13 April 1999

Dr Alan Preston
Secretary
Review of Business Taxation
Department of the Treasury
Parkes Place
CANBERRA ACT 2600

Dear Dr Preston

The Securities Institute of Australia commends Mr John Ralph AO, and his Secretariat for their comprehensive review of business taxation in Australia. We believe it offers a unique opportunity to redress some of the inequities of the current regime and to remove impediments to Australia's economic growth and global competitiveness.

The Institute wishes to comment on some aspects of the taxation of capital gains, specifically the option of extending rollover relief to scrip-for-scrip transactions in mergers and company demergers.

Rollover relief would encourage savings and investment

The Institute considers that the potential application of capital gains tax to scrip-for-scrip mergers and takeovers distorts the market for corporate control and hinders economic efficiency.

Under the current regime shareholders who accept the offer of shares in a scrip-for-scrip transaction are deemed to have realised a capital gain, notwithstanding that they receive no cash and their investments continue through a swapped shareholding. This often results in their decision being influenced more by the potential crystallisation of a tax liability than the merits of the proposal. This was a significant problem in St George/Advance Bank, Westpac/Bank of Melbourne and AMP/GIO, and is known to have prevented many other proposals from proceeding.

In the absence of rollover relief, those relying on share income, especially self-funded retirees, face a reduction in their future income stream by virtue of paying the capital gains tax.

Taxation of unrealised capital gains is also a concern for shareholders who have decided not to accept the offer, but whose shares are compulsorily acquired in a minority mop up.

We believe rollover relief should be extended to any unrealised gains in mergers and acquisitions, whether they are pure scrip-for-scrip transactions or transactions involving part cash and part scrip. In the latter case, rollover relief would apply to the scrip component of the transaction and the capital gains tax cost base could be divided appropriately between the two components.

Rollover relief would be more equitable for all shareholders

The Institute believes the current regime is inequitable in its treatment of some shareholders.

Where there is a scrip-for-scrip merger or takeover, the shareholders in one of the companies (usually the target company) are disadvantaged by being deemed to have realised a capital gain for tax purposes. However, the shareholders in the other company (usually the acquiring company) are not regarded as having disposed of their shares and therefore incur no liability.

The Institute believes it is illogical to treat one group of shareholders more favourably than the other simply because their company has been selected as the remaining company.

Rollover relief would boost Australia's economic growth

The Institute believes the lack of rollover relief for scrip-for-scrip mergers and takeovers discourages the efficient allocation of assets.

In a comparison of the treatment of capital gains in a number of major overseas jurisdictions, the Review of Business Taxation second information paper `An International Perspective' found it to be an area where `other countries provide more generous treatment than does Australia'. In particular, the paper found rollover relief for scrip-for-scrip transactions to be a standard approach in the United Kingdom, the United States, Canada, Ireland, Japan and Sweden, and stated that `this mechanism tends to encourage corporate reorganisation, as well as mergers and takeovers'.

This is supported in the study by Professor Philip Brown and Dr Raymond da Silva Rosa[1], of the University of Western Australia, of data gathered from 1986 to 1996, which shows that in Australia the value of takeovers relative to ASX market capitalisation and average takeover premiums fell sharply during the recession and has not recovered. A recent study by Ernst and Young[2] showed that although the total figures for 1997 would suggest that merger and takeover activity was booming in Australia, these figures were distorted by several one-off privatisations and that the underlying trend was one of more modest growth. The following statistics show that merger and takeover activity in Australia lags markedly behind the United Kingdom and the United States.

	Value of Transactions			Market Cap			Transactions / Mkt Cap		
yr end Dec	US US$b	UK US$b	Aust A$b	US US$b (Dom. coys)	UK US$b (Dom. coys)	Aust A$b (Dom. coys)	US	UK	Aust
1997	597.0	67.7	8.4	10,617.6	2,068.2	453.9	8.4%	4.9%	1.9%
1998	1,222.0	87.1	12.5	12,796.0	2,298.0	453.9	14.3%	5.7%	2.7%

[1] "Measuring Long-run Sharemarket Performance: The Impact of Survivorship Bias, Returns Asymmetry, and Firm Size" by Philip Brown and Raymond da Silva Rosa, The University of Western Australia.

[2] Mergers and Acquisitions Index: Looking Out for Opportunities (1998)

Sources:
- Transaction Values: Corporate Adviser Securities Data
  (criteria of transactions covered: total value of public acquisitions announced during the particular calendar year)
- Market Capitalisations (based on domestic companies only):
  - ASX
  - FIBV (for overseas stock exchanges) ie. London and NYSE/Nasdaq

Many factors contribute to Australia's comparatively low level of activity, including litigation risk and the competition policy. However, we believe the lack of rollover relief has a significant effect on transaction costs and is usually pivotal in determining whether or not to proceed with a bid. By comparison, other jurisdictions look more attractive to potential bidders.

Rollover relief would attract capital

As a capital importing economy Australia competes with other jurisdictions for investment capital to enable business growth to provide the jobs necessary for our economic well being. The lack of rollover relief inhibits potential mergers and acquisitions, especially by overseas bidders, as the cost of the transaction is made greater by the immediate crystallisation of capital gains tax liability for shareholders in the target company. This makes the deal less attractive, and as a result, Australia often misses out on potential investments.

The application of a capital gains tax to unrealised gains in mergers and acquisitions is particularly damaging to high-growth sectors of the economy on which Australia's long-term future growth depends. High growth technology companies go through a number of phases during their development and it is often useful for these companies to achieve economies of scale by merging. However, under the current regime this may not be a viable option because of the lack of rollover relief. The inability to take this `next step up' may lead to these companies stagnating or moving offshore to a more favourable tax environment.

For reasons of neutrality and equity, it is important for rollover relief to be available in a takeover situation, regardless of whether the bidder is a domestic entity or a foreign entity. Otherwise bids by foreign entities will be severely discouraged, damaging our capital markets. Appropriate mechanisms could ensure capital gains tax is recovered by the revenue upon disposal of the shares involved.

Rollover relief would encourage capital reorganisation

The Institute believes the current regime inhibits business diversification through spin-offs, divestitures and equity carve-outs. In the absence of rollover relief, the potential crystallisation of capital gains tax results in the continuation of an organisational structure which is no longer suited to the efficient operation of the business.

There have been no significant company demergers in Australia in recent history. By way of contrast, this activity is prevalent in the United States and the United Kingdom, where more favourable tax regimes encourage structural reorganisation to enable each business to concentrate on its core competencies (Hewlett-

Packard and RJR Nabisco in the United States have recently announced spin-offs). Spin-off businesses have been shown to outperform the average share market performance[3].

Reorganisations would require some allocation of the cost base and we believe that a pro rata allocation could be determined by the company involved on a reasonable basis, subject to judicial review.

Revenue impact of rollover relief

Following our preliminary submission to the Treasurer in February 1998, the Institute commissioned Access Economics to construct two models to assess the potential impact on Commonwealth Government taxation revenue of extending the existing capital gains tax rollover relief provisions to scrip-for-scrip mergers and company demergers.

Based on reasonable assumptions and an introduction date of 1 July 2000, the report found that rollover relief would result in a small cost to the revenue in the first few years, but a net gain to the revenue over time as the relief leads to increased merger and demerger activity.

We enclose a copy of that report.

Transitional Issues

In order to avoid problems in the financial markets, we believe the recommended changes should take effect from the date they are announced, rather than delayed to coincide with other changes to Australia's tax regime. If this does not occur, many transactions may be put on hold until the implementation date, affecting government revenues and causing a severe downturn in corporate finance activities. This would damage economic activity generally.

Conclusion

The Institute recommends the extension of capital gains tax rollover relief to scrip-for-scrip mergers and company demergers in the belief that this will lead to greater economic growth and global competitiveness.

For practicality, the models prepared by Access Economics are confined to Australian publicly listed companies. However, we believe there is nothing to prevent rollover relief being extended to takeovers, mergers and demergers of listed trusts and widely-held trusts, as well as to foreign companies bidding for or merging with Australian entities, provided a mechanism is put in place to ensure Australia receives the appropriate capital gains tax upon ultimate disposal of the shares. There is no reason in principle why rollover relief should not ultimately also be extended to private companies and trusts.

Yours sincerely

[3] The McKinsey Quarterly 1999 Number 1: "Breaking Up is Good to Do", Patricia L Anslinger, Steven J Klepper, and Somu Subramaniam

Alison Lansley FSIA
Chairman, Markets Policy Group

The Revenue Impact of Capital Gains Tax Rollover Relief for Share-Swap Mergers and Demergers

Prepared for:

Securities Institute of Australia

Prepared by:

Access Economics

January 1999

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Executive summary

Rollover relief issues

The Australian taxation system currently provides specific rollover relief from capital gains taxation (CGT) in a range of circumstances.

Some of the existing rollover provisions attempt to overcome potential **economic inefficiencies** that would result from the crystallisation of a CGT liability. A well-known feature of capital gains taxation levied on a realisation basis is that it tends to lock in capital gains. This distortion is attributable to the fact that investors with accumulated capital gains may not realise those gains in order to defer the capital gains tax. In the case of business organisation, the potential crystallisation of a CGT liability may result in the continuation of an organisational structure that is no longer suited to the efficient operation of the business. Rollover provisions, such as those covering the transfer of the assets of a partnership to a wholly-owned company and those covering demutualisations by insurance organisations, help to overcome such inefficiencies.

Some of the existing rollover provisions are based on the concept of **continuity of underlying ownership of assets**. In some circumstances, the tax laws would, in the absence of rollover provisions, regard an event as involving a disposal of an asset even though the true ownership of the relevant asset had not changed. An example is the transfer of the assets of a partnership to a wholly-owned company. Rollover provisions help to prevent such anomalies.

There are also **strong practical reasons** for many of the current CGT rollover provisions. A realisation basis for assessing capital gains reduces the potential for a tax liability to arise when there is no cash to pay that liability.

While the current CGT rollover provisions cover a variety of transactions they are not uniform in their treatment of transactions. In their application to public companies two areas, in particular, stand out as areas where the rollover provisions could be extended. They are share-swap mergers and company demergers.

A share-swap merger is a purchase by an acquiring company of shares in a target company, for which all or part of the consideration paid for the shares of the target company are shares of the acquiring company. **There are clear potential economic inefficiencies in the current CGT treatment of share-swap mergers to the extent that potential CGT liabilities prevent mergers from proceeding. In addition, the current CGT treatment can lead to a CGT liability even though the transactions may not involve cash with which the tax could be paid.**

For the purposes of this report, a demerger is the splitting of a conglomerate company into 2 or more parts where shares in the conglomerate are exchanged for shares in the demerged companies in proportion to each shareholder's proportional interest in the conglomerate. As with share-swap mergers, **the current CGT treatment of company demergers can lead to clear economic inefficiencies and, again, there could be a CGT liability even though the transactions are unlikely to involve cash with which the tax could be paid. In this case there would also be no change in the beneficial ownership of underlying assets.**

Comparison with other rollover relief provisions and the rationales for those provisions suggest that the current treatment of share-swap mergers and company demergers is anomalous; it is also out of step with the treatment of such transactions in many other countries. As recognised in the recent paper by the Review of Business Taxation, *An International Perspective*, many countries provide rollover relief:

> *A second key feature of the taxation of capital gains is the extent to which rollover relief is available for business assets and for so called 'scrip-for-scrip' transactions. This is the standard approach in Canada, Ireland, Japan, Sweden, the United States and the United Kingdom. Conditions typically apply but these are generally not burdensome. This type of relief assists and potentially encourages group restructures, mergers and takeovers. Of course, such relief is less important in the numerous countries which exempt gains on the disposal of shares under certain conditions. (page 82)*

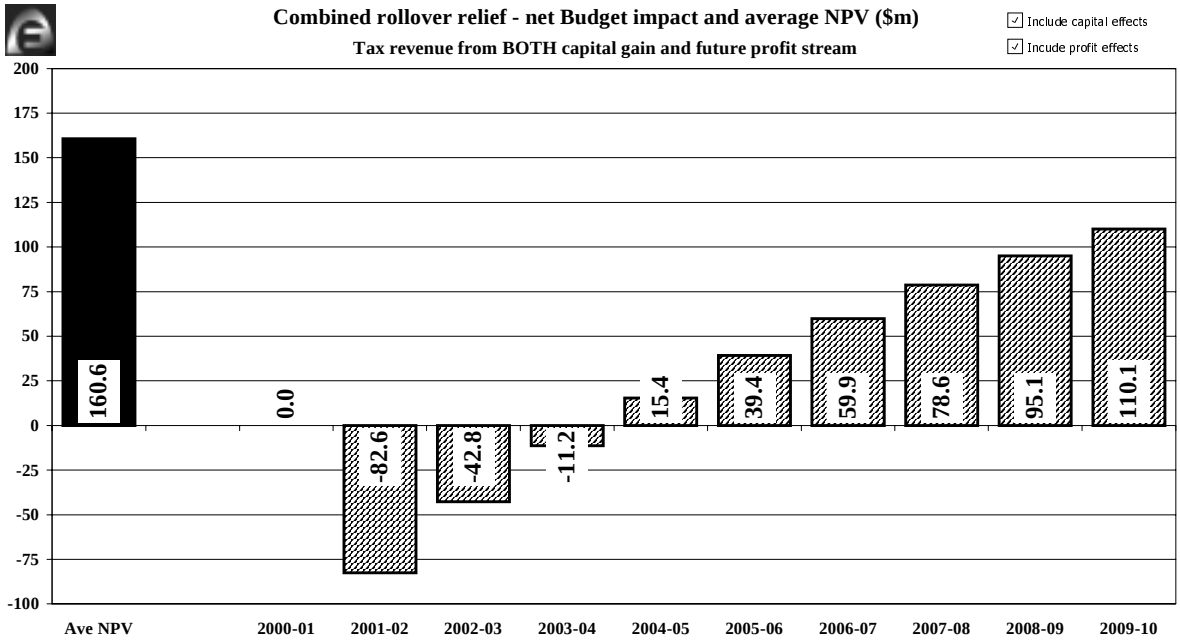
Modelling results

It is in this context that the Securities Institute of Australia asked Access Economics to construct two models to assess the potential impact on Commonwealth Government taxation revenue of extending the existing CGT rollover provisions to share-swap mergers and company demergers. The two models each cover one area of potential relief: share-swap mergers; and company demergers for **Australian public companies**.

The models suggest that, based on a number of reasonable assumptions that reflect real-world factors and an introduction date of 1 July 2000, extending rollover relief to share-swap mergers and company demergers for Australian public companies would result in:

- **A small cost to the revenue in the first few years** following the extension of rollover relief. As indicated in the chart below, the combined cost to the revenue is likely to be around $83 million in 2001-02, with smaller costs to the revenue in the subsequent two years; and

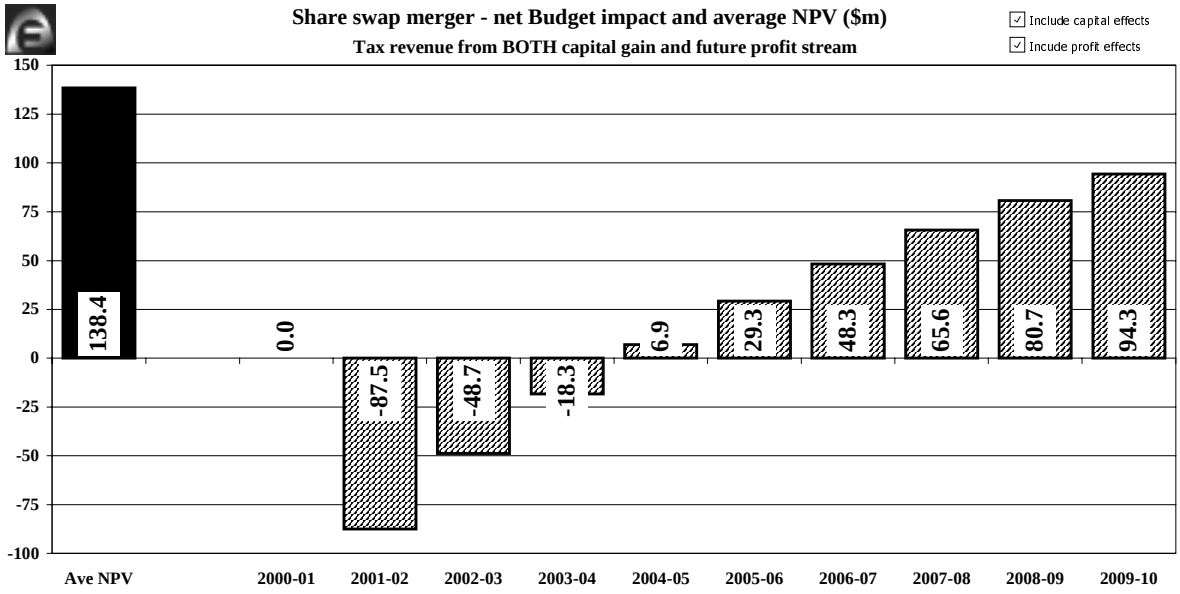
- **But a net gain to the revenue over time as the rollover relief leads to increased share-swap merger and company demerger activity.** These gains to the revenue more than offset the initial losses, such that the average annual net present value (NPV) is positive and larger than the initial loss to the revenue, as illustrated in the chart below.

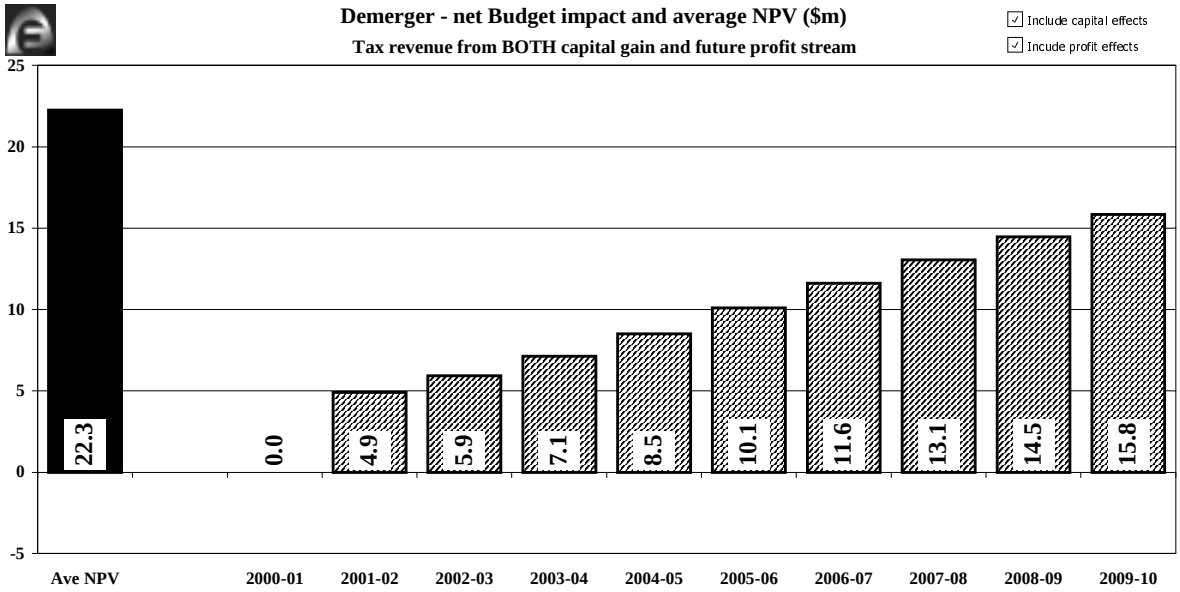


Note: results show the estimated annual impact on Commonwealth taxation revenue. Ave NPV = NPV sum divided by the sum of the discount factors to give a measure of the long-run impact on the annual Budget, in present value terms.

The results from the models are, of course, sensitive to changes in the key parameters on which they are based. The models therefore allow the sensitivity of the results to changes in a wide range of parameters to be investigated. The models and this report also cover the key parameters in detail and provide analysis supporting the assumptions that have been used. To provide a sound basis on which to base policy decisions, the models use conservative assumptions wherever possible so as not to underestimate the initial cost to the revenue of the proposed policy changes. Even with those conservative assumptions, the initial cost to the revenue is small.

The chart on the previous page illustrates the combined impact on Commonwealth tax revenues of extending rollover relief to both share-swap mergers and company demergers. As these are two distinct reforms, the two additional charts below provide the modelling results for each separately.





1. Overview and key parameters for modelling the revenue impacts of rollover relief

Introduction

At the request of the Securities Institute of Australia, Access Economics has constructed two models to assess the potential impact on Commonwealth Government taxation revenue of extending the existing capital gains tax (CGT) rollover provisions to: i) share-swap mergers of public companies; and ii) demergers of public companies. The models have been constructed in a very transparent fashion so users can see precisely what parameters and assumptions have been adopted. Wherever possible, conservative assumptions have been used so as not to underestimate the initial cost to the revenue of extending rollover relief. The models have also been constructed to facilitate undertaking sensitivity analysis for changes in those parameters and assumptions.

This overview section of the documentation outlines some conceptual issues regarding the taxation of capital gains and the measurement of those gains. It also discusses the key parameters to consider when modelling the revenue effects of rollover relief for share-swap mergers and demergers. Section 2 provides base case results for the models and the results of several sensitivity analyses for changes in key parameters are presented in Section 3. The attachment discusses in detail the parameters for the models and the data sources that Access Economics has used to reach a view on appropriate settings for them. The Technical Supplement and the accompanying electronic copy of the models detail how these assumptions are combined to produce the modelling results.

Capital gains taxation as an income tax – measurement issues

If one accepts the base of direct taxation as comprehensive income[4], which includes capital gains, there are important issues in relation to the measurement of capital gains for taxation purposes.

The theoretical definition of income implies that income should be measured, and taxed, as it accrues. Conceptually, however, income might alternatively be assessed only when it is received; in the case of capital gains, for example, when it is realised via a market transaction. The former approach involves difficult and/or arbitrary valuation judgements. The latter in most cases should be determined more objectively.

In Australia, there are examples of both taxation on the basis of accrued gains and taxation on the basis of realised gains. Both bases for the income tax benchmark tax base are recognised by the Government. They are incorporated within the annual *Tax Expenditures Statement* published by the Treasury.

> *Although assessment of income on an accruals basis is the general benchmark, those provisions where income is assessed on a realisation basis (eg under the capital gains provisions of the income tax) are considered to be essential features of the tax system and hence are incorporated into the benchmark. (Department of the Treasury, 1997a, page 60)*

[4] There are strong conceptual arguments in favour of an expenditure base for direct taxation. In particular, an expenditure base would remove the bias against saving that is inherent in an income tax base and can also be more efficient. While these arguments are not covered in this report, that should not be taken as implicit acceptance of a comprehensive income tax base as the ideal tax base.

Especially for capital gains, a realisations basis has attractions because it limits problems inevitably associated with *imputing* accrued capital gains when no objective market transaction between arms'-length parties has taken place.

To ensure that capital gains are only assessed when they are effectively realised, there are many 'rollover' provisions that defer a CGT liability. Some of these rollover provisions are recognised as integral parts of Australia's direct tax system benchmark. Such relief is available, for example, on the death of a taxpayer, in relation to the involuntary disposal of an asset, and for the transfer of assets between spouses upon breakdown of a marriage.

There are other examples, notably for small business rollovers of realised capital gains into similar businesses or where the proceeds are used for retirement, where rollover relief is not regarded officially as part of the income tax benchmark, but instead as a concession or 'tax expenditure'.

Some of the existing rollover provisions are based on the concept of underlying ownership of assets. Conceptually, a capital gain is taken to have been realised for taxation purposes when the ownership of the relevant asset changes. In some circumstances, the tax laws would, in the absence of rollover provisions, regard an event as involving a disposal of an asset even though the true ownership of the relevant asset had not changed. An example is the transfer of the assets of a partnership to a wholly-owned company. Rollover provisions help to prevent such anomalies. According to the Department of the Treasury (1997b, p.6):

> *The policy underpinning most of the existing rollover provisions is that rollover relief is available where, even though there has been a disposal, there has been no change in the beneficial ownership of the asset.*

Some of the existing rollover provisions also attempt to overcome potential economic inefficiencies that would result from the crystallisation of a CGT liability. A well-known feature of capital gains taxation is that it tends to lock in capital gains. There have also been many studies of this "lock-in effect"[5]. This distortion is attributable to the fact that investors with accumulated capital gains may not realise those gains in order to defer the capital gains tax. To the extent that this is the case, investors may hold onto assets that yield a lower rate of return than could be available if the portfolio were reallocated. In such cases, the investment portfolio would be inefficient.

In the case of business organisation, the crystallisation of a CGT liability may result in the continuation of an organisational structure that is no longer suited to the efficient operation of the business. Rollover provisions, such as those covering the transfer of the assets of a partnership to a wholly-owned company, mentioned above, and also others such as those covering demutualisations by insurance organisations, help to overcome such inefficiencies.

There are also strong practical reasons for many of the current CGT rollover provisions. A realisation basis for assessing capital gains reduces the potential for a tax liability to arise when there is no cash to pay that liability. If capital gains tax were assessed on the accrual of gains, tax would be payable even though no money might have been received with which to pay that tax.

While the current CGT rollover provisions cover a variety of transactions they are not uniform in their treatment of transactions. In their application to public companies two areas, in particular, stand out as areas where the rollover provisions could be extended. They are:

- share-swap mergers; and
- demergers where a company is broken up into two or more parts.

This report examines the potential revenue implications of extending the current rollover provision to these areas.

[5] See, for example, the summary in Zodrow (1995, pp.S42-S45).

Definition and timing issues for modelling the revenue impacts of rollover relief

Given the somewhat irregular and unpredictable nature of merger and demerger activity and the associated data limitations, it is difficult to estimate the revenue effects with a high degree of certainty. Hence, the models have been set up with scenario-analysis in mind, enabling the user to easily explore a range of assumptions. Exploring several scenarios can help the user identify upper and lower bounds on the revenue effects and a most likely (or central) scenario.

The models evaluate the revenue that would be received under the proposed rollover relief policy changes and also the revenue that would be received under existing tax arrangements. The difference is the net impact on the revenue. A key difference between the two policies is a change in the timing of capital gains realisations (rather than a significant change in the base). Hence, while revenue may be lost in the earlier years, it is recouped in later years.

The models allow for various types of behavioural changes. For example, there may be 15 share-swap mergers a year if the rollover relief provisions were extended, compared with only 10 share-swap mergers and 2 cash mergers if the current policies persisted (excluding the large number of mergers that would remain cash under both policies). Similarly, for demergers, there may be an increased number if rollover relief was afforded. To calculate the revenue impact it is necessary to assess the capital gains realisations for all relevant companies under both policy scenarios (including calculating capital gains for companies that remain un-merged or remain as a conglomerate under current policies). This is normally referred to in modelling as calculating the 'gross flows', allowing more robust estimates of the net impact.

There are two distinct models: a model for share-swap mergers and a model for demergers, although there is a reasonable degree of common ground between the two. Some of the parameters are common to both models and where differences arise they are noted in the text.

The comments below highlight some of the key issues to address when modelling the revenue effects of rollover relief.

Definitions of share-swap mergers and demergers

For the purposes of the share-swap model, a share-swap merger is defined as a purchase by an acquiring public company of shares in a target public company, for which all or part of the consideration paid for the shares of the target company are shares of the acquiring company.

For the purposes of the demerger model, a demerger is defined as the splitting of a conglomerate public company into 2 or more parts where shares in the conglomerate are exchanged for shares in the demerged companies in proportion to each shareholder's proportional interest in the conglomerate. That is, there is no change in the beneficial ownership of underlying assets.

Timing

Mergers or demergers can be announced and people can buy and sell shares on almost any day of the year. Some mergers may overlap financial years – announced on 15 June and completed on 15 July, with transactions occurring throughout that period.

When constructing a model the aim is to estimate the issue at hand as accurately as possible given the data available. There are often circumstances where leaving out some fine detail can actually improve the model. For example, a road map is essentially a 'model' of a city. A road map contains all the main features necessary to find your way, but leaves out some detail that is not necessary for accurate navigation. By leaving out some unnecessary detail, the road map is far more convenient because you can see a whole suburb on one page. Imagine a road map drawn on a 1:1 scale. It would have fantastic detail (every blade of

grass and every leaf on every tree) but would be so large that a map covering one square kilometre would weigh about 80 tonnes. If a road map is too detailed, it becomes completely useless.

Similarly, there is little gained in constructing a model that allow mergers/demergers and the buying and selling of shares to occur continuously throughout the year. This is an example of detail that does not add much in the way of accuracy but complicates the analysis enormously. Rather, we adopt a timing convention (discussed in more detail in the attachment). In summary, buying and selling of shares caused by mergers/ demergers occur on 1 July of each year. Ordinary buying and selling of shares occur at the midpoint of each year – 31 December. All calculations in the models are performed on an Australian financial year basis.

This timing assumption does not have a significant impact on the results, other than smoothing out some of the profiles. All the results are presented on a financial year basis, so the averaging effect of this timing assumption does not have much impact at the annual level.

The model simulations have a start date of 2000-01. In effect, this assumes that rollover relief is extended to share-swap mergers and demergers with effect from 1 July 2000. As financial markets tend to respond quickly to changes, the model assumes a full impact in the first year (the behavioural change does not phase in over several years).

Another timing issue relates to when revenue is actually collected from a capital gain. Tax revenue from capital gains realised in 2000-01 is usually collected in 2001-02, hence a one year lag is required between a CG realisation and the resulting CGT revenue, in order to conform with (current) Federal Government Budget cash-accounting methods.

The four key parameters for the models

All of the parameters that underpin the models are discussed in detail in the Attachment. There are four key parameters that have the greatest impact on the models' results. The first three: the value of the assets involved in the transactions; the size of the share price gains following mergers/demergers; and the size of the behavioural response to the extension of rollover relief have important effects on the net present value over a run of years of the estimated revenue impacts. The fourth - the share purchase and sale profiles - doesn't materially effect the net present value estimates, but can have important effects on the annual profile of the revenue estimates. These four parameters are discussed in broad terms below.

Value of assets involved in transactions

Calculating capital gains revenue is clearly heavily dependent on the total value of the assets involved in the relevant transactions. The number and average market value of mergers/demergers each year forms the base for calculating gross capital gains and hence revenue.

The assumption about market capitalisation has a significant impact on the likely revenue impacts of the policy change. This assumption has a direct scaling effect – scaling the total revenue effect up or down in the models. It does not change the pattern over time or the sign of results.

The share-swap mergers model assumes an annual average level of transactions valued at around $3.4 billion (before the proposed extension of rollover relief). This is based on data on all Australian share-swap mergers covering the past three years. These data suggest that there have been an average of 16 share swap mergers per year, with an average market capitalisation of $214 million ($3.4 billion = 16 x $214 million).

The data on market capitalisation are rather volatile partly because there have been only around 16 share-swap mergers a year, on average, in the past 3 years, so some alternative data sources were examined. This was mainly done as reasonableness checks on the average market capitalisation of $214 million.

- Additional data were obtained on all cash-based mergers (rather than share-swaps mergers); this gave an average takeover value of $110.6 million.

- As of 31 October 1998, there were 1,161 Australian companies listed on the Australian Stock Exchange (ASX) with a combined market capitalisation of $488,639 million, an average of $421 million per listed company. This is best considered an absolute upper limit on the average size of a share-swap merger, as a few large listed companies (such as Telstra and NAB) are less likely to become takeover targets, yet contribute roughly one-fifth of the total capitalisation of Australian companies on the ASX used in the above calculation.

Overall, an average market capitalisation of $214 million, and an average annual level of share-swap merger activity of $3.4 billion, seems reasonable.

For demergers, there have not been any demergers of the type defined on page 4 in recent Australian history, in part because the current CGT treatment would make such demergers non-viable. The model assumes that – in the absence of a policy change – that will continue in the future.

The implications of a change in policy for the level of share-swap mergers and company demergers are discussed on the following page.

Merger/demerger share price gains

It may often be the case that a merger/demerger results in an increase in the market value of the shares of the target company. In the case of a merger, this is also referred to as the takeover premium. A merger/demerger gain is applied under both scenarios (current policy and rollover relief policy). Merger/demerger gains have a substantial impact on the models' estimates when additional mergers/demergers occur under rollover relief that would not have occurred under existing policies (see the point below on behavioural change). A higher share price gain from mergers/demergers increases the positive net present value of expected future increases in revenue from rollover relief, but also increases the cost to the revenue in the first few years, as a greater amount of capital gains tax is deferred.

Data on Australian share-swap mergers over the past three years suggest an average merger share price gain of 31.0 per cent; the model uses this figure as a starting point. Some part of this observed average share price gain may have been at the expense of lower share prices (and hence lower potential capital gains) of the merged/demerged companies' (Australian) competitors, rather than purely a market valuation of improved corporate efficiency. That would suggest using a lower figure for determining the revenue impacts. On the other hand, it is arguable that the figure of 31.0 per cent is too low because data on cash-based mergers over the same time period suggest an average merger share price gain of 64.8 per cent. (Even after excluding three cash-based mergers with exceptionally large merger gains, the average merger gain is still 35.3 per cent.) Overall, a figure of around 31.0 per cent seems a reasonable estimate of the likely average capital gain from share-swap mergers in the current policy environment.

For demergers, the Securities Institute of Australia suggests that conglomerates currently trade at about 15 per cent below separated value following corporate restructure. Demutualisation of insurance organisations in Australia may also provide something of a benchmark (ie AMP, Colonial Mutual, National Mutual). That experience suggests that the market valued the restructured organisations at about 25 per cent above the value of the pre-restructured organisations (although there are important issues in relation to valuing a mutual insurance organisation that make them a special case).

A demerger gain in the range of 15 per cent to 25 per cent seems appropriate for demergers and the model uses 20 per cent as a starting point.

A merger/demerger share price gain represents investors' beliefs that the post-merger/demerger company will generate more profits than the unmerged company or conglomerate. The models can, at the option of the user, incorporate these additional profits in calculating estimated revenue impacts.

If rollover relief is allowed, it is expected that the size of the merger/demerger gain would, on average, be smaller. This is because the hurdle for a successful merger would have been lowered (by the deferral of tax due to rollover relief); the average takeover premium (the 'price' to merge) would fall. For mergers, the

model uses an overall average share price gain of 23.5 per cent after the extension of rollover relief (7.5 percentage points lower than when there is no rollover relief). For demergers, the model uses an overall average share price gain of 15 per cent after the extension of rollover relief (5 percentage points lower than when there is no rollover relief).

These issues are discussed in more detail on page 24 in the Attachment.

Additional mergers/demergers resulting from rollover relief

The additional mergers/demergers that would occur if rollover relief were extended is one of the most crucial assumptions when determining the revenue impacts. As a rule, the greater the product of merger/demerger share price gains and additional mergers/demergers, the more positive the NPV impact on revenue. In addition, the greater the amount of additional mergers/demergers, the more quickly is the initial loss to the revenue from rollover relief offset by the additional tax revenue generated from the additional market value of the merged/demerged companies.

There is little in the way of Australian experience that could be used as a guide for how much additional merger/demerger activity the extension of CGT rollover relief might generate. There is, however, some overseas experience that may serve as a guide. This is particularly the case in the US, where there have been a large number of major changes to capital gains taxation over the years.

There are likely to be many differences between the factors (including tax factors) affecting decisions by asset holders in Australia and the US about whether or not to realise capital gains. In addition, the large number of studies on the broad issue of how changes to CGT effects capital gains realisations in the US have failed to reach a definitive conclusion. Nevertheless, the US studies suggest that an increase in activity of around 40 per cent to 100 per cent may be reasonable, and the mergers model uses the mid-point of that range (70 per cent) as a starting point. It is arguable that this figure is too conservative. For example, a study by the US Department of the Treasury that looked specifically at how share trading responds to changes in CGT suggests that a figure of around 200 per cent could be possible.

For demergers, the issues are more complex. Given that there have been very few demergers in Australia, it does not seem sensible to discuss responses to rollover relief in terms of percentage changes. Rather, a judgement needs to be made about the extent to which the current CGT treatment is inhibiting demergers and, if rollover relief is extended, how many more demergers are likely to take place each year, on average.

Reports from members of the Securities Institute of Australia suggest that the current CGT treatment is a substantial impediment to demergers and often prevents plans from even reaching the drawing board. It is, however, impossible to arrive at reliable estimates as to how many more demergers might eventuate should rollover relief be extended, so this issue is probably best handled through sensitivity analysis.

As a starting point, the model assumes that there are an additional 2 demergers per year following the extension of rollover relief.

These issues are discussed in more detail on page 26 in the Attachment. The results beginning on page 16 show how sensitive the model estimates are to changes in this assumption.

Share purchase/sale profiles

In order to calculate the likely capital gains, it is necessary to know how long investors have held their shares. The profiles of share purchases before mergers/demergers and sales after mergers/demergers do not have a substantial impact on the net present value estimates produced by the models. The profiles do, however, have a potentially large impact on the annual estimates. In general, the longer people hold their shares, the longer it takes for the tax revenue flow to become positive (ie the greater the push-back of revenue).

There does not seem to be publicly available data on the length of time that shareholders hold onto shares. Of all the surveys undertaken by various organisations, none have asked about the average age of shareholders' portfolios. For example, the 1997 Australian Stock Exchange *Shareholder Segmentation Study* analyses the length of time that people have owned shares, but not how long they hold onto particular parcels of shares.

Turnover could be a guide to the average length of shareholding. The annual turnover on the ASX is about 55 per cent of the total capitalisation. However, these data cannot be used to derive an average holding time, as these examples illustrate:

1. This turnover data could suggest that on average 100 per cent of all shares would be turned over in just under 2 years, if the world was uniformly distributed – a mean holding of just under two years.
2. Or perhaps 55 per cent of shares are turned over once every year and the other 45 per cent of shares are held for (say) 10 years, giving a mean shareholding around 5 years.
3. Or perhaps 5 per cent of shares are turned over 11 times per year and the remaining 95 per cent of shares are held for (say) 10 years, giving a mean holding of nearly 10 years.

These examples illustrate the range of possibilities given the data available. The average length of shareholdings is probably somewhere in the range 2 years to 10 years (and in all likelihood closer to the lower than the upper end of the range). It is also possible to hypothesise that institutional investors will probably turn shares over at a higher rate than private investors. Hence, the mean period of holding is lower for institutional investors.

As a starting point, the models utilise an average (mean) period of share ownership prior to merger/demerger of 3.5 years for private investors and 2.5 years for institutions and uses an exponential function for the distribution of both populations about the average.

Following a merger or demerger, revenue received from the subsequent disposal of shares will depend on how long those shares are held. This raises the same issues discussed above and the same solution has been adopted; that is, the models allow for various statistical profiles to be examined. However, there are likely to be different profiles for the length of time that shares are held under the current CGT treatment and under the proposed extension of rollover relief.

As mentioned on page 3, the lock-in effects of CGT on a realisation basis are well known. The current CGT treatment of share-swap mergers forces a realisation of capital gains for taxation purposes, thereby reducing the lock in effect in respect of the swapped shares for the future. Therefore, under current CGT treatment, the profile of share disposals *after* a share-swap merger is likely to have a lower mean holding period than the profile of share purchases discussed above. That is, under current CGT treatment, shareholders will tend to hold onto their shares for a shorter period after a merger than the period for which shares were held prior to the merger, because a CGT liability is crystallised by the merger and the lock in effect is therefore reduced.

As a starting point, the models assume that this effect, under the current CGT treatment, reduces the mean time until disposal after a merger/demerger by 1.0 years for individuals and 0.5 years for institutions. (Institutions being affected by lock-in less because of faster turnover rates and more rigorous investment decision-making processes.)

Following the extension of rollover relief, the lock-in effects would continue as if there had not been a merger/demerger (excluding share rationalisations, discussed below). The models therefore allow for the mean time until disposal after a merger/demerger to be higher after the extension of rollover relief. To be consistent with the preceding paragraph, the models assume that the mean time until disposal after a merger/demerger is higher by 1.0 years for individuals and 0.5 years for institutions.

For both share-swap mergers and demergers there is likely to be a temporary jump in share sales as shareholders rationalise their holdings in the post merger/demerger companies. This is likely to be a particular issue for demergers, where shareholders might decide to divest themselves of their holdings of part(s) of what was, prior to demerger, a conglomerate.

The models can be run with alternative assumptions for these first-year effects to assess the sensitivity of the results to these parameters. As a starting point, the models use 5 per cent additional share turnover in the first year following a merger and 10 per cent for demergers.

2. Base case results from the model of the revenue impacts of rollover relief

This section presents Access Economics' assessment of the most likely revenue impact of adopting the rollover relief measures outlined in this paper. The next section presents sensitivities around this base case.

The following charts of the revenue impacts are included:

- Charts of the revenue impacts of share-swap mergers.
- Charts of the revenue impacts of demergers.
- Charts of the combined impact of the above two.

Because the revenue effects flow through tax on the capital gains and tax on the future profit stream, these are also illustrated separately. For each of the three versions above, the following three breakdowns are given (hence 9 charts in total):

- Net change in tax revenue relating to capital gains only
- Net change in tax revenue relating to the future profit stream only
- Net change in tax revenue relating to both capital gains and the future profit stream.

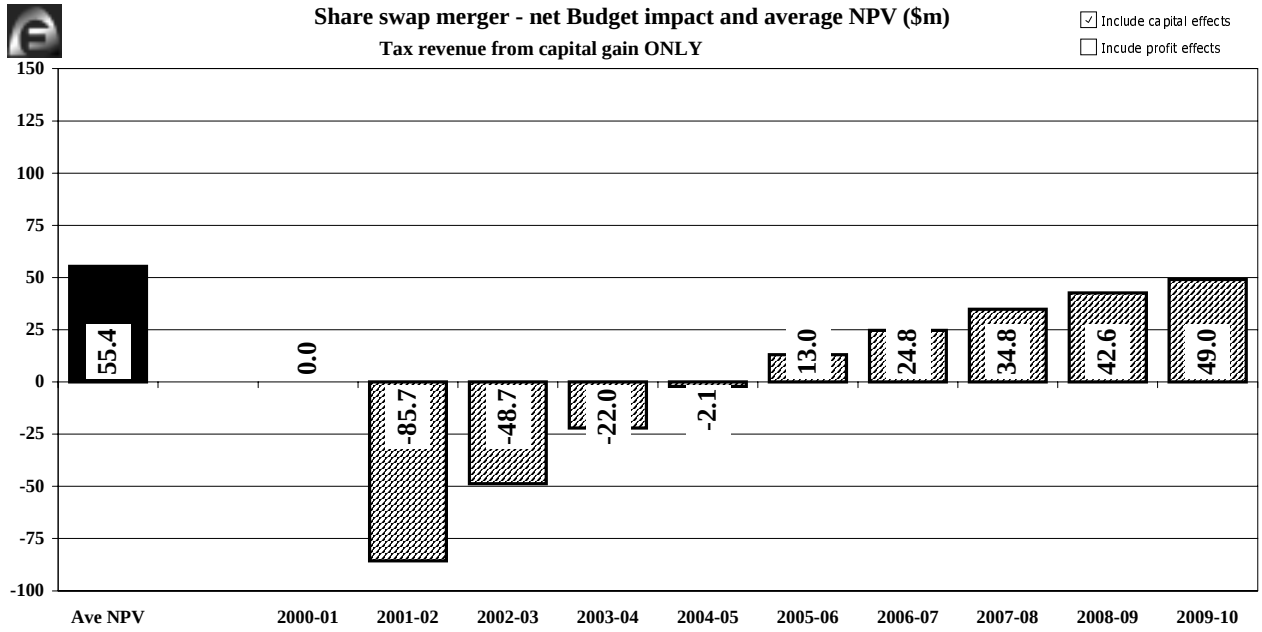
All the charts and tables of revenue impacts show the net impact of the policy change starting on 1 July 2000. The charts and tables are presented in $m (2000-01 prices) for the 10 Australian financial years 2000-01 to 2009-10 inclusive. The average annual net present value (AANPV) is also shown on the left side of each chart and table. The average annual net present value is the NPV divided by the sum of the discount factors. Hence, it gives a measure of the long-run impact on the annual Budget, in present value terms.

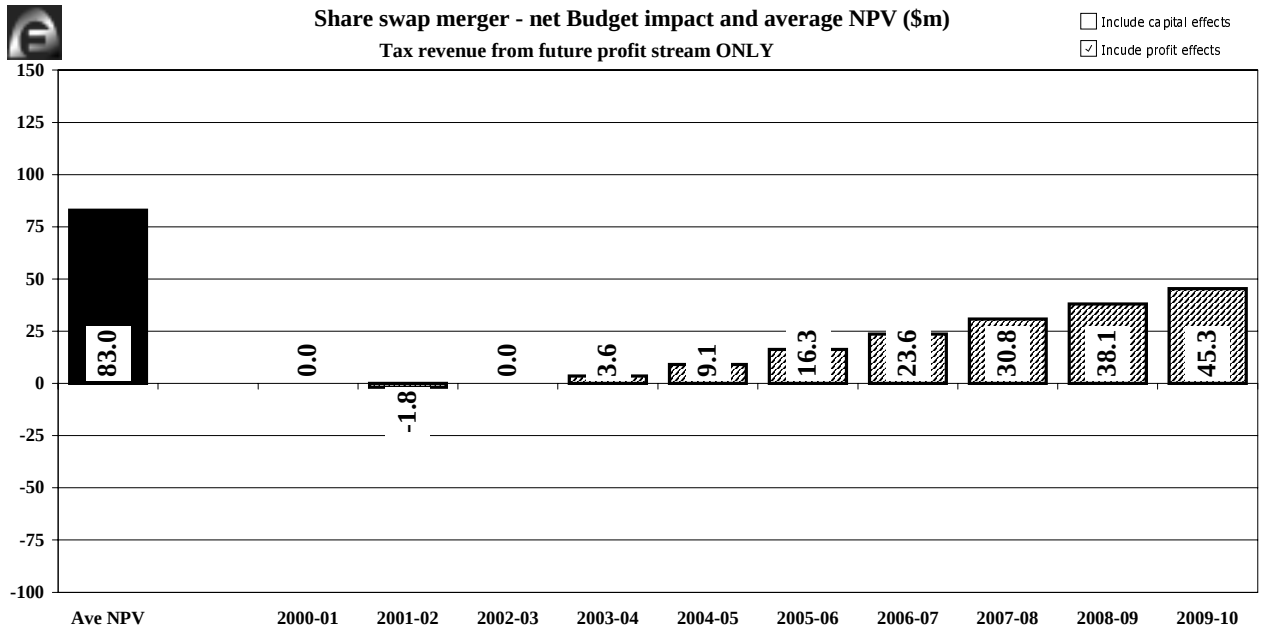
Following the charts of the results is a listing of the assumptions, in the format in which they appear in the model. A summary table of the base case results appears below.

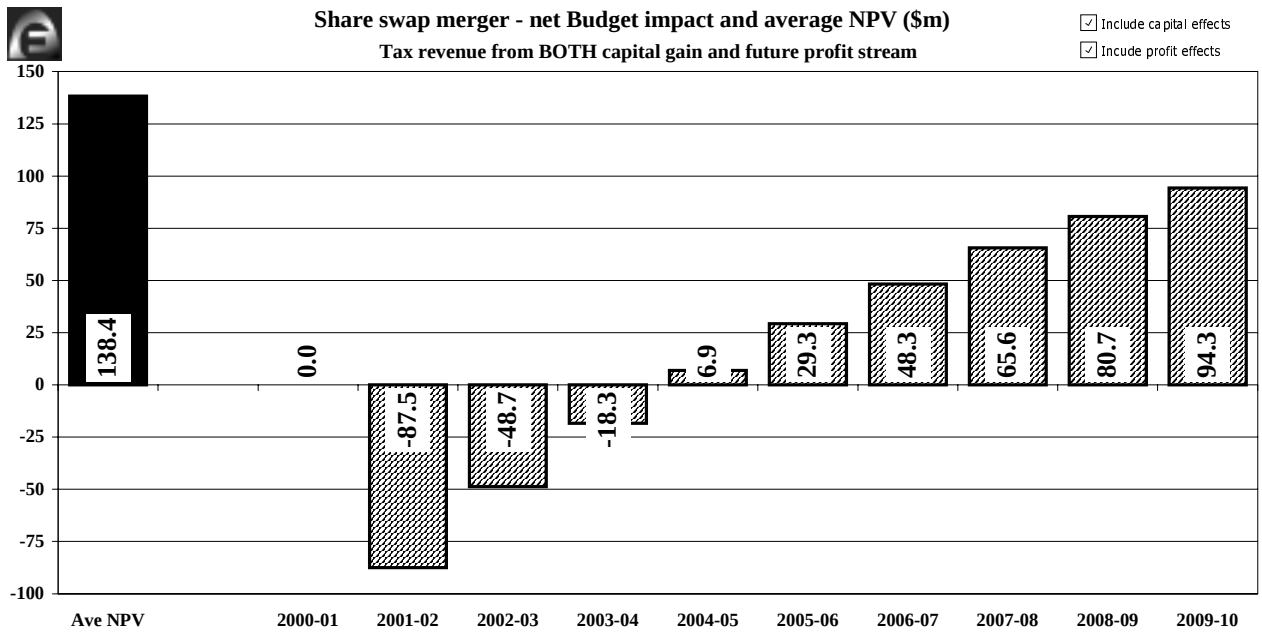
BASE CASE RESULTS ($ million)*

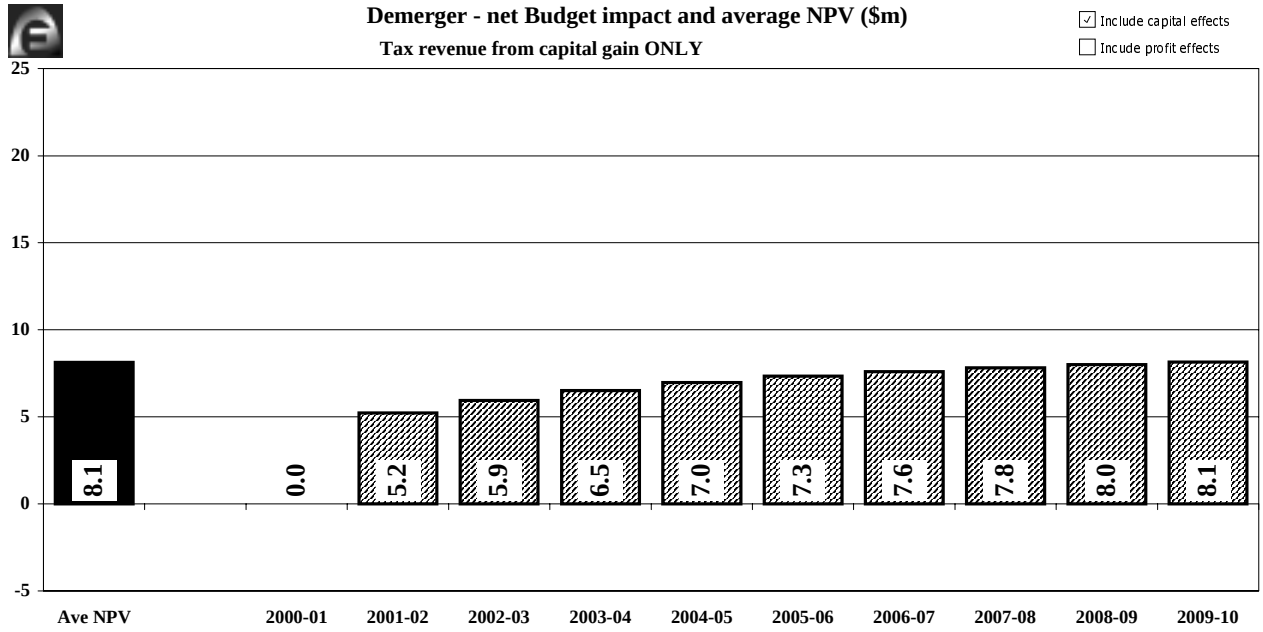
Rollover relief – bottom line	AANPV	2000-01	2001-02	2002-03	2003-04	2004-05	2009-10
Revenue impact of capital gain effects							
Share-swap mergers	55.4	0.0	-85.7	-48.7	-22.0	-2.1	49.0
Demergers	8.1	0.0	5.2	5.9	6.5	7.0	8.1
Total rollover relief package	63.5	0.0	-80.5	-42.8	-15.5	4.8	57.1
Revenue impact of profit effects							
Share-swap mergers	83.0	0.0	-1.8	0.0	3.6	9.1	45.3
Demergers	14.1	0.0	-0.3	0.0	0.6	1.5	7.7
Total rollover relief package	97.1	0.0	-2.1	0.0	4.2	10.6	53.0
Total revenue impact							
Share-swap mergers	138.4	0.0	-87.5	-48.7	-18.3	6.9	94.3
Demergers	22.3	0.0	4.9	5.9	7.1	8.5	15.8
Total rollover relief package	160.6	0.0	-82.6	-42.8	-11.2	15.4	110.1

** Results show estimated annual impact on Commonwealth taxation revenue. AANPV = annual average net present value of revenue impacts.*


Share swap merger - net Budget impact and average NPV ($m)
Tax revenue from capital gain ONLY
Include capital effects
Incude profit effects
150
125
100
75
50
25
0
-25
-50
-75
-100
55.4
0.0
-85.7
-48.7
-22.0
-2.1
13.0
24.8
34.8
42.6
49.0
Ave NPV
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10


Share swap merger - net Budget impact and average NPV ($m)
Tax revenue from future profit stream ONLY
Include capital effects
Incude profit effects
150
125
100
75
50
25
0
-25
-50
-75
-100
83.0
0.0
-1.8
0.0
3.6
9.1
16.3
23.6
30.8
38.1
45.3
Ave NPV
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10


Share swap merger - net Budget impact and average NPV ($m)
Tax revenue from BOTH capital gain and future profit stream
Include capital effects
Incude profit effects
150
125
100
75
50
25
0
-25
-50
-75
-100
138.4
0.0
-87.5
-48.7
-18.3
6.9
29.3
48.3
65.6
80.7
94.3
Ave NPV
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10


Demerger - net Budget impact and average NPV ($m)
Tax revenue from capital gain ONLY
Include capital effects
Incude profit effects
25
20
15
10
5
0
-5
8.1
0.0
5.2
5.9
6.5
7.0
7.3
7.6
7.8
8.0
8.1
Ave NPV
2000-01
2001-02
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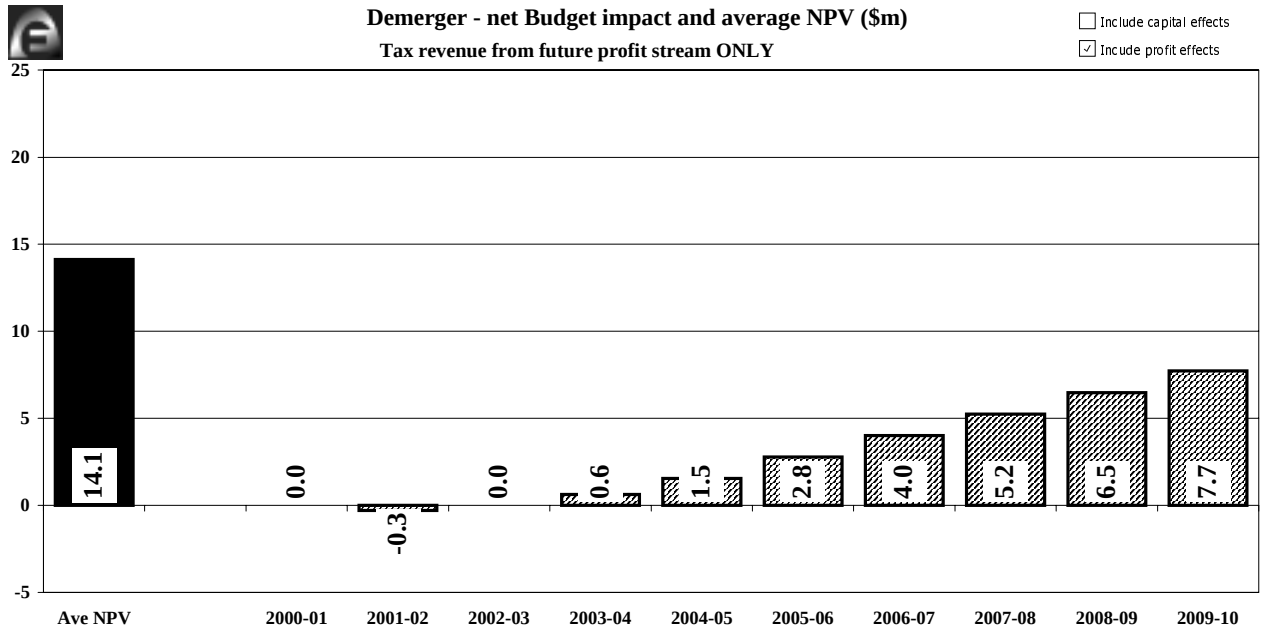
2009-10


Demerger - net Budget impact and average NPV ($m)
Tax revenue from future profit stream ONLY
Include capital effects
Incude profit effects
25
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10
5
0
-5
14.1
0.0
-0.3
0.0
0.6
1.5
2.8
4.0
5.2
6.5
7.7
Ave NPV
2000-01
2001-02
2002-03
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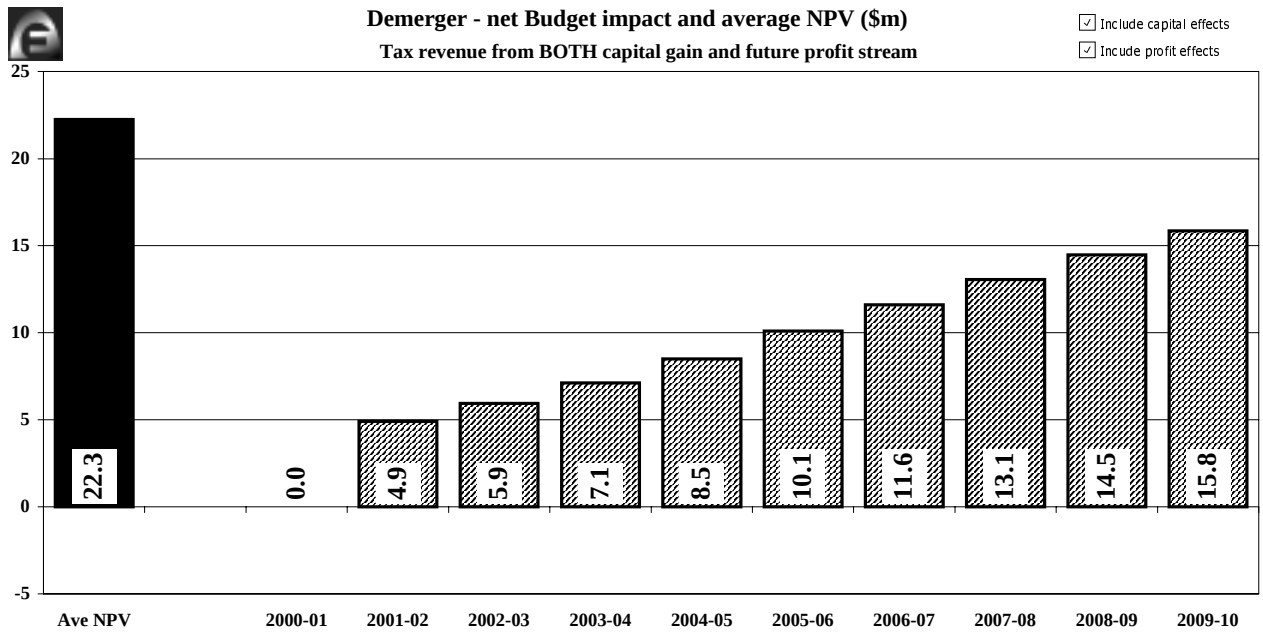
Demerger - net Budget impact and average NPV ($m)
Tax revenue from BOTH capital gain and future profit stream
Include capital effects
Incude profit effects
25
20
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10
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-5
22.3
0.0
4.9
5.9
7.1
8.5
10.1
11.6
13.1
14.5
15.8
Ave NPV
2000-01
2001-02
2002-03
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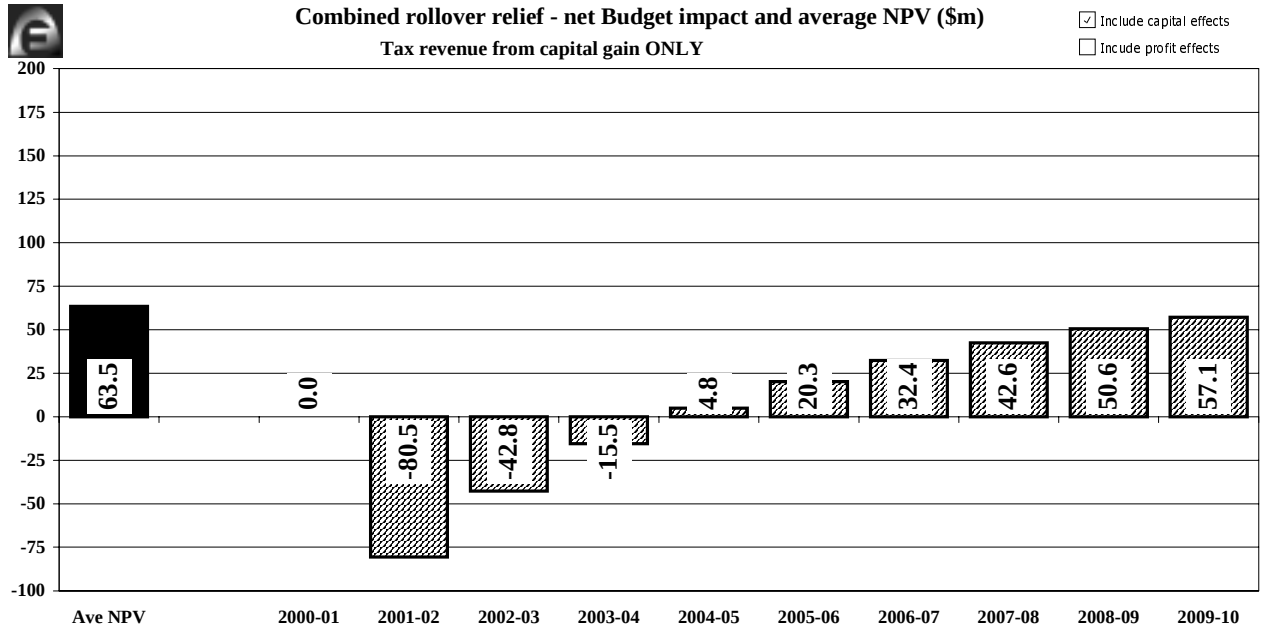
2009-10


Combined rollover relief - net Budget impact and average NPV ($m)
Tax revenue from capital gain ONLY
Include capital effects
Incude profit effects
200
175
150
125
100
75
50
25
0
-25
-50
-75
-100
63.5
0.0
-80.5
-42.8
-15.5
4.8
20.3
32.4
42.6
50.6
57.1
Ave NPV
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
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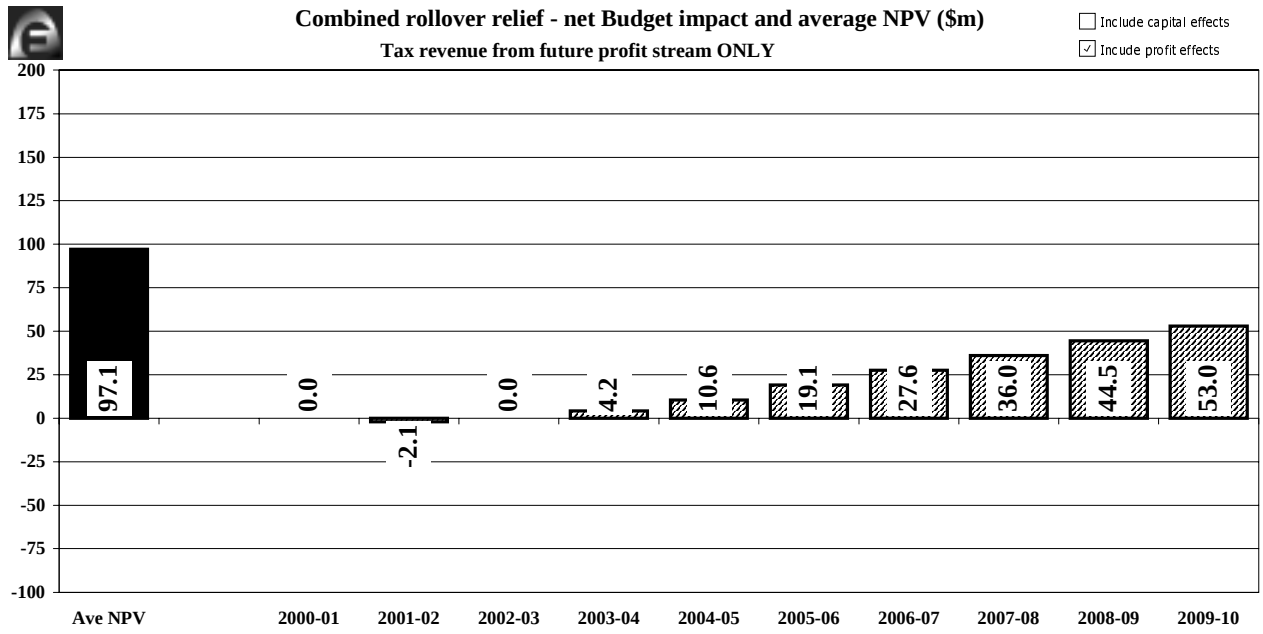
2008-09
2009-10


Combined rollover relief - net Budget impact and average NPV ($m)
Tax revenue from future profit stream ONLY
Include capital effects
Incude profit effects
200
175
150
125
100
75
50
25
0
-25
-50
-75
-100
97.1
0.0
-2.1
0.0
4.2
10.6
19.1
27.6
36.0
44.5
53.0
Ave NPV
2000-01
2001-02
2002-03
2003-04
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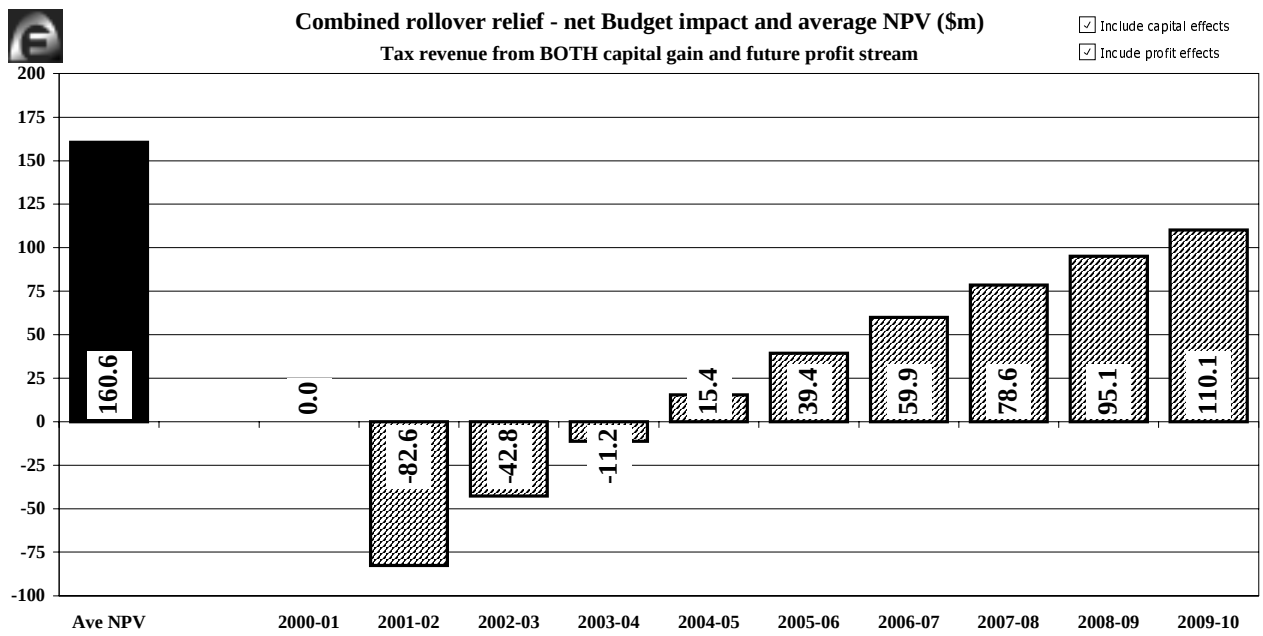
2005-06
2006-07
2007-08
2008-09
2009-10


Combined rollover relief - net Budget impact and average NPV ($m)
Tax revenue from BOTH capital gain and future profit stream
Include capital effects
Incude profit effects
200
175
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125
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25
0
-25
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-75
-100
160.6
0.0
-82.6
-42.8
-11.2
15.4
39.4
59.9
78.6
95.1
110.1
Ave NPV
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2001-02
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2009-10

Assumptions, part 1

Type of assumption	Units	Scope of assumption
SCOPE AND ECONOMIC BACKDROP		**Both mergers & demergers**
Revenue items to include in charts/output		
Include tax revenue from share capital in output		☑ Include capital effects
Include tax revenue from future profits in output		☑ Incude profit effects
Indexation and growth		
CPI indexation	% p.a.	2.5%
REAL share investment capital growth	% p.a.	3.5%
REAL share investment dividend return	% p.a.	4.0%
REAL long term bond rate	% p.a.	3.5%

VALUE OF ASSETS		Share-swap mergers	Demergers
Market capitalisation			
Ave market capitilisation prior to merger/demerger	$m	$214.0m	$250.0m
Ave. toehold investment by predator company	%	10.5%	n.a.
Average cash component of mergers	%	14.1%	n.a.
Merger/demerger gain (before rollover relief)	%	31.0%	20.0%
Reduction in average gain after rollover relief	%	7.5%	5.0%
Number of share-swap mergers/demergers			
Volume of full share-swap mergers/demergers	number p.a.	14.0	0.0
Volume of part-merger share-swap offers (50-90%)	number p.a.	2.0	n.a.
Average aquisition rate in partial mergers	%	75%	n.a.
Change in activity caused by rollover relief			
Extra share-swap mergers/demergers	% / number	70%	1.0
Extra share-swap mergers - previously cash mergers	%	20%	n.a.

SHARE OWNERSHIP PROFILES		Private	Institutions
Length of share ownership prior to merger/demerger			
Distribution function		Exponential	Exponential
Mean of distribution	years	3.5	2.5
St Dev (for gamma & normal distributions only)	years	3.5	2.5
Uniform distribution proportion	%	10.0%	5.0%
Pre-1985 proportion in base year (2000-01)	%	10.0%	5.0%
Annual decline in pre-1985 prop. post base year	%	1.0%	1.0%
Continue grandfathering of pre-1985 status?		☑ Continue pre-1985 grandfathering	
Time until disposal after merger/demerger			
Distribution function		Exponential	Exponential
Mean of distribution	years	2.5	2.0
Increase in mean due to higher lock in post rollover	years	1.0	0.5
St Dev (for gamma & normal distributions only)	years	3.5	2.5
Uniform distribution proportion	%	10.0%	5.0%
First year extra turnover - share-swaps mergers	%	5.0%	5.0%
First year extra turnover - demergers	%	10.0%	10.0%

Assumptions, part 2

Type of assumption	Units	Scope of assumption	Comments and recommended settings

MIX OF SHARE OWNERSHIP		Both mergers & demergers
Private investors - calculated as residual	%	20.2%
Super funds and life funds	%	24.5%
Retail Unit Trust Funds	%	5.0%
Other institutions that pay CGT	%	9.8%
Foreign shareholders	%	30.7%
Other institutions that pay income tax on any CG	%	9.8%

Private income distribution and tax rate	Tax bracket:	< 6k	6k-20k	20k-50k	50k-75k	75k+
Distribution of private investors in bracket	proportion	2.1%	13.3%	31.2%	12.3%	41.1%
Marginal tax rate + medicare levy	tax rate	0.0%	17.0%	31.2%	41.5%	48.5%

TAX RATES AND CAPITAL LOSSES		Both mergers & demergers
Average tax rate for each type of investor		
Private investors - weighted average rate	%	37.1%
Superfunds	%	15.0%
Retail Unit Trust Funds - uses private average	%	37.1%
Other institutions that pay CGT	%	36.0%
Foreign shareholders	%	5.0%
Other institutions that pay income tax on any CG	%	36.0%
Capital losses		
Capital losses available to offset gains	%	20.0%

3. Sensitivity analysis in the model of the revenue impacts of rollover relief

This section undertakes the important task of examining sensitivities around the most likely base case presented in the previous section.

Each of the sensitivities conducted are displayed in terms of the revenue impact of an increase and a decrease around the base case assumption. The tables illustrate the change in the average annual NPV and the impact on revenue in the individual years out-years 1, 2, 3, 4, 5 and 10 are presented (these years correspond to 2000-01, … , 2004-05 and 2009-10 respectively). A brief summary follows each table commenting on the degree of sensitivity to the parameter in question.

The sensitivities are intended to give the reader a quick feel for what assumptions are most important for estimating the revenue impact.

Important note: the tables below cannot be added together to get a combined impact of a set of changes to the assumptions. Because the world is not linear, combinations of assumptions have to be run through the model to get the correct answer.

SENSITIVITY TO CPI ASSUMPTION

	AANPV	2000-01	2001-02	2002-03	2003-04	2004-05	2009-10
SHARE SWAP MERGERS: Revenue impact in levels, $m:							
Increase value to: 3.5%	144.1	0.0	-88.4	-49.0	-18.0	7.9	98.2
Base case value is: 2.5%	138.4	0.0	-87.5	-48.7	-18.3	6.9	94.3
Decrease value to: 1.5%	133.0	0.0	-86.6	-48.3	-18.6	6.0	90.6
Deviation from base case, $m:							
Increase scenario	5.8	0.0	-0.9	-0.4	0.3	1.0	3.9
Decrease scenario	-5.3	0.0	0.9	0.4	-0.3	-0.9	-3.8
DEMERGERS: Revenue impact in levels, $m:							
Increase value to: 3.5%	22.5	0.0	5.0	6.0	7.2	8.6	16.0
Base case value is: 2.5%	22.3	0.0	4.9	5.9	7.1	8.5	15.8
Decrease value to: 1.5%	22.0	0.0	4.9	5.9	7.0	8.4	15.7
Deviation from base case, $m:							
Increase scenario	0.2	0.0	0.0	0.1	0.1	0.1	0.2
Decrease scenario	-0.2	0.0	0.0	-0.1	-0.1	-0.1	-0.2
COMBINED TOTAL OF ROLLOVER RELIEF: Revenue impact in levels, $m:							
Increase value to: 3.5%	166.6	0.0	-83.5	-43.0	-10.8	16.5	114.2
Base case value is: 2.5%	160.6	0.0	-82.6	-42.8	-11.2	15.4	110.1
Decrease value to: 1.5%	155.1	0.0	-81.8	-42.5	-11.6	14.4	106.2
Deviation from base case, $m:							
Increase scenario	6.0	0.0	-0.8	-0.3	0.4	1.1	4.1
Decrease scenario	-5.6	0.0	0.8	0.3	-0.4	-1.0	-3.9

SENSITIVITY TO CAPITAL GROWTH ASSUMPTION

	AANPV	2000-01	2001-02	2002-03	2003-04	2004-05	2009-10
SHARE SWAP MERGERS: Revenue impact in levels, $m:							
Increase value to: 4.5%	149.3	0.0	-90.3	-51.6	-20.9	5.1	99.1
Base case value is: 3.5%	138.4	0.0	-87.5	-48.7	-18.3	6.9	94.3
Decrease value to: 2.5%	128.2	0.0	-84.7	-45.7	-15.6	8.9	89.9
Deviation from base case, $m:							
Increase scenario	10.9	0.0	-2.7	-2.9	-2.6	-1.8	4.8
Decrease scenario	-10.2	0.0	2.8	3.0	2.7	2.0	-4.4
DEMERGERS: Revenue impact in levels, $m:							
Increase value to: 4.5%	23.9	0.0	5.1	6.2	7.4	8.9	16.9
Base case value is: 3.5%	22.3	0.0	4.9	5.9	7.1	8.5	15.8
Decrease value to: 2.5%	20.6	0.0	4.7	5.7	6.8	8.1	14.8
Deviation from base case, $m:							
Increase scenario	1.7	0.0	0.2	0.2	0.3	0.4	1.1
Decrease scenario	-1.6	0.0	-0.2	-0.2	-0.3	-0.4	-1.0
COMBINED TOTAL OF ROLLOVER RELIEF: Revenue impact in levels, $m:							
Increase value to: 4.5%	173.2	0.0	-85.2	-45.4	-13.5	14.1	116.1
Base case value is: 3.5%	160.6	0.0	-82.6	-42.8	-11.2	15.4	110.1
Decrease value to: 2.5%	148.8	0.0	-80.0	-40.0	-8.8	16.9	104.7
Deviation from base case, $m:							
Increase scenario	12.6	0.0	-2.6	-2.7	-2.3	-1.4	5.9
Decrease scenario	-11.8	0.0	2.6	2.8	2.4	1.5	-5.4

SENSITIVITY TO MARKET CAPITALISATION ASSUMPTION

	AANPV	2000-01	2001-02	2002-03	2003-04	2004-05	2009-10
SHARE SWAP MERGERS: Revenue impact in levels, $m:							
Increase value to: $264m	170.7	0.0	-108.0	-60.1	-22.6	8.5	116.3
Base case value is: $214m	138.4	0.0	-87.5	-48.7	-18.3	6.9	94.3
Decrease value to: $164m	106.0	0.0	-67.1	-37.3	-14.1	5.3	72.3
Deviation from base case, $m:							
Increase scenario	32.3	0.0	-20.5	-11.4	-4.3	1.6	22.0
Decrease scenario	-32.3	0.0	20.5	11.4	4.3	-1.6	-22.0
DEMERGERS: Revenue impact in levels, $m:							
Increase value to: $300m	26.7	0.0	5.9	7.1	8.5	10.2	19.0
Base case value is: $250m	22.3	0.0	4.9	5.9	7.1	8.5	15.8
Decrease value to: $200m	17.8	0.0	3.9	4.7	5.7	6.8	12.7
Deviation from base case, $m:							
Increase scenario	4.5	0.0	1.0	1.2	1.4	1.7	3.2
Decrease scenario	-4.5	0.0	-1.0	-1.2	-1.4	-1.7	-3.2
COMBINED TOTAL OF ROLLOVER RELIEF: Revenue impact in levels, $m:							
Increase value to: $264m/$300m	197.4	0.0	-102.1	-52.9	-14.1	18.7	135.4
Base case value is: $214m/$250m	160.6	0.0	-82.6	-42.8	-11.2	15.4	110.1
Decrease value to: $164m$200m	123.8	0.0	-63.2	-32.6	-8.4	12.1	84.9
Deviation from base case, $m:							
Increase scenario	36.8	0.0	-19.5	-10.2	-2.9	3.3	25.2
Decrease scenario	-36.8	0.0	19.5	10.2	2.9	-3.3	-25.2

SENSITIVITY TO MERGER/DEMERGER GAIN ASSUMPTION

	AANPV	2000-01	2001-02	2002-03	2003-04	2004-05	2009-10
SHARE SWAP MERGERS: Revenue impact in levels, $m:							
Increase value to: 36%	195.6	0.0	-94.2	-48.2	-11.4	20.0	133.4
Base case value is: 31%	138.4	0.0	-87.5	-48.7	-18.3	6.9	94.3
Decrease value to: 26%	81.2	0.0	-80.8	-49.2	-25.2	-6.1	55.3
Deviation from base case, $m:							
Increase scenario	57.2	0.0	-6.7	0.5	6.9	13.1	39.1
Decrease scenario	-57.2	0.0	6.7	-0.5	-6.9	-13.0	-39.0
DEMERGERS: Revenue impact in levels, $m:							
Increase value to: 25%	29.3	0.0	6.1	7.5	9.1	10.9	20.7
Base case value is: 20%	22.3	0.0	4.9	5.9	7.1	8.5	15.8
Decrease value to: 15%	15.2	0.0	3.7	4.4	5.2	6.1	11.0
Deviation from base case, $m:							
Increase scenario	7.0	0.0	1.2	1.5	1.9	2.4	4.9
Decrease scenario	-7.0	0.0	-1.2	-1.5	-1.9	-2.4	-4.9
COMBINED TOTAL OF ROLLOVER RELIEF: Revenue impact in levels, $m:							
Increase value to: 36%/25%	224.9	0.0	-88.2	-40.7	-2.3	30.9	154.1
Base case value is: 31%/20%	160.6	0.0	-82.6	-42.8	-11.2	15.4	110.1
Decrease value to: 26%/15%	96.4	0.0	-77.1	-44.8	-20.0	0.0	66.3
Deviation from base case, $m:							
Increase scenario	64.2	0.0	-5.5	2.0	8.9	15.5	43.9
Decrease scenario	-64.2	0.0	5.6	-2.0	-8.8	-15.4	-43.9

SENSITIVITY TO BEHAVIOURAL CHANGE ASSUMPTION

	AANPV	2000-01	2001-02	2002-03	2003-04	2004-05	2009-10
SHARE SWAP MERGERS: Revenue impact in levels, $m:							
Increase value to: 90%	216.8	0.0	-72.7	-30.2	4.5	34.8	149.3
Base case value is: 70%	138.4	0.0	-87.5	-48.7	-18.3	6.9	94.3
Decrease value to: 50%	60.0	0.0	-102.3	-67.2	-41.2	-21.0	39.3
Deviation from base case, $m:							
Increase scenario	78.4	0.0	14.8	18.5	22.8	27.9	55.0
Decrease scenario	-78.4	0.0	-14.8	-18.5	-22.8	-27.9	-55.0
DEMERGERS: Revenue impact in levels, $m:							
Increase value to: 2.0	44.5	0.0	9.8	11.9	14.2	17.0	31.7
Base case value is: 1.0	22.3	0.0	4.9	5.9	7.1	8.5	15.8
Decrease value to: 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deviation from base case, $m:							
Increase scenario	22.3	0.0	4.9	5.9	7.1	8.5	15.8
Decrease scenario	-22.3	0.0	-4.9	-5.9	-7.1	-8.5	-15.8
COMBINED TOTAL OF ROLLOVER RELIEF: Revenue impact in levels, $m:							
Increase value to: 90%/2.0	261.3	0.0	-62.9	-18.3	18.7	51.8	181.0
Base case value is: 70%/1.0	160.6	0.0	-82.6	-42.8	-11.2	15.4	110.1
Decrease value to: 50%/0.0	60.0	0.0	-102.3	-67.2	-41.2	-21.0	39.3
Deviation from base case, $m:							
Increase scenario	100.7	0.0	19.7	24.4	30.0	36.4	70.8
Decrease scenario	-100.7	0.0	-19.7	-24.4	-30.0	-36.4	-70.8

SENSITIVITY TO SHAREHOLDING DISTRIBUTIONAL ASSUMPTION

	AANPV	2000-01	2001-02	2002-03	2003-04	2004-05	2009-10
SHARE SWAP MERGERS: Revenue impact in levels, $m:							
Change dist to: Normal	134.4	0.0	-128.3	-95.9	-59.3	-21.7	102.4
Base case dist is: Exponential	138.4	0.0	-87.5	-48.7	-18.3	6.9	94.3
Change dist to: Gamma	137.5	0.0	-88.9	-48.8	-16.9	9.6	97.4
Deviation from base case, $m:							
Normal dist scenario	-3.9	0.0	-40.8	-47.2	-40.9	-28.7	8.1
Gamma dist scenario	-0.9	0.0	-1.3	-0.1	1.4	2.7	3.1
DEMERGERS: Revenue impact in levels, $m:							
Change dist to: Normal	22.6	0.0	4.2	5.3	6.7	8.4	16.4
Base case dist is: Exponential	22.3	0.0	4.9	5.9	7.1	8.5	15.8
Change dist to: Gamma	22.3	0.0	4.9	5.9	7.1	8.5	15.8
Deviation from base case, $m:							
Normal dist scenario	0.3	0.0	-0.7	-0.7	-0.4	-0.1	0.6
Gamma dist scenario	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COMBINED TOTAL OF ROLLOVER RELIEF: Revenue impact in levels, $m:							
Change dist to: Normal	157.0	0.0	-124.1	-90.6	-52.5	-13.3	118.8
Base case dist is: Exponential	160.6	0.0	-82.6	-42.8	-11.2	15.4	110.1
Change dist to: Gamma	159.7	0.0	-84.0	-42.9	-9.8	18.1	113.2
Deviation from base case, $m:							
Normal dist scenario	-3.6	0.0	-41.4	-47.9	-41.3	-28.8	8.7
Gamma dist scenario	-0.9	0.0	-1.3	-0.1	1.4	2.6	3.0

SENSITIVITY TO AVERAGE LENGTH OF SHAREHOLDING ASSUMPTION

	AANPV	2000-01	2001-02	2002-03	2003-04	2004-05	2009-10
SHARE SWAP MERGERS: Revenue impact in levels, $m:							
Increase average by 1.0	136.5	0.0	-104.0	-69.4	-40.0	-14.0	83.7
Base case average	138.4	0.0	-87.5	-48.7	-18.3	6.9	94.3
Decrease average by 1.0	138.7	0.0	-61.9	-19.7	8.9	30.8	100.5
Deviation from base case, $m:							
Increase scenario	-1.9	0.0	-16.5	-20.7	-21.6	-20.9	-10.6
Decrease scenario	0.3	0.0	25.7	29.0	27.3	23.8	6.2
DEMERGERS: Revenue impact in levels, $m:							
Increase average by 1.0	22.6	0.0	4.7	5.7	6.9	8.3	16.1
Base case average	22.3	0.0	4.9	5.9	7.1	8.5	15.8
Decrease average by 1.0	21.9	0.0	5.3	6.3	7.4	8.6	15.5
Deviation from base case, $m:							
Increase scenario	0.4	0.0	-0.2	-0.2	-0.2	-0.2	0.2
Decrease scenario	-0.4	0.0	0.4	0.4	0.2	0.1	-0.4
COMBINED TOTAL OF ROLLOVER RELIEF: Revenue impact in levels, $m:							
Increase average by 1.0	159.1	0.0	-99.3	-63.7	-33.0	-5.6	99.8
Base case average	160.6	0.0	-82.6	-42.8	-11.2	15.4	110.1
Decrease average by 1.0	160.5	0.0	-56.6	-13.4	16.3	39.4	116.0
Deviation from base case, $m:							
Increase scenario	-1.5	0.0	-16.7	-20.9	-21.8	-21.0	-10.4
Decrease scenario	-0.1	0.0	26.0	29.3	27.5	23.9	5.8

SENSITIVITY TO GRANDFATHERING ASSUMPTION

	AANPV	2000-01	2001-02	2002-03	2003-04	2004-05	2009-10
SHARE SWAP MERGERS: Revenue impact in levels, $m:							
Base case: continue grandfathering	138.4	0.0	-87.5	-48.7	-18.3	6.9	94.3
Change to: stop grandfathering	139.5	0.0	-87.0	-47.6	-16.7	9.1	97.2
Deviation from base case, $m:							
Stop grandfathering	1.1	0.0	0.6	1.1	1.6	2.1	2.9
DEMERGERS: Revenue impact in levels, $m:							
Base case: continue grandfathering	22.3	0.0	4.9	5.9	7.1	8.5	15.8
Change to: stop grandfathering	22.3	0.0	5.0	6.0	7.2	8.6	16.0
Deviation from base case, $m:							
Stop grandfathering	0.1	0.0	0.1	0.1	0.1	0.1	0.1
COMBINED TOTAL OF ROLLOVER RELIEF: Revenue impact in levels, $m:							
Base case: continue grandfathering	160.6	0.0	-82.6	-42.8	-11.2	15.4	110.1
Change to: stop grandfathering	161.8	0.0	-82.0	-41.6	-9.5	17.7	113.1
Deviation from base case, $m:							
Stop grandfathering	1.2	0.0	0.6	1.1	1.7	2.3	3.0

Attachment
Detailed assumptions for modelling the revenue impacts of rollover relief

The key parameters that have the greatest impact on the revenue estimates produced by the models were discussed in broad terms in Chapter 1. This attachment covers all of the models' parameters in detail, covering the data sources and other evidence that Access Economics used to reach a view on appropriate settings for the parameters. Every parameter setting discussed in this attachment can easily be altered in the models if users wish to examine the sensitivity of the models' results to changes in various assumptions. The material below is in the same order as the items in the assumption sheet of the Excel workbook containing the models.

Scope and economic backdrop

Revenue items to include in charts/output

The focus of the models is on calculating the capital gains tax revenue implications of rollover relief for share-swap mergers and demergers. However, there are also some broader income tax revenue implications that the models can assess. Specifically, the models can estimate the income tax receipts from:

- share transactions that are captured on the revenue account rather than on the capital account (for example, where institutional share-holdings are treated as trading stock);
  - the models assume that such transactions do not benefit from rollover relief, either by design of the extension of current rollover provisions, or in practice because of the relatively rapid turnover of such shareholdings. The models incorporate the revenue effects from these shareholdings as part of the 'capital effects'; and
- the additional taxable income received by shareholders from additional dividends generated by the target company after the merger/demerger. The methodology for calculating this aspect is discussed on page 18 in the Technical Supplement.
  - This aspect of the revenue impact can be turned on and off using the 'profit effects' checkbox in the assumptions sheet.

Indexation and growth

Some historical evidence on the various assumptions is presented in the following table and chart.

Table 1: Annual growth in key indicators – 15 year average 1983-84 to 1997-98

Index	NOMINAL	REAL
Price level (CPI)	4.5 per cent	n.a.
Share prices (All Ords Price Index)	10.7 per cent	6.3 per cent
Share returns (All Ords Accumulation Index)	15.1 per cent	10.6 per cent
10 year bond yields (accumulated)	10.6 per cent	6.2 per cent

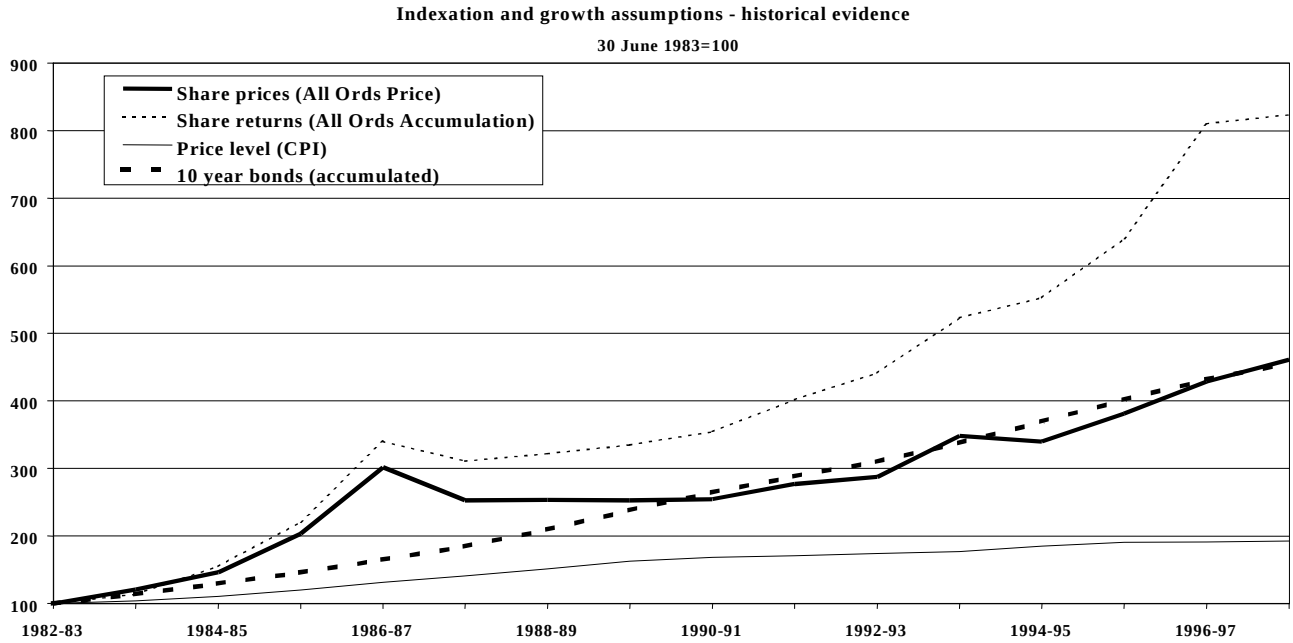
Historical Consumer Price Index (CPI) data are taken from ABS cat. 6401.0. The June quarter weighted average of 8 capital cities is used. If users wish to insert an alternative historical CPI time series in the models, they can enter their preferred values in row 6 of the spreadsheet 'Index'. In relation to the timing issues discussed on page 4, the cost-base calculation for a merger/demerger that occurs on 1 July uses the

June quarter CPI immediately preceding the 1 July merger/demerger. For ordinary purchases or sales of shares (before or after a demerger/merger), notionally on 31 December, the cost-base calculations use the average of the June quarter CPI levels either side of the 31 December transaction.

Over the past 15 years, annual growth in the CPI has average 4.5 per cent. Given the RBA target range for inflation of 2 per cent to 3 per cent over the cycle and more modest inflation in recent years, this parameter is set to the mid-point of the RBA range, 2.5 per cent, in the future. Hence, after the last available historical observation (June quarter 1998), the time series is inflated by 2.5 per cent per annum. The results are not particularly sensitive to the rate of inflation.

Historical data on capital growth for shares use the All Ordinaries share price index from the Australian Stock Exchange, as published in the Reserve Bank Bulletin, Table F.5 - the June quarter average is used. If users wish to insert an alternative historical share price time series in the models, they can enter their preferred values in row 7 of the spreadsheet 'Index'. Note that, for the purposes of modelling capital gains, the capital growth in shares is the quantum of share price increases (not the total returns to owning shares, which would include dividends). Over the past 15 years, the real capital gain from shares has averaged 6.3 per cent, around the same as the real accumulated yield on 10-year Commonwealth Government bonds. As a starting point, the models use annual average real share price growth of 3.5 per cent.

For the purposes of calculating the increased dividends implied from a merger/demerger share price gain following a merger/demerger, the average rate of dividend earnings are required. Historical data on total returns to shares utilises the All Ordinaries Accumulation Index from the Australian Stock Exchange. The difference between the annual average growth in the accumulation index and the share price index can be used as a guide to average annual dividend returns. Over the past 15 years, average annual growth in the accumulation index has been 4.4 per cent more than the average annual growth in the share price index (4.0 per cent is assumed in the models). The chart below shows the performance of $100 invested on 30 June 1983 in either bonds or shares - showing the capital growth (All Ords price index) and the total growth (All Ords Accumulation index). For reference the CPI is included in the chart.



The bond rate is only used for the purpose of calculating a net present value of the impact on the revenue. Over the past 15 years the 10-year bond rate has averaged 10.6 per cent, or 6.2 per cent above the rate of inflation (note that these figures have been rounded so do not exactly line up with the CPI average of 4.5 per cent quoted above). However, the circumstances of the 1980s and early 1990s may be unrepresentative of the bond rates that may apply in the future. A real bond rate of 3.5 per cent has been assumed, which is broadly consistent with current levels and with the economic outlook.

Value of assets

Average market capitalisation prior to merger/demerger

Of all the assumptions in the modelling, those related to the average market capitalisation of target companies are subject to the most volatility. Some relatively large transactions like the $2.7 billion merger of St George Bank and Advance Bank can distort the average somewhat. Based on data from the company Corporate Adviser Securities Data on all share-swap mergers for public companies in the three-year period 1995-96 to 1997-98 inclusive, the average capitalisation of share-swap merger takeover subjects was $214.0 million. This average value relates to the value of the target companies 4 weeks prior to the announcement of a merger (to reduce the possibility of leaks affecting the price). It also excludes 5 of the 48 mergers, for which data on the market capitalisation prior to the announcement of a merger were not available on the database. If the Advance/St George transaction was removed from the above calculation, the three-year average becomes $170.4 million. The median capitalisation was $55.5 million. While the mean is required for revenue calculations, it tends to be more volatile than the median.

A summary sheet of the data obtained from Corporate Adviser Securities Data is at attached at the end of this document. It lists the details of each share-swap merger that has occurred over the past three years. Those data provide estimates of the average market value of the share swap component of the merger. (Where available, an average of the market value on the day prior to announcement and the day prior to completion is used.) An electronic copy of the data accompanies the model in the file RolloverData.xls.

The data on market capitalisation is rather volatile partly because there have been only around 16 share-swap mergers a year, on average, in the past 3 years.

Some alternative data sources were examined, mainly as reasonableness checks on the average market capitalisation of $214.0 million.

- Additional data were obtained from Corporate Securities Data on all cash-based mergers (rather than share-swaps mergers); this gave an average takeover value of $110.6 million. A summary of these data is attached, and also provided with the electronic copy.
- As of 31 October 1998, there were 1,161 Australian companies listed on the Australian Stock Exchange (ASX) with a combined market capitalisation of $488,639 million, an average of $421 million per listed company (source: ASX). This is best considered an absolute upper limit on the average size of a share-swap merger, as a few large listed companies (such as Telstra and NAB) are unlikely to become takeover targets, yet contribute roughly one-fifth of the total capitalisation of Australian companies on the ASX used in the above calculation.

Overall, an average market capitalisation of $214.0 million seems reasonable.

For demergers, there have not been any demergers of the type defined on page 4 in recent history, in part because the current CGT treatment would make such demergers non-viable. The model assumes that – in the absence of a policy change – that will continue in the future.

There are limited data available on the few public company spin-offs in the past ten years. Those data suggest that there has been around 1 spin-off per year in the past decade, with an average market capitalisation of the target (spun off) company of around $175 million. This gives some indication of the potential market capitalisation of demerged companies, but would very much be at the lower end of the range given that a demerger would involve an entire public corporate conglomerate company splitting into two or more parts. As a starting point, the model assumes an average market capitalisation for future demergers of $250 million. Note: this figure is surrounded by a wide margin, as a major demerger could increase this figure considerably.

Average toehold investment by acquiring company

The initial stake of an acquiring company in a target company (the 'toehold' investment) is obtained prior to the announcement of a merger and would not qualify for rollover relief because the toehold investment would have been bought using cash.

The data from Corporate Adviser Securities Data for share-swap mergers in the three years to 30 June 1998 is not complete in respect of toehold investments. Using those 41 (of 48) records for which toehold investment estimates are available, the total toehold investment was $965 million, equivalent to 10.5 per cent of the market capitalisation of target firms (valued 4 weeks prior to merger announcement).

This figure of 10.5 per cent seems quite reasonable in the context of the 15 per cent and 20 per cent thresholds specified under Australian law.

The issue of toehold investments is not relevant for demergers.

Average cash component of mergers

For some share-swap mergers, there is a cash component in the deal, for which it would not be possible to provide rollover relief. Of the 41 share-swap mergers in the three years to 30 June 1998 for which complete information is available, 14 included a cash component. The average value of the cash component (as a proportion of the post-merger market value of the shares attained) was 14.1 per cent, which is used in the model.

Merger/demerger gain

The data obtained form Corporate Adviser Securities Data (see attached summaries) record the shares price of companies 4 weeks prior to the takeover announcement, from which a merger gain can be estimated.

From the sample of share-swap mergers occurring from 1995-96 to 1997-98, the average merger gain was 31.0 per cent. (This excludes 7 of the 48 mergers for which information is incomplete.) Note that data for one observation (Homestake Mining takeover of Plutonic Resources) was incorrect in the original data set, so a corrected value was overwritten using information from the companies involved. All other data has been verified as correct.

However, this 31.0 per cent is likely to be a conservative assumption. The data obtained from Corporate Adviser Securities Data for cash-based mergers suggest an average merger gain of 64.8 per cent. Even after excluding three cash-based mergers with exceptionally large merger gains, the average merger gain is still 35.3 per cent.

For demergers, the Securities Institute of Australia suggests that conglomerates currently trade at about 15 per cent below separated value following corporate restructure. Demutualisation of insurance organisations in Australia may also provide something of a benchmark (ie AMP, Colonial Mutual, National Mutual). That experience suggests that the market valued the restructured organisations at about 25 per cent above the value of the pre-restructured organisations (although there are important issues in relation to valuing a mutual insurance organisation that makes them a special case).

A demerger gain in the range of 15 per cent to 25 per cent seems appropriate for demergers and the model uses 20 per cent as a starting point.

An important consideration in the model is that any merger/demerger gain represents investors' beliefs that the post-merger company will generate additional profits than the unmerged company. A merger/demerger gain of 31.0 per cent must be considered as the expected net present value of the increased future earnings potential of shares in the company due to the merger. This 31.0 per cent can be reverse-engineered into a

future flow of profits, which will generate additional future income tax revenues. A profile is included to reflect the view that it may take a few years for profits to reach the higher plateau, and may even be reduced in the short term, given the likelihood of expenses related to redundancies etc. The merger/demerger gain is important for both CGT collections and company tax collections on the higher future profit stream.

Reduction in average merger/demerger gain with rollover relief

The average merger share price gain of 31.0 per cent over the past three years in probably a reasonable guide to likely gains in the future in the absence of the extension of CGT rollover relief to share-swap mergers. However, the extension of rollover relief should mean that some additional share-swap mergers will be able to proceed with lower merger share price gains than would otherwise be the case. There are two (related) reasons for this. First, some mergers that would have proceeded anyway will now be able to proceed with lower offered share price premiums because the deferral of the CGT liability makes a lower (pre-tax) offer more attractive to some shareholders. Secondly, some mergers (involving lower merger share price gains) will be able to proceed because deferral of the CGT liability makes them viable – as discussed below, international experience suggests this behavioural response could be substantial.

There is no way of knowing with precision by how much the average of all merger share price gains would fall following the extension of rollover relief. However, the following may be reasonable:

- the average share price gain for mergers that would have gone ahead anyway falls by 5 percentage points (from 31.0 per cent to 26.0 per cent); and
- the additional mergers that go ahead after the extension of rollover relief result in share price gains in the range of 10 to 30 per cent (with an average of 20 per cent).

Combining these with the assumed increase in share-swap activity of 70 per cent (discussed below) gives a post-rollover relief reduction in merger share price gains of 7.5 percentage points (ie 31.0-((31.0-5)x1+20.0x0.7)/1.7=7.5). The model for share-swap mergers uses this as a starting point.

For demergers, the model assumes a somewhat smaller reduction in share price gains (5 percentage points) given that the assumed starting point for share price gains (20.0 per cent) is smaller than is the case for mergers.

Volume of share-swap mergers/demergers
Volume of partial share-swap mergers

The data obtained from Corporate Adviser Securities Data indicate that there were 48 share-swap mergers in the three financial years to 30 June 1998, ie an average of 16 per year. The model therefore uses the assumption that this annual average will be followed in future years, in the absence of a policy change.

Of the average of 48 share-swap mergers, 6 are listed as involving the acquisition of less than 100 per cent of the shares of the target company (the database contains complete information on 5 of the 6). The range of shares acquired during those partial mergers was 26.0 per cent to 74.1 per cent of the target company, with a weighted (by market value of the share swap component of each merger) average of around 40 per cent and an average toehold of about 35 per cent in the case of partial mergers. (Note that the toehold figure for partial mergers is much higher than the 10.5 per cent for full mergers.) The model assumes that, of the average 16 share-swap mergers per year, 2 are for partial acquisitions, with an average of 40 per cent of the target company acquired during the transaction (for a total 75 per cent attained at the end of the transaction).

For demergers, as discussed above, there have not been any demergers recent history. The model assumes that – in the absence of a policy change – that will continue in the future.

Change in activity caused by rollover relief

As discussed on page 7, the additional mergers/demergers that would occur if rollover relief were extended is one of the most crucial assumptions (along with total market capitalisation and merger/demerger share-price gains) when determining the revenue impacts. For share-swap mergers, there is also the likelihood that some mergers that would have proceeded on a purely cash basis would include a share component if rollover relief were extended.

Extra share-swap mergers/demergers

While some increase in the value of share-swap mergers and demergers would be expected, the critical question is how much of an increase should be expected? In technical terms, it is necessary to determine the elasticity of share-swap mergers and demergers to changes in capital gains taxation.

There is little in the way of Australian experience that could be used as a guide in answering this question. There have been changes made to the capital gains tax laws in the period since its introduction, but it is likely that the vast majority of those changes have not been large enough to produce a behavioural response that is measurable. The recent introduction of the small business rollover measures are likely to produce behavioural responses, but it is too early to try to estimate such responses.

There is, however, some overseas experience that may serve as a guide. This is particularly the case in the US, where there have been a large number of major changes to capital gains taxation over the years. There has also been a long debate in the US about the responsiveness of the realisation of capital gains to changes in the rate of tax on capital gains. That debate has centred on the question of whether or not a *reduction* in the rate of capital gains taxation might lead to an *increase* in capital gains tax revenue. This would occur, for example, if a 10 per cent reduction in the rate of capital gains tax led to an increase in the value of taxable capital gains realisations of more than 10 per cent. In technical terms, that would mean that the elasticity of capital gains realisations to the rate of capital gains taxation is less than minus one[6].

The large number of studies on this issue in the US have failed to reach a definitive conclusion (Table 2). Studies using cross-sectional data (ie data from different taxpayers in a single year) have tended to produce estimates of the long-run (or permanent) elasticity greater than those studies using time series data (ie aggregated data over a long period of years). The more recent cross-sectional studies have also attempted to estimate separately a short-run (or temporary) elasticity, estimates of which tend to be greater than the long-run elasticity.

There are likely to be many differences between the factors (including tax factors) affecting decisions by asset holders in Australia and the US about whether or not to realise capital gains. There are also likely to be differences in the responsiveness of the realisation of capital gains on different types of assets to changes in the rate of tax on capital gains. In that regard, the US Department of the Treasury (1985) found the elasticity on corporate shares (-2.07) to be significantly greater in absolute value than that for real estate (-0.71) and all other assets (-0.43).

Notwithstanding these differences and the fact that the US studies have not reached a definitive conclusion, a range of -0.4 to -1.0 seems to be a reasonable guide to the likely elasticity of the value of share-swap mergers to rollover relief for capital gains tax. The model therefore uses, as a starting point, an elasticity of -0.7 (the mid-point of that range) as a starting point on what would be a 100 per cent temporary reduction (in the sense that it is deferred) in capital gains taxation associated with rollover relief. This is expressed as a 70% increase in share-swap mergers.

[6] The is sometimes expressed as an elasticity that has an absolute value greater than one.

Table 2: Estimates of Elasticity of Value of Capital Gains Realisations to Capital Gains Tax Rates

Time Series Studies	Estimated Long-Run Elasticity	Cross-Section and Related Studies	Estimated Short-Run Elasticity	Estimated Long-Run Elasticity
US Department of the Treasury (1985)	-0.8	Auten and Clotfelter (1982)	NA	-0.37 to -1.45
US Congressional Budget Office (1988)	-0.79 to -0.99	US Department of the Treasury (1985)	NA	-1.16 to -2.20
Darby, Gilingham and Greenlees (1988)	-0.41 to -0.67	Lindsay (1987)	NA	-1.37
Auerbach (1989)	-0.5	Slemrod and Shobe (1990)	NA	< -1
Jones (1989)	-0.89	Auten, Burman and Randolph (1989)	-1.98	-1.63
Gillingham and Greenlees (1992)	-1.07	Burman and Randolph (1994)	-6.42	-0.18
Bogart and Gentry (1993)	-0.67			

Source: Table summarises the discussion of the above-mentioned studies in Zodrow (1995).

For demergers, the issues are more complex. Given that there have been very few demergers, it does not seem sensible to discuss responses to rollover relief in terms of percentage changes. Rather, a judgement needs to be made about he extent to which the current CGT treatment is preventing demergers and, if rollover relief is extended, how many more demergers are likely to take place each year, on average.

Reports from members of the Securities Institute of Australia suggest that the current CGT treatment is a substantial impediment to demergers and often prevents plans from even reaching the drawing board. It is, however, impossible to arrive at reliable estimates as to how many more demergers might eventuate should rollover relief be extended, so this issue is probably best handled through sensitivity analysis.

As a starting point, the model assumes that there are an additional 2 demergers per year following the extension of rollover relief. The results beginning on page 16 show how sensitive the model estimates are to changes in this assumption.

Extra share-swap mergers – previously cash mergers

There are a range of factors that enter into decisions about the cash vs share mix of a share-swap merger proposal. Decisions are based on factors such as the cash reserves and debt-equity ratio of the acquiring company, the market capitalisation and current share price of both the acquiring company and the target company, and overall market conditions. Cash bids have strong commercial attractions because, inter alia, problems associated with valuing the acquiring companies shares are avoided, risks of market fluctuations in the value of the bid are eliminated, and there is reduced risk of litigation.

Considerations about the CGT liability of the target company's shareholders can be critical to judgements about whether or not to proceed with a proposal that has a share component. That is because it can be important in determining whether or not a merger proposal will be successful (ie whether or not sufficient numbers of the target companies' shareholders will accept the offer). Considerations about the CGT liability of the target company's shareholders may also affect the cash vs shares mix of a share-swap merger, however that impact is likely to be marginal because of the more fundamental factors that affect that mix.

Nevertheless, it is likely that the extension of CGT rollover relief to share-swap mergers would result in some mergers going ahead with a share swap component that previously would have been undertaken on a cash basis. There may also be some increase in the proportion of deals covered by cash in mixed share-swap/cash mergers

While some response along the above lines might be expected, there is no international or domestic evidence that can be drawn on to support any estimate of likely magnitudes. This is therefore an issue that is probably best handled through sensitivity analysis.

As a starting point, the model assumes a 20 per cent increase in annual share-swap mergers that, in the absence of rollover relief, would have been undertaken on a cash basis. In the model, the 20 per cent figure is expressed as a percentage of the value of base share-swap mergers (ie 20% x $214 million x 16 = $685). However, this is also equivalent to 20 per cent of the value of cash-based mergers (ie 20% x $110.6 million x 31 = $686 million).

Share ownership profiles

Length of share ownership prior to merger/demerger

How long have shareholders been holding onto their shares? No one seems to know. Of all the surveys undertaken by various organisations, none seem to ask about the average age of shareholders' portfolios. For example, the 1997 Australian Stock Exchange *Shareholder Segmentation Study* analyses the length of time that people have owned shares, but not how long they hold onto particular parcels of shares.

The longer shares have been held, the greater the accumulated capital gains that can potentially be rolled over after a merger or demerger.

Turnover could be a guide to the average length of shareholding. The annual turnover on the ASX is about 55 per cent of the total capitalisation (source: ASX Fact Book, 1998). However, these data cannot be used to derive an average holding time, as these examples illustrate:

1. This turnover data could suggest that on average 100 per cent of all shares would be turned over in just under 2 years, if the world was uniformly distributed – a mean holding of just under two years.
2. Or perhaps 55 per cent of shares are turned over once every year and the other 45 per cent of shares are held for (say) 10 years, giving a mean shareholding around 5 years.
3. Or perhaps 5 per cent of shares are turned over 11 times per year and the remaining 95 per cent of shares are held for (say) 10 years, giving a mean holding of nearly 10 years.

These examples illustrate the range of possibilities given the data available. The average length of shareholdings is probably somewhere in the range 2 years to 10 years (and in all likelihood closer to the lower than the upper end of the range). It is also possible to hypothesise that institutional investors will probably turn shares over at a higher rate than private investors. Hence, the mean length of holding is lower for institutional investors.

Changes to the assumption regarding the mean length of shareholdings fortunately has almost no impact on the net present value of the change in policy (as it only changes the timing, not the overall amount of money). It does, however, have an impact in individual years. The higher the mean, the more revenue is pushed back, hence the first few years have a higher revenue cost, but the later years have a higher revenue gain.

To help illustrate the point, the models have been set up with various alternative statistical functional forms to represent the profile of shareholdings over time. Regardless of the distribution and mean selected, the NPV stays about the same.

As a starting point, the models utilise an average (mean) length of share ownership prior to merger/demerger of 3.5 years for private investors and 2.5 years for institutions and uses an exponential function for both.

For some of the statistical forms available in the models, the profiles for length of share ownership can quickly tail down toward zero (particularly if a relatively low average is used). The models therefore allow for a proportion of the distribution to be uniformly distributed back until 1985. As a starting point, the models set this proportion at 10 per cent.

Pre-1985 shareholdings

An additional variable that should be considered for assessing CGT liabilities is the proportion of shares attained pre-1985 (ie prior to the introduction of CGT). Given their CGT-free status, there are likely to be some shares purchased prior to that time which have not been sold in the intervening period. A priori, it would be expected that institutional shareholding of pre-85 shares would be lower than that for private investors (and relatively low for both).

As a starting point, the models assume that 10 per cent of shares held by private investors and 5 per cent of shares held by institutions are pre-CGT shares at the simulation start year of 2000-01. The models also assume that these percentages are reduced by 1 percentage point per year thereafter.

The models also provide an option for turning off the pre-CGT status of shares following a share-swap merger but the revenue implications are not sizeable.

Time until disposal after merger/demerger

Following a merger or demerger, revenue received from the subsequent disposal of shares will depend on how long those shares are held. This raises the same issues discussed above and the same solution has been adopted; that is, the models allow for various statistical profiles to be examined. However, there are likely to be different profiles for the length of time that shares are held under the current CGT treatment and under the proposed extension of rollover relief.

As mentioned on page 3, the lock in effects of CGT are well known. The current CGT treatment of share-swap mergers forces a realisation of capital gains for taxation purposes, thereby reducing the lock in effect in respect of those shares for the future. Therefore, under current CGT treatment, the profile of share disposals *after* a share-swap merger is likely to have a lower mean than the profile of share purchases discussed above. That is, under current CGT treatment, shareholders will tend to hold onto their shares for a shorter period of time after a merger than the period of time for which shares were held prior to the merger, because a CGT liability is crystallised by the merger and lock in effect is therefore reduced.

As a starting point, the models assume that this effect, under the current CGT treatment, reduces the mean time until disposal after a merger/demerger by 1.0 years for individuals and 0.5 years for institutions. (Institutions being affected by lock in less because of faster turnover rates and more rigorous investment decision-making processes.)

Following the extension of rollover relief, the lock-in effects would continue as if there had not been a merger/demerger (excluding share rationalisations, discussed below). The models therefore allow for the mean time until disposal after a merger/demerger to be higher after the extension of rollover relief. To be consistent with the preceding paragraph, the models assume that the mean time until disposal after a merger/demerger is higher by 1.0 years for individuals and 0.5 years for institutions.

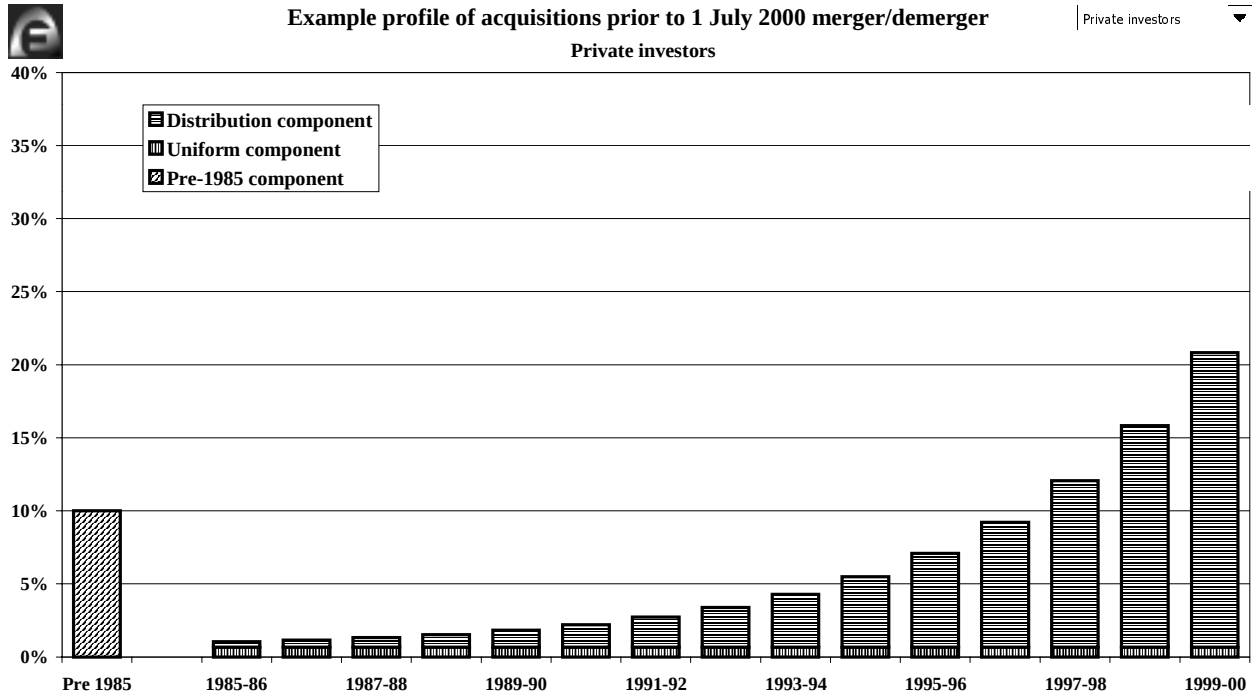
First year extra turnover - share-swaps mergers

For both share-swap mergers and demerger there is likely to be a temporary jump in share sales as shareholders rationalise their holdings in the post merger/demerger companies. This is likely to be a particular issue for demergers, where shareholders might decide to divest themselves of their holdings of part(s) of what was, prior to demerger, a conglomerate.

The models can be run with alternative assumptions for these first-year effects to assess the sensitivity of the results to these parameters. As a starting point, the models use 5 per cent additional share turnover in the first year following a merger and 10 per cent for demergers.

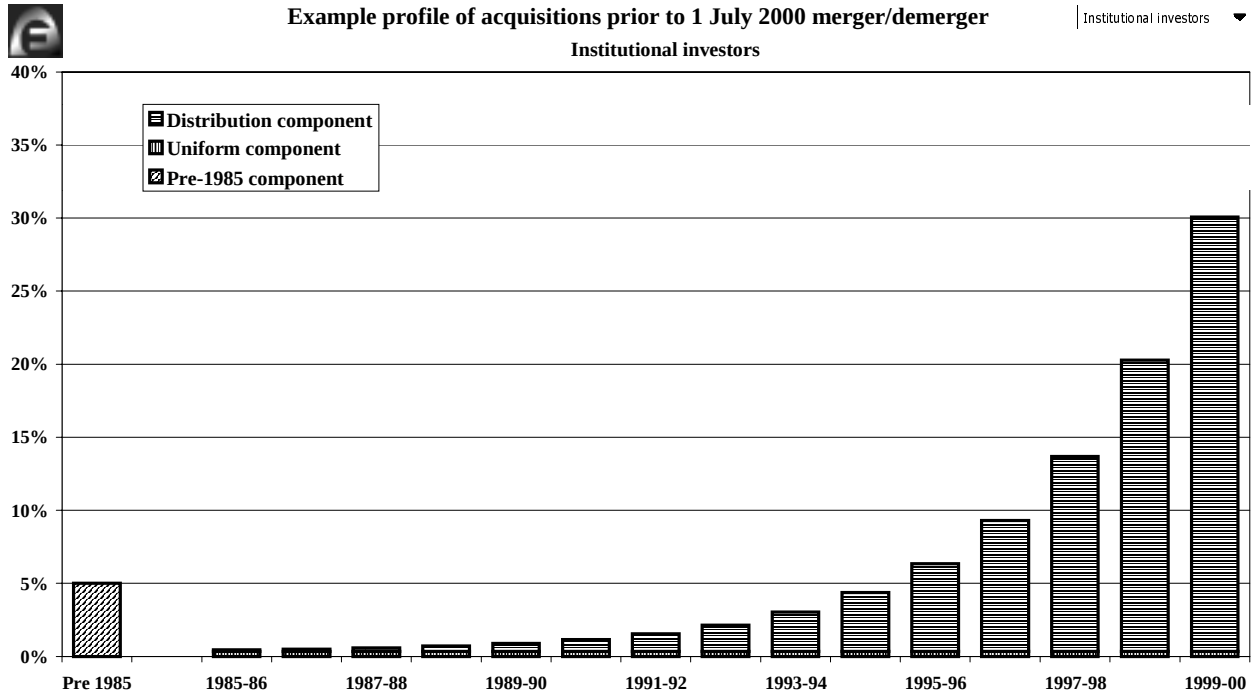
Six charts follow illustrating the distributional assumptions used in the model for the length of time shareholders have held their shares prior to a merger/demerger and the length of time they will hold onto their shares after the merger/demerger.

Share ownership profiles prior to event – private investors



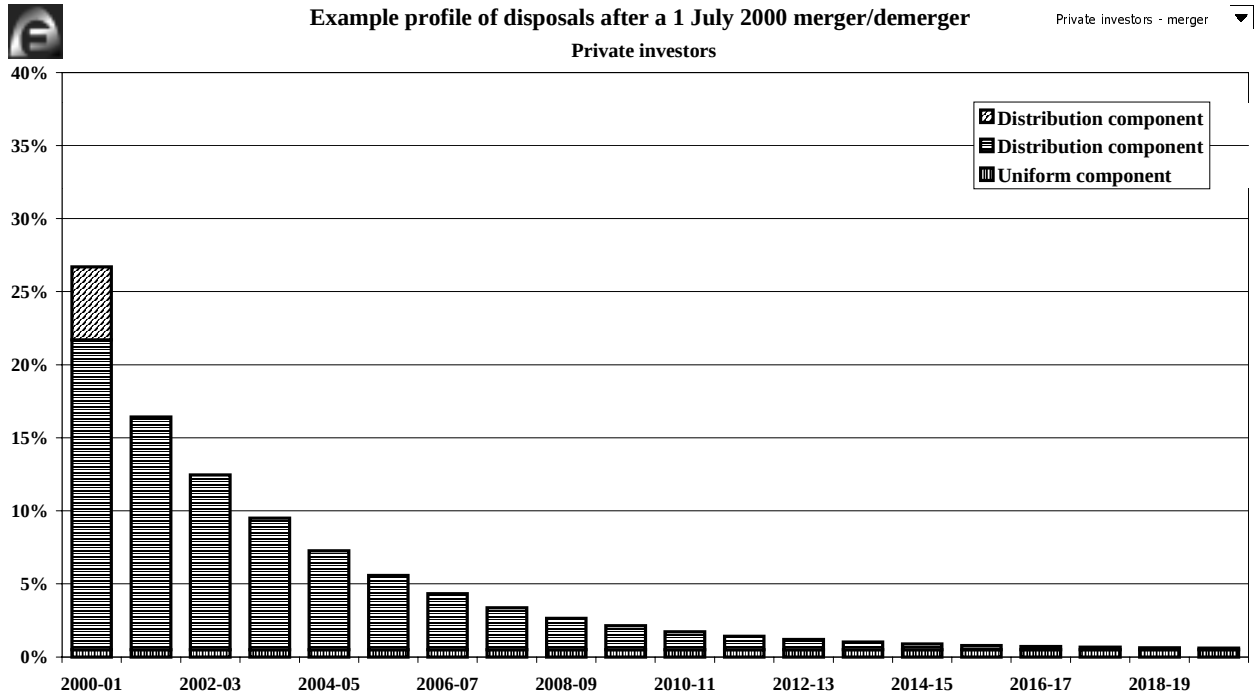
Note: the same distribution of historical share acquisitions is used for mergers and demergers

Share ownership profiles prior to event – institutional investors



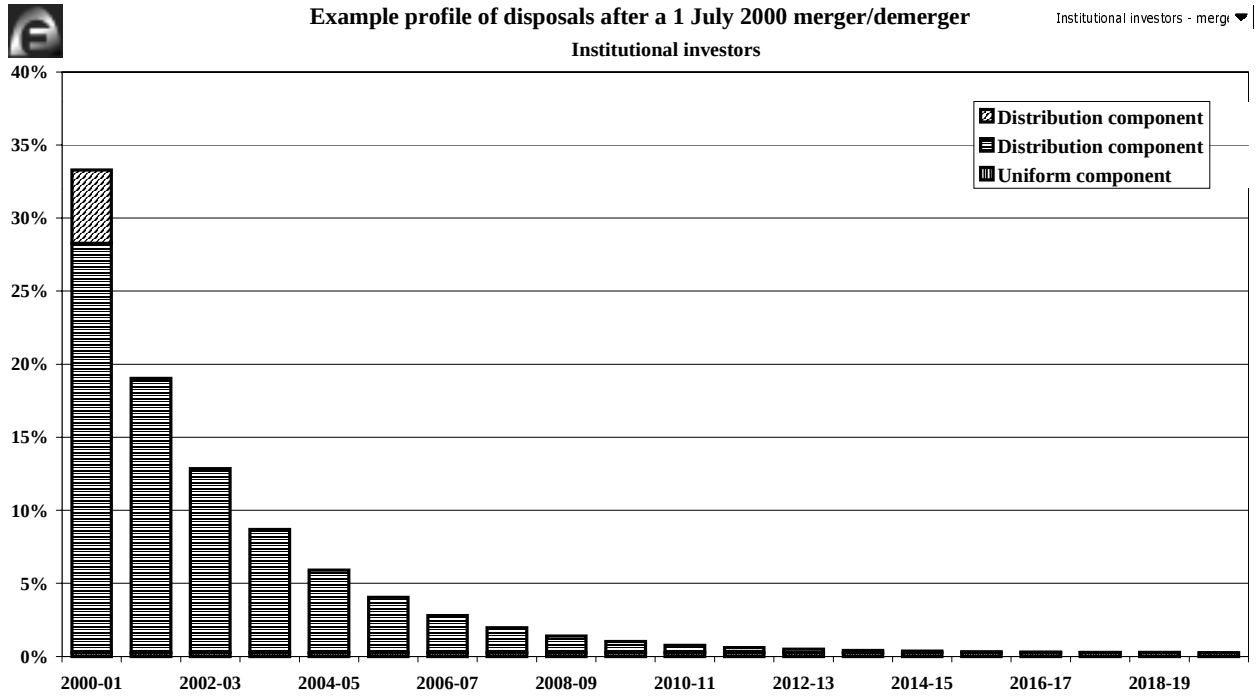
Note: the same distribution of historical share acquisitions is used for mergers and demergers

Share ownership profiles after the event – share-swap mergers, private investors



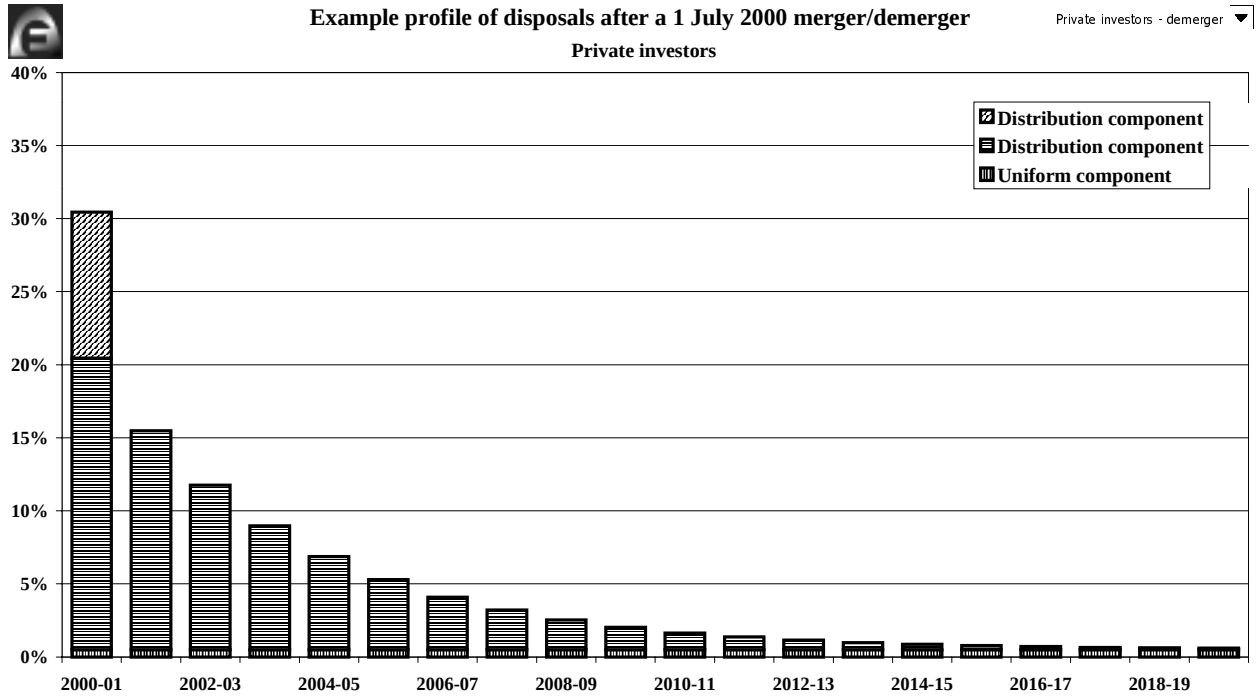
Note: a higher mean length of shareholding is used under rollover relief to reflect lock in

Share ownership profiles after the event – share-swap mergers, institutional investors



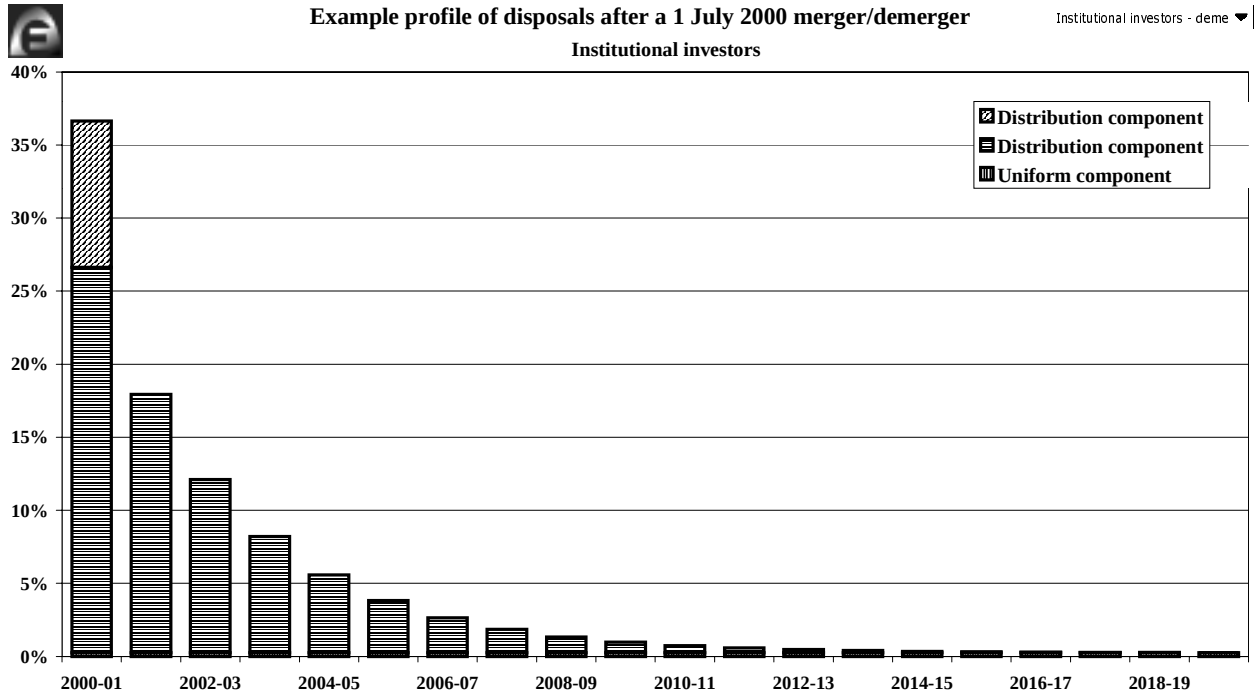
Note: a higher mean length of shareholding is used under rollover relief to reflect lock in

Share ownership profiles after the event – demergers, private investors



Note: a higher mean length of shareholding is used under rollover relief to reflect lock in

Share ownership profiles after the event – demergers, private investors



Note: a higher mean length of shareholding is used under rollover relief to reflect lock in

Mix of share ownership

Translating realised capital gains into CGT payable depends on which type of taxpayer the shareholder is.

The Australian Taxation Office *Taxation Statistics 1995-96* provides estimates of the realised capital gains attained by individuals, superannuation funds, and companies subject to tax on capital gains (Table 3).

Table 3: Realised Capital Gains From Shares

	Amount of Gain ($m)	Per cent of Total Gain
Individuals	731	42.3
Superannuation funds	410	23.7
Companies subject to CGT	589	34.0
Total	1730	100.0

The Australian Stock Exchange also provides, in its *1998 Fact Book*, the following information on shareholdings in the June quarter 1997

Table 4: ASX Shareholdings

Type of Shareholder	Per cent of Australian Listed Shares Held
Government	0.1
Other Companies	11.2
Banks and deposit-taking institutions	4.0
Life and super funds	24.5
Other financial institutions	9.3
Private investors	20.2
Foreign investors	30.7
Total	100.0

There are also data available from the then Australian Investment Managers' Association (AIMA), which relate to the financial year ending June 1995, as outlined in Table 5.

Table 5: AIMA Data on Investments in Australian Listed Equities

	Investment in Listed Australian Equities ($ million)	Per cent of total
Life Funds	10904	11
Superannuation funds	65479	63
Retail unit trusts	8336	8
General Insurance funds	5885	6
Other retail and wholesale	12407	12
Total	103011	100

The alternative data sources produce different estimates that, in part, can be explained by the different definitions used. For example, the ATO data are estimates of realised capital gains, which depend on both who owns the shares and how much gain is attained on selling those shares. For the purposes of the models, it is who owns the shares that is most relevant (because the amount of gain per share is assessed separately).

Using the ASX data as a base, the models assume the share ownership profile outlined in Table 6. The ASX data have been adjusted to take specific account of retail unit trusts, so that the eventual tax rate of the unit holders can be used. The AIMA data were used as a guide to the importance of retail unit trusts relative to superannuation funds, but were adjusted upward arbitrarily to reflect the fact that the AIMA data are dated and that the relative importance of retail unit trusts would have increased in the intervening period. Using the ASX data for private and foreign shareholders, other institutions are derived as a residual. For such institutions, a substantial part of the income from trading in shares would be captured on the revenue account rather than the capital account. In the absence of reliable data, the models assume, as a starting point, that the split between revenue and capital account for other institutions is 50:50.

The tax rates in table 6 are discussed below.

Table 6: Shareholder Profiles Used in the Models

Shareholder Type	Per cent of All Shares Held	Tax Rate (per cent)
Private investors	20.2	Discussed below
Superannuation funds and life offices	24.5	15
Retail unit trusts	5.0	Average of private investors
Other institutions subject to CGT	9.8	36
Other institutions on revenue account	9.8	NA
Foreign shareholders	30.7	20

Private income distribution and tax rate

The ASX 1997 *Shareholder Segmentation Study* provides information on the value of shares owned according to level of *household* income, however it does not provide information on the value of shares owned according to level of *shareholder* income.

The Access Economics Micro Model (AEMM) has therefore been used to estimate the total ownership of shares (and other assets) by the marginal tax rate of the owners. The AEMM is a microsimulation model that covers the main aspects of the circumstances of households and individuals in relation to demographics, the labour market, income, taxes, government transfers, expenditure/savings and household assets. The model draws on data from a large number of sources with the current version being based on the Unit Record File from the 1993-94 Household Expenditure Survey (HES) from the Australian Bureau of Statistics. The AEMM model is quarterly and applies a combination of static ageing and dynamic accumulation techniques to provide an updated picture for any quarter from 1993-94 to the present time of the areas covered by the model. Through linkages with Access Economics' macro models and other forecasting tools it is further possible to perform out-year forecasts.

The HES is conducted with five years intervals and surveys a representative sample of Australian households. The 1993-94 version HES was conducted over the 12 month period from July 1993 to June 1994 and each household remained in the survey for the two weeks it took to complete the personal diaries that recorded the expenditure information. There are 8,421 households in the survey, which contains information on about 17,271 persons aged 15 and above. The response rate to the survey was 86 per cent. The survey aims to measure levels and patterns of expenditure on commodities and services and to identify factors, which influence these levels and patterns. The information collected by the HES thus includes a broad range of characteristics of persons and households including details on income and demographic composition.

The key elements in the derivation of the estimates in Tables 7 and 8 below can be summarised by the following points and are discussed, in turn, below:

- The derivation of the ownership of shares, trusts and rental property in 1993-94;
- The updating of the ownership of assets to July 1998;

- The updating of private income to July 1998;
- The calculation of government transfers for July 1998; and
- The calculation of taxable income for July 1998.

Imputation of household assets[7]

The HES has limited information in relation to the wealth of individuals and households. However, there is quite detailed information on the income related to different forms of assets and various imputation techniques have been applied to get an estimate of the ownership of household assets. The income capitalisation technique whereby a rate of return (or a distribution of rates) is applied inversely to the investment income stream is one such technique. This method has been used to obtain estimates of the ownership of shares and trusts. The estimate for equity in rental property is more complicated. The 1993-94 HES collects net returns from rental investments and there is not a simple relationship between the value of the property and the net income. A large number of rental investments are heavily geared and the net rent is often reported as zero or negative. A more complete picture of the relation between gross and net return on the on hand side and property value and loans on the other hand side is found in the ABS Survey of Rental Investors (1993 and 1997). Information from this survey has been applied to estimate property values and loans in the 1993-94 HES.

Table: Total Assets by Marginal Tax Rate of the Owner
Current Tax Rates

Marginal Tax Rate	Upper Threshold	Shares		Trusts		Rental Property		Capital Gains (95-96)	
		Value	Share	Value	Share	Value	Share	Value	Share
	$	m$	%	m$	%	m$	%	m$	%
0%	5,400	2,438	2.0	847	0.9	21,183	13.6	0	0.0
20%	20,700	16,363	13.5	15,364	17.2	37,491	24.1	207	9.8
34%	38,000	22,542	18.6	14,565	16.3	34,478	22.1	406	19.2
43%	50,000	14,985	12.4	4,397	4.9	21,798	14.0	244	11.6
47%	-	64,583	53.4	54,125	60.6	40,749	26.2	1,254	59.4
ALL		120,911	100.0	89,297	100.0	155,701	100.0	2,111	100.0

Table: Total Assets by Marginal Tax Rate of the Owner
Proposed New Tax Rates

Marginal Tax Rate	Upper Threshold	Shares		Trusts		Rental Property	
		Value	Share	Value	Share	Value	Share
	$	m$	%	m$	%	m$	%
0%	6,000	2,498	2.1	1,233	1.4	22,600	14.5
17%	20,000	16,099	13.3	14,869	16.7	34,573	22.2
30%	50,000	37,730	31.2	19,072	21.4	57,779	37.1
40%	75,000	14,915	12.3	5,980	6.7	25,834	16.6
47%	-	49,668	41.1	48,145	53.9	14,916	9.6
ALL		120,911	100.0	89,297	100.0	155,701	100.0

[7] A more comprehensive description of the techniques applied to impute asset value to the 1993-94 HES is found in Baekgaard (1998).

Updating of household assets

The asset values for 1993-94 have been updated to 1998 by a combination of dynamic accumulation accounting and alignment to aggregate benchmarks for each type of asset. The dynamic accumulation techniques use group accounts to control annual increments of each asset type for subgroup of the population defined by, for example, age, sex and income level. The overall outcome is aligned with aggregate benchmarks for the different types of assets.

Updating of private income

The AEMM updates private income in different categories: 'Wage and Salaries', 'Business Income' and 'Investment Income'. The updating of 'Wage and Salaries' is performed separately for the four groups defined by part-time/full-time employment and sex. Within each of the four groups, the weekly earnings are updated according to estimates of the development in the percentiles of the distribution of weekly earnings as measured by the ABS. In order to ensure consistency with the development in Average Weekly Earnings a subsequent alignment is performed. The updating of the income of the self-employed is performed jointly with the updating of the assets of the self-employed. The method ensures consistency between the components of the national accounting income equation. The consistency applies for individuals as well as for the aggregates by industry as the outcome is aligned with the National Account estimates of income and capital for unincorporated businesses. Investment income is updated by applying the appropriate rates of return to the updated asset stocks.

Calculation of government benefits

The AEMM tax-benefit module calculates taxes and government transfers. The pensions, allowances and other payments are calculated on the basis of the relevant eligibility criteria and rates applying to the year and quarter of evaluation.

Calculation of taxable income

The taxable income is calculated by adding up all taxable components of private income and government transfers. Allowable deductions are imputed on the basis of information from the Australian Taxation Office. However, due to the crude nature of this imputation, the estimated deductions have not been subtracted from taxable income in the above tables.

The models utilise the proposed new personal tax rates in Table 8.

Table 7: Total Assets by Marginal Tax Rate of the Owner
Current Tax Rates

Marginal Tax Rate	Upper Threshold	Shares		Trusts		Rental Property		Capital Gains (95-96)	
		Value	Share	Value	Share	Value	Share	Value	Share
	$	m$	%	m$	%	m$	%	m$	%
0%	5,400	2,438	2.0	847	0.9	21,183	13.6	0	0.0
20%	20,700	16,363	13.5	15,364	17.2	37,491	24.1	207	9.8
34%	38,000	22,542	18.6	14,565	16.3	34,478	22.1	406	19.2
43%	50,000	14,985	12.4	4,397	4.9	21,798	14.0	244	11.6
47%	-	64,583	53.4	54,125	60.6	40,749	26.2	1,254	59.4
ALL		120,911	100.0	89,297	100.0	155,701	100.0	2,111	100.0

Table 8: Total Assets by Marginal Tax Rate of the Owner
Proposed New Tax Rates

Marginal Tax Rate	Upper Threshold	Shares		Trusts		Rental Property	
		Value	Share	Value	Share	Value	Share
	$	m$	%	m$	%	m$	%
0%	6,000	2,498	2.1	1,233	1.4	22,600	14.5
17%	20,000	16,099	13.3	14,869	16.7	34,573	22.2
30%	50,000	37,730	31.2	19,072	21.4	57,779	37.1
40%	75,000	14,915	12.3	5,980	6.7	25,834	16.6
47%	-	49,668	41.1	48,145	53.9	14,916	9.6
ALL		120,911	100.0	89,297	100.0	155,701	100.0

Tax rates and capital losses

Average tax rate for each type of investor

For private investors, the above analysis is used to determine the appropriate tax rate. In doing so, it is assumed that the averaging provisions prevent the realisation of a capital gain moving individuals into higher tax brackets.

For superannuation and life funds, the standard marginal tax rate of 15 per cent is used.

For other institutions, it is assumed that the majority of them will be taxed at the standard company tax rate of 36 per cent. (This assumption could, for example, be changed to 30 per cent, given the terms of reference for the Business Tax Review.)

For companies – which would fall within the category of other institutions - an issue is that the average rate of tax paid on capital gains in 1995-96 was 27% for companies with taxable income over $5 million (which accounted for 75 per cent of all taxable capital gains in 1995-96). Analysis of Australian Taxation Office *Taxation Statistics 1995-96* suggests that this is the result of the large value of non-refundable tax rebates and credits claimed by companies in 1995-96. These rebates and credits, which in 1995-96 amounted to $7.8 billion, reduce the average amount of tax paid by companies on all taxable income, including net capital gains. For the purposes of the models, and as a conservative assumption, it is assumed that all such

non-refundable rebates and credits are fully utilised and hence the marginal tax rate on additional realised capital gains from shares is 36 per cent.

There does not seem to be publicly available information on the average rate of tax paid on capital gains earned by foreign shareholders. The current rules are: non-resident shareholders in resident public companies are subject to Australian capital gains tax at normal rates, but only if they have held 10% or more of the issued capital of the resident public company at any time during the 5 years preceding the disposal of the shares. If that ownership threshold is not met, capital gains by non-residents are not taxed. Non-residents are fully taxed in relation to disposals of shares in private companies. No withholding tax is applicable to capital gains.

Given that foreign shareholders are mostly exempted from capital gains, as a starting point, the models assume that foreign shareholders pay an average of 5 per cent tax on realised capital gains.

Capital losses available to offset gains

The Australian Taxation Office *Taxation Statistics 1995-96* suggests that, for individuals and funds (primarily superannuation funds), capital losses applied represented around 20 per cent of gross capital gains in 1995-96 (Table 9). Therefore, if rollover relief for share-swap mergers had been introduced at that time, it is likely that around 20 per cent of the initial cost to the revenue of rollover relief would have been offset by reduced use of capital losses.

Table 9: Capital Gains and Losses

	Data ($ million)			Derived		
	Net Capital Gains	Capital Losses Applied	Capital Losses Carried	Gross Capital Gains	Capital Losses Applied/ Gross Capital	Capital Losses Applied/ Capital Losses
All Individuals	2261	595	1837	2856	21%	24%
All Funds (primarily super funds)	2268	571	533	2839	20%	52%
Taxable Companies	1994	1171	5306	3165	37%	18%

* Capital Losses Stock = Capital Losses carried Forward + Capital Losses Applied

Part of the benefit to the revenue of increased share-swap mergers following the introduction of rollover relief will also be offset by the application of capital losses. Two factors are relevant here:

- there is some degree of mismatch between entities earning capital gains and those that have unused capital losses (as evidenced by the stock of capital losses that is carried forward each year); and
- it is likely that, in the base case of no change in policy, all capital losses that could be utilised were utilised.

These factors suggest that, at the margin, there will be diminishing opportunities to apply capital losses to the additional capital gains arising from rollover relief. This could justify the use of a smaller loss offset factor than the 20 per cent referred to above.

In the interests of simplicity, the model starts with the assumption that 20 per cent of gross capital gains will be offset by the application of capital losses both before and after the introduction of rollover relief. This assumption can be varied within the model.

For demergers, there are also potentially important issues in relation to the transfer of unused losses (both capital and revenue) and franking account balances from the conglomerate to the demerged companies. The model assumes that the extension of CGT rollover relief to demergers is developed in a way that prevents a net tax benefit from such transfers of unused losses (both capital and revenue) and franking account balances.

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Technical Supplement

Methodology for Modelling the Revenue Impacts of Rollover Relief

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January 1999

Technical Supplement
Methodology for modelling the revenue impacts of rollover relief

Previous sections have discussed key parameters and recommended settings for these parameters. This Technical Supplement discusses how these assumptions are combined to produce a bottom line.

Access Economics has constructed two models for the purpose of estimating the revenue effect of extending rollover relief to share-swap mergers and demergers. The two models have many similar features, hence much of the discussion below relates to both share-swap mergers and demergers. The two models diverge mostly in the settings of the various parameters (discussed in an earlier section), rather than the actual calculations. Where there are differences in the calculations, it is noted in the text.

The modelling is contained in the Excel 97 file **RolloverReliefModel.xls**. There are several worksheets and charts within this spreadsheet file. Sheets and charts that begin with 'Mer' relate to share-swap mergers. Sheets and charts that begin with 'Dem' relate to demergers. The remaining sheets and charts are common to both. There are both colour and black & white versions of the charts, for ease of printing.

The calculations are performed on a gross-flows basis. That is, for all the shares in all the companies within the scope, the model calculates the total capital gain revenue under the current policies and the total capital gain revenue under the rollover relief policy to derive the impact on revenue. Modelling the gross flows ensure subtleties such as compounding and behavioural change are better accounted for.

The modelling work can be roughly divided into two parts:

1. Developing generic functions to calculate capital gains realisation ratios under various circumstances. This involves calculating shares prices, inflation adjustments and so forth under various assumptions and policies. These calculations take into account the profile of shareholders' acquisitions and disposals of shares pre- and post-merger, as follows:

   - For the no-policy change base case:

     - the capital gains realised (as a proportion of market capitalisation) when shares are involuntarily disposed of in a share-swap merger or demerger (calculated by the CG_Disp(…) function discussed on page 7); and
     - the capital gains realised (as a proportion of market capitalisation) when shares are voluntarily disposed of in the years following a share-swap merger or demerger (calculated by the CG_Acqu(…) function discussed on page 11).
     - the capital gains realised (as a proportion of market capitalisation) on shares in companies that do not merge under current policies (but would merge under rollover relief). This uses the CG_Roll(…) function (as there is no involuntary disposal of shares) but in this case the merger/demerger gain is zero as no merger/demerger occurred.

   - For the rollover relief case, the capital gains realised (as a proportion of market capitalisation) when shares are voluntarily disposed of in the years following a share-swap merger or demerger, where CGT rollover relief is afforded (this is the CG_Roll(…) function discussed on page 13).

2. Grossing up the realisation ratios from Part 1 using estimates of the pre-merger market capitalisation of target companies in the case of share-swap mergers, or using estimates of the pre-demerger market capitalisation of companies in the case of demergers. An allowance is made for merger/demerger gains resulting from the merger/demerger activity. Part 2 also calculates the amount of tax revenue from capital gains realisations, allowing for the various tax rates paid by the mix of different types of investors, offsetting capital losses, changes in activity resulting from the policy change, and so on.

Revenue on capital gains that is picked up through the income tax net is also accounted for. Revenue from higher profits (as implied by the merger/demerger gain) is also accounted for.

Part 1 of the model – capital gains realisation ratios

This part of the model develops functions for evaluating capital gains realisation ratios for share-swap mergers and demergers under alternative tax treatments.

The model is constructed in Excel 97. The calculations for part 1 are implemented using custom functions written in Visual Basic. To understand how the model calculates capital gains realisation ratios it is necessary to have an understanding of how to write custom functions in Excel.

A crash course in Excel custom functions

People familiar with Excel spreadsheets will no doubt be familiar with many of Excel's built-in functions. These include SUM(…), NPV(…), and so on. However, there are often functions we might like to use that are not built-in to Excel. The Visual Basic programming facility in Excel allows users to create their own functions. Once these functions have been created, they operate just like built-in Excel functions.

For example, suppose a modeller needs a function that raises a series of numbers to a given power then sums the series and returns the result. Excel does not have this function built-in so it will need to be custom-made:

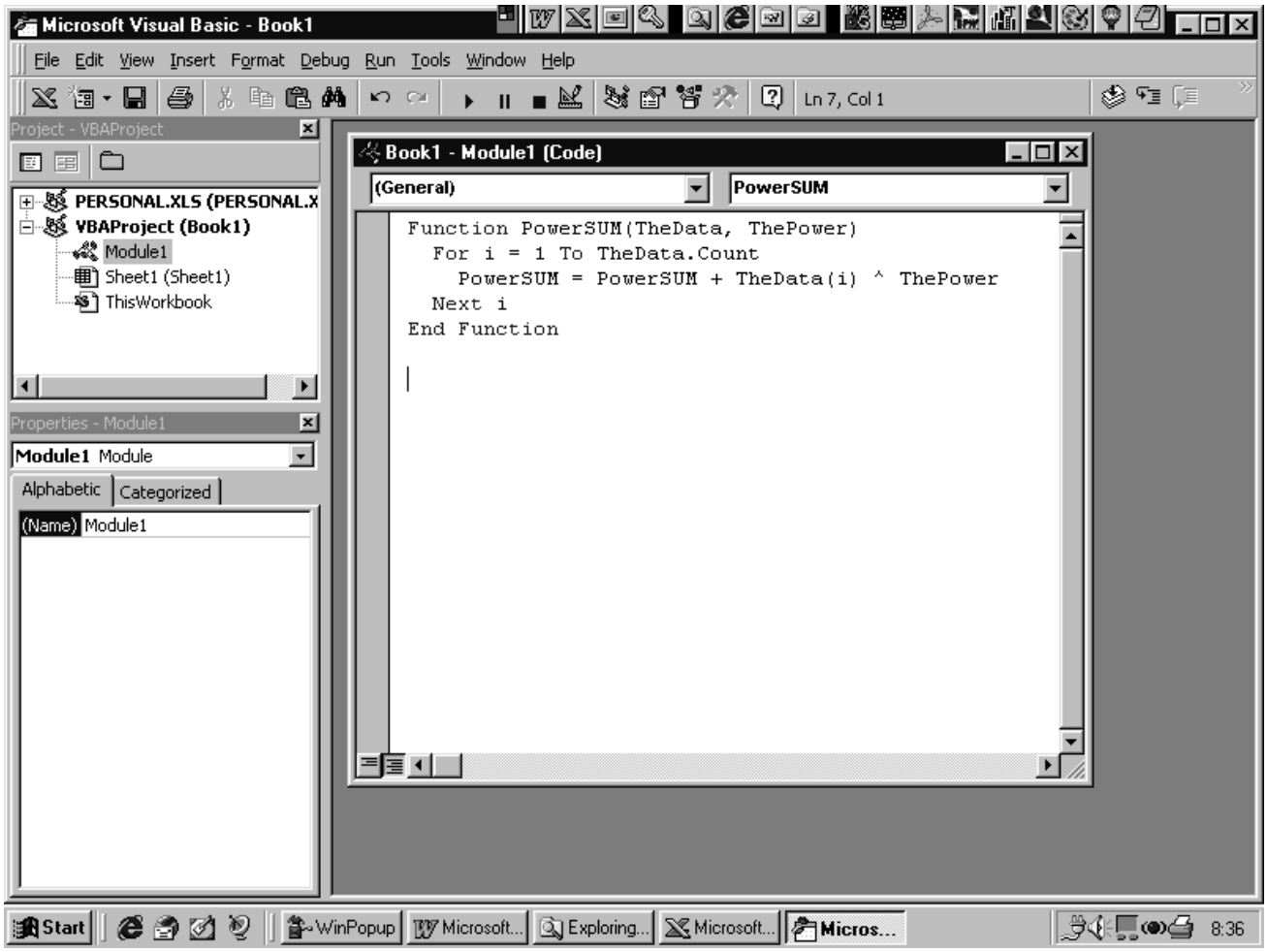
- Open Excel 97 and ensure there is a blank workbook open (probably called Book1), then open the Visual Basic editor (hit Alt+F11, or use the menu Tools, Macro, Visual Basic Editor).

- Book1 should appear in a pane down the left-hand side of the editor. Click on Book1 in this left-hand pane and select the menu Insert, Module. A new window will appear, probably titled Book1 – Module1 (Code). Note: if the words `Option Explicit` happen to appear at the top of the new window, delete them so the new window is completely empty.

- In this new window, type the following code (Visual Basic will automatically format and insert some words):

```
Function PowerSUM(TheData, ThePower)
  For i = 1 To TheData.Count
    PowerSUM = PowerSUM + TheData(i) ^ ThePower
  Next i
End Function
```

- This function will go through a range of cells, (which are referred to as `TheData` in the Visual Basic code), raise the value in each cell to `ThePower` and accumulate the result. The Visual Basic editor should look like the following graphic:

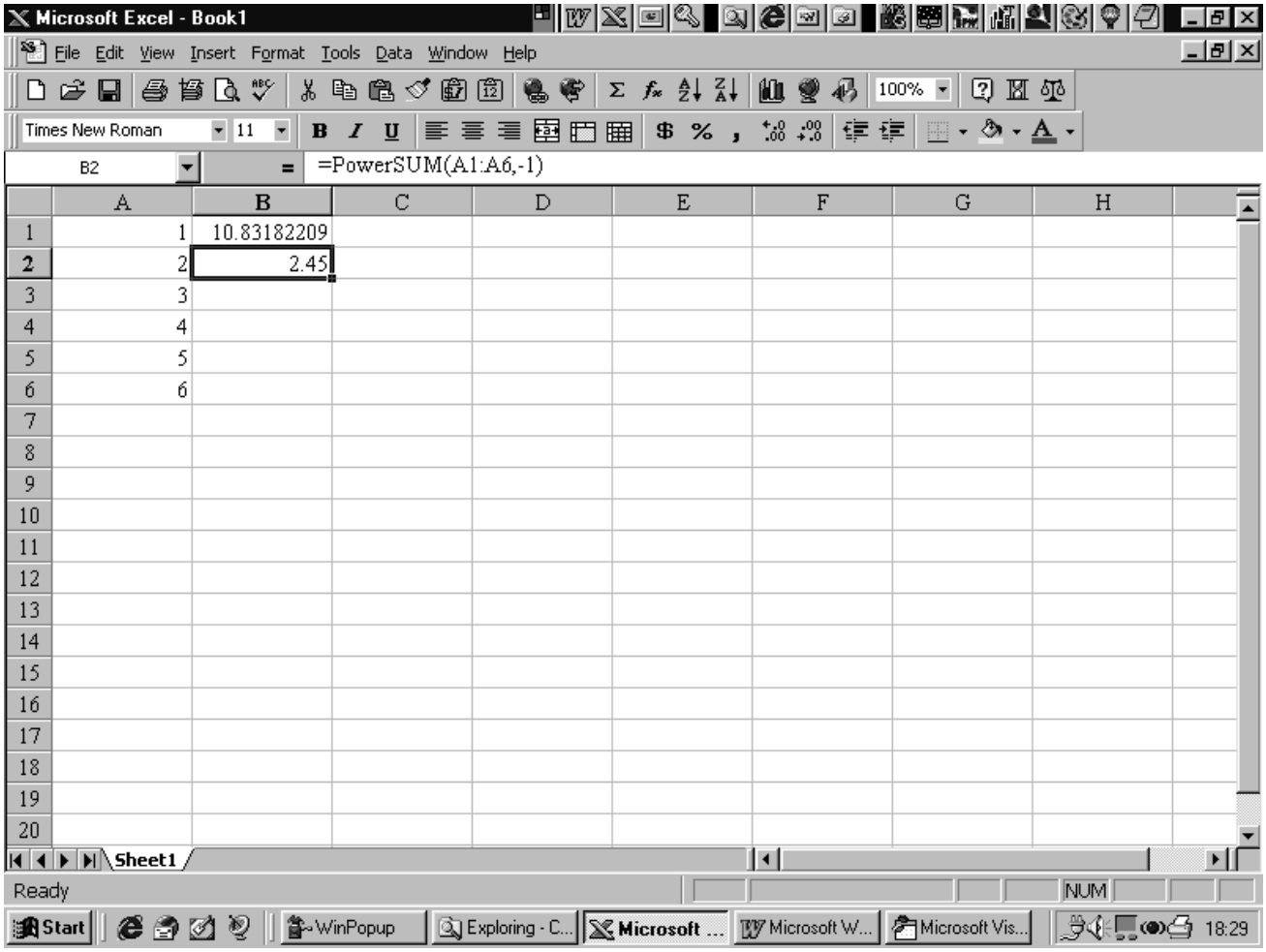


- To try out the custom function, switch back to Excel (hit Atl+F11, or use the menu View, Microsoft Excel).

- On a spreadsheet in Book1 type the numbers (say) 1,2,3,4,5,6 in cells A1:A6 respectively. In cell B1 type the formula: =PowerSUM(A1:A6,0.5) (this should return the sum of the square roots)

- In cell B2 type the formula: =PowerSUM(A1:A6,-1) (this should return the sum of the inverses)

- The spreadsheet should look something like the following graphic. The file **PowerSUM.xls** accompanying the model software contains this demonstration if users wish to examine the file on their computer.



There are several advantages to using custom functions:

- It avoids repetition by only having to write a complex capital gains calculation once. Then the modeller can invoke the custom function each time a capital gains realisation calculation is required – this is much safer than the endless copying/filling/repeating of complex formulae often performed in spreadsheet modelling.

- It is more efficient, the model ends up being a few hundred KB instead of probably several MB if the formulas were done the long way on a spreadsheet.

- It is easier to check for errors.

- It is faster to recalculate after a change in assumptions.

- It encourages good programming and modelling habits.

Calculating capital gains realisation ratios

Before we leap into the functions that calculate capital gains realisation ratios, there are a few preliminary functions that help calculate probabilities given the type of probability distribution selected by the user.

If you wish to see any of the source code for these functions on your computer screen, just hit Alt+F11, or use the menu Tools, Macro, Visual Basic Editor while the model is open in Excel 97. Access Economics has elected not to read- or write-protect this source code so that others may examine our methodology. However, this source code is subject to copyright and should therefore not be copied in whole or in part, unless appropriate arrangements are first discussed with Access Economics.

The ProbDist(…) function

The ProbDist(…) custom function is used to calculate the proportion of investors that purchased their shares in a given year. For example, it might calculate that for a merger/demerger occurring on 1 July 2000, 12% of shareholders purchased their shares during 1997-98. We can then use this 12% to weight the capital gain accrued by these shareholders and then aggregate the result. The function is =ProbDist(*DistType, X1, X2, Mean, SD*) and calculates the probability under the selected distribution, in the range [X1,X2] given a mean and standard deviation.

Four distributional assumptions of the pattern of purchases for individual and institutional shareholders are available: Exponential, Gamma, Chi-square and (truncated) Normal. The user can run the model with any of the four distributions to examine the sensitivity of results to the nature of the distribution. The user can specify a mean and standard deviation of the profile of shareholdings (standard deviation only applies in Normal and Gamma distributions).

The arguments are defined as follows:

Argument	**Description**	**Example**
DistType	1 for exponential, 2 for gamma, 3 for chi-square and 4 for normal.	1
X1	Lower bound of the interval (a number of years).	5
X2	Upper bound of the interval (a number of years). *Note: X2 should always be larger than X1*	6
Mean	Mean of the distribution (in years).	4
SD	Standard deviation of the distribution (gamma and normal only).	3

The ProbDist(…) function returns the probability of a random variable of the selected distribution falling in the specified interval, given the mean and standard deviation. For example, =ProbDist(4,0,2,3,5) will calculate the area under a normal probability distribution in the interval [0,2] with a mean of 3 and standard deviation of 5.

The code to generate this probability is reproduced below. To see the code while the model is open in Excel 97, hit Atl+F11 and look at the code in Module1 in the model. Note that in Visual Basic a comment is preceded by the character ' (single quote), and an _ (underscore) is used to wrap long lines.

```
Function ProbDist(DistType, X1, X2, Mean, SD)
                'the function to calculate probabilities in a given interval
  Application.Volatile (False)
                'helps control automatic calculation
  If DistType = 1 Then
    ProbDist = Exp(-X1 / Mean) - Exp(-X2 / Mean)
                'exponential assumption (function gives right hand tail, hence X1-X2)
  ElseIf DistType = 2 Then
    ProbDist = Application.WorksheetFunction.GammaDist(X2, Mean^2 / SD^2, SD^2 / Mean, True) - _
               Application.WorksheetFunction.GammaDist(X1, Mean^2 / SD^2, SD^2 / Mean, True)
                'gamma assupmtion (function gives left hand tail, hence X2-X1)
  ElseIf DistType = 3 Then
    ProbDist = Application.WorksheetFunction.ChiDist(X1, Mean) - _
               Application.WorksheetFunction.ChiDist(X2, Mean)
                'chi square assupmtion (function gives right hand tail, hence X1-X2)
  Else
    ProbDist = Application.WorksheetFunction.NormDist(X2, Mean, SD, True) - _
               Application.WorksheetFunction.NormDist(X1, Mean, SD, True)
                'normal assumption (function gives left hand tail, hence X2-X1)
  End If
End Function
```

Some brief comments appear throughout the code. Additional comments to help those not familiar with Visual Basic code:

- The `Application.Volatile (False)` command ensures that cells containing the custom function are only recalculated when cells directly referenced by the function's arguments change. This makes spreadsheet recalculation more efficient.
- Where a function like `Application.WorksheetFunction.GammaDist` appears it means we are using built-in Excel functions to help evaluate some probability distributions like gamma, chi-square and normal.
- For the gamma distribution we have to convert the mean and standard deviation into the parameters α and β that are required for Excel's built-in gamma distribution function, hence the expressions `Mean^2 / SD^2` and `SD^2 / Mean` respectively for the gamma distribution.

The Rescale(…) function

The Rescale(…) function corrects for the problem that all four of the probability distributions available in the ProbDist(…) function have infinite right-hand tails and the normal distribution also has an infinite left-hand tail. Hence, there will often be some non-zero probability beyond the relevant range we are interested in. The Rescale(…) function calculates the amount of the probability distribution that actually falls within the relevant range for rescaling purposes. In practice, the relevant range is usually from the current year back to 1985-86 (the model separately treats shares purchased in 1984-85 or earlier).

For example, suppose we are using an exponential distribution for shareholdings purchased in the 15 years from 1999-00 back to the first post-CGT year of 1985-86, inclusive, with a mean of 5 years. The area under this curve only adds up to 95.02% (because we are truncating the right-hand tail at 1985-86), rather than the 100% we usually require of a probability distribution, hence we scale up the post-CGT weights by dividing by 0.9502.

The Excel custom function that calculates this rescaling factor is =Rescale(*DistType*, *X*, *Mean*, *SD*) which calculates the probability in the relevant range for rescaling purposes. The arguments are as follows:

Argument	**Description**	**Example**
DistType	1 for exponential, 2 for gamma, 3 for chi-square and 4 for normal.	1
X	Upper bound of the interval.	15
Mean	Mean of the distribution.	4
SD	Standard deviation of the distribution (gamma and normal only).	3

The Rescale(…) function returns the probability of a random variable of the selected distribution falling between 0 and the specified upper bound, given the mean and standard deviation. For example, =Rescale(2,15,4,5) will calculate the area under a gamma probability distribution in the interval [0,15] with a mean of 4 and standard deviation of 5. The code to generate this probability is reproduced below. The additional comments for the ProbDist(…) function above also apply here.

```
Function Rescale(DistType, X, Mean, SD)
                'the function to calculate cumulative probabilities within range
  Application.Volatile (False)
                'helps control automatic calculation
  If DistType = 1 Then
    Rescale = 1 - Exp(-X / Mean)
                'exponential assumption
  ElseIf DistType = 2 Then
    Rescale = Application.WorksheetFunction.GammaDist(X, Mean^2 / SD^2, SD^2 / Mean, True)
                'gamma assupmtion
  ElseIf DistType = 3 Then
    Rescale = 1 - Application.WorksheetFunction.ChiDist(X, Mean)
                'chi square assupmtion
  Else
    Rescale = Application.WorksheetFunction.NormDist(X, Mean, SD, True) - _
              Application.WorksheetFunction.NormDist(0, Mean, SD, True)
                'normal assumption - has to take account of infinite left-hand tail
  End If
End Function
```

The TheMaxOf(…) Function

This is a trivial function used to calculate a maximum from two alternatives. Excel also has a built-in MAX(…) function but this one is easier to access from within Visual Basic:

```
Function TheMaxOf(X, Y)
  If X > Y Then
    TheMaxOf = X
  Else
    TheMaxOf = Y
  End If
End Function
```

The CG_Disp(…) function

The CG_Disp(…) function calculates the capital gains realisation ratio when a share-swap merger or demerger occurs and is treated as a disposal for CGT purposes (that is, the current treatment). This function forms the first part of calculating the capital gains realised under the current tax policy – the 'baseline case'.

Calculating the capital gains realised after a share-swap merger/demerger, considered as disposal of shares (that is, under the current policy), as a ratio of the post-merger/post-demerger value of the company requires the following:

- For each year from 1985-86 to the current year repeat the following steps (note that shares purchased prior to 1985-86 are, of course, excluded from these calculations):
  - Estimate the proportion of shareholdings that were purchased during the year in question.
  - Derive the original purchase price of the shares during the year in question.
  - Inflation-adjust the original purchase price, if they were purchased more than one year before disposal.
  - Calculate the percentage capital gain for the year in question by divided the post-merger/demerger price by the inflation-adjusted purchase price.
  - Multiply the percentage capital gain by the proportion of shares purchased during the year in question.

In effect, we have to calculate a weighted sum of the capital gains realised in each point in time, weighted by the proportion of shares originally purchased in each previous point in time.

Given a distribution of when shareholders originally purchased shares, historical share prices, CPI data and an assumption about merger/demerger gains, it is possible can calculate the capital gain realised ratio due to the merger/demerger. There are several real-life considerations to include in this:

- All share-swap mergers and demergers (that is, disposals of shares caused by a merger or demerger) occur on 1 July each year.
- All purchases and disposals occurring through normal trading of shares are made on 31 December of each year (note that this is the mid-point of each financial year, which is the most appropriate point for calculating gains between financial years).
- The share price in the June quarter immediately preceding the merger/demerger, plus any merger/demerger gain arising due to the merger/demerger, are used to calculate the share price at the time of the merger/demerger. (This is the disposal price for calculating the realised gains under current CGT arrangements.)
- The share price is normalised to $1 on the day of the merger/demerger (the model uses the percentage change rather than absolute change, so this is a fairly trivial assumption).
- The June quarter average of the All Ordinaries Index is used as a proxy for a generic share price up until June quarter 1998, then a capital growth assumption is applied thereafter. Users can readily enter alternative historical data into the model to allow for the possibility that takeover targets may under-perform the market average.
- The June quarter 8 capital cities CPI is used for the inflation adjustment up until June quarter 1998; an inflation assumption is applied thereafter.
- Pre-1985 shareholdings are excluded from the calculation.
- The further away we get from 1985, the smaller the proportion of pre-1985 shareholdings.
- Standard continuous probability distributions (such as exponential, gamma, chi-square and normal) all tend to be virtually zero once you get about two standard deviations from the mean. To fatten up the tails we mix in a uniform distribution. This gives more flexible distributions that can produce profiles such as a large amount of turnover within a few recent years, but also a reasonable proportion of long-term shareholders.
  Note: there are charts included in the model that illustrate the probability distribution/shareholding profile.
- Shares purchased within 12 months of the merger/demerger do not qualify for CPI indexation, while those purchased earlier require CPI indexation.
- The acquisition price used for shares purchased on 31 December is the average of the All Ordinaries in the two June quarters either side of the December acquisition. This is scaled relative to the $1 disposal price. Note: This and the previous step are used to work out ratios of the disposal price to the acquisition price. Both are subsequently scaled up to the actual dollar disposal values using the assumed level of share-swap merger and demerger activity.
- The CPI adjustment uses the June quarter CPI immediately preceding the 1 July merger, relative to the average of the CPI in the two June quarters either side of the December acquisition (unless the acquisition was within 12 months).

The Excel custom function that calculates the capital gain when a share-swap merger or demerger is treated as a disposal is:

=CG_Disp(*SharePrice, Inflation, CurrentYr, StartYr, CgtStartYr, Dist, Mean, StDev, UniProp, Pre85Prop, Pre85Decl, AbnormalGain*)

There are several arguments to this function, with the following usage:

Argument	Description	Example
SharePrice	The range of cells containing the June qtr All Ords timeseries	$D$10:$AP$10
Inflation	The range of cells containing the June qtr CPI timeseries Note: the *SharePrice* range and *Inflation* range should be the same dimension.	$D$12:$AP$12
CurrentYr	The year in which share-swap mergers/demergers force a disposal	25
StartYr	The first year in which mergers/demergers can occur (2000-01)	21
CgtStartYr	The year where CG first started to accrue (1985-86) Note: the above three …*Yr* arguments index the relevant cell in the *SharePrice* range.	6
Dist	The probability distribution to use - see ProbDist(…) function above	1
Mean	The mean of the probability distribution	5
StDev	The standard deviation (gamma & normal only)	4
UniProp	The proportion of uniform distribution to mix in to get fatter tails	0.2
Pre85Prop	The proportion of shares purchased pre-1985 in the *StartYr*	0.1
Pre85Decl	The rate of decline in *Pre85Prop* as we move away from *StartYr*	0.01
AbnormalGain	The percentage merger/demerger gain	0.15

The CG_Disp(…) function returns the capital gain realised, measured as a proportion of the total value of the merger/demerger activity. The actual function is reproduced below, followed by additional comments to help interpret the Visual Basic code. Note that the ProbDist(…), Rescale(…) and TheMaxOf(…) functions are all used within the CG_Disp(…) function.

```
Function CG_Disp(SharePrice, Inflation, CurrentYr, StartYr, CgtStartYr, Dist, Mean, StDev, _
                 UniProp, Pre85Prop, Pre85Decl, AbnormalGain)
                 'the function to calculate CG realised for a share-swap merger/demerger
                 'treated as a disposal
  Dim i, ScaleFactor, Weight, PurchasePrice, CpiAdjPurPrice, ExcludeProp, _
      MergerSharePrice, MergerCPIlevel, AdjStartYr
                 'defines some temporary variables
  Application.Volatile (False)
                 'helps control automatic calculation
  AdjStartYr = TheMaxOf(CgtStartYr, CurrentYr - 20)
                 'adjust start year so 20 years is maximum length of share holding
  ScaleFactor = Rescale(Dist, CurrentYr - AdjStartYr, Mean, StDev)
                 'calculates the density between disposal year and 1985
  ExcludeProp = (1 - UniProp - TheMaxOf(0, Pre85Prop - Pre85Decl * (CurrentYr - StartYr)))
                 'proportion of Pre85 and uniform distribution to subtract from the distribution
  MergerSharePrice = SharePrice(CurrentYr - 1) * (1 + AbnormalGain)
  MergerCPIlevel = Inflation(CurrentYr - 1)
                 'calculates the share price and the CPI for a 1 July merger using June qtr data
  For i = AdjStartYr To CurrentYr - 1
                 'loop year by year from 1985-86 to the year before the 1 July disposal
    Weight = ProbDist(Dist, CurrentYr - i - 1, CurrentYr - i, Mean, StDev) / ScaleFactor * _
                      ExcludeProp + UniProp / (CurrentYr - AdjStartYr)
                 'the proportion of people who bought their shares in a given year
    PurchasePrice = 0.5 * (SharePrice(i - 1) + SharePrice(i)) / MergerSharePrice
                 'backcasting a share price for the year in which the shares were purchased
    If i = CurrentYr - 1 Then
                 'check for length of share holdings
      CpiAdjPurPrice = PurchasePrice
                 'no inflation adjustment for holding periods < 1 year
    Else
      CpiAdjPurPrice = PurchasePrice * MergerCPIlevel / (0.5 * (Inflation(i - 1) + Inflation(i)))
                 'adjusting the purchase price for inflation if >= 1 year
    End If
    CG_Disp = CG_Disp + Weight * (1 - CpiAdjPurPrice)
                 'weighted accumulation of capital gain, note that disposal price = 1
  Next i
End Function
```

Notes:

- The command `Dim i, ScaleFactor, …` creates temporary variables to store intermediate calculations.
- The proportion of pre-85 shares, `Pre85Prop` is reduced by the amount `Pre85Decl` each year until it hits 0, so that the further we move away from 1985, the smaller the pre-85 proportion.

The calculations made by the above custom function are represented in a (perhaps more familiar) spreadsheet presentation in the graphic below. It is an illustration only (not actually part of the model) to help readers not

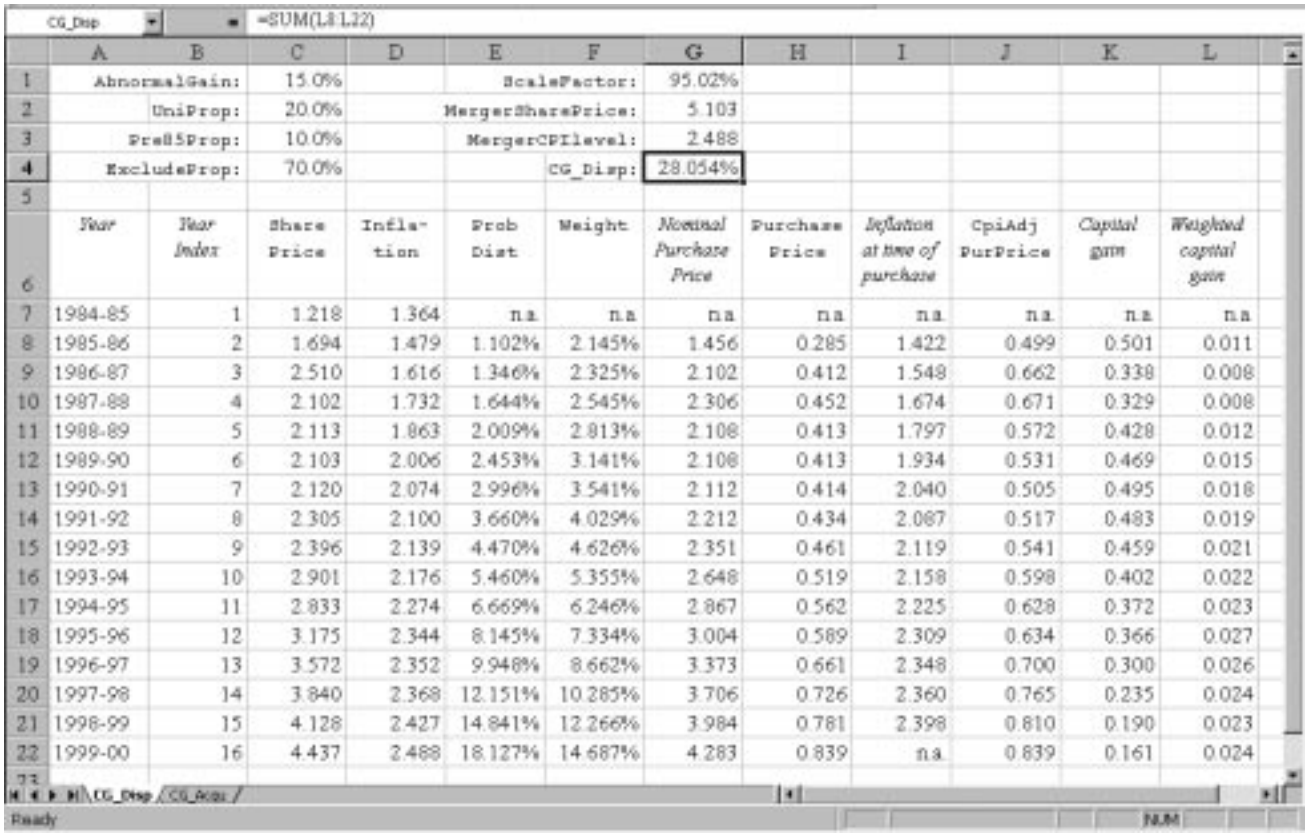
comfortable with Visual Basic code. Variable names in the illustration below typed in `Courier` font correspond to variables in the custom function code above. Variable names typed in *Time New Roman Italics* font are extra variables included to make the illustration more transparent. If you would like to see the formulae behind each cell, see the file **Example.xls** accompanying the electronic copy of the model.

This graphic calculates the capital gains realisation ratio (as a proportion of the total market value of the merger) under current tax policies, using an exponential distribution with a mean of 5. The merger is assumed to occur on 1 July 2000. Capital gain liable shares in the target company are purchased on 31 December each year, starting with 31 December 1985 with the last purchase occurring on 31 December 1999.

The result of the calculation is 28.054%. This means that a company with a market value of $10m after the merger/demerger (that is inclusive of abnormal gains) would generate $2.8054m in realised capital gains in the year the merger/demerger occurred.

Note that the calculation in the graphic below takes up a large number of cells to calculate the capital gains realised for a single year. To estimate an NPV we need to repeat this calculation for many years. This is where custom functions can be far more efficient – taking up only 1 cell per year of calculation, rather than the scores of cells that would be used if it was done using standard spreadsheet techniques. Most of the cells in the graphic can be removed and simply replaced with one cell containing:

=CG_Disp($C$7:$C$22, $D$7:$D$22, 17, 17, 2, 1, 5, 5, 0.2, 0.1, 0.01, 0.15)



CG_Disp =SUM(L8:L22)

	A	B	C	D	E	F	G	H	I	J	K	L
1	AbnormalGain:		15.0%			ScaleFactor:	95.02%					
2	UniProp:		20.0%			MergerSharePrice:	5.103					
3	Pre85Prop:		10.0%			MergerCPIlevel:	2.488					
4	ExcludeProp:		70.0%			CG_Disp:	28.054%					
5												
6	*Year*	*Year Index*	Share Price	Inflation	Prob Dist	Weight	*Nominal Purchase Price*	Purchase Price	*Inflation at time of purchase*	CpiAdj PurPrice	*Capital gain*	*Weighted capital gain*
7	1984-85	1	1.218	1.364	na	na	na	na	na	na	na	na
8	1985-86	2	1.694	1.479	1.102%	2.145%	1.456	0.285	1.422	0.499	0.501	0.011
9	1986-87	3	2.510	1.616	1.346%	2.325%	2.102	0.412	1.548	0.662	0.338	0.008
10	1987-88	4	2.102	1.732	1.644%	2.545%	2.306	0.452	1.674	0.671	0.329	0.008
11	1988-89	5	2.113	1.863	2.009%	2.813%	2.108	0.413	1.797	0.572	0.428	0.012
12	1989-90	6	2.103	2.006	2.453%	3.141%	2.108	0.413	1.934	0.531	0.469	0.015
13	1990-91	7	2.120	2.074	2.996%	3.541%	2.112	0.414	2.040	0.505	0.495	0.018
14	1991-92	8	2.305	2.100	3.660%	4.029%	2.212	0.434	2.087	0.517	0.483	0.019
15	1992-93	9	2.396	2.139	4.470%	4.626%	2.351	0.461	2.119	0.541	0.459	0.021
16	1993-94	10	2.901	2.176	5.460%	5.355%	2.648	0.519	2.158	0.598	0.402	0.022
17	1994-95	11	2.833	2.274	6.669%	6.246%	2.867	0.562	2.225	0.628	0.372	0.023
18	1995-96	12	3.175	2.344	8.145%	7.334%	3.004	0.589	2.309	0.634	0.366	0.027
19	1996-97	13	3.572	2.352	9.948%	8.662%	3.373	0.661	2.348	0.700	0.300	0.026
20	1997-98	14	3.840	2.368	12.151%	10.285%	3.706	0.726	2.360	0.765	0.235	0.024
21	1998-99	15	4.128	2.427	14.841%	12.266%	3.984	0.781	2.398	0.810	0.190	0.023
22	1999-00	16	4.437	2.488	18.127%	14.687%	4.283	0.839	na	0.839	0.161	0.024
23												

CG_Disp / CG_Acc /

Ready NUM

The CG_Acqu(…) function

The CG_Acqu(…) function calculates the capital gains realisation ratio when shares acquired during share-swap mergers or demergers are subsequently disposed of voluntarily. This function forms the second part of calculating the capital gains realised under the current tax policy – the 'baseline case'. This calculation is necessary to ensure the modelling fully captures the gross flows under the alternative policies.

For example, calculating the capital gains realisation ratio from normal disposals of shares occurring in the year 2004-05: The scope only extends to disposals of shareholdings that were originally acquired through a share-swap merger/demerger that took place on or since the policy simulation start date of 1 July 2000. Shareholders dispose of their shares over time according to some probability distribution. To calculate the capital gains realisation ratio take, for example, the proportion of shares acquired on 1 July 2000 and disposed on 31 December 2004 multiplied by the capital gain accrued over that period. Added to this is the proportion of shares acquired on 1 July 2000 and disposed on 31 December 2004 times the gains over that period, and so on, finishing with a merger on 1 July 2004 disposed of on 31 December 2004. There are several real-life factors we need to add to this:

- There are no pre-1985 shareholdings to account for, as under the current treatment all shares are considered to be acquired on the day of the merger, which is 1 July 2000 or later. Under current policies, all pre-85 status is lost after a merger or demerger.
- The probability distributions are the same as those in the CG_Disp(…) function (exponential, gamma, chi-square and normal) with a uniform distribution mixed in to fatten up the tails.
- All shares are assumed to have been disposed of by the end of 20 years (the area under the probability distribution in the range [0,20] = 100%).
- Shares purchased within 12 months of the merger/demerger do not qualify for CPI indexation.
- Timing assumption: disposals caused by mergers/demergers always occur on 1 July of each financial year. Disposals via normal share trading always occur on the midpoint, 31 December of each financial year.
- The acquisition price for shares acquired in a July 1 merger/demerger is the average level of the All Ordinaries index in the June quarter immediately preceding the merger/demerger, normalised to $1.
- The disposal price used for shares sold on 31 December is the average of the All Ordinaries in the two June quarters either side of the December disposal. This is scaled relative to the original $1 acquisition price.
- An allowance is made for higher turnover in shares in the first year after a merger/demerger due to shareholders rationalising their holdings.
- Note that merger/demerger gains do not need to be accounted for here as the capital gain arising from any abnormal gain was already counted in the CG_Disp(…) function. It is assumed that the abnormal gain counted in CG_Disp(…) function captures the additional earnings potential of the merged/demerged company. That is, the abnormal gain captures the efficiency gains from the merger/demerger.
- The CPI adjustment uses the June quarter CPI immediately preceding the 1 July merger/demerger, relative to the average of the CPI in the two June quarters either side of the December acquisition (unless the acquisition was within 12 months).

The Excel custom function that calculates the ongoing realisations of capital gains when a share-swap merger/demerger is treated as a disposal is:
=CG_Acqu(*SharePrice, Inflation, CurrentYr, StartYr, Dist, Mean, StDev, UniProp, FirstYrProp*)

There are several arguments to this function, which have the following usage:

Argument	**Description**	**Example**
SharePrice	The range of cells containing the June qtr All Ords timeseries	$D$10:$AP$10
Inflation	The range of cells containing the June qtr CPI timeseries Note: the *SharePrice* range and *Inflation* range should be the same dimension.	$D$12:$AP$12
CurrentYr	The year in which the normal-trading disposals occur	25
StartYr	The first year of mergers/demergers causing disposals (2000-01)	21

	Note: the above two …*Yr* arguments index the relevant cell in the *SharePrice* range.	
Dist	The probability distribution to use - see ProbDist(…) function above	1
Mean	The mean of the probability distribution	5
StDev	The standard deviation (gamma & normal only)	4
UniProp	The proportion of uniform distribution to mix in to get fatter tails	0.2
FirstYrProp	Extra turnover in shares in the first year due to rationalisation	0.1

The CG_Acqu(…) function returns the capital gain realised in a given year, measured as a proportion of the total value of the company, post merger/demerger, when the share were considered disposed of then newly acquired after the merger/demerger. The actual function is reproduced below.

```
Function CG_Acqu(SharePrice, Inflation, CurrentYr, StartYr, Dist, Mean, StDev, UniProp)
                'the function to calculate ongoing CG after a share-swap merger/corporate
recontruction
                'treated as a disposal
  Dim j, ScaleFactor, Weight, DisposalPrice, CpiAdjPurPrice, AdjStartYr, _
      CurrentSharePrice, CurrentCPIlevel
                'defines some temporary variables
  Application.Volatile (False)
                'helps control automatic calculation
  AdjStartYr = TheMaxOf(StartYr, CurrentYr - 19)
                'adjust start year so 20 years is maximum length of share holding
  ScaleFactor = Rescale(Dist, 20, Mean, StDev)
                'rescales for any density prior to the start year (really for normal dist only)
  CurrentSharePrice = 0.5 * (SharePrice(CurrentYr - 1) + SharePrice(CurrentYr))
  CurrentCPIlevel = 0.5 * (Inflation(CurrentYr - 1) + Inflation(CurrentYr))
                'calculates current share price and CPI for a 31 Dec sale of shares
  For j = AdjStartYr To CurrentYr
                'loop year by year from the first year of the simulation period to the current year
    Weight = ProbDist(Dist, CurrentYr - j, CurrentYr - j + 1, Mean, StDev) / ScaleFactor * _
             (1 - UniProp - FirstYrProp) + UniProp / 20 + IIf(j = CurrentYr, FirstYrProp, 0)
                'the proportion of people who bought their shares in a given year
    DisposalPrice = CurrentSharePrice / SharePrice(j - 1)
                'forecasting a share price for the year in which the shares were disposed
    If CurrentYr = j Then
                'check for length of share holdings
      CpiAdjPurPrice = 1
                'no inflation adjustment for holding periods < 1 year
    Else
      CpiAdjPurPrice = CurrentCPIlevel / Inflation(j - 1)
                'adjusting the purchase price for inflation if >= 1 year
    End If
    CG_Acqu = CG_Acqu + Weight * (DisposalPrice - CpiAdjPurPrice)
                'weighted accumulation of capital gain
  Next j
End Function
```

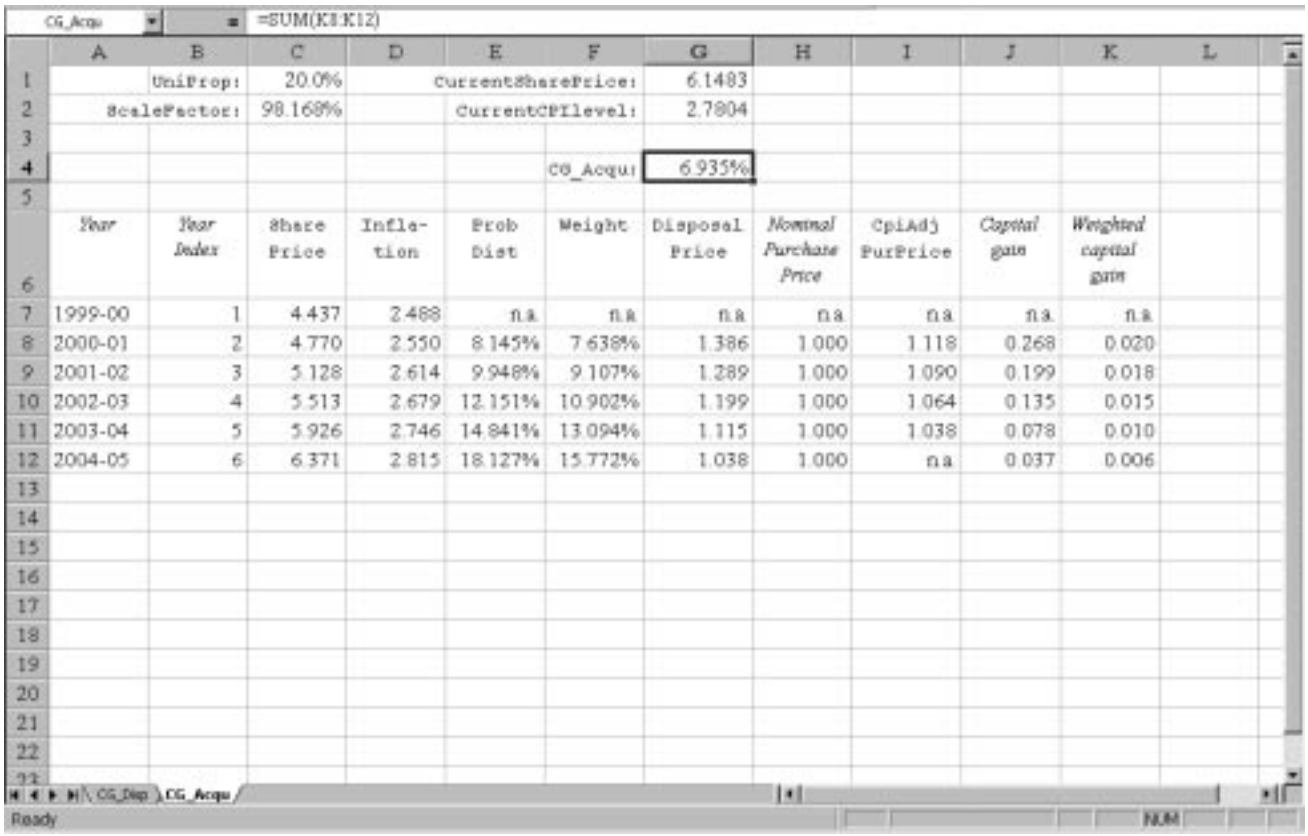
The calculations made by the above custom function are represented in a (perhaps more familiar) spreadsheet presentation in the graphic below. It is an illustration only (not actually part of the model) to help readers not comfortable with Visual Basic code.

This graphic calculates the capital gains realised (as a percentage of the total market value of the merger/demerger) under current tax policies, using an exponential distribution with a mean of 5. The year of evaluation is assumed to be 2004-05. Capital gain liable shares in the companies were acquired through various mergers/demergers on 1 July each year from 2000 to 2004.

The result of the calculation is 6.935%. This mean that if the average company is valued at $10m after a merger/demerger, then all mergers/demergers that occurred from 1 July 2000 to 1 July 2004 would generate $0.6935m in realised capital gains during 2004-05.

Note again that the calculations in the graphic below takes up a large number of cells compared to the custom function:

=CG_Acqu($C$7:$C$12, $D$7:$D$12, 6, 2, 1, 5, 5, 0.2, 0)



	A	B	C	D	E	F	G	H	I	J	K	L
1		UniProp:	20.0%		CurrentSharePrice:		6.1483					
2		ScaleFactor:	98.168%		CurrentCPIlevel:		2.7804					
3												
4						CG_Acqu:	6.935%					
5												
6	Year	Year Index	Share Price	Inflation	Prob Dist	Weight	Disposal Price	Nominal Purchase Price	CpiAdj PurPrice	Capital gain	Weighted capital gain	
7	1999-00	1	4.437	2.488	n.a	n.a	n.a	n.a	n.a	n.a	n.a	
8	2000-01	2	4.770	2.550	8.145%	7.638%	1.386	1.000	1.118	0.268	0.020	
9	2001-02	3	5.128	2.614	9.948%	9.107%	1.289	1.000	1.090	0.199	0.018	
10	2002-03	4	5.513	2.679	12.151%	10.902%	1.199	1.000	1.064	0.135	0.015	
11	2003-04	5	5.926	2.746	14.841%	13.094%	1.115	1.000	1.038	0.078	0.010	
12	2004-05	6	6.371	2.815	18.127%	15.772%	1.038	1.000	n.a	0.037	0.006	

The CG_Roll(…) function

The CG_Roll(..) function calculates the capital gains realisation ratio when shares acquired voluntarily in the past and exchanged for shares in another company via a share-swap merger or demerger at some time on or since 1 July 2000 (with capital gains rolled-over allowed), are disposed of voluntarily in future years. This function calculates the capital gains realised under the proposed change to tax policy – the 'alternative case'.

For example, consider calculating the capital gains realisation ratio from disposals via normal trading of shares occurring in the year 2004-05 that were swapped in a share-swap merger or demerger that took place on or since the policy simulation start date of 1 July 2000. Shareholders dispose of their shares over time according to some probability distribution. To calculate the total capital gains realised, we calculate the relevant capital gain in each cross-combination of acquisition and disposal and multiply it by the proportion of shares in that cross-combination. All shares are assumed to be disposed of in the midpoint of the year, for example, for 2004-05 on 31 December 2004:

- The first batch to consider is shares swapped in a merger/demerger on 1 July **2000:**
  - acquired on 31 December **1985**, swapped on 1 July **2000** and disposed on 31 December 2004,
  - acquired on 31 December **1986**, swapped on 1 July **2000** and disposed on 31 December 2004,
    … and so on, up to shares:
  - acquired on 31 December **1999**, swapped on 1 July **2000** and disposed on 31 December 2004.
- The next batch to consider is shares swapped in a merger/demerger on 1 July **2001:**
  - acquired on 31 December **1985**, swapped on 1 July **2001** and disposed on 31 December 2004,
    … and so on, up to shares:
  - acquired on 31 December **2000**, swapped on 1 July **2001** and disposed on 31 December 2004.
- And so on until we reach the final batch to consider, shares swapped on 1 July **2004:**
  - acquired on 31 December **1985**, swapped on 1 July **2004** and disposed on 31 December 2004,
    and so on up to shares:
  - acquired on 31 December **2003**, swapped on 1 July **2004** and disposed on 31 December 2004.

In effect, this is like the cross product of the CG_Disp(…) function and the CG_Acqu(…) functions discussed on pages 7 and 11, respectively.

The Excel custom function that calculates the capital gain when a share-swap merger is treated as a disposal:
=CG_Roll(*SharePrice, Inflation, CurrentYr, StartYr, CgtStartYr, _*
PreDist, PreMean, PreStDev, PreUniProp, Pre85Prop, Pre85Decl, GrandFather, _
PostDist, PostMean, PostStDev, PostUniProp, FirstYrProp, AbnormalGain)

There are several arguments to this function, which have the following usage:

Argument	**Description**	**Example**
SharePrice	The range of cells containing the June qtr All Ords timeseries	$D$10:$AP$10
Inflation	The range of cells containing the June qtr CPI timeseries Note: the *SharePrice* range and *Inflation* range should be the same dimension.	$D$12:$AP$12
CurrentYr	The year in which the disposals via normal trading occur	25
StartYr	The first year in which share-swap mergers can occur (2000-01)	21
CgtStartYr	The year where CG first started to accrue (1985-86) Note: the above three …*Yr* arguments index the relevant cell in the *SharePrice* range.	6
PreDist	Pre-merger prob. dist. to use - see ProbDist(…) function above	1
PreMean	Pre-merger mean of the probability distribution	5
PreStDev	Pre-merger standard deviation (gamma & normal only)	4
PreUniProp	Pre-merger prop. of uniform dist. to mix in to get fatter tails	0.2
Pre85Prop	The proportion of shares purchased pre-1985 in the *StartYr*	0.1
Pre85Decl	The rate of decline in *Pre85Prop* as we move away from *StartYr*	0.01
GrandFather	TRUE if pre-85 share keep their status, FALSE is they lose pre-85	FALSE
PostDist	Post-merger prob. dist. to use - see ProbDist(…) function above	1
PostMean	Post-merger mean of the probability distribution	5
PostStDev	Post-merger standard deviation (gamma & normal only)	4
PostUniProp	Post-merger prop. of uniform dist. to mix in to get fatter tails	0.2
FirstYrProp	Extra turnover in shares in the first year due to rationalisation	0
AbnormalGain	The percentage merger/demerger gain due to a successful merger	0.15

The CG_Roll(…) function returns the capital gain realised in a given year, measured as a proportion of the total post merger market capitalisation, when the capital gains are rolled over at the time of the merger. The actual function is reproduced below.

```
Function CG_Roll(SharePrice, Inflation, CurrentYr, StartYr, CgtStartYr, _
                 PreDist, PreMean, PreStDev, PreUniProp, Pre85Prop, Pre85Decl, GrandFather, _
                 PostDist, PostMean, PostStDev, PostUniProp, FirstYrProp, AbnormalGain)
                 'the function to calculate CG realised when a share swap/demerger is rolled over
  Dim i, j, ScaleFactori, ScaleFactorj, Weighti, Weightj, PurchasePrice, DisposalPrice, _
      CpiAdjPurPrice, ExcludeProp, AdjStartYrj, AdjStartYri, CurrentSharePrice, CurrentCPIlevel
                 'defines some temporary variables
  Application.Volatile (False)
                 'helps control automatic calculation
  AdjStartYrj = TheMaxOf(StartYr, CurrentYr - 19)
                 'adjust start years so 20 years is maximum length of shareholding
  CurrentSharePrice = 0.5 * (SharePrice(CurrentYr - 1) + SharePrice(CurrentYr))
  CurrentCPIlevel = 0.5 * (Inflation(CurrentYr - 1) + Inflation(CurrentYr))
                 'calculates current share price and CPI for a 31 Dec sale of shares
  ScaleFactorj = Rescale(PostDist, 20, PostMean, PostStDev)
                 'rescales for any density prior to the start year or after year 20
  For j = AdjStartYrj To CurrentYr
                 'loop year by year from the first year of the simulation period to the current year
    AdjStartYri = TheMaxOf(CgtStartYr, j - 20)
                 'adjust start years so 20 years is maximum length of share holding
    ScaleFactori = Rescale(PreDist, j - AdjStartYri, PreMean, PreStDev)
                 'calculates the density between disposal year and 1985
    Weightj = ProbDist(PostDist, CurrentYr - j, CurrentYr - j + 1, PostMean, PostStDev) / _
              ScaleFactorj * (1 - PostUniProp - FirstYrProp) + PostUniProp / 20 + _
              IIf(j = CurrentYr, FirstYrProp, 0)
                 'the proportion of people who bought their shares in a given year
    ExcludeProp = 1 - PreUniProp - TheMaxOf(0, Pre85Prop - Pre85Decl * (j - StartYr))
                 'the proportion of Pre85 shareholding and uniform distribution to subtract
    DisposalPrice = CurrentSharePrice / SharePrice(j - 1)
                 'forecasting a share price for the year in which the shares were disposed
    For i = AdjStartYri To j - 1
                 'loop year by year from 1985-86 to the year before the 1 July disposal
      Weighti = ProbDist(PreDist, j - i - 1, j - i, PreMean, PreStDev) / ScaleFactori * _
                ExcludeProp + PreUniProp / (j - AdjStartYri)
                 'the proportion of people who bought their shares in a given year
      PurchasePrice = 0.5 * (SharePrice(i - 1) + SharePrice(i)) / SharePrice(j - 1) / _
               (1 + AbnormalGain)
                 'backcasting a share price for the year in which the shares were purchased
      CpiAdjPurPrice = PurchasePrice * CurrentCPIlevel / (0.5 * (Inflation(i - 1) + Inflation(i)))
                 'inflation adj. purchase price - all holdings are >= 1 year (30 Dec assumption)
      CG_Roll = CG_Roll + Weighti * Weightj * (DisposalPrice - CpiAdjPurPrice)
                 'weighted accumulation of capital gain
    Next i
  Next j
  If GrandFather = False Then
                 'allowing for the option that pre-85 status is lost after rollover
    For j = AdjStartYrj To CurrentYr
                 'loop year by year from the first year of the simulation period to the current year
      Weightj = ProbDist(PostDist, CurrentYr - j, CurrentYr - j + 1, PostMean, PostStDev) / _
                ScaleFactorj * (1 - PostUniProp - FirstYrProp) + PostUniProp / 20 + _
                IIf(j = CurrentYr, FirstYrProp, 0)
                 'the proportion of people who bought their shares in a given year
      DisposalPrice = CurrentSharePrice / SharePrice(j - 1)
                 'forecasting a share price for the year in which the shares were disposed
      Weighti = TheMaxOf(0, Pre85Prop - Pre85Decl * (j - StartYr))
                 'the proportion of people who bought their shares pre 1985
      If CurrentYr = j Then
                 'check for length of share holdings
        CpiAdjPurPrice = 1
                 'no inflation adjustment for holding periods < 1 year
      Else
        CpiAdjPurPrice = CurrentCPIlevel / Inflation(j - 1)
                 'adjusting the purchase price for inflation if >= 1 year
      End If
      CG_Roll = CG_Roll + Weighti * Weightj * (DisposalPrice - CpiAdjPurPrice)
                 'weighted accumulation of capital gain
    Next j
  End If
End Function
```

Notes:

- The CG_Disp(…) function loops over i= CG start year to the year before the current year (that is, it loops over all the years where purchases of shares could have occurred prior to a disposal occurring due to a merger/demerger). The CG_Acqu(…) function loops over j= start year to the current year (that is, all the years where share-swap mergers or demergers could have occurred leading to shares sold voluntarily in the current year). The CG_Roll(…) function loops over both i and j because there is no merger/demerger causing disposals nor acquisitions to all occur at a fixed point in time – that is, it is necessary to loop over every possible combination of years when purchases and sales via normal trading of shares could have occurred.
- We use the product of the weights `Weighti * Weightj` from the pre-merger purchase profile and the post-merger disposal profile, respectively. This implicitly assumes the two distributions are independent.
- If shares lose their pre-85 status, then the capital gains are calculated only from the time of the merger/ demerger.

For the first two functions, CG_Disp(…) and CG_Acqu(…) it was possible to illustrate the calculations performed by the custom function in a spreadsheet presentation. However, the CG_Roll(…) function is roughly the cross-product of the first two and takes up so many cells that a spreadsheet illustration is just not possible.

Part 2 of the model – tax revenue

The calculations for Part 2 are more straightforward, compared with the capital gains realisation ratio custom functions in the previous section. These calculations are implemented using more standard spreadsheet calculations. The types of issues taken into account in Part 2 include:

- Calculating the capital gains realisation ratios using the functions developed in Part 1.
- Grossing up realisation ratios by the amount of market capitalisation of target/reconstructed companies covered including adjustments for any cash component in transactions.
- Allowing for an increased number of share-swap mergers or demergers following the extension of rollover relief. Also allowing for an increase in share-swap mergers that would otherwise have been cash mergers.
- Allowing for a reduction in the average merger/demerger gain after rollover relief is allowed.
- Allowing for increase average length of shareholding due to the lock-in effect of rollover relief.
- Allowing for private/institutional mix of shareholders, including:
  - Different disposal/acquisition profiles for private versus institutional investors.
- Allowing for revenue collected through the capital gains tax net and the income tax net, including:
  - Profits from trading in shares that are treated on the revenue account (rather than the capital account).
  - Any tax obtained from foreign investors.
  - Increased dividends as implied by the merger/demerger gain.
- Apply average tax rates, allowing for the different average tax rates for private shareholders, superfunds, life funds, retail finds, etc…
- Calculating the net revenue impact in each year and the Net Present Value of the revenue impact.

There are two sets of calculations in the models – the share-swap merger calculations are on the worksheet titled MerCalc and the demerger calculations are on the worksheet titled DemCalc. The assumptions underpinning the models are on the worksheet titled Assump. Readers are encouraged to have the model up on their computer screen while reading the discussion below.

Capital gains realisation ratio

To apply the custom formulae developed in Part 1 we need a *SharePrice* time series and an *Inflation* time series. Historical data for these are entered on rows 6 and 7 of the Index worksheet, respectively. The All Ordinaries share price index and the CPI are used in history, but users can feed in alternative data for share prices if they wish. On row 10 and 12 these series are rebased and the capital growth and inflation assumptions from the Assump worksheet are applied to extrapolate these series into the future.

To evaluate the current policy, we use the CG_Disp(…) formula in rows 8 and 9 for private investors and institutions, respectively, to get the capital gains realisation ratio due to share-swap mergers (on the MerCalc worksheet) and similarly for demergers (on the DemCalc worksheet) as a proportion of market capitalisation. On-going CGT realisations, post merger/demerger, are calculated using the CG_Acqu(…) formula in rows 11 and 12, again separately for private and institutions respectively. To evaluate revenue under current policies, it is also necessary to count capital gains on companies that would not have merged/reconstructed under current policies, but would have under rollover relief, to properly account for the gross flows. To do this we can use the CG_Roll(..) formula, with a merger/demerger gain and first-year disposal effect of zero (since no merger/demerger took place, there is no merger/demerger gain or first-year rationalisation, but otherwise the CGT calculations are the same). This is done in rows 14 and 15, for private and institutional investors respectively.

To evaluate the alternative policy, the CG_Roll(…) function is used, but this time allowing for merger/demerger gains. This is done in rows 19 and 20, for private and institutional investors respectively. An increase in the average length of share holding post merger/demerger is assumed to account for the additional lock in effect for investors granted rollover relief.

The reason for evaluating equations separately for private and institutional investors is so the model can allow for the higher share turnover profiles (lower mean holding times) that are likely for institutions compared to private investors.

Market capitalisation

The market capitalisation is the next item calculated, which is used to gross up the capital gain realisation ratios. This is done in cells D22:G23 on the MerCalc and DemCalc worksheets. Under current policies we need to know the market capitalisation of all share-swap mergers/demergers, plus the capitalisation of mergers that would have been cash-based under current policies but would have a share-swap component if rollover relief was allowed. The calculation also has to factor in any merger/demerger gains applicable. These calculations are the number of mergers times the average market capitalisation, less the amount of toehold investment (for share-swap mergers only), as specified on the Assump worksheet.

To calculate capital gains revenue the model first calculates the total base of capital gains (rows 25 to 30 on the MerCalc and DemCalc worksheets), by taking the product of:

- The capital gain realisation ratios.
- The $m market capitalisation figures, noting that:
  - The toehold investment is excluded in the case of share-swap mergers;
  - Merger/demerger gains are included for those mergers/demergers that go ahead (note that under existing policies there will be some mergers/demergers that do not proceed due to the absence of rollover relief, hence these have no merger/demerger gain);
  - It is possible to have a cash component in a share-swap merger. Under the current policies, cash and share-swaps are both treated as disposals, so there is no difference. However, in the case of rollover relief the proportion that is taken as cash is treated as a disposal, while the remainder is treated as a rollover. The proportion is expressed as a proportion of market capitalisation including merger/demerger gains; and
  - The number of mergers/demerger occurring under rollover relief is assumed to be greater than or equal to the number occurring under current policies. When there are additional mergers/demergers

under the rollover relief scenario, the current-policy calculations still have to count the (lower) capital gains that would have been realised on these un-merged/un-demerger companies, to take account of gross flows.

- If rollover relief is granted, the average merger/demerger gain would fall – that is, acquiring companies could offer lower premiums to target company shareholders because the CGT barrier is removed.

Note that the calculation of the capital gains base on rows 25 to 30 on the MerCalc and DemCalc worksheets are intermediate calculations only and cannot be interpreted as gross capital gains.

Revenue from capital gains

From the capital gains base calculations, the model takes account of the mix of private investors and the various types of institutional investors and the average tax rate paid by each. Note that the capital gains on shares held by share trading companies is treated as income, so are calculated separately.

Offsetting capital losses are applied at this point to reduce the average tax paid on a given dollar of capital gain. A one year lag is introduced to reflect the timing difference between tax liability incurred and tax collected.

These calculations are on rows 35 to 40 on the MerCalc and DemCalc worksheets. This is the total capital gains tax revenue collected under the alternative policies. However, there are still several income tax calculations to make.

Some revenue from the capital gain in the shares is actually collected through the inome tax net. This is the tax payable on profits from shares held by trading companies and is calculated in rows 45 and 48.

Revenue from the efficiency dividend

The income tax revenue generated from the increased company income and hence dividend payments implied by the merger/demerger gain due to the merger or demerger is calculated in rows 53 to 60.

The issue is that whenever a merger/demerger gain occurs, it reflects the markets' expectation of higher future earnings from holding shares in the post-merger or post-demerger entity. If shares increase in value by (say) 30% as a result of a merger or demerger, standard asset pricing theory says that investors value the net present value of the expected additional after-tax flow of dividends at 30% of the current share price.

Given assumptions about merger/demerger gain (say, 30%), an average tax rate (say, 25%) and a rate of return for discounting purposes (say, 10%) we can reverse-engineer the implied dividend flow that investors are pricing into the share.

Note that the sum of the discount factors is a converging series: $\sum_{i=0}^{\infty} \frac{1}{(1+r)^i} = \frac{1+r}{r}$.

Implied dividend flow = (0.30 ÷ (1.10 ÷ 0.10)) ÷ (1 – 0.25)
= (0.30 ÷ 11.00) ÷ 0.75
= 3.64%

Hence in the above example investors are pricing in a before-tax earnings increase of 3.64 percentage points per annum as a result of the merger.

However, it is likely that this stream of higher profits is not uniform – profits may even be lower in the short term due to restructuring. To reflect this, a profile is entered in row 19 on the Index worksheet. A value of 100% on this line indicates the profit stream is at the 'long run' level in the year indicated. A value less than 100%, and even negative, generates the short-run profile described above. It is impossible to use historical

data to guide this assumption, as the short-run change in the pattern of profitability of target companies is subject to much external noise. Hence, a fairly conservative profile has been adopted as follows:

Efficiency gain	Year 1	Year 2	Year 3	Year 4	Year 5 +
Time pattern	-25%	+25%	+50%	+75%	+100%

Given the above calculations, it is then a matter of applying the implied increase in the earnings rate to the dollar value of the investment, then calculating income tax revenue on the increased dividend payments.

Note importantly that the efficiency dividend compounds over time as more mergers/demergers occur. After 4-5 years there has been a large number of additional mergers, and the increased profit and hence tax revenue generated by those mergers/demergers accumulates to a significant number.

The additional dividend payments are imputed to shareholders and the marginal tax rates of the various shareholders types are applied to derive revenue.

Presentation of results

The model reports gross revenue figures – that is, the gross revenue collected under both the current and alternative policy – on rows 64 and 65 on the MerCalc and DemCalc worksheets. These gross figures are useful for benchmarking to historical CGT collection on all share disposals to ensure the figure falls within reasonable bounds.

The net Budget impact is of most use for assessing the impacts of the policies. The NPV of the series of net Budget impacts is also reported.

To ensure that the NPV is on a comparable scale to the annual numbers in the chart illustrating the annual net Budget impacts, the NPV is divided by the sum of the discount factors to give an 'averaged NPV'. The averaged NPV gives the average annual impact on the Budget in present value terms, so may be easier to interpret than a normal NPV (the latter is the cumulative sum so the magnitude can be difficult to interpret).

The formulae used, for a cash flow X_i and an interest rate r are:

$$Normal\ NPV = \sum_{i=0}^{\infty} \frac{X_i}{(1+r)^i} \tag{1}$$

$$Ave.\ annual\ NPV = \sum_{i=0}^{\infty} \frac{X_i}{(1+r)^i} \Big/ \sum_{i=0}^{\infty} \frac{1}{(1+r)^i} \tag{2}$$

Given that the denominator in the above equation converges, this can be written:

$$Ave.\ annual\ NPV = \frac{1+r}{r} \sum_{i=0}^{\infty} \frac{X_i}{(1+r)^i} \tag{3}$$

However, when using a real bond rate around 3% to 4% for discounting, the sum takes more than a hundred years to converge, hence formula (2) is actually used in practice, with the summation extending to 100 years instead of ∞.

See row 66, in particular cell V66, on the MerCalc or DemCalc worksheets if you would like to examine the averaged NPV formula closely.

The model also includes several charts: realisation ratios, budget impact and probability distributions to help illustrate some of the concepts.