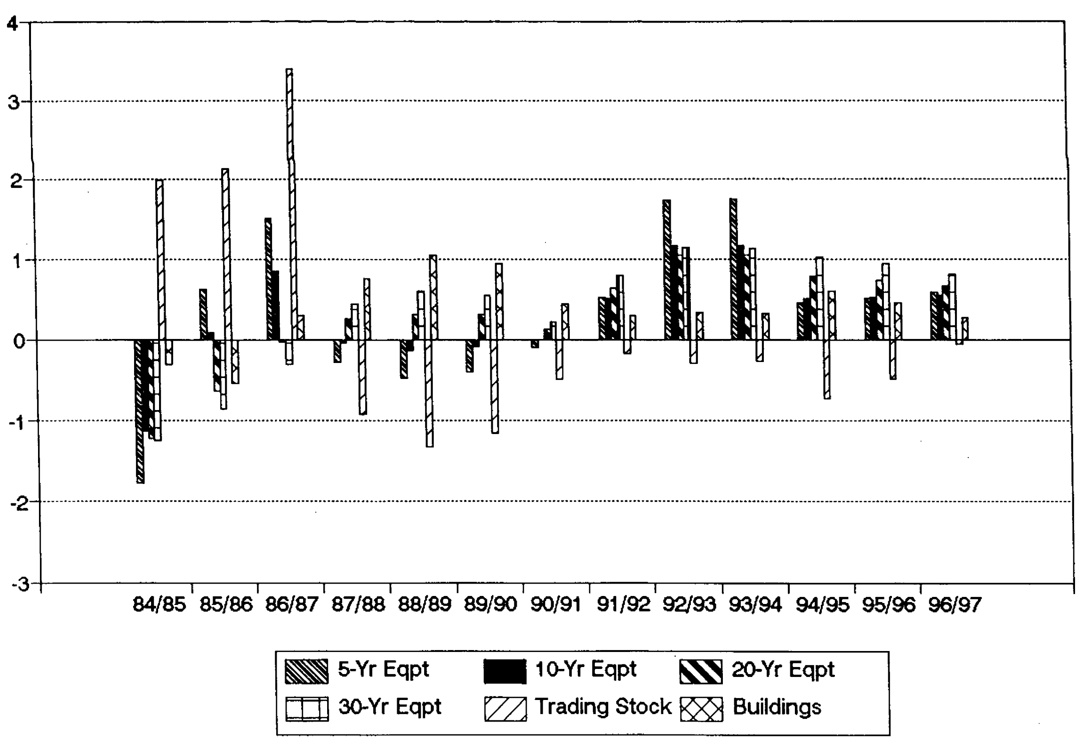
r = 0.05, m, π Varying, a = 0.2, b = 0.4



Figures 4.6 and 4.7 analyse data in a way which allows intersectoral biases to be examined. Figure 4.6 shows differences between costs of capital for 5-year, 10-year, 20-year and 30-year equipment, trading stock and buildings for unincorporated enterprises and for base-case companies. In the absence of any capital gains tax, there would be no differences between corporate and unincorporated costs of capital. However, in practice there can be large differences caused by the way in which the capital gains tax claws back tax preferences from companies but not unincorporated

enterprises. It is of interest that in 1990/91 the year in which inter-asset biases appear smallest, intersectoral biases also appear smallest. This is the combined effect of the absence of substantially accelerated depreciation or any investment allowance in this year and only a moderate (3.4 per cent) rate of inflation. In 1991/92 these biases increased despite a lower inflation rate because of the introduction of a more accelerated depreciation regime. The biases increased further in 1992/93 because of the introduction of a 10 per cent investment allowance. In 1992/93 and 1993/94 the cost of capital for corporate investment in 5-year equipment exceeded that for unincorporated investment by approximately 1.7 percentage points. With the termination of the investment allowance in 1994/95 intersectoral biases became much smaller and were all less than one percentage point except for 30-year equipment in 1994/95.

Figure 4.6 Differences in Costs of Capital:
Corporate (Base Case) - Unincorporated, $r = 0.05$, $a = 0.2$, $b = 0.4$, m, π Varying

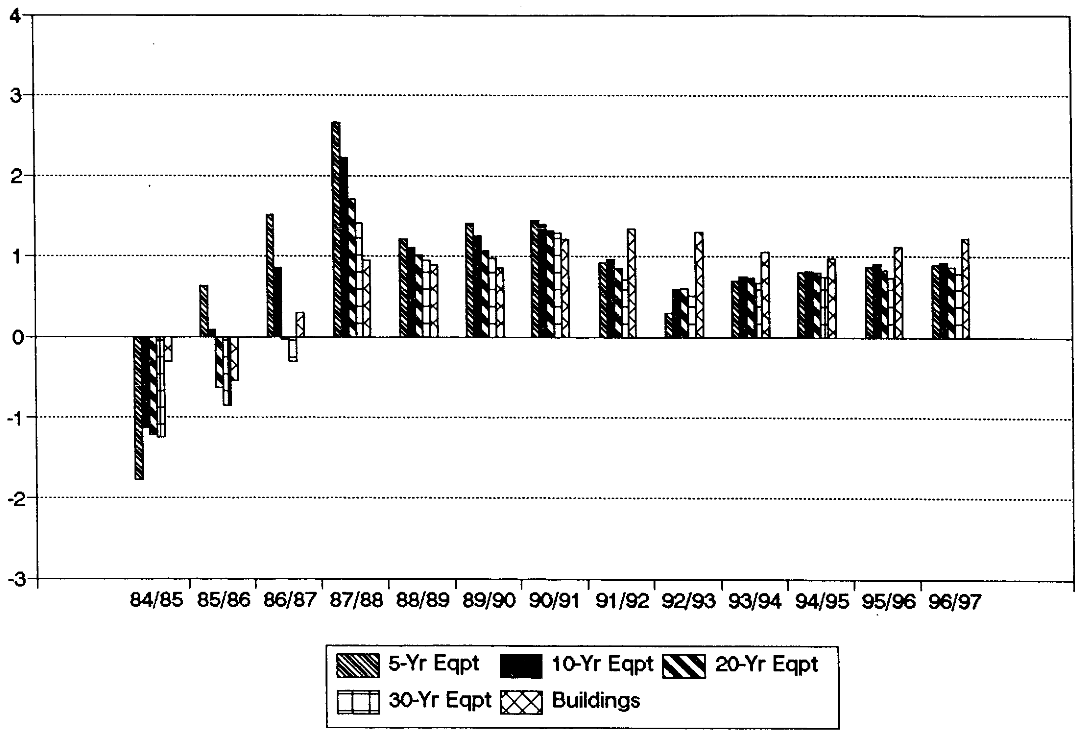


One puzzle that emerges from the results is that our model appears incapable of explaining the change in the corporate sector's share of fixed capital stock reported in Table 1.1. The combined effects of accelerated depreciation, the 18 per cent investment allowance, inflation and partial debt finance led to estimated costs of capital being lower in 1984/85 for companies than unincorporated enterprises for each of the four forms of equipment investment analysed and for buildings. By 1994/95 the direction of all of these biases was reversed. It seems difficult to explain why the corporate sector's share of real net capital stock rose rather than fell over the period. It should be noted that this disturbing feature of the model would not be removed by assuming a traditional view model of a classical company tax system for the reasons given in footnote 5. Such a model would tend to magnify tax biases favouring corporate investment in 1984/85.

One possible explanation is that firms place much less emphasis on accelerated depreciation provisions and investment allowances than our model suggests. A possible reason may be that many projects do not involve a one-off investment but a stream of investment over many years. If a firm is being established or being expanded to invest in a new area, it may often not be reasonable for it to expect current investment allowances or accelerated depreciation provisions will continue into the future. Given the frequency with which these provisions have been changed, they may have a smaller effect on capital flows between companies and other enterprises than our model predicts because firms have little confidence on them remaining throughout the life of many projects. In 1984/85 this may have been particularly important for the 18 per cent investment allowance which had a legislated termination date of 30 June 1985. On the other hand, temporary provisions encourage firms to bring forward purchases of capital goods and can potentially have a larger effect on investment than permanent provisions. To help explain the data, it is necessary to assume that the former effect dominates.

To examine the effects of the full imputation reform Figure 4.7 shows how differences between corporate and unincorporated costs of capital would have changed over time if a classical company tax had been retained. By comparing Figures 4.6 and 4.7 it is clear that full imputation does not necessarily reduce intersectoral biases relative to a classical company tax system. In particular, in 1992/93 and 1993/94 intersectoral biases for all forms of equipment investment appear to be smaller under a classical company tax system than those under full imputation. However, under current tax settings intersectoral biases appear to be generally smaller than would have arisen under a classical company tax system. In 1996/97 it appears that for none of the six forms of investment analysed is it the case that intersectoral biases are larger under full imputation than under a classical company tax system.

Figure 4.7 Differences in Costs of Capital
Corporate (Classical) - Unincorporated, $r = 0.05$, m, π Varying, $a = 0.2$



4.7 Summary and Concluding Comments

This chapter has extended our analysis of financial biases and the cost of capital to consider how financial and investment distortions are likely to have changed over time and especially the effects of the full imputation reform. There are many important qualifications one can raise about our analysis especially our failure to analyse the effects of varying marginal tax rates across different suppliers of capital in a given year and the fact that important classes of shareholders (foreigners and Australian companies) are ignored. However, the question of how changes to the tax system have affected financial policy and investment incentives seems an important question and our analysis provides at least a step to analysing these issues.

Treating all shareholders as being taxed at a single marginal rate seems an even stronger assumption when analysing Australia's former classical company tax system than when analysing full imputation because under the former tax system and under the inflation rates occurring at that time the direction of a number of biases seem to depend on the assumed value of m. If we approximate m by the average marginal tax rate of shareholders, it appears that full imputation has reversed a number of biases that arose under Australia's former classical company tax system. However, there seems to be little evidence that these biases have fallen as a result of full imputation. In particular, there is a strong bias favouring the payment of franked dividends which may potentially cause firms to make excessive payments of dividends and incur unnecessarily high transactions costs if they issue new equity to replace the capital. Australia's provision allowing the franking of bonus shares was designed to avoid this problem but this provision appears to be little used. Further research is required to determine the reasons. Despite some possible costs associated with firms paying excessive levels of franked dividends, it is far from clear that this bias should be removed. Indeed, this bias is a critical feature of Australia's full imputation provisions. Without this feature, the full imputation reform may have involved a reduction in tax revenue without having much on reducing investment biases.

Income-tax-base broadening measures such as the termination of investment allowances and movements from more-accelerated to less-accelerated systems of depreciation appear to have had important effects in reducing inter-asset biases for unincorporated enterprises. Movements to reintroduce investment allowances and to move back to more-accelerated depreciation provisions have had the opposite effect. Inter-asset biases have also been reduced by reductions in inflation. Measures which reduce inter-asset biases for unincorporated enterprises generally also reduce these biases for the base case companies we have focussed on in this thesis. The full imputation reform itself has had an extremely powerful effect in reducing inter-asset biases for these companies and the effects of these other measures have been small in comparison. Reductions in company tax are clawed back at the shareholder level. For companies paying unfranked dividends in all periods, the effects of the full imputation reform are more dramatic still. Inter-asset biases have been eliminated completely.

If one compares unincorporated enterprises and base case companies, it would appear that inter-firm biases have also generally fallen over time. However, it seems unclear whether full imputation involves greater or smaller intersectoral biases than would apply under a classical company tax system. In particular, tax preferences such as the 10 per cent investment allowance available in 1992/93 and 1993/94 can cause intersectoral biases to increase. This is because the benefits of such measures are partially clawed back from companies as a result of full imputation and capital gains taxes. This suggests that the full imputation scheme is relatively inflexible. If the government wishes to provide tax incentives to encourage specific forms of investment, a major consequence may be to introduce intersectoral biases because unincorporated enterprises are able to capture the full benefits of these incentives but they are clawed back from companies by additional taxes on shareholders. Biases regarding whether investment is undertaken by companies or unincorporated enterprises would have been eliminated entirely if (as in New Zealand) the company tax rate and top personal marginal tax rate were aligned and if there had been no capital gains tax on shares. By levying a tax on gains in shares, the government has reintroduced a bias against corporate investment.

A final empirical concern with our analysis stems from the fact that when account is taken of detailed provisions of the tax code and rates of inflation, corporate costs of capital for equipment investment and buildings appear to have increased over time relative to unincorporated costs of capital since 1984/85. Over the same period, the corporate sectors share of net real capital stock has appeared to climb steadily. Our analysis fails to explain this trend.

APPENDIX 4.1 THE COST OF CAPITAL WITH A CLASSICAL COMPANY TAX SYSTEM

In calculating the cost of capital assume once more that debt is a fixed proportion of capital stock as in equation (3.1) and that the firm chooses I, D and V^N to maximise its initial value. Substituting (2.9) into (4.4) and using (2.10), (3.1) and (4.2), the Lagrangian for the firm's optimisation problem becomes

$$L = \sum_{t=1}^{\infty} \frac{1}{\prod_{s=1}^{t}(1+\phi_s)} \left(\frac{1-m_t}{1-c_t} D_t - V_t^N + \lambda_t^1 [(1-\tau_t) p_t F(K_{t-1}) - q_t I_t (1-\tau_t k_t) + q_t b_t K_t \right.$$

$$- (1+i_t(1-\tau_t)) b_{t-1} q_{t-1} K_{t-1} + \tau_t \sum_{s=-\infty}^{t} \Delta_{s,t-s} q_s I_s + V_t^N - D_t \;]$$

$$\left. + \lambda_t^2 (I_t + (1-\delta) K_{t-1} - K_t) + \lambda_t^3 D_t + \lambda_t^4 V_t^N \right)$$

where λ_t^3 and λ_t^4 are inequality constraints on dividends and new equity issues respectively.

The first-order conditions imply

$$\lambda_{t+1}^1 \big((1-\tau_{t+1}) p_{t+1} F'(K_t) - (1+i_{t+1}(1-\tau_{t+1})) b_t q_t \big) + (1+\phi_{t+1}) (\lambda_t^1 q_t b_t - \lambda_t^2) - \lambda_{t+1}^2 (1-\delta) = 0 \quad (4.11)$$

$$\lambda_t^1 \big(q_t (1-\tau_t (k_t + \Delta_{t,0}) \big) - q_t \left(\frac{\tau_{t+1} \lambda_{t+1}^1 \Delta_{t,1}}{1+\phi_{t+1}} + \frac{\tau_{t+2} \lambda_{t+2}^1 \Delta_{t,2}}{(1+\phi_{t+1})(1+\phi_{t+2})} + \ldots \right) - \lambda_t^2 = 0 \quad (4.12)$$

$$\frac{1-m_t}{1-c_t} - \lambda_t^1 + \lambda_t^3 = 0 \quad (4.13)$$

$$-1 + \lambda_t^1 + \lambda_t^4 = 0 \quad (4.14)$$

For a mature firm paying dividends in year t and subsequent years, $\lambda_t^3 = \lambda_{t+1}^3 = \ldots 0$. This means that

$$\lambda_t^1 = (1-m_t)/(1-c_t), \; \forall t \quad (4.15)$$

Substituting (4.15) into (4.12) yields

$$\lambda_t^2 = \left(\frac{1-m_t}{1-c_t} \right) q_t (1 - \tau_t k_t - \Omega_t) \quad (4.16)$$

where
$$\Omega_t = \sum_{u=0}^{\infty}\left(\frac{\Delta_{t,u}\tau_{t+u}\left(\frac{1-m_{t+u}}{1-c_{t+u}}\right)}{\prod_{s=t+1}^{t+u}(1+\phi_s)}\right) \tag{4.17}$$

Substituting into (4.11) yields

$$\frac{\left(\frac{1-m_{t+1}}{1-c_{t+1}}\right)(1-\tau_{t+1})p_{t+1}F'(K_{t-1})}{q_t} = \left[\frac{1-m_t}{1-c_t}(1-\tau_t k_t)-\Omega_t\right](1+\phi_{t+1}) - \frac{q_{t+1}}{q_t}\left(\frac{1-m_{t+1}}{1-c_{t+1}}(1-\tau_{t+1}k_{t+1})-\Omega_{t+1}\right)(1-\delta)$$
$$+b_t\left((1-\tau_{t+1})i_{t+1}-\phi_{t+1}\right)\left(\frac{1-m_{t+1}}{1-c_{t+1}}\right) \tag{4.18}$$

If r, π, i, m, c, τ, b, k and Z are constant through time and $p_t = p(1+\pi)^t$ and $q_t = q(1+\pi)^t$,

$$\rho = \frac{pF'}{q} - \delta = \frac{\left(1-\tau(k+Z)\right)\left(\phi-\pi+\delta(1+\pi)\right)+b\left(i(1-\tau)-\phi\right)}{(1+\pi)(1-\tau)} - \delta \tag{4.19}$$

where Z is the present value of depreciation deductions,

$$Z = \sum_{u=0}^{\infty}\frac{\Delta_{t,u}}{(1+\phi)^u} \tag{4.20}$$

CHAPTER 5: FUTURE DIRECTIONS

This thesis has attempted to modify some important international studies to analyse corporate financial policy and investment decisions under Australian tax settings. To focus on key issues in as simple as possible a setting, it has made a number of simplifying assumptions. It has abstracted from risk and uncertainty, considered only firms which are in a taxpaying position, abstracted from any transactions costs of issuing different securities, considered only firms which are owned by Australian shareholders and treated all shareholders as being taxed at a uniform rate, *m*.

Because of the simplicity of the model, there is considerable scope for further modification. The thesis is only a very partial move towards analysing corporate financial policy and investment decisions and should be thought of as a first step in a much wider research program.

It would be desirable to extend this analysis in a number of directions. This involves both a theoretical and an empirical side. Important theoretical extensions include the following:

- *allowing for foreign shareholders and international equity flows.* Allowing for outflows of foreign capital from Australia is straightforward. Dividends received by Australian companies from a wide list of 'comparably-taxed' countries including Canada, France, Japan, New Zealand, the United Kingdom and the United States are exempt. This means that the cost of capital net of foreign taxes would be the same as for the case of expensing analysed in Chapter 3. As regards inflows of capital, it may also not be too difficult to modify the analysis of the thesis to allow for foreign portfolio investors who will normally be taxed on dividends from Australia but be able to claim credits for withholding taxes. It is more complex to modify the analysis to allow for the case of foreign direct investors where incentives to invest will often depend on complex interactions between Australian and foreign tax systems.
- *allowing for companies in a tax-loss position.* This would be a minor amendment which is easily incorporated within the general analytical frameword of this thesis.
- *extending the model to allow for a q theory of investment.* Following the work of Summers (1981) and Abel (1979 and 1982), it has become common to consider how taxes can affect investment decisions in a model which allows for convex adjustment costs. There have been no Australian studies which consider the effects of taxation in this framework. Our model could be modified to allow for convex adjustment costs and hence allow these types of models to be considered in an

Australian context. This would also appear to be a relatively straightforward modification of the analysis in this thesis.

- *allowing for uncertainty.* A number of authors have examined the effects of taxes on the return from risky assets. For example, Gordon (1985) argues that when uncertainty is taken into account, taxation of corporate income can leave incentives to invest little changed because of the risk-spreading effects of the tax. Bulow and Summers (1984) argue that this conclusion can be overturned if the prices of capital goods are uncertain and depreciation allowances are set ex ante. It would be of interest to extend the model to incorporate uncertainty.
- *extending the model to allow for multiple classes of shareholder.* It would be of interest to consider multiple classes of shareholder perhaps by modifying the work of Brennan (1971) and Gordon and Bradford (1980).
- *allowing for transactions costs in issuing new equity.* Our model has suggested that it will normally be optimal for widely-held companies to have a policy of paying out the maximum level of franked dividends or franked bonus shares. One reason for firms not doing so is transactions costs. It would be of interest to attempt to modify the model to allow for transactions costs of issuing new equity.

Important empirical studies stemming from this study include the following:

- an examination of the question of why firms issue debt when new equity appears to be tax preferred. This study seems to be of particular interest because of the way in which the financial policy bias is in the opposite direction of the United States bias which has had much more attention.
- an examination of why firms pay unfranked dividends when there appear to be preferable alternatives including reducing debt or lending.
- an examination of why some firms appear to retain substantial levels of frankable earnings when paying franked dividends or issuing franked bonus shares appears to be preferred.

While the thesis has been a small step in analysing the effects of Australian tax provisions on corporate financial policy and investment decisions, this appears to be an important research area which has received much too little analysis in Australia. The thesis is a start at analysing these issues in an Australian context. Within its very simplified framework, the thesis has come to conclusions on corporate financial policy which differ from those of previous Australian studies. It has also developed expression for the cost of capital which take account of taxes on both companies and shareholders and allow the value of the firm to be set endogenously. It is hoped that further work will expand our understanding of issues raised in the thesis.

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