Final Report

Risk management and efficient housing assistance provision: a new methodology

authored by

Jon Hall
Mike Berry

for the

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Sydney Research Centre

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CONTENTS

GLOSSARY

The concepts set out below are important to an understanding of the arguments developed in the rest of the paper. They help to clarify aspects of the discussion.

Affordable Housing	'…conveys the notion of reasonable housing costs in relation to income: that is, housing costs that leave households with sufficient income to meet other basic needs such as food, clothing , transport, medical care and education' (The National Housing Strategy, 1991, Issues Paper No 2, pix)
Assistance Output	Is the number of new households provided with longer term (greater than two months), housing assistance in a given period.
Capital Asset Pricing Model	Defines a benchmark for calculating correlation as an index of the market value weighted portfolio of all possible investments. In addition the CAPM creates an additional asset known as the risk free asset where there is zero variance and zero covariance-no risk. This class of asset has been traditionally represented by Commonwealth issued securities. The CAPM defines risk as the covariability of the security's returns with the market's returns. The CAPM then defines risk explicitly as the volatility of an asset's returns relative to the volatility of the market's portfolio returns. (Harrington, 1983, pp. 12-13)
Common-wealth Rent Assistance	A Government Program providing a non-taxable income supplement paid to individuals and families who rent in the private rental market. Pensioners and those receiving more than the base rate of Family Tax Benefit Part A (FTB A) may be eligible for C.R.A.
Correlation Analysis	Correlation analysis is an investigation of the measure of statistical association among random variables based on samples.
Cost Benefit Analysis	A method to assess the relative desirability of competing alternatives, where desirability is measured as the economic concept of net benefit to society as a whole. CBA is basically about the comparative total benefits and costs to society of different policy responses to the same supply problem.
Cost Effectiveness Analysis	Where the output of a project is not readily measurable in monetary terms an alternative approach is cost effectiveness analysis. This type of appraisal **compares the costs of different initial project options with the same or similar outputs.**
Co-variance	A measure of the relationship between two data sets. A covariance produces the average of the products of deviation for each data point pair.
Economic Appraisal	Economic Appraisal is a method for analysing all of the cost and benefits associated with a particular project. There are two types of economic appraisal, Cost Benefit Analysis (CBA) and Cost Effectiveness Analysis (CEA).
Housing Accessibility	'the cost of becoming a home purchaser or entering a rental arrangement' (The National Housing Strategy, 1991, Issues Paper No 2, p. ix).
Housing Affordability	'the ongoing cost of housing in relation to gross income' (The National Housing Strategy, 1991, Issues Paper No 2, p. ix).

Housing Allowance	A Housing Allowance is a government cash payment designed to bridge, or lessen the gap between available gross household income and the level of household income required to obtain appropriate housing without incurring housing related stress. Housing allowances have traditionally been of two types: a cash payment direct to households; or 'vouchers' which are provided to households but which can only be redeemed for cash by the provider of the accommodation.
Housing Assistance	Housing assistance is therefore defined as any means of providing assistance to income units (or households) such that those income units in the lowest 40% of the income distribution range are wholly, or partially, protected from housing stress. The duration of this assistance is income related and may vary from a few months up to forty or more years.
Housing Stress	'Income units are said to be in financial housing stress if they pay more than 30% of gross income on housing and are in the lowest 40% of the income distribution range' (The National Housing Strategy, 1991, Issues Paper No 2, p. ix).
Latin Hypercube Simulation	'Latin Hypercube sampling is a recent development in sampling technology designed to accurately recreate the input distribution through sampling in fewer iterations when compared to Monte Carlo simulation. The key to Latin Hypercube sampling is the stratification of the input probability distributions' (Palisade Corporation, A Guide To Using @RISK, pg264). It is the preferred method of analysis.
Monte Carlo Simulation	'Monte Carlo sampling refers to the traditional technique for using random or pseudo random numbers to sample from a probability distribution. Monte Carlo sampling techniques are entirely random – that is, any given sample may fall within the range of the input distribution. (Palisade Corporation, A Guide To Using @RISK, pg263)'
Rent Assistance	A method of delivering housing assistance defined in the simulation modeling as the subsidy arising out of the difference between the affordable rent payment at 25% of household income and the payment that would be required should market rents be charged
Risk	The possibility that an expected outcome is not achieved or is replaced by another, or that an unforeseen event occurs. This is a broad view of risk that includes both uncertainty due to future events and the consequences of limited knowledge, information or experience. (NSW Department Of Public Works, 1993, p. 6).
Risk Analysis	The process of identifying risks, estimating their likelihoods, and evaluating potential consequences.
Risk Consequence	The 'fallout' from the crystallisation of risk may be short or longer term, gain or loss, but will often be a diachronic state. (Croft, 2001, p. 743).
Risk Consequences	The impacts on desired outcomes from the risk event occurring. Essentially the concern focuses on loss, since although windfalls may also result they do not create a liability or cost.
Risk Crystallisation	An event (either individual or collective, chosen or imposed) causes the crystallisation of potential into something substantive.
Risk Exposure	The possibility of economic, financial or social loss or gain, physical damage or injury, or delay. The significance of risks is the impact they may have on the achievement of project objectives, delivery goals or management effectiveness.

Risk Management	The set of activities concerned with identifying potential risks, analysing their consequences and devising and implementing responses so as to ensure that project or program objectives and delivery goals are achieved. This includes management of ongoing risks associated with the ownership of assets.
Sensitivity, Sensitivity Analysis	Sensitivity generally refers to the variation in output of a mathematical model with respect to changes in the values of the model's inputs. A sensitivity analysis attempts to provide a ranking of the model's input assumptions with respect to their contribution to model output variability or uncertainty
Systematic Risks	*Systematic risks* are risks stemming from the general economic or natural environment – i.e. from movements in the economy (business cycle boom and bust) and natural disasters.
Uncertainty	Uncertainty refers to *lack of knowledge* about specific factors, parameters, or models, as they may impact on future outcomes.
Unsystematic Risks	Unsystematic risks are risks specific to the asset or investment sector in question (residential property) and to the agencies involved. Unsystematic risk can, in a perfect capital market, be eliminated by the investor by thoroughly diversifying investment across all assets (Hall, Berry and Carter, 2001, p. 7).

EXECUTIVE SUMMARY

Declining Housing Affordability

Housing affordability for low to moderate income households declined in Australia during the 1990s, especially in the private rental sector. This occurred in spite of generally buoyant general economic conditions and historically low nominal interest rates. In an increasingly integrated world, large-scale economic restructuring of the Australian economy, led to rising economic inequality and greater insecurity, particularly in the labour market. Rising housing prices and rents concentrated in the inner and middle suburbs of the capital cities intensified housing stress – i.e. housing related financial hardship – for lower income households. For many households locked into the lower half or two-fifths of the income distribution, average housing prices and rents increased faster than disposable incomes. The progressive decline in the stock of low cost rental dwellings further intensified the housing and related problems faced by this section of the population.

In the light of these trends, current housing policies are failing. The real value of housing assistance to public and private tenants has fallen over the past decade or so. This trend is in line with the general tightening of public borrowing and expenditure patterns in Australia during this period, though other areas of policy have not been so affected – notably, the continuing tax-favoured treatment of owner occupiers and the recent First Home Owners Grant scheme.

The Need for Efficient Housing Assistance Policy

The existence of political constraints on public expenditure therefore places a premium on the *efficiency* of housing assistance policies. In other words, governments are necessarily concerned to *maximize* the positive impact of whatever total volume of housing assistance they provide. In this way they can, collectively, improve housing affordability for the maximum number of households in stress allowed by available resources. Efficient outcomes, in this sense, can be achieved by *minimizing* the long term expected subsidy cost per assisted tenant per year.

Greater housing assistance efficiency is a necessary, though not sufficient, condition for meeting key components of the general aims of a national housing policy outlined in the 19 April 2002 'Joint Communique of Australian Housing Ministers' in which:

> Ministers expressed commitment to the development of positive options for a new CSHA that will:
>
> - create a modern, sustainable housing system;
> - support community development and the renewal of public housing estates;
> - support wider government outcomes in health, education and labour market reforms; and
> - stimulate private sector investment in the supply of low cost housing.
>
> Ministers agreed that a national approach to these challenges is vital.

Research Questions

Key questions that need to be addressed when evaluating housing assistance efficiency are:

(a) which assistance options are affordable for which household and income groups?

(b) what are the risks associated with and subsidy costs of each of the assistance options when applied to each of the groups?

(c) how much should be spent on?

- capital funding for public housing;
- private rental subsidy and housing allowances;
- home loan subsidy; and
- shared equity subsidy; and

(d) what are the longer term implications of recurrent subsidies?

This project explores these questions and focuses on the issues of risk and risk management by government. It builds on and extends the findings of an earlier AHURI study carried out by Berry and Hall and the Allen Consulting Group for the Affordable Housing National Research Consortium[1].

The project addresses the following ***specific questions***:

(a) what are the main systematic risks associated with the various housing assistance options?

(b) historically, have the main systematic risks associated with housing assistance options varied significantly and therefore are they likely to vary significantly in the future?

(c) In comparisons of housing assistance options are there possible scenarios of the systematic risks where the subsidy costs for one option may increase whilst the subsidy costs of another option may decrease? and hence;

(d) are any of the covariances of the systematic risks of housing assistance options highly positive?

(e) are any of the covariances of the systematic risks of housing assistance options near zero, zero or negative?

(f) do the subsidy costs associated with each housing assistance option vary significantly under different scenarios of the main systematic risks?

If the answers to questions (b), (c), (e) and (f) are 'yes', it is probable that a strategy which consistently uses a mix of housing assistance approaches will assist more low-income households in the longer term than policies focused on one means of delivering assistance only.

The *aims of this project*, then, are fourfold -- viz. to:

(a) analyse the relative impact of each type of risk and combination of risks on subsidy requirements for different housing assistance options, given acceptable affordability benchmarks, utilising a suite of models developed for this purpose.

(b) comprehensively test whether a strategy providing for the delivery of housing assistance using a mix of delivery options will, in the longer term, be more efficient (i.e. impose lower real subsidy costs per household assisted) than any strategy which depends on a single assistance option, i.e. relying on one principal means of providing the assistance.

(c) the extent that mixed strategies are efficient, provide tools for determining the most efficient mixes of housing assistance options.

(d) document the procedures necessary for housing authorities to apply the tools in their particular jurisdictions.

[1] **For details see the four relevant and summary reports published on www.consortium.asn.au**

There are four main types of risk that affect housing assistance options. These are:

systematic risks including:

- *general economic risks*, which includes such variables as inflation, capital growth or contraction rates, rental yield, unemployment and income growth or contraction, changes in nominal and real interest rates, and construction cost escalation rates; and
- *natural disasters**,*** such as landslip, earthquake, fire, flood, lightning, wind and weather.

unsystematic risks including:

- *structural and financial risks,* including funding sources, ownership, and residual risks to the Authority where there is private sector involvement; contractual risks, and procurement planning; and
- *agency or issue specific risk,* including political, project management, project delivery (contract selection, tendering, negligence etc.), human error, organisational (including industrial relations, resources shortage, management, work practices etc.) and systems (including communications failure, hardware and software failure, etc.)

The main systematic risks associated with housing assistance options are:

- **dwelling price growth or contraction;**
- **rental yield** - 'real rents';
- **income growth/loss, vacancy rates and defaults** and therefore reduced payments;
- **inflation;**
- **interest rates; and**
- **cost escalation.**

Under each of the various housing assistance options currently available (with the exception of housing allowances) governments face very similar systematic risks, with the main differences being related to the method of financing. In the current institutional environment the main risks associated with capital provision, home loans and shared equity reside with State government, while the risks of direct assistance programs are borne by the Commonwealth.

Assuming that the minimisation of subsidy costs to government as a whole is a major consideration, the guiding rules that might apply to the choice of delivery mechanism are that in times of:

- low to moderate interest rates and moderate to higher levels of gross private rental yields and capital growth; public and community housing options will prove to be most cost-effective;
- as interest rates rise, and capital growth declines shared equity will likely outperform public housing as the most efficient delivery mechanism;
- in periods of low housing interest rates, high gross rental yields and little capital growth subsidies on home loans will come to the fore; and
- when rental yields are low dwelling prices are stagnant and mortgage rates are high, direct assistance will be most cost effective.

A Hypothesis

The hypothesis is if:

- the future experience of systematic risk will be 'bounded' by the range of past experience;
- unsystematic risk is zero for all housing assistance options;
- there is no difference in the cost or terms of finance available for all housing assistance options;
- funds are borrowed at the 'risk free' rate on fully variable terms with no prepayment penalties or other additional costs and fees at the 'real' 10 year Commonwealth Bond Rate;
- SHA's are responsible for all losses (the difference between the realised dwelling price minus the mortgage balance outstanding plus termination costs) or shortfalls (the difference between an 'affordable payment' defined as a percentage of household income and the required payment) arising from defaults or income loss for all housing assistance options.

then

- a strategy providing for the delivery of housing assistance using a variety of delivery options and dynamically adapted to trends in systematic risks will, in the longer term, be considerably more efficient (i.e. impose significantly lower real subsidy costs) than any strategy which is monocentric, i.e. relying on one principal means of providing the assistance.

This hypothesis is tested in chapter 7, based on the approach developed in chapter 6. below.

Evaluation Method

Three common evaluation methods are: cost benefit analysis (CBA), cost effectiveness analysis (CEA) and financial appraisal. Financial Appraisal concentrates on effects relating to the agency sponsoring the project, in this case, government housing assistance providers. Although there is much common ground between economic and financial appraisal there are a number of significant differences. The main difference is the perspective: in a financial analysis the project is examined from the narrow perspective of the entity undertaking the project. It does not take account of effects on other enterprises or individuals, including externality effects.

For the purposes of the analysis in this study, housing assistance options have been examined from the perspective of a financial appraisal for Government, since this allows the research questions specifying this project to be adequately addressed. Of course, for other policy or program evaluation purposes, CBA or CEA may be the more appropriate method to draw upon.

This study also abstracts from a detailed and exhaustive analysis of the taxation impacts (indirect and direct) of the alternative housing assistance options. These effects are highly complex and would require a separate study to fully capture the range of impacts and their intensity across the different delivery mechanisms. It is not clear that the outcomes of such a study would materially alter the conclusions that can be drawn from the present analysis of the efficiency of alternative assistance options. However, the model developed for this study (detailed in chapters 6 and 7) does allow the direct tax impacts of housing option selection to be included, in the sense that, for example, income tax paid by private investors in each option can be calculated and deducted from gross subsidy requirements to give a net subsidy cost to the Commonwealth.

The Model

The housing subsidy model developed for the Affordable Housing National Research Consortium has been modified into four models which can calculate real net subsidy costs for each of the four main housing assistance options, listed above.

The model is used to construct specific scenarios, for each option, based on the probability of future values for the key risk variables like: inflation, rental growth, interest rates and tenant incomes, etc. The Monte Carlo simulation technique is used to generate a number of scenarios (one hundred) for each of the three capital cities selected, Sydney, Melbourne and Adelaide.

This approach assumes that the future will mirror the past in relation to the relative frequencies of outcomes with respect to the key risk variables.

Thus, the more probable past values of, for example, interest rates will figure in a correspondingly high proportion of the scenarios generated.

The model calculates for each of the scenarios, the gross (and direct after tax) subsidy cost required for each of the assistance options (noted below), given the input data and probability distributions of risk variables.

The process entailed:

- modification of the Affordable Housing National Research Consortium's Housing Subsidy Model such that it is able to calculate subsidy for an:
  - off-budget debt option where dwellings are purchased for social housing tenants and sold as tenants leave ('the Consortium model');
  - rent assistance[2] option;
  - home loan option;
  - on budget (grant funded) public housing;
  - shared equity (a combination of the results for home loans and on-budget grant funding of public housing).
- development of two streams of technical analysis:
  - obtaining the requisite housing cost information as necessary inputs for the starting day of the Model simulation;
  - obtaining the risk data; analysing that risk data for distributions and correlations; and completing the simulations for inputting the necessary risk data numbers to be used through the financial modeling.
- finalising the assumption issues, including commencing household incomes and terms of the transaction.

An 'all options mixed option' was arbitrarily created by splitting the subsidy evenly across the five basic options: i.e. 20% weighting to each of the latter. In other words, one-fifth of the subsidy is devoted to each of: the public debt option; the rent assistance option; the home loan option; the grant funded public housing option, and; the shared equity option.

Secondly a 'best two cases' option has been developed based on 50% of the subsidy costs applying to each of the lowest two cost options applying in each metropolitan area.

Finally, a 'partial mixed option' was specified mirroring the current division of Commonwealth housing assistance between Commonwealth Rent Assistance[3] and grant funded public housing.

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[2] A method of delivering housing assistance defined in the simulation modeling as the subsidy arising out of the difference between the affordable rent payment at 25% of household income and the payment that would be required should market rents be charged.

[3] A Government Program providing a non-taxable income supplement paid to individuals and families who rent in the private rental market. Pensioners and those receiving more than the base rate of Family Tax Benefit Part A (FTB A) may be eligible for C.R.A.

The model thus allows us to compare the required subsidy costs of the selected options across a set of scenarios that reflect the likelihood of the various risks crystallizing over the proposed term of the analysis (25 years).

The Results

Probability and risk analysis has two central components;

- the first is the ***likelihood*** that an event may occur; in the case of this work the likelihood of financial savings accruing from following a 'all assistance options' mixed or 'best two assistance options' against any single option and the Commonwealth funding mix.

  Thus the first part of the results analysis for the three cities is about quantifying this likelihood of savings if a mixed assistance or best two assistance option is pursued.

- the second is; once the likelihood has been determined what is the probable ***impact*** or ***extent*** of the event; in this case the extent of savings (or addition to output) that may accrue.

These two components are independent of each other. Thus the second part of the analysis is about if the event does occur (i.e. savings from a mixed or best assistance option case) what is the quantified extent of this savings or increase in output from an all options mixed or best two options against any individual option or the Commonwealth funding mix.

The report handles this question in two ways:

- it documents the average extent of the savings from all those cases where savings are generated;
- for all of the 100 cases tested it documents the mean value of subsidy per tenant year for each assistance option and the Commonwealth funding mix and compares that with the mean value of the subsidy per tenant year for the all options mixed or the best two options outcome with the difference between the means being the potential average savings.

Thus the possible extent of savings or additions to output are quantified. This is why potential savings vary between over 100% (only savings cases) to 50% (comparisons of means).

The *main findings of the research* are as follows.

Likelihood

1. If the economic environment of the future reflects the environments of the last twenty years, an all options mixed strategy (20% spending on each assistance option) would be superior in 54% of possible outcomes, for the three cities taken together. Thus, the probability of efficiency gains is moderate, in relation to the all options mixed approach modeled in this study. However, the probability of gains becomes very high under the 'best two cases' approach. Additionally, where gains are achieved (e.g. in the application of both the 'all options mixed' and the 'best two-case' approaches) they are very substantial.
2. It is likely that under current interest rate conditions and with the diversity of real residential rent and price regimes, a national capital city-specific approach would generate considerably higher probabilities of savings. That is, a national policy that tailored particular assistance options/mixes to each jurisdiction, or (more ambitiously) definable spatial housing market segments, would most probably generate significant overall savings in total subsidy costs. Alternatively, significantly more affordable housing support could be delivered to households in housing stress for any given housing assistance budget allocation.
3. The research has revealed a diversity of efficiency outcomes. In Adelaide both probabilities and subsidy savings are the opposite to those applying in Melbourne and Sydney, with rent assistance overwhelmingly cheaper in 80% of mixed cases, but in only

33% in Melbourne and less than 20% in Sydney. By contrast, a mixed strategy was more efficient than 78% of the public housing options tested in Adelaide, but for only 1% of the cases tested in Melbourne and 2% in Sydney. Rent assistance was the dominant efficient strategy in Adelaide but supply side options involving public housing and bond funded social housing dominate the probability outcomes in Melbourne and Sydney.

4. Whilst the particular all options mixed outcome tested was only just better than an even chance (54%) of being more efficient than any individual approach overall, if the most efficient two options are selected (rent assistance and bond funded social housing in Adelaide, public housing and bond funded social housing in Melbourne and Sydney), the probabilities of efficiency or output gains are much higher.

   Furthermore, in more than 40% of the cases in Adelaide and in an overwhelming majority of possible outcomes in Melbourne (82%), and Sydney, (92%), the probability is that this strategy would be more efficient that the current predominant Commonwealth funding mix of primarily Commonwealth Rent Assistance and public housing. It is clear from the best two option analysis that the current Commonwealth funding mix has more than 2 chances in 3 of being considerably *less efficient* than a selection of the best two options that could be applied in the three capital cities.

Impact Or Extent Of Effect

5. It is obvious from the research that supply side assistance options such as public housing and bond funded social housing will always be much more efficient than rent assistance in circumstances where real capital gains are expected to be 0.5% p.a. or more.

   At real capital gains being experienced in Melbourne and Sydney these efficiency benefits will be very large. By contrast, where real capital gains are falling and initial dwelling prices are relatively low (such as in Adelaide) it also clear that there is a very high probability that rent assistance will be the most efficient housing assistance response.

6. In the cases where savings are indicated, the selection of the 'correct' assistance option strategy will itself generate very substantial improvements in the likely long term output (i.e. households assisted) of housing assistance options. For example, when compared to the current Commonwealth funding mix an all options mixed strategy generates average output gains of nearly 60%, and if the best two options are selected in each capital city the aggregate assistance output could be more than doubled.

   If we examine all cases, both those that generate savings and those that do not, the average subsidy cost for each assistance option across the 100 iterations for each city also reveals that substantial efficiency or output gains could be generated from the selection of the 'correct' mix of assistance options.

   In Adelaide the mean subsidy cost for rent assistance is about a third of that applying to other options, whereas in Melbourne and Sydney mean subsidy costs per tenant year for public housing and bond funded social housing are many times cheaper than rent assistance (See page 66).

   In aggregate, across all three cities, public housing and bond funded social housing generate assistance outcomes 60% higher than rent assistance. Overall, on average, the best two options outcome generates output gains of nearly 50% on the current Commonwealth funding mix.

7. In examining the worst case for all of the options it is obvious that bond funding has considerably greater downside risk attached to it than public housing or rent assistance in Adelaide, and again, public housing in Melbourne and Sydney. However, the worst case for bond funding in Melbourne and Sydney is not significantly greater than that for rent assistance. If we compare a policy which selected the best two options then we find that there is less downside risk than that attaching to the current Commonwealth funding mix.

8. Changing income levels does not noticeably affect the above outcomes and increasing the term of the transactions simply makes home loans more efficient than rent assistance.

In Conclusion

The research suggests that there is considerable room for improvement in the long term output of housing assistance policy through more flexible, variegated and targeted assistance policies.

In this context, the new Commonwealth State Housing Agreement could establish a national framework for negotiating, implementing and monitoring bilateral agreements with each State that tailor the policy interventions to the particular housing market conditions that exist in each jurisdiction. This would allow the governments to maximize the output efficiency of housing assistance, while pursuing the four aims of a national housing policy outlined in the 'Joint Communique of Australian Housing Ministers', listed above at the end of chapter 3.

Simply continuing the current policy that tends to regard housing assistance as an adjunct to income security policy is likely to perpetuate the inefficiencies and rigidities that exist within the current system.

Whilst the outcome for the client may have the same effect as an income security approach, housing assistance does not perform like an income security payment for the provider of the assistance. There are, as demonstrated in this study, substantial costs associated with a cash payment approach.

It is likely that extending this study to an Australia-wide project would reveal a much higher probability of a mixed approach being more efficient than the current 'two arms' strategy. A sophisticated risk management approach by both the Commonwealth and the States would see the operation and maintenance of all of the main types of housing assistance monitored, with the emphasis changed between options as economic circumstances dictate.

1 INTRODUCTION

1.1 Background

Since the beginning of the 1990s access to secure, appropriate, and affordable housing has consistently declined for low to moderate income Australian households. Whilst the supply of low cost private rental housing and access to home ownership participation was falling the demand for affordable public and social rental housing was clearly increasing. Trends in affordability have been very adverse. In metropolitan locations low income tenants have extremely limited affordable housing choices, both by location and dwelling type (Berry and Hall, 2001).

Whilst the supply of affordable housing has declined, demand, as reflected in statistics on housing stress, increased substantially for low income tenants over the 1986-96 period. By 1996, almost three out of four low income private tenants in the main metropolitan areas (excluding Canberra) were suffering housing stress (i.e. in the lowest two income quintiles and paying more than 30% of their gross income in housing payments) (Berry and Hall, 2001), when measured by the conservative National Housing Strategy benchmark. As a proportion of all households, these financially stressed renter households are growing much more rapidly than total renter households.

These trends in lower cost housing supply, affordability and housing stress have occurred against a background of significant change in Government housing assistance policies. At the beginning of the new Millennium the supply of new government assisted or sponsored public and affordable housing has fallen substantially when compared to late 1980's levels. Moreover, bifurcation between the two levels of government (Commonwealth Rent Assistance and State public housing) of the delivery of different types of housing assistance raises important questions about the efficiency and the equity of the total housing assistance 'package'.

One of the goals of both Commonwealth and State Housing Authorities is to maximise the number of needy households provided with secure, appropriate and affordable housing. In this context, and given satisfaction of vertical (different quanta of assistance for different household incomes) and horizontal (the same quantum of assistance for households with the same incomes) equity issues, efficiency is therefore of fundamental importance, the lower the long term subsidy cost per household or per household year, the greater the number of households which can be assisted. For example identification of say an 18% reduction in subsidy cost is tantamount to delivering the same increase in assistance output, a current urgent priority.

Some of the questions that need to be addressed when evaluating housing assistance efficiency are:

(a) which assistance options are affordable for which household and income groups?

(b) what are the risks associated with and subsidy costs of each of the assistance options when applied to each of the groups?

(c) how much should be spent on?

- capital funding for public housing;
- private rental subsidy and housing allowances;
- home loan subsidy; and
- shared equity subsidy; and

(d) what are the longer term implications of recurrent subsidies?

This project explores these questions and focuses on the issues of risk and risk management by government.

It builds on and extends the findings of an earlier AHURI study carried out by Berry and Hall and the Allen Consulting Group for the Affordable Housing National Research Consortium[4].

The project addresses the following specific questions:

(a) what are the main systematic risks associated with the various housing assistance options?

(b) What do we mean when we talk about systematic risks as they affect housing policy? In some cases, changes to a particular risk variable may have an opposing affect on different assistance options; increasing subsidy costs for one whilst decreasing it for another. For example, if regular housing payment to income ratios are the same for the two forms of assistance, increasing real rents or rental yields will decrease the subsidy costs for public housing (because of higher net rents received) but increase the cost of rent assistance. Alternatively, the affordability benefit of one form of assistance (rent assistance) will not be equal to that provided by the other (public housing) for a given level of subsidy. Similarly, in Australia, one of the forms of government home purchase assistance (Mortgage and Rent Relief Program [MRRP]) is to help make payments on mortgages of households who may be facing hardship through temporary income loss. By contrast, in Britain there have been recent developments in requiring home loan borrowers to obtain repayment insurance and pay the appropriate premiums. In the former example the State is accepting some of the risk of income loss, whilst in the latter, the price of this risk is left to the home purchaser.

Therefore:

(c) historically, have the main systematic risks associated with housing assistance options varied significantly and therefore are they likely to vary significantly in the future?

(d) In comparisons of housing assistance options are there possible scenarios of the systematic risks where the subsidy costs for one option may increase whilst the subsidy costs of another option may decrease? and hence;

(e) are any of the covariances of the systematic risks of housing assistance options highly positive?

(f) are any of the covariances of the systematic risks of housing assistance options near zero, zero or negative?

(g) do the subsidy costs associated with each housing assistance option vary significantly under different scenarios of the main systematic risks?

If the answers to questions (c), (d), (f) and (g) are 'yes', it is probable that a strategy which consistently uses a mix of means of providing housing assistance will assist more low-income households in the longer term. This follows from the basic theory of modern finance which identifies the conditions necessary for efficient investment, leading to the maximisation of financial returns, (in this case, the minimization of subsidy costs) at a given level of risk (see Berry, 2002, chapter 3.1).

[4] **For details see the four relevant and summary reports published on www.consortium.asn.au**

Research Aims

The aims of this project are fourfold -- viz. to:

(a) analyse the relative impact of each type of risk and combination of risks on subsidy requirements for different housing assistance options, given acceptable affordability benchmarks, utilising a suite of models developed for this purpose.

The current housing assistance model developed for the Affordable Housing National Research Consortium (see footnote 1) can handle all of the systematic risk variables and two of the four main housing assistance options.

This model has been adapted and developed to also include mainstream public housing and home purchase assistance delivery options.

The data already used for housing cost analysis in the Consortium project is used for the initial housing cost analysis in this present study.

Later sections of the Final Report outline in detail the main systematic risks applying to each of the housing assistance delivery options. The project has obtained the relevant data on these risks for Adelaide and Melbourne in addition to that obtained for Sydney.

(b) comprehensively test whether a strategy providing for the delivery of housing assistance using a mix of delivery options will, in the longer term, be more efficient (i.e. impose lower real subsidy costs per household assisted) than any strategy which depends on a single assistance option, i.e. relying on one principal means of providing the assistance.

There are a number of assessment techniques that can be used to quantify subsidy cost comparisons and possible efficiency gains. There are, however, substantial disadvantages associated with some of these techniques.

For example, straight sensitivity analysis is really only useful for testing the effects of changes in one systematic risk variable at a time. In addition, sensitivity analyses tend not to bear any necessary relationship to the probability of certain scenarios of systematic risks arising.

Probability analysis is the main method by which insurance premiums are calculated. It works from the premise of documenting past events over long periods of time and identifying 'worst' (i.e. highest claims cost) through to 'best' (lowest claims cost) cases. These 'cases' are then ranked by isolating the probability of certain claims amounts being able to cover the universe of events, i.e. *x* amount will have a 25% probability of being sufficient to cover all potential future events (covers 25% of the cases which occurred in the past), *y* amount will have a 75% probability of being sufficient to cover all potential future events (covers 75% of the cases which occurred in the past) and so on. In our case we have calculated the various systematic risk scenarios according to their probability of occurring (based on past experience) using Latin Hypercube simulations (see page 6), derived from the @RISK probability software program.

We have inputted a range of systematic risk scenarios covering different probability outcomes for each of our housing assistance models and calculated the required subsidy cost per tenant year. The results chapter compares a range of multiple or mixed housing assistance options with the four single options under a range of probability outcomes to determine how often a mixed option is cheaper than a particular single option. It also documents the efficiency outcomes which occur viz a viz subsidy savings. Particular attention will be paid to comparisons with an assistance policy that includes only rent assistance or public housing.

(c) the extent that mixed strategies are efficient, provide tools for determining the most efficient mixes of housing assistance options.

A CD ROM, is provided containing a range of generic financial models plus the detailed systematic risk data for the three States selected for analysis.

(d) document the procedures necessary for housing authorities to apply the tools in their particular jurisdictions.

The report contains within it the procedures and processes for:

- obtaining appropriate risk data;
- obtaining the @RISK software program;
- constructing probability schedules using the program and the risk data;
- inputting into the model; and
- running, compiling and analysing composite assistance option outcomes against individual assistance option results.

1.3 Structure of the Final Report

Chapter 2 examines in more detail:

- recent research into housing stress and affordability;
- goals of assistance policy;
- housing assistance options
- the concept of risk and housing risk and its relevance to housing policy;
- housing assistance options and systematic risks;
- investment theory and its potential relevance to assistance efficiency;
- a potential hypothesis relating to housing assistance.
- intergovernmental arrangements and social housing provision.

Chapter 3 contains a review of references as it applies to:

- concepts of risk, and
- risk and housing.

A comprehensive examination indicated no literature available on housing assistance options and government risk.

Chapter 4 details the methodology and relevant issues arising.

Chapter 5 documents the analysis results. The chapter sets out

- probability of efficiency or output gains;
- extent of savings or increases in output;
- mean results;
- maximum exposures; and
- an evaluation of income and term effects on the results.

Chapter 6 sets out the findings and conclusions.

CHAPTER 2 NATIONAL POLICY CONTEXT

2.1 The Supply of and Demand for Affordable and Social Housing

One of the most pressing issues facing housing policy makers is how to increase the number of new low to moderate income households provided with appropriate and affordable housing in the face of clear evidence of declining supply and burgeoning demand.

Although aggregate home ownership participation rates declined only slightly during the 1990's participation by younger age and lower to moderate income households declined significantly (Yates, 1998). Concomitantly, average real house prices across the six State capital cities and Darwin increased by 2.8% compound per annum during the decade (Yong Tu, 2000).

The supply of low cost private rental housing also declined by a significant 18% over the period 1986-1996 at a time when the private rental market grew by 34% (Wulff and Yates, 2001). This decline in the low rent stock was widespread throughout Australia, although the loss of stock was most severe in the Sydney metropolitan region. In 1986, at an Australia wide level, there were almost two low rent dwellings for every low-income household in the private rental market. By 1996, there were less than 4 low rent dwellings for every 5 low-income households and an overall shortage of rental dwellings affordable for low-income households of 50,000 dwellings.(Wulff and Yates, p. 63).

Berry and Hall (2001),found that although nominal mortgage interest rates have fallen progressively through the 1990s and real rates are also down to below 5% per cent in the current year:

- the real prices and rents of units and houses increased faster than real incomes in the inner locations of Melbourne, Sydney and Adelaide (except rents in inner Melbourne)
- real mortgage payments rose by between 20 and 40 per cent in the two inter-censal periods, 1986-91 and 1991-96, with the largest increases in Adelaide and Sydney in the later period
- the proportion of households renting privately increased significantly during the 1986-96 period in all three cities. This occurred fastest when and where dwelling prices were rising quickest

Whilst the supply of low cost private rental housing and access to home ownership participation was clearly declining for these households, the demand for affordable public and social rental housing was just as clearly increasing (Berry and Hall, 2001, p. 10).

Berry and Hall also found that low-income tenants have extremely limited affordable housing choices, both by location and dwelling type. Moreover, where a small degree of choice appears to exist – viz. renting a one-bedroom unit on the fringe of metropolitan areas – this ignores the question of appropriateness. Clearly, this only represents a real choice for small households.

Moreover, housing stress increased substantially for low-income tenants over the 1986-96 period, (Berry and Hall, 2001)

Berry and Hall's main conclusions regarding housing stress in the bottom two income quintile households are as follows.

In June 2000:

- *no household can affordably buy an average priced three bedroom house in any metropolitan location;*
- *39% of Adelaide's and 15% of Melbourne's salient households can afford to buy an average one bedroom unit in North Adelaide and South East Melbourne (resp.), with no households in Sydney being able to affordably purchase any such dwelling in any location;*
- *only 9% of Melbourne's, and 3% of Sydney's salient households can afford to rent an average three bedroom house in South East Melbourne and Outer Western Sydney (resp.), with no households being able to rent the average three bedroom house in any Melbourne location.*

- *over 50% of salient households from each capital city can afford to rent an average one bedroom unit in the outer locations (North Adelaide, South Eastern Melbourne and Outer Western Sydney);*
- *a very small proportion of households are able to afford to rent an average one bedroom unit in inner Melbourne or Sydney locations (5%, Inner Melbourne only); and 38% of households can afford the rent of a one bedroom unit in Eastern Adelaide* (Berry and Hall, 2001, p. 11).

Moreover, housing stress increased substantially for low-income tenants over the 1986-96 period:

- Adelaide: up from 63.4% to 76.1%
- Melbourne: up from 60.5% to 74%
- Sydney: up from 67.3% to 80.7%
- Brisbane: up from 63.7% to 64.3%
- Hobart: up from 57.7% to 62.4%

The numbers of low-income tenants in housing stress increased over the period by 7,400 (Adelaide), 22,600 (Melbourne) and 28,600 (Sydney). The total increase for the seven capital cities was 90,000, so that by 1996, 227,480 low-income households were experiencing housing stress, as defined above.

> Some higher income households will choose to commit a higher proportion of their incomes to housing and be able to afford it. However, other higher income tenants may be struggling and reasonably said to be suffering housing stress. This suggests that housing affordability problems may be climbing the income ladder, affecting not only unemployed and under-employed people but those who have been described as the 'working poor' and, even middle income households (Berry and Hall, 2001, pp. 65-6).

If the rate of growth of stressed households experienced in the last 10 years continues, then the number of households experiencing stress in metropolitan Australia will double in 15 years and reach nearly one million within 20 years. This does not include households struggling in regional Australia (Berry and Hall, 2001, pp. 12-13).

2.2 Goals of Housing Assistance Policy

One of the implicit goals of both Commonwealth and State Housing Authorities is to maximise the number of new households in need that are provided with secure, appropriate and affordable housing.

Methods For Maximising Households Assisted

There are three ways in which the number of new households being assisted can be expanded:

(a) by increasing the amount of funds available to provide long term housing assistance; or

(b) by reducing the long term real subsidy cost per household assisted such that a greater number of households can be helped with the same amount of funds;

(c) By a combination of the preceding two ways.

In the context where the total real allocation of new funds for housing assistance is declining efficiency issues assume major importance (See Figure 1, p. 23). In this context, and given satisfaction of vertical and horizontal equity issues, the lower the long term subsidy cost per household or per household year, the greater the number of households who can be assisted.

2.3 Housing Assistance Options

In order to comprehensively assess the efficiency of total government assistance to housing a number of steps must be followed. These steps are:

- first, the range of current and potential assistance options needs to be identified;
- second, the options need to be assessed, one compared to another, at a point in time;

- third, the options need to be subject to sensitivity tests of the range of variables that might affect subsidy costs;
- fourth, the options need to be subject to the same analysis over long periods of time using 'real' (actual historical) data on the variables; and
- fifth, combinations of assistance options need to be compared with different single options under real data conditions.

Only with this form of assessment can policy decisions be made with any confidence about the most efficient or cost effective housing assistance delivery options or mix of options and the best governmental and organisational context for delivery.

Demand side assistance is targeted directly at the low-income housing consumer and takes the form of either the provision of a cash payment or a 'voucher' (to buy housing services) in the hands of the housing consumer. Proponents of this form of assistance argue that, given markets are efficient, then the provision of allowances will bring about an increase in the supply of low cost housing at the most competitive price (subsidy). They also argue that this form of assistance permits closer and tighter targeting and removes the inequities associated with the differential levels of assistance available to public tenants viz a viz private tenants.

Supply side assistance is targeted initially at increasing the stock of dwellings available for either assisted purchase or rental. Funds are made available for capital acquisition and construction (public rental housing), subsidisation of the return on dwellings owned in the private sector but managed in the public sector (public rental housing, community housing programs), subsidisation of the mortgage repayment, deposit costs or risks (Government home loan schemes) and in the case of shared equity, subsidisation of the rent or mortgage repayment (or both). Equitable targeting is achieved by the development of income related eligibility criteria and in some, but not all programs, regular income reviews.

Proponents of supply side programs argue that demand side assistance is inefficient and that the number of households supported will never be able to be maintained or increased (because of rising real rents). They also argue that demand side assistance cannot provide the same quality of housing support, because the standard of housing provided cannot be effectively guaranteed and security of tenure assured.

In some European and Scandinavian countries a mixture of demand and supply side assistance is delivered, complemented by the extensive use of special tax concessions for low cost-low-income targeted housing (Hall, Berry and Carter, 2001, pp. 29-38).

In Australia some minor tax concessions are available by way of stamp duty relief for the purchase of homes by certain classes of purchasers. However, the use of tax concessions is mainly limited to the State Government sphere of operations, with the major exception being Federal exemption of owner occupied housing from the capital gains tax. The Commonwealth has also refrained (from the 1920s on) from taxing the imputed rental income of home-owners.

To summarise, notwithstanding special financing arrangements, the mains forms of assistance comprise the following (or variations thereof):

- direct assistance to private and public renters via untied (cash, rent assistance) or tied payments (vouchers)
- on budget grant funded public housing (and within public housing, community, pensioner, and aboriginal housing, including subsidised but publicly or community non profit managed housing)
- off-budget (debt or equity funded) public housing (and within public housing, community, pensioner, and aboriginal housing, including subsidised but publicly or community non profit managed housing)
- directly and indirectly subsidised home loans (including mortgage assistance); whether in part (shared equity) or as a whole

2.4 Housing Policy and the Relevance of Risk

There are many variables that can influence the real subsidy cost per household of different housing assistance options. In some cases (as noted earlier), changes to a particular variable may have an opposing affect on different assistance options; increasing subsidy costs for one whilst decreasing it for another. As an example, Table 1 below sets out a before and after subsidy comparison should private rental yields increase from say 5.4% to 6.15%, whilst renters pay the lesser of 25% of income, or private market rents (as in the current public housing system in most States). The higher rental yield effectively *increases* the required rent assistance subsidy (by $980) and *reduces* the required capital subsidy for public housing (by $500).

Table 1:
Assistance Options and The Opposing Effect Of Changes To Private Rental Yields

Commencing Case: Private Rental Yields 5.4%	**% And Payment Amount (annual)**
Maximum Percentage Of Income In Payments	25%
Initial Private Rental Yield	5.4%
Public Housing Cost Of Funds	5.75%
Public Housing Administration Costs (% Of Dwelling Value)	0.88%
Rates And Maintenance (% Of Dwelling Value)	1.52%
CASE 1 OUTCOMES	
Initial Tenant Income (annual)	$30,000
Initial Dwelling Value	$130,000
Cost Of Funds (Public Housing)	$7,475
Administration Costs	$1,144
Rates And Maintenance	$2,041
TOTAL PUBLIC HOUSING COSTS	$10,660
Market Rents	$7,020
Maximum Rents At 25% Of Income	$7,500
Therefore: ***Rent Assistance Subsidy*** ***Public Housing Subsidy***	 ***$0*** ***$3,160***
CASE 2: Private Rental Yields Increase to 6.15% (all other assumptions remain the same)	
Private Rental Yields	6.15%
Market Rents	$8,000
CASE 2 OUTCOMES AND COMPARISON WITH CASE 1	
Rent Assistance Subsidy ***Increase On Case 1***	***$500*** ***+$500***
Public Housing Subsidy ***Decrease On Case 1***	***$2,660*** ***-$500***

Alternatively, in the cases compared in Table 1, the affordability benefit of one form of assistance (rent assistance) will not be equal to that provided by the other (public housing) for a given level of subsidy. The financial cost of each and every assistance option is therefore subject to certain risks, and hence risk is central to the issue of subsidy efficiency and assistance output.

What do we mean when we talk about risk? In this analysis (as noted in chapter 2) risk is the possibility that an expected outcome is not achieved or is replaced by another, or that an unforeseen event occurs. This view of risk (as noted in chapter 2), includes both uncertainty and the consequences of limited knowledge, information or experience.

In this context risk analysis is the process of identifying risks, estimating their likelihoods, and evaluating potential consequences.

It can be argued that this sort of definition of risk, whilst helpful in examining affordability issues does not reflect the cumulative and iterative nature of housing risk.

For example, a single increase in private rental yields may be able to be afforded by lower to

moderate income tenants for a few months, but the subsequent continuous erosion of discretionary income may create financial pressures in other areas which then force a change (or loss) of residence. Similarly, one increase in mortgage interest rates might be able to be afforded but the margin of financial 'comfort' may be considerably reduced. A subsequent further increase in rates and therefore payments may force a dwelling sale and a 'trading down' of the housing consumption of the household.

It can also be pointed out that the trend in housing policy is a marked shift from government to individual provision for risk. Three examples are:

- in the case of public housing, secure tenure is assured by government policy whereas private market rent assistance carries no such guarantee. The major shift from supply subsidies to demand side assistance in the real amount of housing assistance funds available has hastened this shift in risk to individuals;
- similarly, should private rents increase, the quality of housing available at the deemed price is not affected. By contrast, the rent assistance recipient may need to reduce quality to maintain the same payment outcome; and
- finally, historically, many home purchase programs contained provisions to protect borrowers in the event of unintended income loss by maintaining payments at a set proportion of income. In Britain, for example, this type of support has been replaced by less generous and more restrictive mortgage payment insurance, the cost of which is borne by the individual borrower

Perri 6 (1998, p347-376) emphasises the importance of the recognition of risk in housing policy and argues that there are a range of general risks that, whilst not primarily housing risks, impact significantly on housing risks. They also argue that a large part of housing policy is implicitly about the reduction or elimination of certain kinds of risk. This work is discussed in more detail below.

These arguments deal with issues that apply to the recipients of the assistance. This project, in contrast, is primarily about the impact of risks on housing assistance efficiency, and hence on government assistance providers. The primary question therefore is (Hall, Berry and Carter, 2001, p41):

Is There an Optimal Cost Effective Assistance Option?

A simple way to test this question is to construct a basic model of the four main assistance options and compare the subsidy cost to government under different economic conditions. The following summary is drawn from Hall, Berry and Carter (2001, pp. 38-42).

Attachment 3 contains a copy of the Modeling assumptions as set out in Hall, Berry and Carter (2001, p. 40).

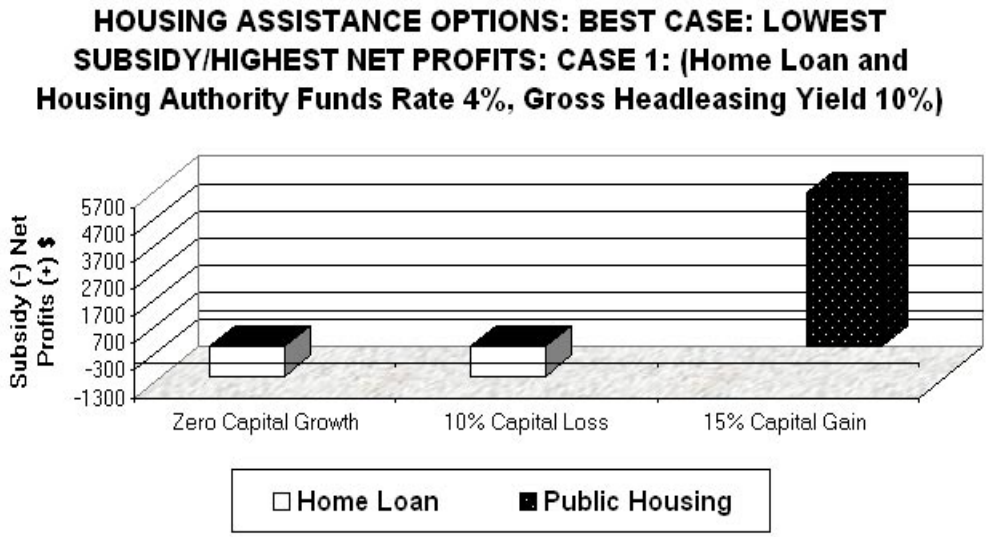
All of these cases are externally consistent, one with each other, with the only difference being that in the mortgage and direct assistance/headleasing options the impact of transaction costs and maintenance and rates does not affect the subsidy calculation because they are to the account of the borrower. Conversely, the benefit or cost of capital growth/loss is to the account of the client (home loan) or the lessor (headleasing).

Twelve possible variations to economic variables were tested: These involved two cases and three capital growth options. The cases are:

- Case 1: 4% mortgage and housing authority cost of funds, 10% gross rental yields, capital growth rates of –10%, 0%, and +15%p.a.;
- Case 2: in reverse, 10% mortgage and housing authority cost of funds, 4% gross rental yields, with the same capital growth outcomes, -10%, 0%, and +15%p.a.

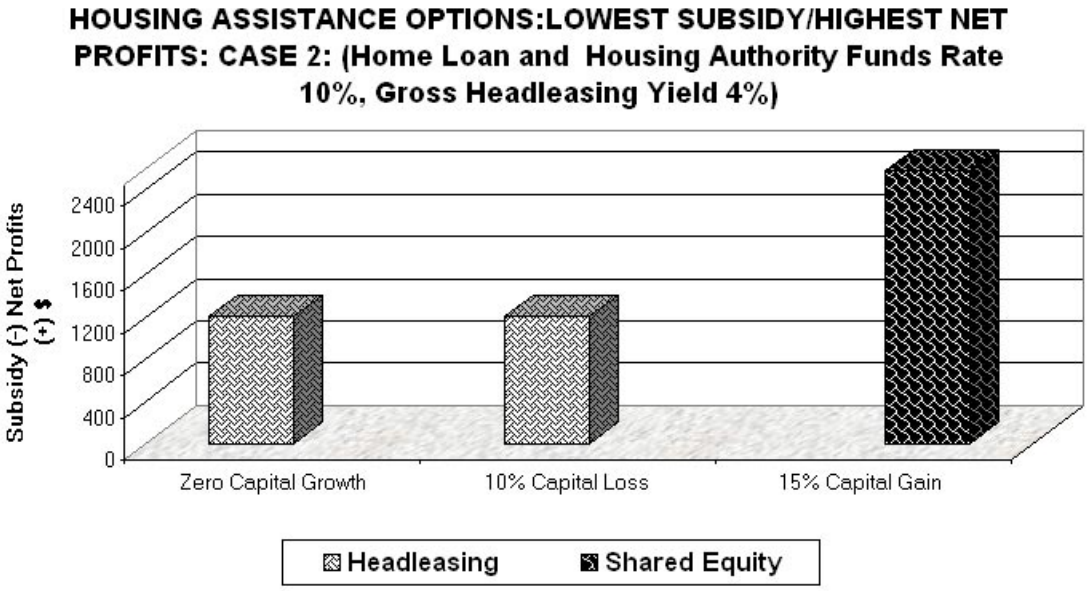
Graphs 1 and 2 set out the result of such analysis.

GRAPH 1



Source: Berry M, & Hall J, 2001, *Policy Options For Stimulating Private Sector Involvement in Affordable Housing Across Australia: Stage 2:* for the Affordable Housing National Research Consortium, DUAP Sydney pg 41.

GRAPH 2



Source: Berry M, & Hall J, 2001, *Policy Options For Stimulating Private Sector Involvement in Affordable Housing Across Australia: Stage 2:* for the Affordable Housing National Research Consortium, DUAP Sydney pg 41.

The graphs present the 'best case' option from the twelve scenarios drawn for each case. In case 1, if the capital growth of the dwelling is zero or negative, the cheapest subsidy option for government (both levels taken as a whole) is to provide mortgage loans. If, on the other hand, substantial capital growth occurs (15% in this example) then the best option from a strictly fiscal viewpoint is capital (e.g. public housing) provision, which in this case produces a negative subsidy or profit to government. This 'profit', of course, accrues in the form an appreciating asset portfolio.

In other words, if dwelling values are increasing at even moderate rates, social housing not only delivers the most cost–effective outcome but it also may actually deliver a surplus when the value of the equity is taken into account; in the case above this option delivers a $5,600 surplus.

This assumes that the social housing stock is managed in an efficient and effective manner.

In case 2, on the other hand, direct assistance minimises subsidy costs in the negative or zero capital growth situations, while shared equity generates maximum profits in the high capital growth case.

In the former situation, direct assistance and headleasing actually delivers a $1,200 surplus per client because the payment being generated is 1% more than the assumed market yield of 4%. In the latter situation, shared equity is the most efficient option generating net surpluses for the housing authority of $2,581 per annum per dwelling.

As Hall, Berry and Carter (2001) demonstrate, there is no "first/best" cost effective delivery mechanism for all economic circumstances. Any one of the four methods of delivery could be the most cost effective option depending on the state of the economy and, especially, of housing and financial markets.

The basic principle that therefore applies to the assessment of delivery mechanisms for housing assistance is: if appropriateness and tenure considerations are equal there is no "best" cost delivery outcome *for government as a whole* in all circumstances.

Of course, the support costs vary in their impact *between* the two levels of government across the four delivery mechanisms in the wake of the changes in the economy that give rise to risk.

2.5 Assistance Options and Systematic Risks

Whether or not certain risks crystallise over the life of any housing assistance program is central to assistance efficiency. If these risks have different impacts depending on the assistance option, what then are the key risks faced by government? (This section summarises Hall, Berry and Carter, 2001, pp. 29-38).

There are four main types of risk which affect housing assistance options. These are:

systematic risks including:

- *general economic risks*, which includes such variables as inflation, capital growth or contraction rates, rental yield, unemployment and income growth or contraction, changes in nominal and real interest rates, and construction cost escalation rates; and
- *natural disasters**,*** such as landslip, earthquake, fire, flood, lightning, wind and weather.

unsystematic risks including:

- *structural and financial risks,* including funding sources, ownership, and residual risks to the Authority where there is private sector involvement; contractual risks, and procurement planning; and
- *agency or issue specific risk,* including political, project management, project delivery (contract selection, tendering, negligence etc.), human error, organisational (including industrial relations, resources shortage, management, work practices etc.) and systems (including communications failure, hardware and software failure, etc.)

Each of the four delivery mechanisms is analysed below with respect to these risk categories.

(A) Capital Funding Risks

When any social housing provider makes a direct investment in housing for on-renting to low to moderate income earners it assumes a number of systematic risks. In Australia these risks are borne directly by the State governments (state housing authorities – SHAs) as the primary owner of social housing assets.

However, the Commonwealth is indirectly impacted through the funding demands of the States in the context of the Commonwealth State Housing Agreement (CSHA). Some of the risk can also be transferred to other social housing providers, as in the case of the small Community Housing Program in the first half of the 1990s.

These risks are:

Dwelling Price or Asset Risk

Any dwelling purchased by social housing providers may gain or lose value according to market price movements. Consequently, it is possible that at different times the asset base of SHAs and other providers may actually fall.

Rental Yield Risk

Many SHAs “mark to market”, that is, unrebated rents are set at the prevailing private rental market yields. For SHAs with any significant proportion of unrebated tenants, there is a risk that the unrebated rental income may either fall, or not increase, affecting the rent income received.

Rental Payment Risk

There are three payment risks associated with social rental housing and these are:

Unemployment and/or Income Loss Risk

Research on low to moderate income earners has indicated that their income is highly volatile and in times of recession a significant proportion of this group may suffer substantial income loss. For a very high proportion of public housing tenants, pensions and benefits are the primary source of income and this risk may not be very high. However, for employed tenants in public or community housing there is a risk of income loss and the consequent reduction in rent received as a result of downward adjustments in rent paid.

Unemployment and/or Default Risk

The second payment risk is the risk that tenants may completely default, and rental income is lost.

Vacancy Risk

Finally, higher than anticipated vacancies may result in loss of rental income received, although this risk is not very high in public housing due to the large waiting lists. However, even here, difficult-to-let dwellings (such as some high rise estates) may experience above average tenant turnover and vacancy rates.

Interest Rate Risk

If debt financing is used, whether directly by SHAs or on-passed as grants from central borrowing authorities, interest rate risk is present. If rates rise the cost of subsidies increases or (where the rate of capital growth outweighs the subsidy cost) the rate of return will be reduced.

Cost Escalation Risk

Finally, social housing providers face the risk that maintenance and other costs may escalate at a faster rate than anticipated with consequent higher expenditures.

Agency or issue specific risks will be the same whichever housing assistance option is utilised and are:

- political;
- project planning;
- project management;
- project delivery (contract selection, tendering, negligence etc.);
- human error;
- organisational (including industrial relations, resources shortage, management, work practices etc.); and
- systems, (including communications failure, hardware and software failure, etc.).

Because structural or organisational risks have the same impact for all assistance options the remainder of the analysis is concerned only with systematic risks.

(B) Home Purchase Programs

When providing home purchase finance under Home Purchase Programs governments face a number of similar systematic risks but crystallisation results in somewhat different consequences. To date, these schemes have been implemented by the States but funded by the States and Commonwealth through the CSHA and by accessing the loan market.

Dwelling Price or Asset Risk and Defaults

In the case of these programs, SHAs normally underwrite the risk of mortgage default even when the programs are privately financed. Mortgage defaults will only result in a loss where the outstanding balances plus termination costs are greater than the dwelling value at the time of sale. Consequently, if dwelling prices fall significantly the SHA is exposed to a potential loss.

Mortgage Repayment

The repayment risks associated with home purchase programs are similar to those applying to public and community housing but because home loan portfolios usually consist of wage earners, income is not indexed to the CPI (as in the case of pensioners and beneficiaries) or protected from a reduction.

For the employed assisted home-owner there is a risk of income loss or decline with a consequent inability to meet the mortgage repayment. This will either mean a default or provision of additional subsidy support to bridge the gap between affordable repayments and the mortgage repayment requirement.

Interest Rate

Where Variable or CPI Indexed debt is used to fund the mortgages, SHAs face a further risk that interest rate or inflationary increases will result in unaffordable payments for borrowers with increased subsidy or default the result.

(C) Shared Equity

Systematic risks will be the same as those for both capital provision and home purchase programs but depending on the relationships between the variables, the risks if crystallised, may have a lesser impact. To date, shared equity schemes have been seen to be the responsibility of State governments.

Dwelling Price or Asset Risk and Defaults

Mortgage defaults will only result in a loss where the outstanding balances plus termination costs are greater than the value of the clients equity share, at the time of sale. Consequently, if dwelling prices fall significantly, the SHA is exposed to a potential loss.

Mortgage Repayment

For the employed assisted shared equity home-owner there is a risk of income loss or decline with a consequent inability to meet the mortgage repayment component, thereby raising the possible alternative outcomes of default and extra subsidy liability.

Rental Payment

Usually the rental repayment component of shared equity programs commences as a certain percentage of the investor's share and is indexed to CPI. Again, if incomes do not grow as fast as CPI, additional subsidy will be required to continue to meet the affordability benchmark.

Alternatively, if market rents increase faster than CPI and incomes also increase at the same rate, the housing provider will be foregoing the difference between the CPI indexed rent and the market rent.

Interest Rate

Where variable or CPI Indexed debt is used to fund the mortgages, SHAs face a further risk that interest rate or inflationary increases will result in unaffordable payments for borrowers with increased subsidy or default the result.

(D) Direct Assistance: Rent Assistance or Housing Allowances

Direct assistance in the form of Commonwealth Rent Assistance has, to date, been a primary Commonwealth responsibility. This form of assistance has grown substantially since the late 1980s, in total, and now exceeds supply side capital subsidies delivered through the CSHA. In the case of housing allowances, whilst the provider faces no dwelling price, asset or construction risk, the other systematic risks will have a much greater impact than in the case of capital provision through public or community housing.

Rental Yield, Real Rent Risk

Unlike the case of capital provision, where only a portion of the portfolio is subject to rental yield risk, in the case of direct assistance the amount of assistance required to support any given number of households will directly increase or fall according to changes in real rents or rental yields. If real rents increase faster than inflation, then for the majority of households on pensions and benefits, the 'gap' between an affordable (i.e. income related) rent payment and the market rent will increase necessitating a major increase in the amount of assistance provided, or a reduction in the quality of housing which can be rented. This gap will also grow for low-income tenants employed in occupations where incomes are not rising as fast as inflation – the so called 'working poor'. This risk is borne by the Commonwealth and is considerable, as experience in a number of European countries attests.

Rental Payment

The payment risks associated with capital provision also apply to direct assistance.

Unemployment and/or Income Loss Risk

For employed tenants there is a risk of income loss or decline and the consequent reduction in rent received as a result of downward adjustments in rent required.

Unemployment and/or Default Risk

The second payment risk is the risk that tenants may completely default, and rental income is lost. In the case of direct assistance, it is unlikely that any private investor would provide housing for assisted tenants unless the default risk is assumed by Federal or State Housing Authorities.

(E) Risk Conclusions

It can be seen that under each of the various options currently available (with the exception of housing allowances) governments face very similar systematic risks, with the main differences being related to the method of financing. In the current institutional environment the main risks associated with capital provision, home loans and shared equity reside with State government, while the risks of direct assistance programs are borne by the Commonwealth.

Table 2 sets out a summary of the major risks associated with the various housing assistance options and classifies these risks according to the likely severity of the impact on government subsidy costs.

Table 2: Summary of Major Risks to Government

Risk	Capital Provision	Subsidised Home Loans	Shared Equity	Direct Assistance (RA or Vouchers)
Systematic Risks				
Dwelling Price/Asset	Yes (High)	Yes (Moderate)	Yes (Low)	No
Rental Yield- 'Real Rents'	Yes (Low)	No	Yes (Low)	Yes (High)
Unemploy'mt Income Loss	Yes (Low)	Yes (High)	Yes (Moderate)	Yes (Moderate)
Unemploy'mt Default	Yes (Low)	Yes (High)	Yes (Moderate)	Yes (Moderate)
Interest Rate\Inflation	Yes (Moderate)	Yes (High)	Yes (Moderate)	Yes (Moderate)
Constr. Cost Escalation	Yes (High)	No	No	No
Structural and/or Financing Risks				
Prepayment\ Reinvestment	Possibly	Possibly	Possibly	No
Earnings	Possibly	Possibly	Possibly	No
Vacancy	Yes (Low)	No	No	No
Agency or Issue Specific Risks				
Political	Yes	Yes	Yes	Yes
Project Management	Yes	Yes	Yes	Yes
Project Delivery	Yes	Yes	Yes	Yes
Human Error	Yes	Yes	Yes	Yes
Organisational	Yes	Yes	Yes	Yes
Systems	Yes	Yes	Yes	Yes

Source: BERRY M, & HALL J, 2001, *Policy Options For Stimulating Private Sector Involvement in Affordable Housing Across Australia: Stage 2:* for the Affordable Housing National Research Consortium, DUAP Sydney.

To restate, ***the main systematic risks*** associated with housing assistance options are:

- ***dwelling price growth* or contraction;**
- ***rental yield*** - 'real rents';
- ***income growth/loss, vacancy rates and defaults*** and therefore reduced payments;
- ***inflation;***
- ***interest rates; and***
- ***cost escalation.***

Table 3 sets out the impact on subsidy costs to government of variations in the main risks.

Table 3:
Impact on Subsidy Costs of a Rise or Fall in Each of the Systematic Risks

Risk	Capital Provision	Subsidised Home Loans	Shared Equity	Direct Assistance (RA or Vouchers)
Rising				
Dwelling Price/Asset	Reduce	Reduce	Reduce	No Impact
Rental Yield- 'Real Rents'	Reduce	No Impact	Reduce	Increase
Unemploy'mt Income Loss	Increase	Increase	Increase	Increase
Unemploy'mt Default	Increase	Increase	Increase	Increase
Interest Rate\Inflation	Increase	Increase	Increase	Increase
Constr. Cost Escalation	Increase	No Impact	No Impact	No Impact
Falling				
Dwelling Price/Asset	Increase	Increase	Increase	No Impact
Rental Yield- 'Real Rents'	Increase	No Impact	Increase	Reduce
Unemploy'mt Income Loss	Increase	Increase	Increase	Reduce
Unemploy'mt Default	Increase	Increase	Increase	Reduce
Interest Rate\Inflation	Reduce	Reduce	Reduce	Reduce
Constr. Cost Escalation	Reduce	No Impact	No Impact	No Impact

Source: BERRY M, & HALL J, 2001, *Policy Options For Stimulating Private Sector Involvement in Affordable Housing Across Australia: Stage 2:* for the Affordable Housing National Research Consortium, DUAP Sydney.

Assuming that the minimisation of subsidy costs to government as a whole is a major consideration, the guiding rules that might apply to the choice of delivery mechanism are that in times of:

- low to moderate interest rates and moderate to higher levels of gross private rental yields and capital growth; public and community housing options will prove to be most cost-effective;
- as interest rates rise, and capital growth declines shared equity will likely outperform public housing as the most efficient delivery mechanism;
- in periods of low housing interest rates, high gross rental yields and little capital growth subsidies on home loans will come to the fore; and
- when rental yields are low, dwelling prices are stagnant and mortgage rates are high, direct assistance will be most cost effective (Hall, Berry and Carter, 2001, p. 42).

2.6 Investment Theory and its Relevance to Assistance Efficiency

There are two key techniques that are used and examined in modern portfolio theory, Naïve Diversification and Markowitz Diversification.

Portfolio analysis emphasises the 'dominance principle':

> The dominance principle states that:
>
> 1. among all investments with any given expected rate of return, the one with the least risk is the most desirable; or
>
> 2. among all the assets in a given risk class, the one with the highest expected rate of return is the most desirable (Francis,1976, p. 398).

If this is extended to portfolios of investments:

> An efficient portfolio, then, is any asset or combination of assets which has the:
>
> 1. maximum expected return in its risk class or conversely;
>
> 2. the minimum risk at its level of expected return (Francis,1976, p. 398).

The objective of portfolio management is to develop efficient portfolios. The group of all efficient portfolios is called the efficient set of portfolios. The grouping of the efficient set of portfolios is called the *efficient risk frontier.*

Naive Diversification

Long term analysis of the risks associated with investment in firms listed on the New York Stock Market has found that 25% of the variability of return is due to what we have described earlier as *systematic risk*, whilst Naïve diversification asserts that simply by randomly increasing the number of stocks held the unsystematic portion of the total risk will decrease towards zero. Research has found that will this will usually occur until as many as 15 securities are added to the portfolio (Francis,1976, p. 401).

Markowitz Diversification

Markowitz diversification requires a number of assumptions, viz:

> (a) the rate of return is the most important outcome of any investment;
>
> (b) investors visualise the various possible rates of return from any asset in a probabilistic fashion;
>
> (c) investors define risk as variability of return and are willing to base their investment decision on only two things - expected return and risk; and
>
> (d) investors prefer to hold the investment with the maximum rate of return in any given risk class they select, or conversely investors prefer to minimise risk at whatever expected rate of return they seek (Francis,1976, p. 421).

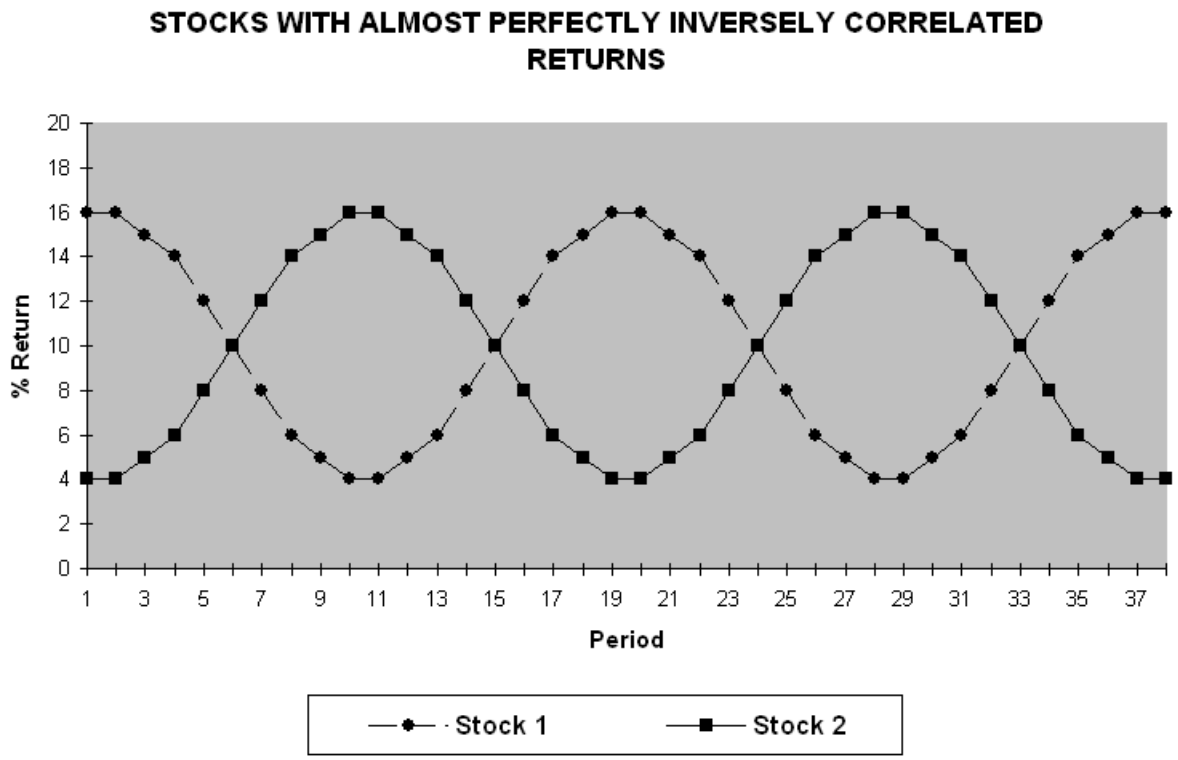
Markowitz Diversification is defined by Francis as combining assets whose returns are less than perfectly correlated in order to reduce portfolio risk without sacrificing portfolio returns (Francis,1976, p. 404).

This is achieved by measuring the covariance of returns of stocks.

Finally, the correlation coefficient squared is the coefficient of determination and gives the percentage variation in the dependent variable which can be explained by concurrent variance in the independent variable.

Graph 3 sets out the returns on two hypothetical stocks which are almost perfectly negatively correlated.

GRAPH 3



The essence of Markowitz diversification is to find securities with low positive correlations or negative covariances (Francis,1976, p. 455).

If we substitute 'housing assistance options' for 'firms' and 'subsidy costs' for 'returns' it may be that this theory has significant relevance to the determination of the most efficient approach to the means of delivering housing assistance.

2.7 A Possible Hypothesis for Housing Assistance Efficiency

The hypothesis is if:

- the future experience of systematic risk will be 'bounded' by the range of past experience;
- unsystematic risk is zero for all housing assistance options;
- there is no difference in the cost or terms of finance available for all housing assistance options;
- funds are borrowed at the 'risk free' rate on fully variable terms with no prepayment penalties or other additional costs and fees at the 'real' 10 year Commonwealth Bond Rate;
- SHA's are responsible for all losses (the difference between the realised dwelling price minus the mortgage balance outstanding plus termination costs) or shortfalls (the difference between an 'affordable payment' defined as a percentage of household income and the required payment) arising from defaults or income loss for all housing assistance options.

then

- a strategy providing for the delivery of housing assistance using a variety of delivery options and dynamically adapted to trends in systematic risks will, in the longer term, be considerably more efficient (i.e. impose significantly lower real subsidy costs) than any strategy which is monocentric, i.e. relying on one principal means of providing the assistance.

This hypothesis is tested in chapter 7, based on the approach developed in chapter 6.

2.8 Assistance Efficiency, Housing Policy Developments and Intergovernmental Arrangements

An efficient housing assistance system may demand the use of a variety of assistance options combined with constant dynamic management. Such a system would require a holistic and rapidly responsive approach to the management of housing policy. This has major implications for the delivery options used by State and Commonwealth Governments and the intergovernmental arrangements which apply to the provision of housing assistance.

Berry and Hall, (2001, pp. 81-83) have documented the major changes which have occurred in housing policy in the 1990s (reproduced below).

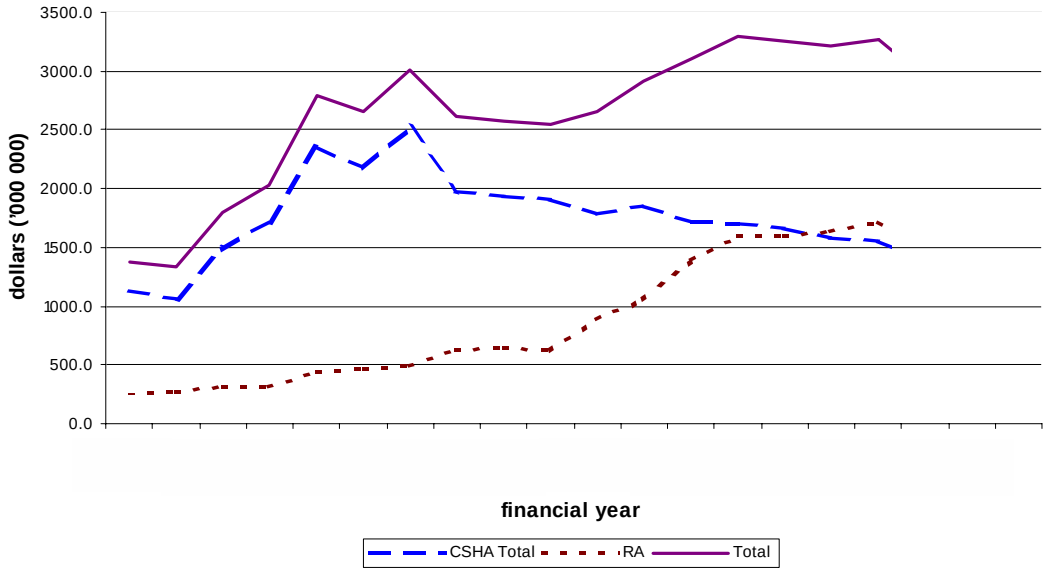
Yates (1997, p. 266) has commented:

> Because of the changes which are taking place, the 1990s can be regarded as representing a watershed in relation to federal housing policies in Australia. In the immediate post-war period through to the 1980s, Australia's housing system was dominated by tenure-based policies which were directed towards home ownership and the provision of public housing with private tenants virtually being excluded from housing assistance of any form…. In the 1990s, however, we have seen, or are about to see, an apparent U-turn in federal housing policies with the elimination of explicit home ownership policies, the withdrawal of the Commonwealth from direct involvement in public housing funding and a rapid expansion of rental assistance for private tenants.

In fact, at the time Yates was writing, the Commonwealth pulled back from the major reforms that would have meant the replacement of capital subsides for public housing in favour of demand-side subsidies in the form of Commonwealth Rent Assistance paid to both public and private tenants. The 1996 Commonwealth State Housing Agreement (CSHA), originally intended as an interim arrangement, was eventually extended to 1999 and was succeeded by the 1999 CSHA due to finish in 2003. A new CSHA is being negotiated at the time of writing (September 2002).

Under the 1999 agreement the Commonwealth undertook to continue to maintain capital grants to the SHAs, with state government matching, albeit at a falling real value. However, the general shift away from supply-side to demand-side subsidies is apparent in the funding contributions of the Commonwealth over the past 10 or 15 years (see Figure 1).

Figure 1 – Commonwealth and State Expenditure on housing assistance over the period 1980-81 to 1999-2000, in constant 2000 dollars



Source: Australian Housing Policy Project, Fact Sheet 3; Housing Assistance Funding Trends, Australian Housing and Urban Research Institute, Melbourne.

The 1996 CSHA enshrined a number of changes from earlier agreements. The 1984 CSHA had clearly specified as a major objective the expansion of the public housing stock managed by the SHAs. A commitment was also made to providing housing assistance to all those in

need as a way of solving existing housing-related poverty. Both the 1984 and 1989 CSHAs limited the extent to which CSHA funds could be directed towards financing owner occupation, in order to give precedence to the aim of building up the public rental stock. The States were encouraged to access private funds to finance their home ownership programs, which most did, with adverse consequences for some in the early 1990s, notably in N.S.W. As a consequence annual additions to the public rental stock ran at about 10,000 to 15,000 nationally during the 1980s.

The 1996 CSHA removed the objective of expanding public housing, and also removed any mention of providing levels of assistance to meet all housing-related needs. There was a desire desire to treat all tenants, public and private, on an equal footing. The 1996 agreement also targeted the homeless and Aboriginal and Torres Strait Islanders as groups with particular and pressing needs for assistance. Owner-occupiers would continue to benefit from taxation relief on capital gains and imputed rent.

This agreement freed up the earlier constraints on SHAs moving CSHA funds out of their public rental accounts to finance any Commonwealth allowable activity, including unrestricted funding of rental rebates and stock renovation. As a consequence of this change, allied to the falling real value of annual capital grants, a rising rental rebate bill and ballooning maintenance and upgrade costs, the annual additions to the public stock have fallen to less than 5,000 in the last few years.

This constraint on the public stock has been reinforced by relaxation of the terms on which public housing is sold. The proportion of sales to additions rose from less than 10 per cent in the mid-1980s to around 30 per cent in the mid-1990s[5].

In 1990 a Special Premiers Conference was convened to put housing assistance on the agenda of microeconomic reform, in line with the general program of collaboration between the levels of government that culminated in 1992 with the formation of the Council of Australian Governments (COAG). COAG established the following four principles that should guide future housing assistance policy:

- clearer delineation of Commonwealth and State/Territory roles, with the Commonwealth assuming primary responsibilities for income support and the States and Territories bearing the responsibility for public housing provision and management;
- a national needs assessment that would ensure that the level of assistance would be determined on a consistent basis across all jurisdictions;
- output rather than input targets to be established and monitored. This suggested a regime that would focus on actual results rather than intended outcomes; and
- implementation of a charter of resident rights.

This process was influential in guiding the negotiations responsible for the 1996 CSHA and in subsequent developments. Bilateral agreements specifying output targets and agreed benchmarks for performance have, as noted above, been instituted between the Commonwealth and States/Territories. A number of States have moved towards tighter targeting of available public housing dwellings towards groups deemed to be in greatest need. For example, in 1997 Victoria moved to make eligibility for public housing the same as eligibility for social security benefits and pensions.

Victoria subsequently began raising rents for existing public tenants from 20 per cent to 23 per cent of assessed income and 25 per cent for new public tenants.

Over the past few years the SHAs have sought to rationalise and consolidate their activities in both public renting and support for home ownership, generally in the context of a slowly declining level of activities, in line with the falling real value of Commonwealth and State resource commitments to this policy field and some uncertainty as to the longer term future of the CSHA. Conversely, the Commonwealth's fiscal commitment to Commonwealth Rent Assistance has continued to grow in total dollar terms, as Figure 1 shows. A number of SHAs

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[5] The 1996 agreement also moved some way to identifying and separating Commonwealth roles and responsibilities in housing provision, introducing transparent monitoring and reporting relationships. Greater flexibility was also sought through introducing bilateral agreements between the Commonwealth and individual States and Territories.

are also having to battle with fiscal and management problems posed by a rapidly obsolescing public stock and therefore to show interest in possible approaches to area regeneration, particularly in relation to their large estates.

In 2002 additional supply responses to assistance needs has fallen to very low levels whilst the Commonwealth is almost exclusively focused on delivering a demand response via cash payments through the Commonwealth Rent Assistance Program. State Housing Authorities are basically in the business of managing their existing public dwelling stock and attempting a very small number of additions a year.

We now have a housing policy that splits the main method of delivery of housing assistance between the two levels of governments and may, (if the hypothesis tested in this study proves to be correct) be an inefficient assistance policy. The proposed analysis therefore reaches to very heart of housing policy and intergovernmental arrangements.

In this context, it should be noted, a 'Joint Communique of Australian Housing Ministers', released on 19 April 2002, concluded that:

"Ministers expressed commitment to the development of positive options for a new CSHA that will:

- create a modern, sustainable housing system;
- support community development and the renewal of public housing estates;
- support wider government outcomes in health, education and labour market reforms; and
- stimulate private sector investment in the supply of low cost housing.

Ministers agreed that a national approach to these challenges is vital."

One of the key issues which this research also addresses is the extent to which private sector investment in 'supply side' options may be more or less efficient than other assistance options.

CHAPTER 3 THE NATURE OF RISK

An extensive and comprehensive literature review was conducted of all relevant international journals, academic publications, appropriate overseas research schools, State Government departmental sources and Australian university libraries. This search failed to identify any previous work dealing specifically with housing assistance options and systematic risks. It did, however, reveal related and tangential literature on:

- public policy and the nature of risk; and
- housing careers and risk.

Whilst the material outlined below has not directly changed any aspect of the approach in this research, it proved to be contextually useful.

3.1 Characteristics Of Risk

In *Risk Society,* Beck (1992) discusses the multi-faceted nature of risk, raising issues around social change during modernity under two main themes: that of reflexive modernisation; and that of the developing salience of risk.

Croft (2001, p. 7), maintained that:

> While the notion of risk can be particularly helpful when considering factors connected with the affordability and sustainability of housing, issues around the conceptualisation of risk first need to be overcome. Existing fixed definitions of risk tend to be focused either narrowly on the identification of specific events or consequences, or widely on paradigmatic issues. Either way, they have difficulty in reflecting the cumulative and iterative nature of housing risk.

Ewald (1991, p. 199), looking at risk and insurance, suggests that there are different perceptions of what constitutes 'risk', which are dependent upon why the question is being mooted.

Perri 6, (1998, p. 347) maintains that concepts of risk help us to understand how housing *politics* frames debates about housing *policy*, and therefore help housing policy advocates design their strategies.

Risks and Public Policy

Perri 6 (1998, p. 358) suggests that:

> broadly, public policy, understood as strategies of risk management, can seek to anticipate risks, and act preventively on the causes to reduce the magnitude or frequency of those risks, or act curatively, accept the risks of harm, but seek to reduce the damaging effects or to spread losses between individuals or over time across an individual's life through the use of legal rights, insurance and other institutional mechanisms.

This discussion on risk has helped to refine the nature of the risks being assessed in this project. Essentially, the risks analysis being conducted in this project is exclusively quantitative in nature and focused on agency rather than societal or individual consequences. It does however take account of the iterative and cumulative nature of housing risk as the analysis is conducted over long periods and includes provision for the impact of uncertainties associated with income, dwelling price and interest rate change. Consequently, the conclusions of this project must be seen within these constraints. Public policy will also have to deal with (or at least, recognize) the broader dimensions of risk excluded from this study when framing and implementing measures designed to – for example – ameliorate housing stress.

3.2 Housing Risk

Croft discusses the concept of 'housing careers' and refers to the notion that housing careers are prone to being undermined by risk, arguing that there has been a marked shift from government to individual provision of support for risk.

Croft (2001, p. 746) argues that homeowners are now subjected to increased risk:

> ….the most striking example of increased risk is that experienced by home owners in the housing market of the late 1980s and early 1990s, as the implications of recession and over-geared lending fed into the property market, causing an unprecedented number of households with housing debt problems (Burrows, 1998; Ford et al., 1995; Forrest & Murie, 1994).

Croft also refers to the issue of affordability crises arising from income risks.

Perri 6 points out that as far as housing policy issues are concerned the interests of the various parties and the risks they assume are not equal:

> In housing policy, for instance, the interests of mortgagors do not necessarily fit with those of their mortgagees, or those of landlords with tenants, especially over financial issues…

Perri 6 reinforces the notion of the importance of the recognition of risk in housing policy:

> Starting with the simple fact that housing policy must be about all sorts of risks, not all of which are primarily housing risks, and that policy action in many other fields impacts enormously on housing risks.

Moreover, Perri 6 (1998, p. 343, p. 363, p. 373) suggests concerns about housing risk are being reflected in changing housing policy management styles.

> There are signs, too, of a wider interest in anticipationist styles of management about housing risks.

The discussion in the literature has two main themes,

- recognition of risk as central issue in housing policy debates; and
- the impact of particular types of housing risk on individual households.

This project, however, uses the framework and methodology of financial markets to inform the typology and assessment of risk consequences. The project looks towards the broader macro-economic context and its potential impact on the subsidy exposure associated with particular methods of delivering housing assistance.

CHAPTER 4 METHODOLOGY

This section of the Report canvasses the following steps in exploring the general hypothesis advanced in section 3.7 and the specific research questions proposed in chapter 1: namely

(a) assessment method;

(b) model development;

(c) assessment process;

(d) details of the preferred probability analysis method using Latin Hypercube simulation;

(e) model cost data; and

(f) risk data trends and content

4.1 Assessment Method

Before proceeding to the development or modification of assessment models there are two major issues which need to be addressed:

- what assessment method is to used in the analysis;
- if financial analysis is to be used how are taxation effects to be dealt with?

Assessment Method

As outlined in chapters 2 and 4, there are three principal options for assessing the subsidy efficiency of housing assistance options:

- cost benefit analysis (CBA)
- cost effectiveness analysis (CEA)
- financial appraisal (FA)

As outlined above, the difficulties of using either CBA or CEA include:

- the difficulty of measuring all of the costs and benefits of a project
- the difficulty of putting monetary values on things like security of tenure and human life
- concerns that Cost-Benefit Analysis may not account for income distribution and equity effects
- concerns that Cost-Benefit Analysis can be readily manipulated to support a particular position (EPAC, 1995, p. 164).

One of the most difficult areas is the measurement and assessment of externalities. “Externalities” is a term used to describe ‘third party’ economic costs/benefits arising from a particular investment, i.e. costs and benefits which extend beyond the users or direct beneficiaries of that investment.

Some of the positive externalities arising from public housing might be:

- when compared to the private rental sector, public housing creates lower housing payments for households obtaining access. This means they will enjoy greater disposable income than previously.

  They will thus be able to spend more on transport to pursue jobs, and on appropriate clothing for interviews, etc, resulting in a greater likelihood of gaining employment and ultimately, higher numbers of low-income households employed;

- again, because of higher disposable income and potentially greater self-esteem, households may be more willing to engage in job training and skill improvement and therefore generate higher productivity in the economy as a whole;

- greater expenditure on non housing related consumer needs due to the greater disposable income arising from the more affordable rents, etc.;

Financial Appraisal concentrates on effects on the agency sponsoring the project. Although there is much common ground between economic and financial appraisal there are a number of significant differences.

The main difference is the perspective: in a financial analysis the project is examined from the narrow perspective of the entity undertaking the project. It does not take account of effects on other enterprises or individuals, including externality effects.

Table 4 below (from Sinden and Thampapillai, 1995), shows the main differences between the two perspectives.

Table 4: A Comparison of the Private and Social Perspectives

Item	Private (Financial Analysis)	Social (Cost-Benefit Analysis)
Overall Goal	Increase net income	Increase economic welfare
Choice Criterion	Net financial returns to the individual entity	Net benefits to society as a whole
Purpose	Indicate economic worth of an alternative to the entity	Indicate economic worth to society as a whole
Benefit Values	Prices received	Willingness to pay (usually exceeds price)
Cost Values	Prices paid	Opportunity Cost (=Real resource costs)
Taxes Paid	Included as a cost	Excluded as they are a transfer payment
Subsidies Received	Included as a benefit	Excluded as they are transfer payment
Discount Rate	Individual rate of time preference	Social rate of time preference (usually much less than the entity rate)
Government Costs	Excluded	Included
Externalities	Ignored	Included
Unpriced Benefits And Costs	Included	Included
Time Horizon	Usually two decades	Usually more than one generation
Interest Payments	Interest payment as cost	Not usually included

For the purposes of this analysis, housing assistance options have been examined from the perspective of a financial appraisal for Government, since this allows the research questions specifying this project to be adequately addressed.

Taxation Issues

Historically some analysts have argued that any consideration of the equity and efficiency of housing assistance options is not complete without a full consideration of the taxation benefits and implications of these options. Whilst this is fully acknowledged there are major practical difficulties in comprehensively assessing taxation impacts and implications.

These difficulties are set out below.

Assessing the Net Impact on The Supply of Available Dwellings.

The tax effects associated with any housing assistance option will crucially depend on whether or not the option results in an increase in the supply of available dwellings. In the case of on budget public housing the impact on supply is measurable and unequivocal. However, in the case of options involving housing allowances, subsidy of privately owned but publicly managed public housing, subsidised home loans and shared equity programs, the net impact on the supply of available dwellings is much more difficult to establish. For reasons of equity and efficiency subsidised privately owned public housing, home ownership and shared equity

programs are not normally tied to new dwellings. However, it is clear that some portion of the recipients will buy or occupy new dwellings, but, because of data inadequacies, it is not possible to accurately predict what portion this will be. In the case of housing allowances there may be a supply response but there are no reliable methods of assessing the dimensions of such a response; more technically, there are no reliable data on the price elasticity of supply of rental housing in Australia.

Where new dwellings are provided there will be direct increments to Commonwealth tax revenue from the following sources:

- income tax, if the financing involves the use of private sector funding, returns to investor on interest paid will accrue additional income tax liabilities at the investor's marginal tax rate; and
- capital gains tax, where the structure involves private rental investment, additional capital gains tax liabilities will accrue.

and to State tax revenue from the following:

- other than mainstream public housing, additional stamp duty on the purchase of the dwelling;
- for rental investment, land tax; and
- for home purchase, mortgage stamp duty.

Conversely, at the State level there will be tax subsidies where concessions apply, for example exemption from stamp duty on purchase for first home buyers.

Taxation Impacts and Investor Categories

In the case of private investment in housing assistance options it is impossible to quantify the likely tax benefit/cost unless the precise investor categories and proportions and financial structure are known. This is because, for example, in the case of a limited partnership, superannuation funds have different marginal tax rates and capital gains tax treatments to life assurance companies which are in turn different to banks which are also different to private individuals.

Assessing the Cost or Benefit of Indirect Tax Effects and Welfare Payments.

Whilst the direct tax impact can easily be identified, a housing assistance option providing new dwellings will have a host of indirect tax effects.

These indirect tax effects are mostly revenue positive, with the most important being:

- ***goods and services tax***: materials used in the construction of new dwellings will be subject to GST, leading to an increase in tax revenue; and
- ***income tax***: not only will there be an increase in revenue accruing from the tax on returns earned by investors but during the construction phase there will be an increase in income tax accruing from the income of builders and associated staff.
- ***reduction in unemployment benefits:*** research conducted by the NSW Department of Housing (Carter, Hall and Milligan, 1988) indicated a significant number of previously unemployed persons are employed in the construction of new housing when the market expands.

  This results in a fall in the level of unemployment benefits which would otherwise be paid by the Commonwealth

These indirect tax effects are extremely difficult to quantify.

Different Nature of the Principal Commonwealth and State Taxes

A study for the National Youth Housing Strategy on financing youth housing (Glazebrook, Hall and Residex, 1995) found that the different nature of the principal Commonwealth and State taxes, means that different funding methods impact on the two levels of Government quite differently, and that certain economic conditions are more advantageous to one level of government than the other.

For example, income tax is a progressive tax, whilst stamp duty and land tax are predominately 'flat' taxes. This means, for example, where interest rates and the cost of funds are rapidly rising, and property prices are static, the income tax revenue available to the Commonwealth arising out of investments in residential rental property investments will also increase rapidly, yet the stamp duty proceeds payable to the State Government will remain unchanged. Conversely, where property prices are increasing, whilst rents and interest rates are falling, the tax revenue to the Commonwealth will fall whilst that to the States will increase.

Consequently, any assessment of the costs and benefits of housing assistance options must at the very least be prefaced by the question, *on behalf of which level of government are the costs and benefits being assessed?*

Finally, it should be noted that the *Financing Youth Housing Study* found that tax revenues provide a considerable hedge against subsidy risks, for example if debt servicing costs rise so too do the receipts from taxes on interest, if property prices increase rapidly so too do the State receipts from land tax and stamp duty.

Possible Changes to Tax Regimes

When conducting modeling of the likely range of outcomes for assessing the subsidy costs of different housing assistance options, analysts would normally conduct a 'bounded' analysis of the possible range of economic scenarios that might be tested. 'Bounded' analysis says that the future will not be any worse or better that the events of the past (say 20, 30 or 100 years) and that the analysis will test the 'worst' and 'best' cases having reference to the worst and best past experience. Whilst this may be an appropriate method for developing economic scenarios it cannot be applied to taxation regimes, in that taxation changes are subject to 'political risks' and it is impossible to bound the analysis in this way.

For all these reasons, the subsequent analysis ignores the detailed indirect taxation impacts of housing assistance options.

4.2 Model Development

The housing subsidy model developed for the Affordable Housing National Research Consortium has been modified into four models which can calculate real net subsidy costs for each of the four main housing assistance options.

The current Model also calculates the direct tax effects.

4.3 Assessment Process

The assessment method and model structure canvass two of the three main elements of the methodology. One final major element remains to be detailed, the quantitative technique to be used in the assessment process.

Table 5 sets out the main quantitative risk analysis techniques that can apply to the assessment of housing assistance options. The second set of techniques pertain to the actual operation and monitoring of a particular capital project.

Table 5: Quantitative Techniques

Housing Assistance Options Techniques	Applications
Sensitivity Analysis	Very wide application, from economic appraisal and financial feasibility to operations and maintenance models
Scenario Analysis	Economic appraisals and feasibility studies
Probability Assessment	Quantification of risk probabilities and consequence distributions

Sensitivity Analysis

Sensitivity Analysis does not formally attempt to quantify risk. Rather, it focuses on determining how sensitive the output (NPV or IRR) is to changes in any of the input variables.

The main input variables for housing assistance options and the options to which they apply are set out in Table 6.

The normal method of sensitivity analysis is to hold every variable except one constant and (in turn) vary each particular input variable by a common factor, say 1% and document the effect on output. In this way the analysis helps to identify which variables the project is most sensitive to.

Scenario Analysis

Scenario analysis take sensitivity analysis further by ***setting up a set of assumptions about all the input variables which is effectively a view about the assumed future conditions under which the option will be operating.***

From sensitivity analysis we know the variables which will most favourably (and adversely) affect the option outcomes. The normal process is to construct three scenarios, although a greater number is also common. These are usually called *'base case', 'best case'* and *'worst case'.*

The 'base case' usually most closely approximates current conditions and reflects the analyst's view of the 'most likely' future.

The 'best case' most closely approximates the changes to those variables required to produce the analyst's view of the practicable most favourable outcome.

The 'worst case' most closely approximates the changes to those variables required to produce the analyst's view of the practicable worst outcome.

Sensitivity and Scenario Analysis can be combined to obtain a more complex and sensitive understanding of the impact of different risks and potential futures on housing assistance costs.

Sensitivity testing and scenario testing have a marked weakness in that the range of situations examined might not approximate the combination of variable risk outcomes that may have happened in the past – and could happen in the future. The choice of the values for the variables to be used in each of the 'best', 'base' and 'worst' cases is arbitrary and may not reflect any real *probability* of what might happen in the future, on the basis of what we know (for certain) has happened in the past.

Table 6: Input Variables and Housing Assistance Options

INPUT VARIABLES	ASSISTANCE OPTIONS
Assistance Period	All
Real Asset Appreciation	Public Housing, Home Loans, Shared Equity
Real Market Rental Yields	Pub. Hous., Hous. Allow., Shared Equity
Real Rent Growth	Pub. Hous., Hous. Allow., Shared Equity
Real Income Growth	All
Real Interest Rates	Pub. Hous., Hous. Allow., Shared Equity
Income Loss Magnitude (i.e. percentage by which original income reduced)	All
Income Loss Duration (i.e. period of income loss)	All
Default Rate	All
Commencing Income	All
Commencing House Value	All
Maximum Payment To Income	All
Establishment And Selling Costs	Pub. Hous., Shared Equity.
Equity to Debt Ratio	Pub. Hous., Shared Equity.
Cyclical Maintenance	Pub. Hous., Shared Equity.
Rates, Taxes And Administration	Pub. Hous., Shared Equity.
Loan Origination, Establishment and Operating Costs (margin %)	Home Loans, Shared Equity
Prepayment Period	Home Loans, Shared Equity
Rent Indexation Principle (CPI or fixed yield to dwelling value)	Pub. Hous., Hous. Allow., Shared Equity
Rent Rate (ie commencing percentage of investor share)	Shared Equity
Proportion of Rates And Maintenance Paid By Tenant, OR reduction in income assumed to enable payment	Shared Equity

4.4 The Preferred Method: Probability Analysis and 'Smoothed' Monte Carlo, (Latin Hyercube) Simulation

Probability Analysis

A more rigorous approach is to apply probability analysis to the historical data (in this case, for each of the three selected states). Probability Analysis is the most complex of the techniques that might be used to assess risks associated with potential housing assistance options. The ***probability*** associated with an event is the chance that it will occur.

Probability analysis makes one overriding assumption and that is that the economic events of the future will not be outside the boundaries of the events of the past.

It has been extensively used in the insurance industry to calculate premium and capital adequacy requirements.

It is possible to review the history of:

- dwelling price appreciation;
- market rental yields;
- rent growth;
- income growth;
- interest rates;
- default rates;
- recurrent cost growth;

and construct specific scenarios for the 'best' outcome, i.e. the probability being 1 in 100 of occurrence, and the worst outcome, the probability also being 1 in 100.

This will enable the savings associated with mixed assistance strategies to be evaluated at a number of selected probability outcomes in each of the states. 'Smoothed' Monte Carlo simulation techniques will be used to randomly generate the systematic risk scenarios.

Monte Carlo Simulation

Monte Carlo simulation is the preferred method of generating probability distributions of exposure and risk in both the insurance industry and in the context of environmental safety analysis. The advantages as discussed by Poulter (1988, p. 9), are set out below.

> Distribution functions for the exposure or risk estimate display the range of exposure or risk and the probability associated with each value of exposure or risk. A point estimate such as a mean does not provide this information. For example, a point estimate of the central tendency of exposure of risk does not indicate the uncertainty of the estimate. It may be important to know both the high end of the range of risk as well as the central tendency, if the goal is to avoid an unacceptable outcome. Similarly, a high-end point estimate may be much higher than the central tendency; the point estimate does not indicate how much higher it is than the median or mean of the exposure or risk. Both kinds of information are useful to risk managers.

Furthermore, in the comparative analysis contemplated in this research project it may be that the systematic risk scenarios generated at the high end of the probability range generate different efficiency results (higher or lower) than those at the mean or lower probability ranges.

> Additional advantages flow from information provided by Monte Carlo simulation. Results are conducive to sensitivity analysis, permitting the risk assessor to determine where additional data will be most useful in reducing uncertainty. The need to select a single value for the input parameters is avoided, which can be a contentious exercise (ibid., p. 9).
>
> Monte Carlo techniques in and of themselves do not dictate any particular degree of protectiveness or conservatism, they provide more information for implementation of such policy choices. The use of Monte Carlo simulation to propagate uncertainty in the values of input variables to the output is also relatively straightforward and may be valuable to the consumer of the information, particularly if such techniques are combined with sensitivity analysis to determine the major and perhaps reducible sources of uncertainty in risk estimates (ibid., p. 14).

The principles and insights to be gained from this form of analysis are clearly articulated by the United States Environmental Protection Agency (USEPA) (1997, pp. 1-2).

- The purpose and scope of the assessment should be clearly articulated in a "problem formulation" section…
- The methods used for the analysis (including all models used, all data upon which the assessment is based, and all assumptions that have a significant impact upon the results) are to be documented and easily located in the report.
- The results of sensitivity analyses are to be presented and discussed in the report.
- The presence or absence of moderate to strong correlations or dependencies between the input variables is to be discussed and accounted for in the analysis.
- Information for each input and output distribution is to be provided in the report.
- "Calculations of exposures and risks using deterministic (e.g. point estimate) methods are to be reported if possible. Providing these values will allow comparisons between the probabilistic analysis and past or screening level risk assessments.

The USEPA further articulates the insights that can be obtained from using this form of analysis (1997, p. 4).

- An appreciation of the overall degree of variability and uncertainty and the confidence that can be placed in the analysis and its findings.
- An understanding of the key sources of variability and key sources of uncertainty and their impacts on the analysis.
- An understanding of the critical assumptions and their importance to the analysis and findings.
- An understanding of the unimportant assumptions and why they are unimportant.

- An understanding of the extent to which plausible alternative assumptions or models could affect any conclusions.
- An understanding of key scientific controversies related to the assessment and a sense of what difference they might make regarding the conclusions.

4.5 Housing Assistance Option Cost Data

In the Stage 4 Report for the Affordable Housing National Research Consortium (Hall, 2002) data was obtained from all States on the housing cost components that will be used in the current analysis. The variables are:

- initial average dwelling price;
- other purchasing expenses, (the cost of legal and procurement costs);
- initial maintenance and rates costs, (the operating cost of public housing minus interest expenses);
- initial administration costs, (is the administration cost of public housing);
- other selling expenses, (is the cost of legals and other disposal costs); and
- tenant vacancy rates.

4.6 Systematic Risk Data and Trends

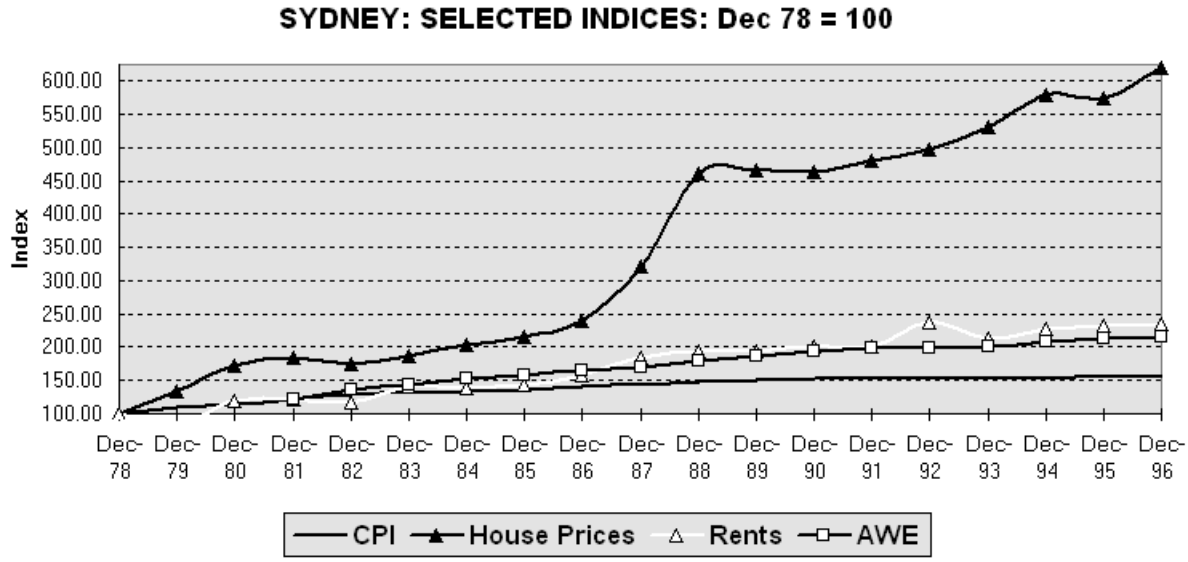
Systematic Risks

To restate the main systematic risks associated with housing assistance options are:

- inflation;
- income growth/loss, vacancy rates and defaults and therefore reduced payments or losses through unemployment and other circumstances;
- interest rates;
- dwelling price growth or contraction;
- rental yields; and
- cost escalation

Graph 4 sets out the indices for the Consumer Price Index (CPI), house prices, house rents and Average Weekly Ordinary Time Earnings for the period December 1978 to December 1996.

GRAPH 4



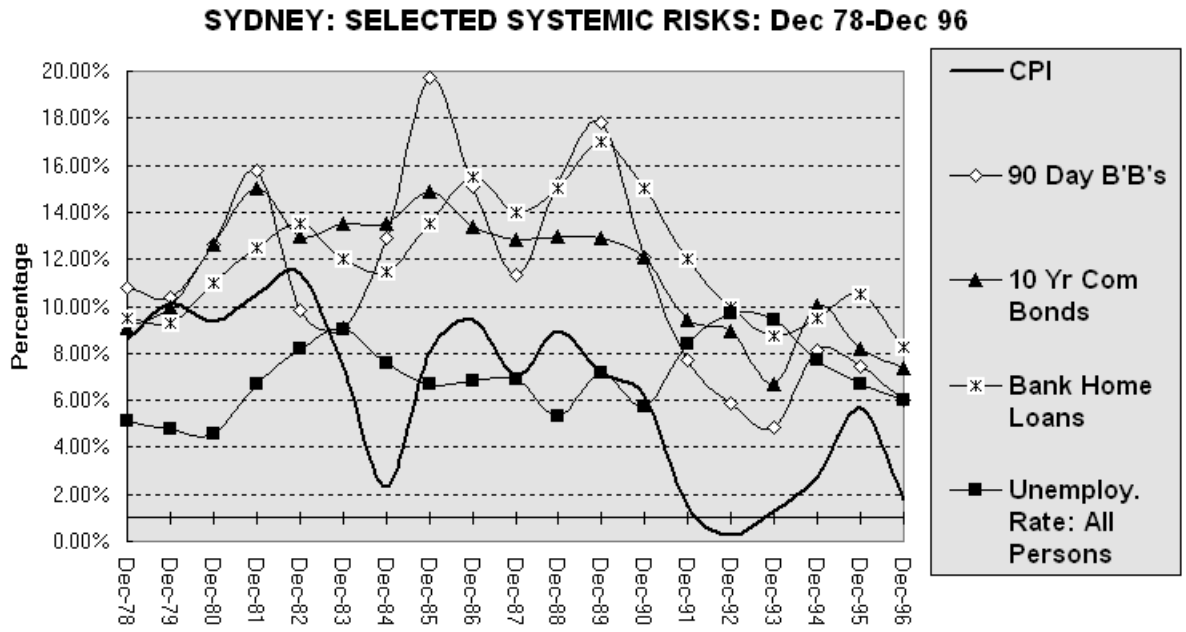
SOURCE: Australian Bureau Of Statistics, various series, Residex P/L house and rent price indices.

Graph 4 indicates that house prices have increased at a rate more than four times faster than CPI, rents have increased at the rate of 1.5:1(CPI), and AWE has increased at the rate of approximately 1.4:1.

Graph 5 sets out the trends for 90 Day Bank Bills, 10 Year Treasury Bonds, Bank Variable Home Loan Rates, and the Unemployment Rate (all persons). This graph highlights the high

degree of volatility and suggests both possible lagged positive and inverse correlations between certain variables.

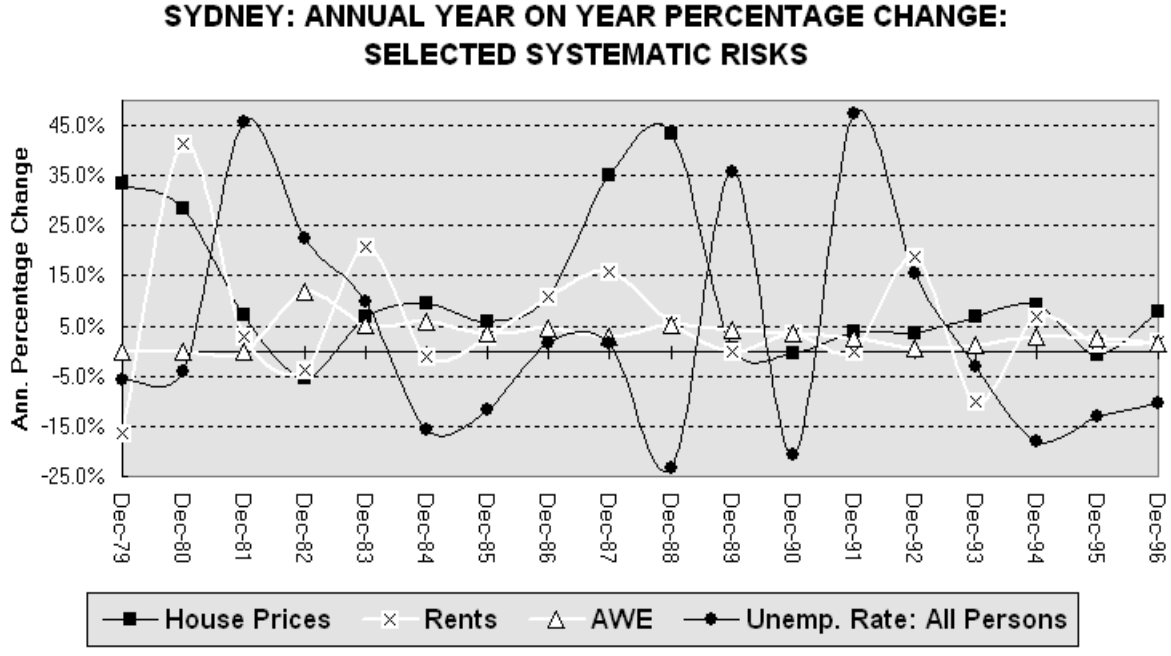
GRAPH 5



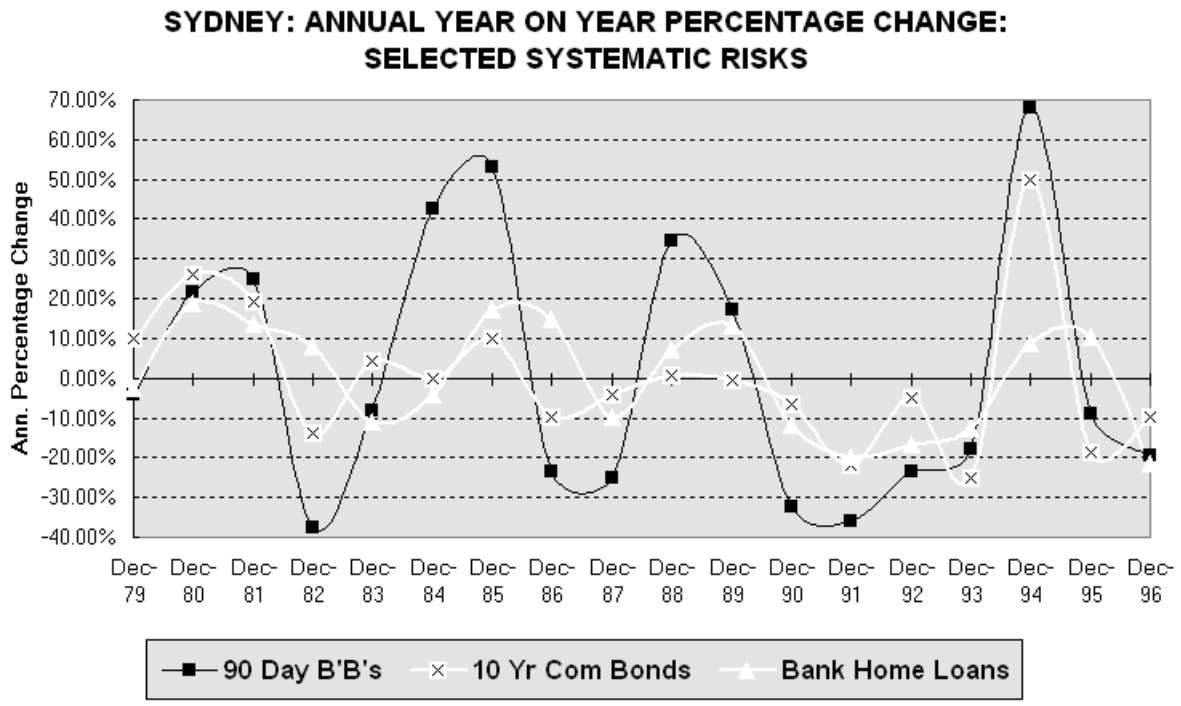
SOURCE: Reserve Bank Quarterly Bulletins, (various), Australian Bureau Of Statistics, Labour Force, 6203.1

Graphs 6, 7 and 8 set out the annual percentage change over the period December 1980 to December 1996.

GRAPH 6

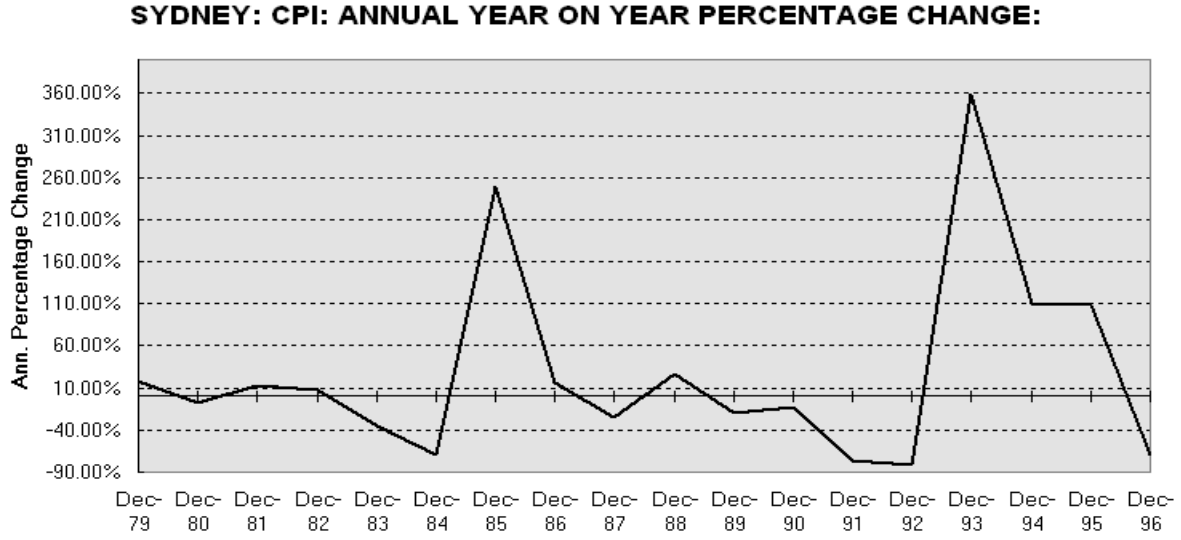


GRAPH 7



SOURCE: Residex P/L House And Rent Price Indices, Australian Bureau Of Statistics, various series

GRAPH 8



SOURCE: Reserve Bank Quarterly Bulletins, (various), Australian Bureau Of Statistics, Labour Force, 6203.1

These graphs show the extensive range of each of the risks, and the very high volatility associated with each.

The ranges are:

- CPI, - 0.28% to 11.39%;
- house prices, - 0.7% to 43.3%;
- rents, -16.3% to 41.3%;
- AWE, - 0.5% to 11.7%;
- unemployment rate, - 23.2% to 47.4%;
- 90 day bank bills, - 5.99% to 19.75%;
- 10 year Commonwealth bonds, - 6.7% to 15%;
- bank variable rate home loans, - -21.43% to 18.92%.

4.7 Assumption Issues

Notwithstanding the use of appropriate data it will still be necessary to make a series of assumptions which, in order to ensure option neutrality are common to all options tested. These common assumptions are:

- the systematic risk in the future is the same as that which applied to the past;
- funding is by way of fixed rate financing at the real rate derived from the scenarios (this includes the debt funding component of public housing);
- the commencing dwelling value is that provided by all States for public housing average costs;
- purchasing and selling expenses are 1.2% of the dwelling value at both purchase and sale for the public housing and shared equity cases; and
- the maximum rent or mortgage payment of the client is 25% of gross income p.a.

Specific Assumptions

To ensure that any results are robust enough to take account of all possible circumstances it is necessary to test both a range of incomes over a range of different time periods.

Attachment 2 sets in details the process followed in the analysis whilst Attachments 1, and 3 to 7, provide the definitional and quantitative supporting documentation for the research. There are also two separate excel files one of which contains the Model and the other the results of the simulations, simulation.xls.

CHAPTER 5 ANALYSIS RESULTS

Probability and risk analysis has two central components;

- the first is the ***likelihood*** that an event may occur; in the case of this work the likelihood of financial savings accruing from following a 'all assistance options' mixed or 'best two assistance options' against any single option and the Commonwealth funding mix.

  Thus the first part of the results analysis for the three cities is about quantifying this likelihood of savings if a mixed assistance or best two assistance option is pursued.

- the second is; once the likelihood has been determined what is the probable ***impact*** or ***extent*** of the event; in this case the extent of savings (or addition to output) that may accrue.

These two components are independent of each other. Thus the second part of the analysis is about if the event does occur (i.e. savings from a mixed or best assistance option case) what is the quantified extent of this savings or increase in output from an all options mixed or best two options against any individual option or the Commonwealth funding mix.

The report handles this question in two ways:

- it documents the average extent of the savings from all those cases where savings are generated;
- for all of the 100 cases tested it documents the mean value of subsidy per tenant year for each assistance option and the Commonwealth funding mix and compares that with the mean value of the subsidy per tenant year for the all options mixed or the best two options outcome with the difference between the means being the potential average savings.

Thus the possible extent of savings or additions to output are quantified. This is why potential savings vary between over 100% (only savings cases) to 50% (comparisons of means).

Section 5.1 deals with the ***likelihood*** of savings or output gains whilst Section 5.2 sets out the impact or ***extent of savings*** or output gains generated where savings cases are examined. Section 5.3 examines the ***extent of savings*** which would result if the means of the assistance option cases eventuated.

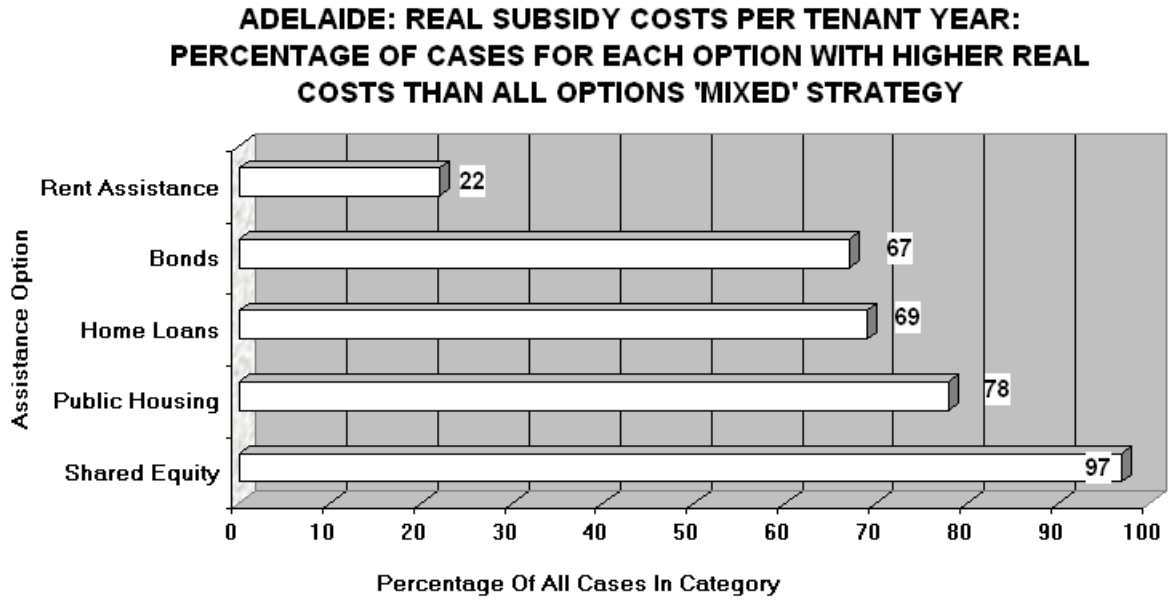
5.1 Probability of Subsidy Savings from a Mixed Strategy

Attachment 7 contains tables of every iteration result for the individual cases in Adelaide, Melbourne and Sydney.

Adelaide

Graph 9 sets out the percentage of total iterations for the assistance option category, where the "all assistance options mixed" produced a lower subsidy cost per tenant year than the corresponding individual option. To recap, the mixed options category selected for comparison in this study arbitrarily divides the total housing assistance budget evenly across the five specified options (four single assistance options plus shared equity). Of course, as already noted, the model presented here allows simulations to be run for any combination of those five options and the subsidy cost outcomes to be compared with each other and the five basic options.

GRAPH 9



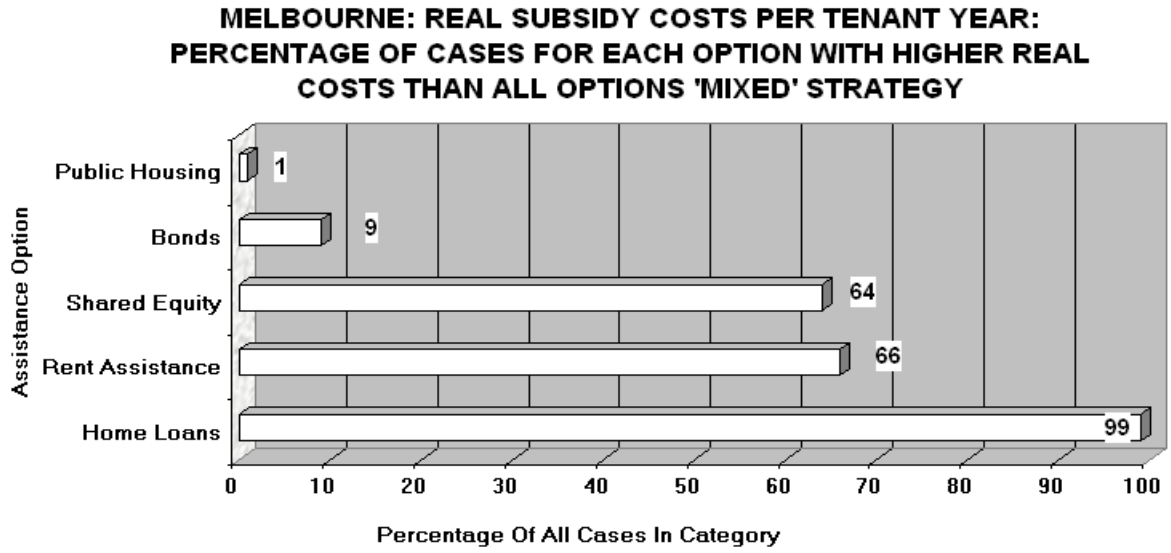
For four of the assistance options, bond funded social housing, home loans, public housing and shared equity, the mixed strategy was cheaper in nearly 70% of cases or more, with the mixed strategy being cheaper than public housing in 78% of cases. One assistance option, however, rent assistance, was significantly cheaper in nearly 80% of the 100 cases tested.

Melbourne

Graph 10 sets out the same results for Melbourne.

Unlike Adelaide, in the Melbourne context, public housing outperformed a mixed strategy in over 99% of cases (compared to just 22% in Adelaide) and bond funded social housing was cheaper in over 90% of cases. For three options the mixed strategy was more efficient being cheaper than shared equity in 64% of cases and rent assistance and home loans and in 66% and 99% of cases respectively.

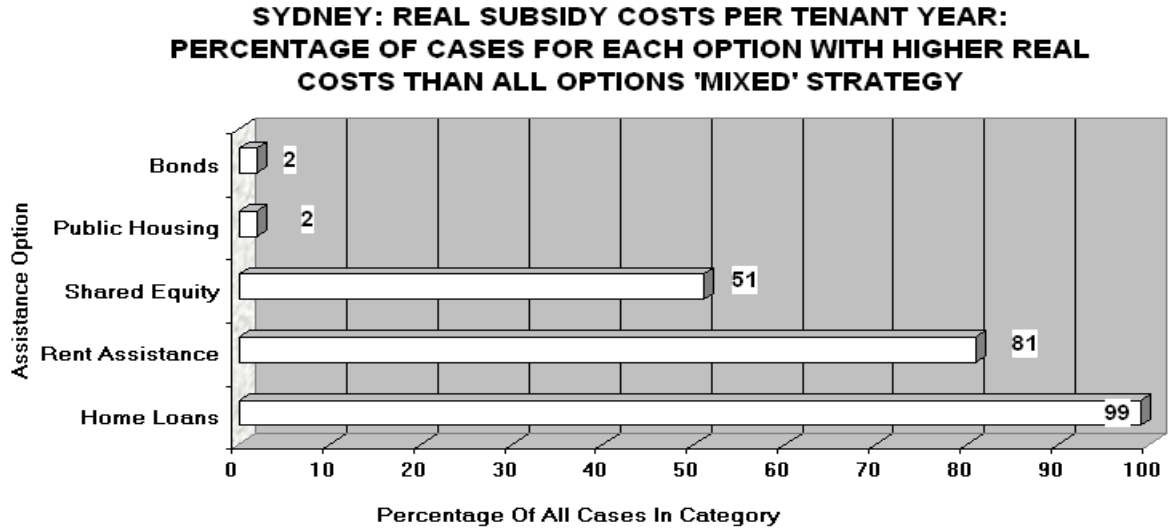
GRAPH 10



Sydney

Graph 11 sets out the same results for Sydney.

GRAPH 11



The trend in the results in Melbourne is even more extreme in the Sydney context, both public housing and bond funded social housing being cheaper than the all options mixed strategy in 98% of iterations. Rent assistance is an even more inefficient option in Sydney with the mixed strategy being cheaper in 81% of all cases or iterations. Home loans was the poorest performer in all three cities. However, it must be remembered that the aggregate mean long term interest rate in the past 20 years has been close to 10%. Therefore at current long term interest rates the home loan result would dramatically improve.

Aggregate Probabilities

Subsequent to the above analysis we then examined the proportion of the 500 assistance cases for each city (100 cases multiplied by the five assistance option results) where the mixed strategy was cheaper that any individual option.

We also then compared the all options mixed outcomes with the Commonwealth funding mix (see Table 7 below) and the cheapest two options in each city with the current Commonwealth funding mix. The outcome for this mix can be approximated by multiplying the public housing option outcome by 44.78% and the Commonwealth Rent Assistance option outcome by 55.22% and adding the two together.

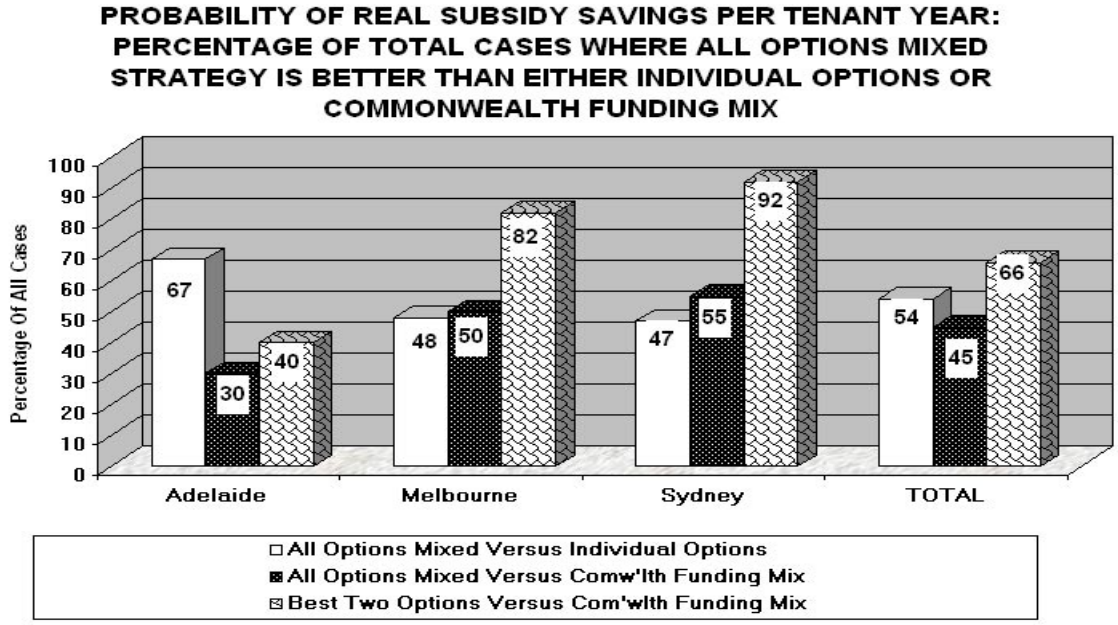
Table 7: Derivation Of Commonwealth Funding Mix: 2000/2001

Item	Amount $M's
Base CSHA Funding	743.98
Additions To Base Funding	89.66
Aboriginal Rental Housing	91
Crisis Accommodation	39.655
Community Housing	63.99
State Matching	364.134
Total Grant funded social housing (public housing option)	**1,392.419**
Commonwealth Rent Assistance	**1,717**
TOTAL	**3,109.419**
Percentage Of Total Funding	
Grant funded social housing	44.78
Rent Assistance	55.22

Source: Housing Assistance (Form Of Agreement) Determination 1999, Commonwealth Of Australia Commonwealth Department of Family and Community Services Website.
Note: First Home Owners Grant excluded because of 'sunset'provisions

Graph 12 sets out the results.

GRAPH 12



Overall the mixed strategy was more efficient i.e. cheaper than any individual strategy in 67% of cases in Adelaide, 48% in Melbourne and 47% in Sydney for an overall average for the three cities of 54%. In other words, the selected mixed strategy would tend to deliver modest efficiency gains, by way of reduced subsidy requirements, in relation to any individual option.

When compared to the current Commonwealth funding mix the mixed strategy was only cheaper in 30% of the cases tested in Adelaide, 50% in Melbourne and just over 45% in Sydney.

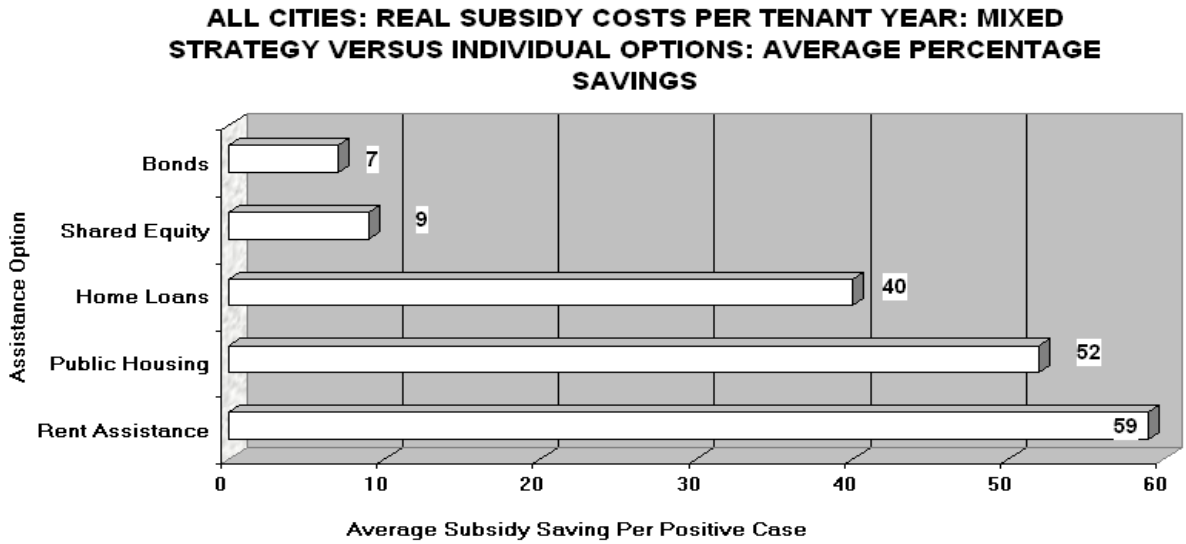
However when we considered the best two assistance options in each city against the Commonwealth funding mix we found very significant differences.

In Adelaide some 40% of cases were cheaper than the current Commonwealth funding mix, in Melbourne 82% and in Sydney 92% with an aggregate average for the three locations of 66% of all 500 assistance options tested in each location. This suggests that tailoring 'best fit' assistance policies to particular jurisdictions has the potential to deliver significant efficiency gains to government, to which we now turn.

5.2 Extent of Possible Savings (or Increase in Output)

Graph 13 sets out the aggregate average subsidy saving for each option across all cases where savings occurred from an all options mixed strategy.

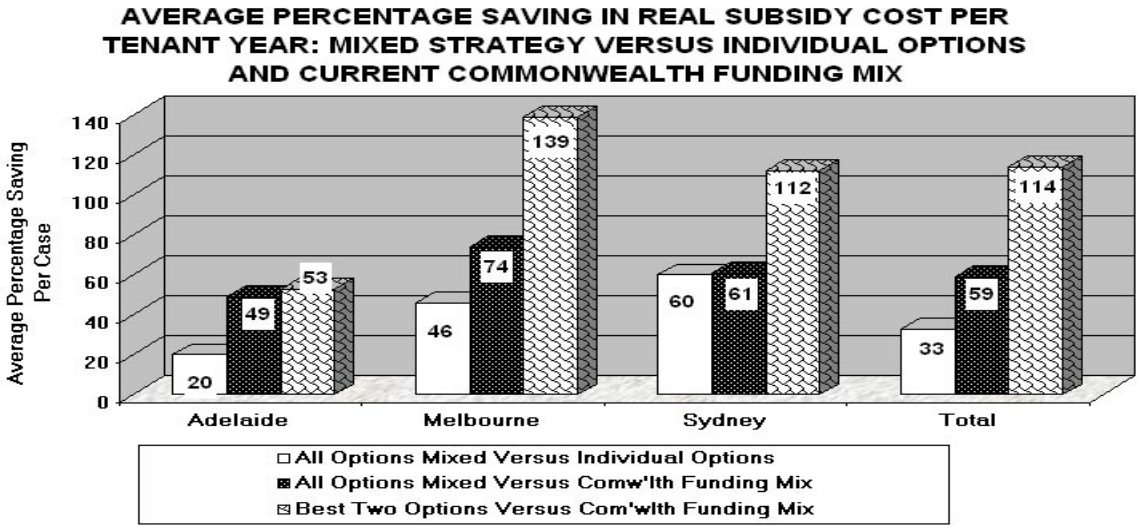
GRAPH 13



The graph indicates that the bond option is very efficient with a mixed strategy only producing aggregate average subsidy savings (in the positive cases) of 7%. However the average savings in the multiple option compared to public housing is 52%, and for rent assistance 59%. This suggests that the range of subsidy outcomes in these options is more extreme.

Graph 14 compares the average percentage saving in real subsidy costs per tenant year when the all options mixed strategy is compared with individual options and the current Commonwealth funding mix, and the best two options are compared with the funding mix.

GRAPH 14



This graph shows that the all options mixed produces considerable average savings when compared to all individual options, in Adelaide 29%, in Melbourne 46% and in Sydney 60% with the total for all 33% (note the total for all is lower because of the higher number of tenant years per outcome in Adelaide than in Melbourne or Sydney). When we examine the all options mixed against the Commonwealth funding mix we find the average aggregate saving in all positive cases is 49% in Adelaide, 74% in Melbourne and 61% in Sydney with the total average being 59%.

Finally an examination of the best two options against the Commonwealth funding mix, (rent assistance and bonds in Adelaide, public housing and bonds in Melbourne and Sydney), shows very large potential savings indeed, 53% in Adelaide, 139% in Melbourne, 112% in Sydney for an overall average of 114% across all three cities. There would appear to be considerable room for improvement in the total system mix of housing assistance options.

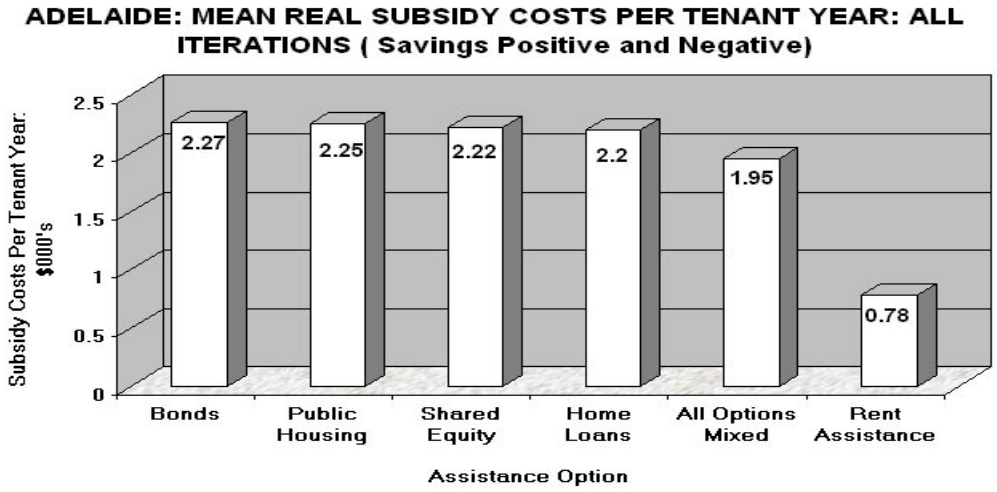
5.3 Mean Real Subsidy Costs per Tenant Year (All Iterations)

The above analysis may in fact be a partial perspective on the outcomes in that it is only examining the average for all the cases where the mixed or two best options produced savings viz a viz individual options or the Commonwealth funding mix. Therefore, we have examined the mean real subsidy costs per tenant year for each option and compared this to the all options mixed outcome.

Adelaide

Graph 15 sets out the mean outcomes for subsidy costs per tenant year for Adelaide.

GRAPH 15

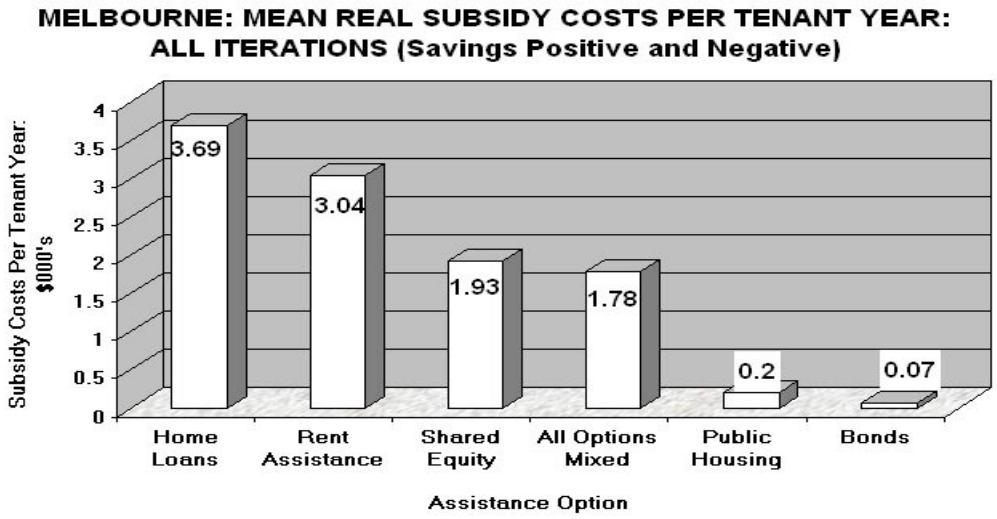


The mean outcome for rent assistance is clearly much cheaper than all other options in Adelaide, with there being little difference between the other four options.

Melbourne

Graph 16 sets out the same result for Melbourne.

GRAPH 16



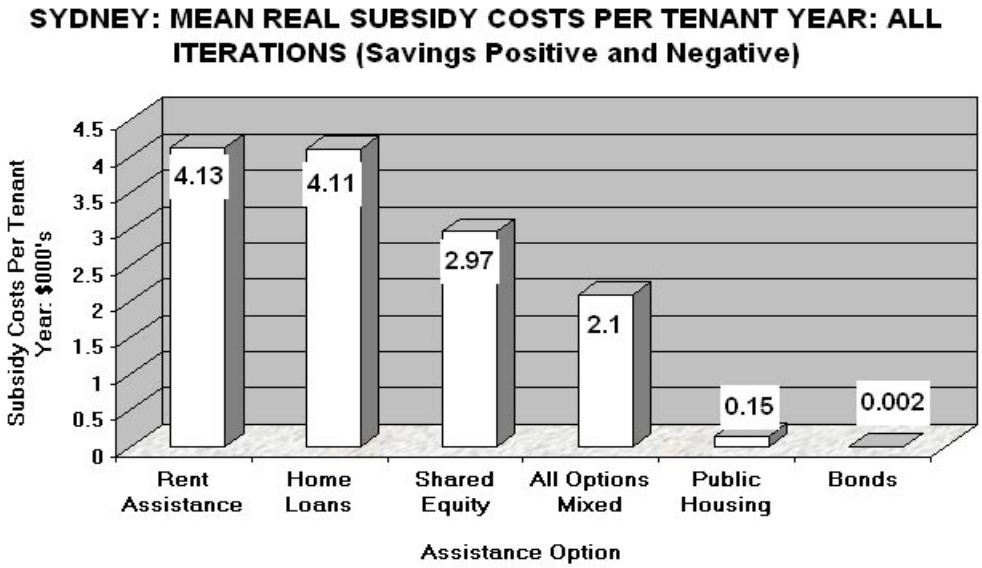
The results for Melbourne are similar to the positive savings outcomes with the mean outcome for home loans and rent assistance being many times the mean cost for bond funded social housing and public housing. Only public housing and bonds outperformed the all options mixed outcome with the mean for both bond funding and public housing being almost zero. This result occurs because of both the leverage obtained from the high real capital appreciation of the dwellings and the number of years in the cash flow where the buy-back price of the bonds is less than the original face value. Consequently, the net realised value of the dwellings is much higher than the principal obligation on the bonds with resultant capital surpluses occurring.

These factors produce outcomes where almost half the cases tested generated actual profits thereby drastically reducing the average across all 100 cases.

Sydney

Graph 17 sets out the same result for Sydney

GRAPH 17



The trends in Sydney are the same as in Melbourne, except more attenuated. Rent assistance and home loans are clearly the most expensive options for the delivery of housing assistance in both Sydney and Melbourne.

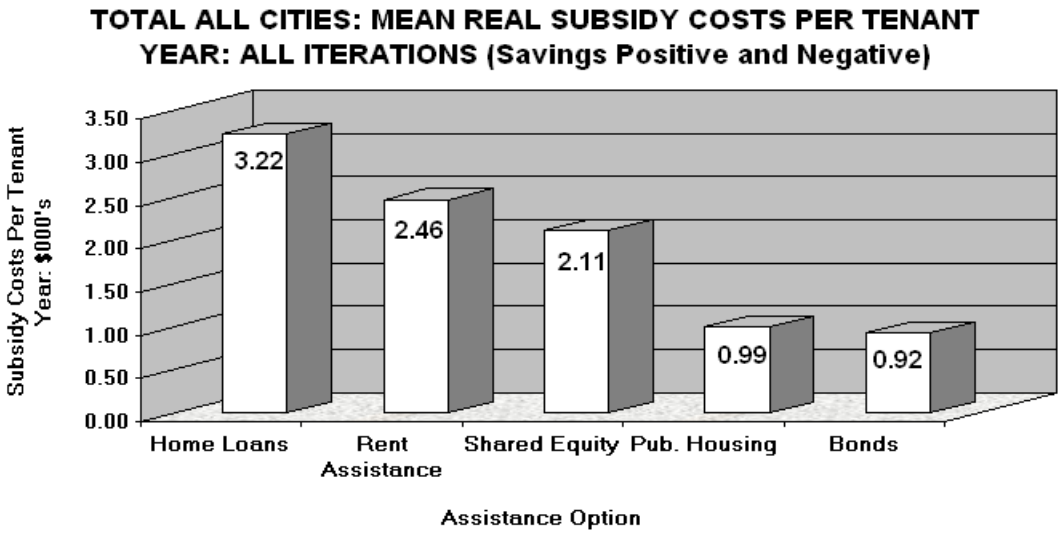
The mean outcome for rent assistance is again many times that for public housing and bond funded social housing, with public housing and bond funded social housing being clearly much more efficient than all options mixed.

Again, both bond funded and public housing options have almost as many cases where profits are generated as where subsidy costs are incurred because of the impacts outlined earlier and the higher real capital gain assumed on the basis of trends over the previous 20 years (3.8% real p.a.). It can be anticipated, however, that in the current interest rate environment home loans would decline significantly in cost.

Aggregate Outcomes All Cities

Graph 18 sets out the mean for each option for all the cities combined.

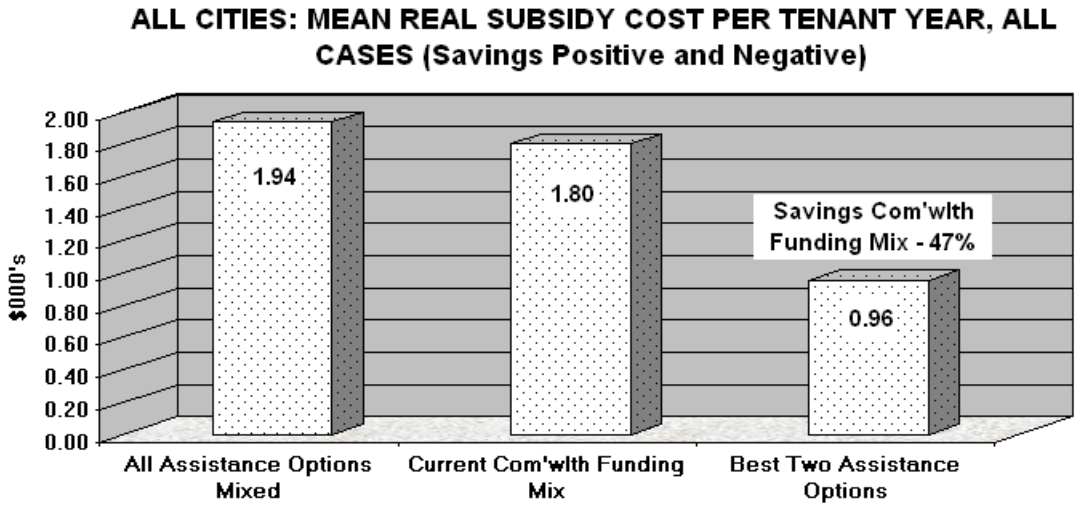
GRAPH 18



Clearly public housing and bond funded social housing are considerably more efficient that other forms of delivering housing assistance (in the three cities examined), with public housing being 60% cheaper than rent assistance and bond funding, 62%. Home loans are considerably more expensive than all other options.

Graph 19 sets out the results for all assistance options mixed, current Commonwealth funding mix and the best two assistance options.

GRAPH 19

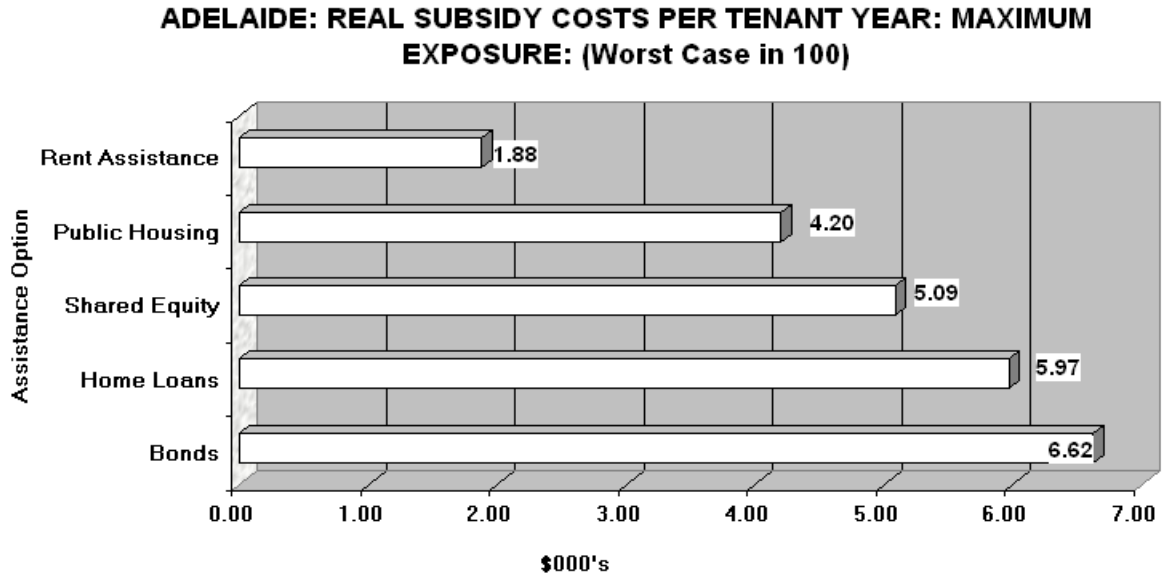


The graph shows that the mean for all assistance options mixed is slightly more expensive than the current Commonwealth funding mix, with a combination of public housing and bond funded social housing being 47% cheaper than the current Commonwealth funding combination.

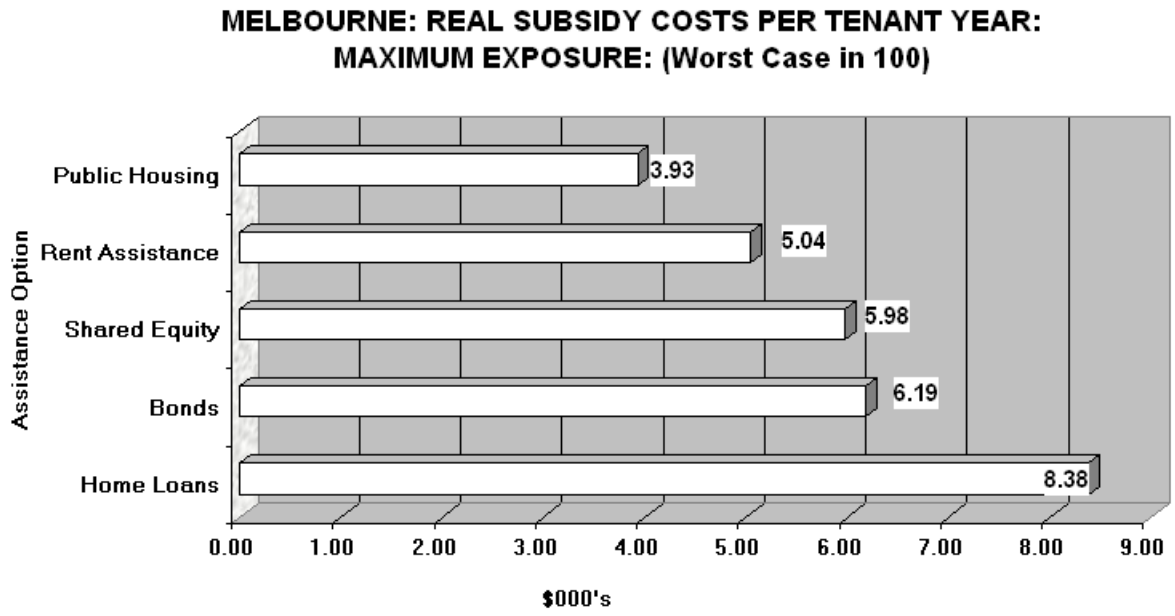
5.4 Maximum Exposure

It appears that bond funding and public housing both deliver significantly lower cost subsidy outcomes in most cases. However it is important to examine the downside risk associated with the different options. Graphs 20, 21 and 22 set out the **worst case** subsidy result for the five options in the three cities.

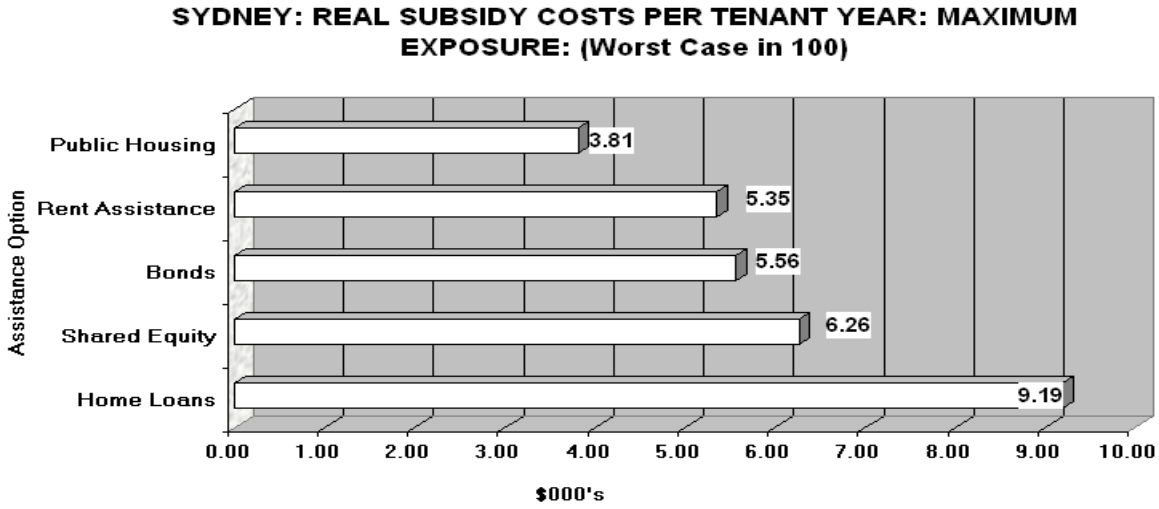
GRAPH 20



GRAPH 21


MELBOURNE: REAL SUBSIDY COSTS PER TENANT YEAR:
MAXIMUM EXPOSURE: (Worst Case in 100)
Assistance Option
Public Housing
Rent Assistance
Shared Equity
Bonds
Home Loans
3.93
5.04
5.98
6.19
8.38
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
$000's

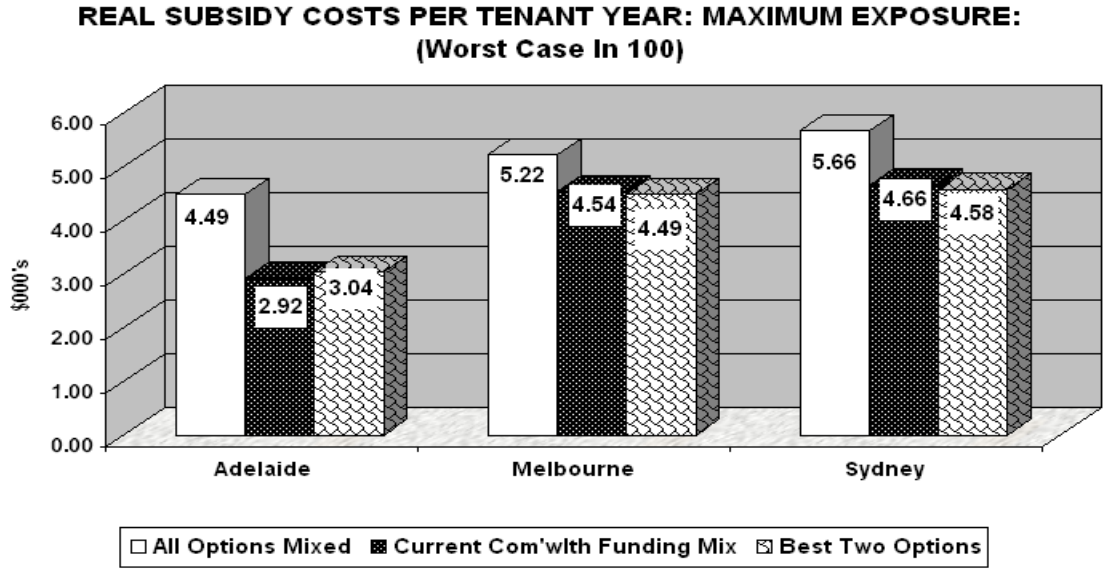
GRAPH 22



The use of bond funding for social housing carries significantly greater potential downside risk than that associated with public housing. However, the exposure under rent assistance is only slightly less than that associated with bonds. Interestingly, public housing has the lowest downside risk in both Melbourne and Sydney and the second lowest in Adelaide. The reason that the bonds outcome is most extreme in Adelaide is due to the fact that dwelling prices have fallen in real terms for significant periods in the last twenty years. This means that the difference between the net realised sale proceeds from dwellings and bond principal payments owed, will, in many years, be adverse.

Graph 23 sets out the maximum exposure where a mixed strategy is used, compared to the current Commonwealth funding mix and the best two options.

GRAPH 23



In Adelaide the all options mixed produces significantly higher exposures than either the current Commonwealth funding mix or the best two options (being bond funding and public housing). However, in Melbourne and Sydney, an all options mixed outcome is only 6.5% and 17% more expensive than the current Commonwealth funding mix. If the best two options are considered they have only slightly higher maximum exposures in Adelaide, and have slightly lower exposures in Melbourne and Sydney.

Overall, the all options mixed strategy examined here is likely to produce significant savings in the majority of cases when compared to an individual assistance option, and for less than 50% of the cases when compared to the current Commonwealth funding mix. However, choice of the best two options appears to have much higher probabilities of delivering very large savings

benefits (or output gains) at lower absolute risks than the current Commonwealth funding mix. The most subsidy efficient two options are rent assistance and home loans in Adelaide and bond funded social housing and public housing in Melbourne and Sydney.

It remains to be seen whether less even mixed options strategies – e.g. where the mix was skewed towards one or two of the basic five options -- would deliver greater savings. The model would allow this question to be pursued in a systematic and consistent fashion.

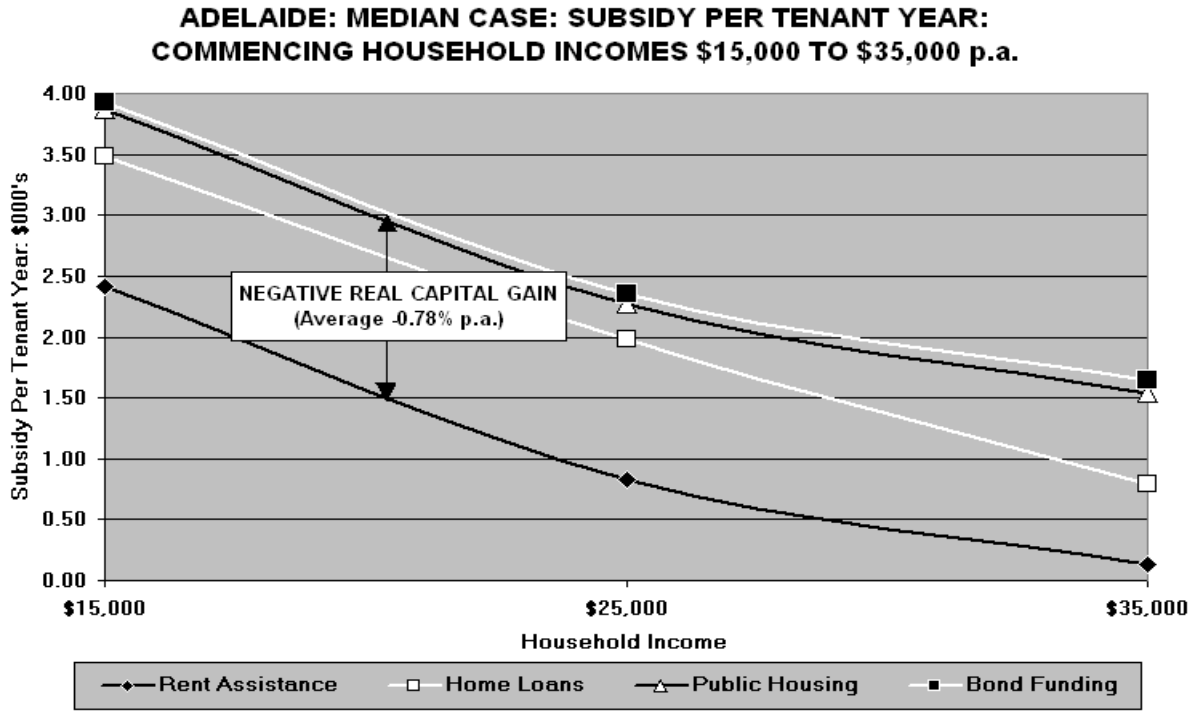
5.5 Household Incomes and Assistance Efficiency

An examination of the subsidy per tenant year has been conducted for the first quartile, median and third quartile all options mixed cases for Adelaide, Melbourne and Sydney for the standard 25 year term. Commencing household incomes (CHI) of $15,000, $25,000 and $35,000 were tested. The relative subsidy efficiency of the different assistance options did not change for the different cases nor for higher and lower commencing household incomes.

Adelaide

Graph 24 sets out the results for the median case in Adelaide.

GRAPH 24



The substantial difference between the subsidy per tenant year for rent assistance and public housing is almost entirely due to long term average real residential capital losses experienced in Adelaide (the mean being some 0.78% per annum over the twenty year period).

For all options except home loans, subsidy per tenant year declines in an almost linear fashion until the $25,000 commencing income is reached. Between $25,000 and $35,000 CHI, the rate of subsidy decline moderates substantially for the three assistance options of rent assistance, public housing, and bond funded social housing due to 25% of incomes being equal to market rents and the cessation of rent subsidies.

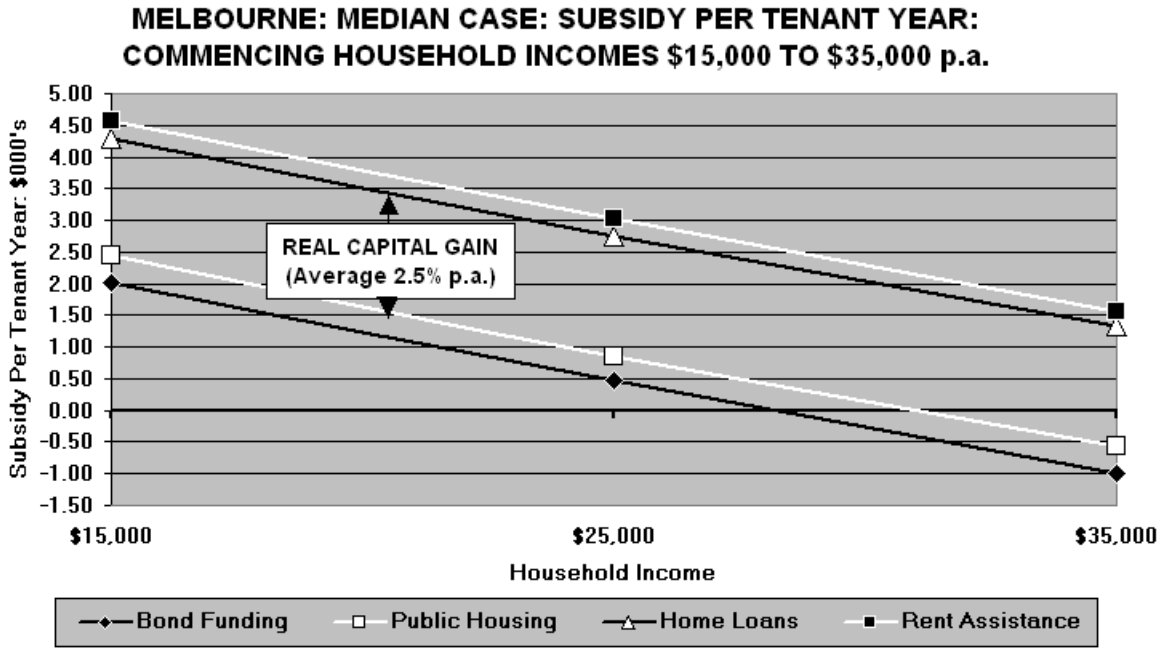
Because home loans have much higher commencing repayments, the attainment of full repayments without subsidy necessitates higher income levels than in the other options. Between $25,000 and $35,00 CHI, therefore, subsidy per tenant year continues to decline at a greater rate than for the other options.

Bond funded social housing is slightly more expensive than public housing due to the marginally greater impact of negative capital gain on this option.

Melbourne

Graph 25 sets out the results for the median case in Melbourne.

GRAPH 25



Because of much higher commencing dwelling values in Melbourne than in Adelaide, (and hence considerably higher market rent and loan repayments) market rent payments and unsubsidised loan repayments are not reached until CHI's are almost at $35,000 p.a. For this reason subsidy per tenant year declines in an almost linear manner from $15,000 CHI p.a. to $35,000 CHI p.a..

The graph demonstrates that rent assistance and home loans commence at the high end of the range and continue to maintain this position throughout the income ranges tested.

Almost all of the difference between the rent assistance case and the public housing and bond funded social housing cases is due to the long run, real, residential capital appreciation of 2.5% p.a.

Bond funded social housing is marginally cheaper than public housing throughout the range due to the slight compound effects on the bond repayments.

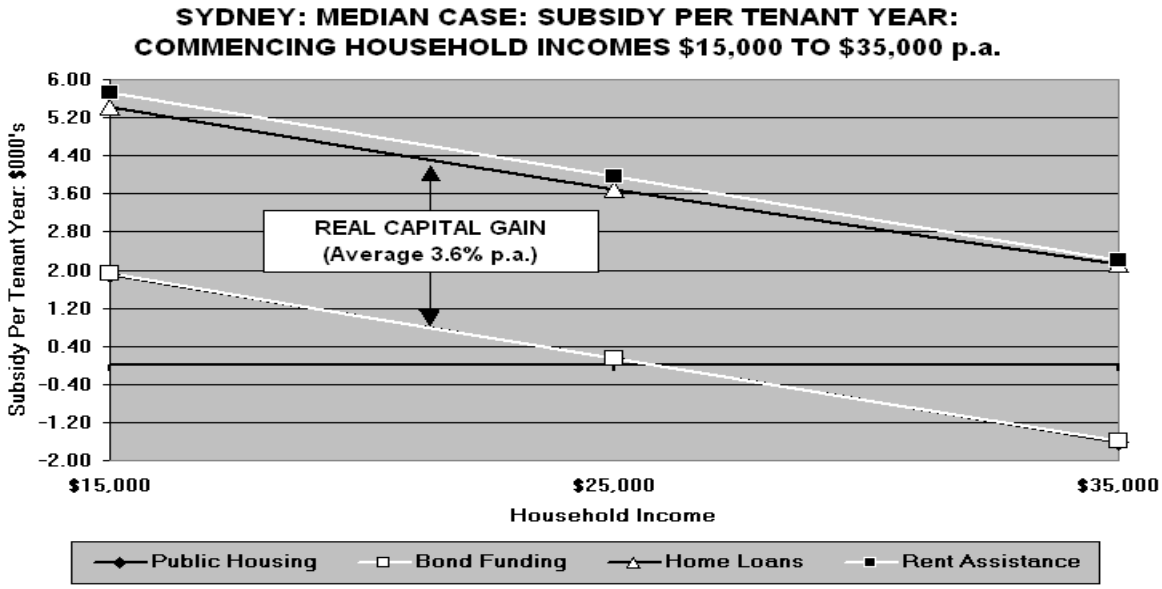
Sydney

Graph 26 sets out the results for the median case in Sydney.

The same comments apply to the Sydney assessment, as for Melbourne, except the effects of higher commencing dwelling prices and higher average real capital gains widens the subsidy gap between rent assistance and supply side assistance options.

The slight compound effect on bond principal payments evident in the Melbourne case almost disappears because of the very large real capital gain impact in Sydney (average 3.6% p.a.).

GRAPH 26



5.6 Different Transaction Periods and Assistance Efficiency

The same distributed cases outlined above were modeled at commencing household incomes of $25,000 and transaction terms of 15, 25 and 35 years. Dwellings are assumed to be sold or tenants vacate on a pro-rata basis i.e. 6.66% p.a. in the fifteen year case, 4% p.a. in the 25 year case and 2.85% p.a. in the 35 year iteration.

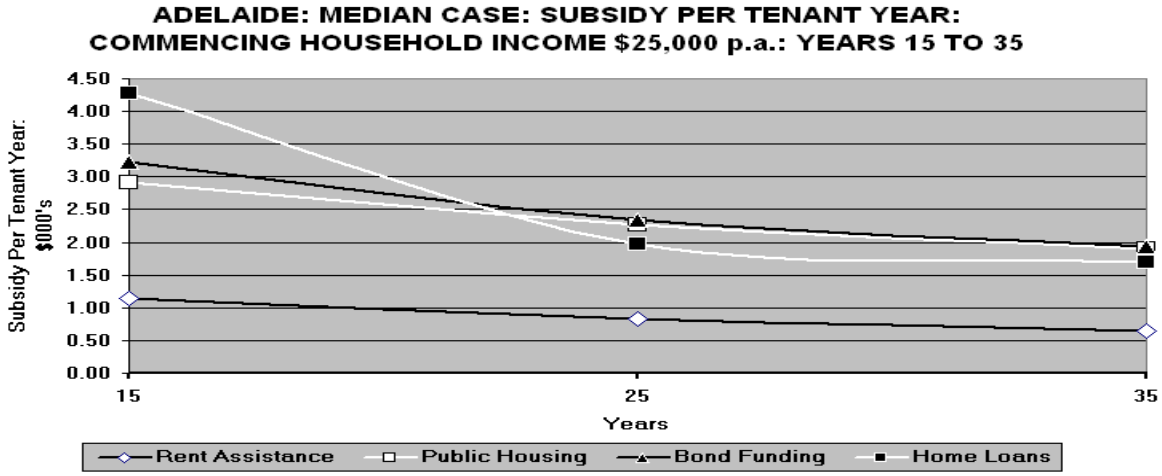
Adelaide

Graph 27 sets out the results for the median case.

The combination of households enjoying some moderate real income growth (average 0.81% p.a.) combined with real dwelling price falls (and hence in some periods of constant rental yields, lower rents) means that over the latter third of the longer term transaction 25% of incomes is sufficient to meet market rents, reducing the rate of subsidy reduction.

For credit foncier loans where there are constant amount repayments, a 10 year longer term (as in the 35 year case) means commencing home loan repayments fall dramatically from the 25 year option. Concomitantly, subsidy per tenant year also substantially reduces, to the point where home loans become more efficient than either public housing or bond funded social housing.

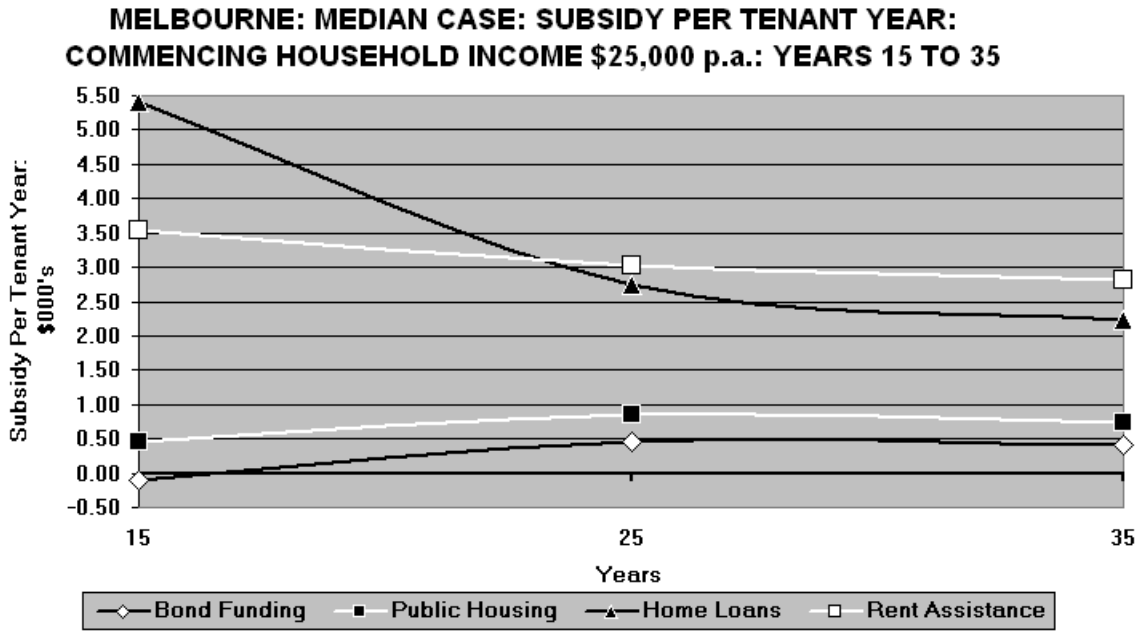
GRAPH 27



Melbourne

Graph 28 sets out the results for the median case.

GRAPH 28



Although dwelling prices and rents did not fall very often throughout the last twenty years, real incomes also increased in Melbourne (average 0.56%p.a.) and in the 35 year option, 25% of incomes reach market rents later than in Adelaide. As a consequence, in the rent assistance option, the rate of decline in subsidy per tenant year is less significant than in the Adelaide case.

In the public housing and bond funded social housing cases subsidy increases slightly between 15 and 25 years due to the impact of the deficit covering payments being incurred for a longer term. Once 25 years is reached however subsidy per tenant year stabilises as 25% of incomes become almost sufficient to meet market rents.

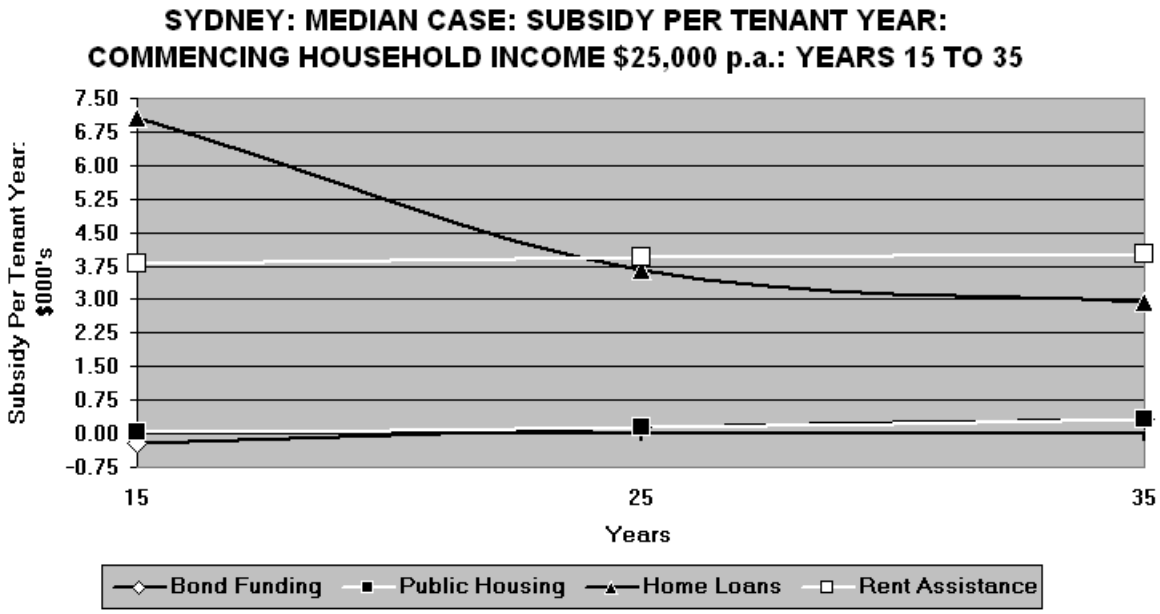
For credit foncier home loans the same comments apply as in the Adelaide case.

Sydney

Graph 29 sets out the results for the median case.

Subsidies per tenant year for the rent assistance option increase slightly throughout the whole term of the 35 year transaction because the rate of real income growth (0.82% p.a. average) is just insufficient to meet the rate of real growth in rents. This is also true of the public housing and bond funded social housing options.

GRAPH 29



Similar comments apply to the home loan option as those outlined for Adelaide and Melbourne. However, the decline in subsidy per tenant year is more dramatic and in the 35 year case there is a significant difference in subsidy efficiency between home loans and rent assistance (home loans being 35% cheaper).

CHAPTER 6 FINDINGS AND CONCLUSIONS

6.1 Probability of Efficiency and Output Gains are Equivocal

If the economic environment of the future reflects the environments of the last twenty years, an all options mixed strategy (20% spending on each assistance option) would be superior in 54% of possible outcomes. Thus, the probability of efficiency gains is moderate, in relation to the all options mixed approach modeled in this study. However, the probability of gains becomes very high under the 'best two cases' approach. Additionally, where gains are achieved (e.g. in the application of both the 'all options mixed' and the 'best two-case' approaches) they are very substantial.

6.2 Factors Which Need to be Taken into Consideration

Very high real capital gains in Melbourne and Sydney ensured that in 40% of the cases few of the simulations indicated savings from a mixed outcome. Long term interest rates averaged nearly 10% for the last twenty year period ensuring home loans performed poorly in all contexts.

It is likely that under current interest rate conditions and with the diversity of real residential rent and price regimes a national capital city-specific approach would generate considerably higher probabilities of savings. That is, a national policy that tailored particular assistance options/mixes to each jurisdiction, or (more ambitiously) definable spatial housing market segments, would most probably generate significant overall savings in total subsidy costs. Alternatively, significantly more affordable housing support could be delivered to households in housing stress for any given housing assistance budget allocation.

6.3 Diversity of Outcomes

The research has revealed a diversity of efficiency outcomes.

In Adelaide both probabilities and subsidy savings are the opposite to those applying in Melbourne and Sydney, with rent assistance overwhelmingly cheaper in 80% of mixed cases, but in only 33% in Melbourne and less than 20% in Sydney. By contrast, a mixed strategy was more efficient than 78% of the public housing options tested in Adelaide, but for only 1% of the cases tested in Melbourne and 2%in Sydney. Rent assistance was the dominant efficient strategy in Adelaide but supply side options involving public housing and bond funded social housing dominate the probability outcomes in Melbourne and Sydney.

6.4 The Probabilities of the Best Two Options Not Equivocal

Whilst the particular all options mixed outcome tested was only just better than an even chance (54%) of being more efficient than any individual approach overall, if the most efficient two options are selected (rent assistance and bond funded social housing in Adelaide, public housing and bond funded social housing in Melbourne and Sydney), the probabilities of efficiency or output gains are much higher.

Furthermore, in more than 40% of the cases in Adelaide and in an overwhelming majority of possible outcomes in Melbourne and Sydney the probability is that this strategy would be more efficient that the current predominant Commonwealth funding mix of primarily rent assistance and public housing. It is clear from the best two option analysis that the current Commonwealth funding mix has more than 2 chances in 3 of being considerably less efficient than a selection of the best two options that could be applied in the three capital cities.

6.5 Demand and Supply Side Outcomes

It is obvious from the research that supply side assistance options such as public housing and bond funded social housing will always be much more efficient than rent assistance in circumstances where real capital gains are expected to be 0.5% p.a. or more.

At real capital gains being experienced in Melbourne and Sydney these efficiency benefits will be very large. By contrast, where real capital gains are falling and initial dwelling prices are

relatively low (such as in Adelaide) it also clear that there is a very high probability that rent assistance will be the most efficient housing assistance response.

6.6 Output Gains From a 'Correct' Assistance Option Strategy

In the cases where savings are indicated, the selection of the 'correct' assistance option strategy will itself generate very substantial improvements in the likely long term output (i.e. households assisted) of housing assistance options. For example, when compared to the current Commonwealth funding mix an all options mixed strategy generates average output gains of nearly 60%, and if the best two options are selected in each capital city the aggregate assistance output could be more than doubled.

If we examine all cases, both those that generate savings and those that do not, the average subsidy cost for each assistance option across the 100 iterations for each city also reveals that substantial efficiency or output gains could be generated from the selection of the 'correct' mix of assistance options.

In Adelaide the mean subsidy cost for rent assistance is about a third of that applying to other options, whereas in Melbourne and Sydney mean subsidy costs per tenant year for public housing and bond funded social housing are many times cheaper than rent assistance.

In aggregate, across all three cities, public housing and bond funded social housing generate assistance outcomes 60% higher than rent assistance. Overall, on average, the best two options outcome generates output gains of nearly 50% on the current Commonwealth funding mix.

In this regard it should be noted that because public housing is sold only spasmodically and intermittently, the capital benefits accruing to the States are locked up in the balance sheets of State Housing Authorities, and an appropriate focus would be on how these balance sheet benefits could be realised for future housing assistance investment. One possibility would be to settle on a appropriate asset sales program and tender the real capital gain stream for sale thereby releasing funds for new social housing investment ahead of the returns that would be achieved.

6.7 Are There Higher Risks in Selecting the Best Two Assistance Options?

In examining the worst case for all of the options it is obvious that bond funding has considerably greater downside risk attached to it than public housing or rent assistance in Adelaide, and again, public housing in Melbourne and Sydney. However, the worst case for bond funding in Melbourne and Sydney is not significantly greater than that for rent assistance. If we compare a policy which selected the best two options then we find that there is less downside risk than that attaching to the current Commonwealth funding mix.

6.8 What About Different Incomes and Transaction Terms?

Changing income levels does not noticeably affect the above outcomes and increasing the term of the transactions simply makes home loans more efficient than rent assistance.

6.9 In Conclusion

The research suggests that there is considerable room for improvement in the long term output of housing assistance policy through more flexible, variegated and targeted assistance policies. In this context, the new Commonwealth State Housing Agreement could establish a national framework for negotiating, implementing and monitoring bilateral agreements with each State that tailor the policy interventions to the particular housing market conditions that exist in each jurisdiction. This would allow the governments to maximize the output efficiency of housing assistance, while pursuing the four aims of a national housing policy outlined in the 'Joint Communique of Australian Housing Ministers', listed above at the end of chapter 3.

Simply continuing the current policy that tends to regard housing assistance as an adjunct to income security policy is likely to perpetuate the inefficiencies and rigidities that exist within the current system.

Whilst the outcome for the client may have the same effect as an income security approach, housing assistance does not perform like an income security payment for the provider of the assistance. There are, as demonstrated in this study, substantial costs associated with a cash payment approach.

It is likely that extending this study to an Australia-wide project would reveal a much higher probability of a mixed approach being more efficient than the current 'two arms' strategy. A sophisticated risk management approach by both the Commonwealth and the States would see the operation and maintenance of all of the main types of housing assistance monitored, with the emphasis changed between options as economic circumstances dictate.

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ATTACHMENT 1 DATA DEFINITIONS: HOUSING COSTS

"Initial Average Dwelling Price"

is the mean/median of the two values of the cost of the construction of, or private purchase of dwellings for public housing as contained in the Productivity Commission's Report on Government Services, 2000. This value is then indexed to the change in median dwelling prices set out in the Real Estate Institutes, Market Facts, to bring to December 2000 values. Because public housing stock acquisition encompasses both spot purchases and new construction, and because the land cost component is historic, it was considered the above analysis would more closely reflect a proxy for average public housing acquisition costs. This is used as the average commencing dwelling acquisition cost in each State

"Other Purchasing Expenses"

is the cost of legal and procurement costs, but not including stamp duty, associated with acquiring the dwellings and expressed as a percentage of purchase value. This value is based upon bulk conveyancing, fixed fee experience, and procurement by tender processes.

"Initial Maintenance and Rates Costs"

is the operating cost of public housing minus interest expenses and costs of dwelling disposals as set out in the Productivity Commission's Report On Government Services 2000. These costs for each State are indexed to the weighted average CPI for the six capital cities and calculated as an annual percentage of the initial average dwelling price as at December 2000.

"Initial Administration Costs"

is the administration cost of public housing as set out in the Productivity Commission's Report On Government Services 2000. These costs for each State are indexed to the weighted average CPI for the six capital cities and calculated as an annual percentage of the initial average dwelling price as at December 2000.

"Other Selling Expenses"

is the cost of legals and other disposal costs, (but not including stamp duty) expressed as a percentage of sale value. This value is based upon bulk conveyancing fixed fee experience, and disposal by auction processes.

"Assisted Tenant Vacancy Rate"

is the number of vacant public housing dwellings (after deducting untenantable dwellings) divided by the total public housing dwellings, (minus untenantable dwellings),(expressed as a percentage), as set out in the Productivity Commission's Report on Government Services, 2001

"Private Tenant Vacancy Rate"

is the vacancy rate, (expressed as a percentage), applying to private residential rental dwellings for the six capital cities plus Darwin as set out in the Real Estate Institute of Australia's Market Facts for the December quarter, 2000.

"Tenant Relocation Rate"

is the number of tenants transferring within the public housing system, (after deducting untenantable dwellings) divided by the total public housing dwellings, (minus untenantable dwellings),(expressed as a percentage), as set out in the Productivity Commission's Report on Government Services, 2001.

"Stamp Duty"

is the percentage of either initial purchase value or final sale value assumed to be paid in stamp duty.

"Initial Percentage Of Income In Rent"

is the assumed annual commencing proportion of the tenants gross income from all sources that is paid in rent.

"Initial Dwelling Disposal Rate"

is the assumed percentage of original dwellings sold each year.

"Loan Origination Costs % Of Initial Loan Principal"

Mortgage originators receive a once off fee for loan origination which is expressed as a percentage of the initial loan amount borrowed.

Loan Administration Costs % Of Loan Principal Outstanding

Home loans also incur an annual administration cost for functions such as repayment collection, arrears and default management. This is usually expressed as an annual percentage of the loan principal outstanding.

"Tax Paying Entity"

is the assumed tax regime applying to the investor in the bonds and entities receiving interest from short term borrowings.

ATTACHMENT 2 ANALYSIS DEVELOPMENT

1. The Process

Essentially carrying out this project requires the following:

- modification of the Affordable Housing National Research Consortium's Housing Subsidy Model such that it is able to calculate subsidy for a:
  - debt option where dwellings are purchased for social housing tenants and sold as tenants leave;
  - rent assistance option;
  - home loan option;
  - on budget (grant funded) public housing (the fifth option shared equity is simply a combination of the results for home loans and on-budget grant funding of public housing);
- development of two streams of technical analysis;
  - obtaining the requisite housing cost information as necessary inputs for the starting day of the Model simulation;
  - obtaining the risk data; analysing that risk data for distributions and correlations; and completing the simulations for inputting the necessary risk data numbers to be used ***through*** the financial modelling;
- finalising the assumption issues, including commencing household incomes and terms of the transaction.

The steps in the post model modification part of the research are:

- obtain 20 years of risk data;
- conduct frequency distribution analysis
- conduct correlation and covariance analysis;
- choose probability method, i.e. Monte Carlo or 'Smoothed' Monte Carlo, (Latin Hypercube);
- complete probability analysis;
- complete financial modeling of 100 scenarios; and
- document results and policy implications.

2. Model Modification And Operation

The Model has been modified to meet the above requirements and a copy has been lodged with this final Report.

Options

Debt Option

The Housing Subsidy model essentially calculates the commencing amount of funds that should be put on deposit to pay required rental subsidy for social housing tenants and capital shortfalls on debt repayments (if any) for the term of the transaction. The Model assumes dwellings required to house social housing tenants are initially purchased from the proceeds of a bond issuance, and that as time goes on the proceeds of sales of the dwellings are used to repatriate the principal owed on the bonds and to provide for any operational shortfalls. In the event that the net sale value of the dwellings exceeds the bond principal outstanding the Model reduces the initial capital subsidy injection required, and makes up for any operating shortfall by short term borrowings such that the surplus from sale of dwellings versus bond principal repayments is exactly equal to the principal outstanding on the short term borrowings at the end of the transaction.

The Model uses Excel Goal Seek capacities to exactly calculate the initial contribution required such that at the end of the transaction all liabilities are discharged, and the accumulated cash

flow is zero. In addition to the debt funded option the Model also has the capacity to calculate subsidy costs of three other housing assistance options, Rent Assistance, Home Purchase Assistance, and On Budget Capital Funding of Public Housing.

Rent Assistance

Using the same method (without any bond funding and short term borrowing), the Model also automatically calculates the commencing amount of funds that should be put on deposit (and to earn interest prior to being drawn down) to pay the required rental subsidy for the same social housing tenants should they be renting dwellings in the private sector.

In this model all assumptions about costs and revenues are the same as in the debt funded option, however the Model simply computes as subsidy the difference between the required payment according to income and the payment that would be required if market rents are being charged. As in the debt option, it is assumed all tenants leave at (or by) the end of the transaction period.

Home Purchase Assistance

The home purchase assistance option presumes that home loans are provided to clients. These loans are funded from the proceeds of a bond issuance. The bond issuance has exactly the same characteristics as those that applied to the bond issuance in the debt option. The exception is that the total value of the bonds issued is less than that applying to the debt option by the extent of the borrowers initial purchase deposit (which is variable in the Model). It is assumed that the loans provided to the borrowers are 'straight line', i.e. constant repayment, credit foncier loans and that the difference between the borrowers' capacity to pay at the requisite percentage of income and the required loan repayment is subsidised until, or if, borrowers incomes can support a full unsubsidised repayment. The household income, dwelling value and related assumptions are the same as those applying in the other options (see subsequent dialog boxes).

Repayments of principal and prepayments are used to repurchase bonds issued whilst borrower interest payments plus subsidy meet the bond interest obligations. As with the debt option the home purchase option calculates the commencing amount of funds that should be put on deposit to pay loan subsidies, and bond interest or principal shortfalls (if any) for the term of the transaction. In the event that at transaction termination the sale of the dwellings from defaulting loans, or loan principal payments exceeds the bond principal outstanding the Model reduces the initial capital injection required, and makes up for any operating shortfall by short term borrowings such that the surplus from loan principal payments (and/or the sale of dwellings arising from defaulting loans) versus bond principal payments is exactly equal to the principal outstanding on the short term borrowings. Identically to the debt option, the Model exactly calculates the initial contribution required such that at the end of the transaction all liabilities are discharged and the accumulated cash flow is zero.

On Budget Capital Funding of Public Housing

The Model now also contains a further comparison with on budget capital funding of public housing. All of the tenant income, rates maintenance and administration cost, and dwelling value assumptions, etc. are always the same for the capital funding model as all other options.

The practical reality is that mainstream State Housing Authorities use grant funds to purchase dwellings, which are then occupied by public tenants. As existing public tenants leave new subsidised public tenants take their place. Consequently, the Model assumes the dwellings are purchased from grant funds, any shortfall/surplus in quarterly net rents after rebates is compensated by short term borrowings, and at the end of the quarter are either paid for from, or returned to, internal funds. There are no places for private tenants. Vacant dwellings are reoccupied by social housing tenants or sold.

At the end of the transaction all of the remaining dwellings are sold. If, as in some of the Debt Model cases, dwellings are assumed to be sold throughout the term, these assumptions carry through to the capital funding option.

Shared Equity

In the current simulations the analysis simply assumes a 50% share on the part of the housing authority and a 50% share on the part of the purchaser. All other assumptions are as per those applying to either the public housing or the home loan module. Subsidy results are therefore simply the mean of the outcome for public housing and home loans.

Model Operation

Within the module are 8 command buttons. These are:

- Housing Cost
- Financial.
- Housing Index.
- Tenant/Rent.
- Home Loan.
- TaxCom.
- Scenarios (the only input tables in the first module).
- Scenarios Choose.

and two reporting tables:

- Results (the main reporting table).
- Cash Flow (the second reporting table).

The Model requires users to estimate the 'real' interest rate currently applying and calculates the nominal interest rate from the two components of CPI and Real Interest Rates.

The Real Debt or Investment Rate is the difference between the assumed inflation rate and the nominal interest rate on borrowings/interest earnings.

The Model automatically calculates nominal debt and investment rates according to the formula $(1+n)*(1+i)-1$, where:

- **n** = the assumed real debt or investment rate.
- **i** = the Consumer Price Index (forecast) for Australia.

Users have a choice of debt instrument between floating, fixed and real rate instruments. Internalised within the Model are the Reserve Bank's formulas for calculating interest payments on the bonds (half yearly for nominal bonds, and quarterly for real rate bonds) and for calculating the bond price at any early redemption (i.e. before maturity). The formulas for calculating bond Prices can be further examined in the Reserve Bank's Press Release NO 24, 1992, titled 'Pricing of Government Securities'.

Housing Indexation

These indexation functions set down the real percentage by which the initial dwelling prices, maintenance and rates and administration costs increase or decrease each year.

If zero is inserted then dwelling prices increase by inflation and maintenance, rates and administration costs are maintained at the same percentage of dwelling value that is inserted in the transaction at the beginning. If a plus or minus percentage is included, the original cost or price is adjusted in the first year by the following formula.

- $(1+c)*(1+i)-1$, where:
- **c** = the Cost or Price Growth Rate.
- **i** = the Consumer Price Index (forecast) for Australia.

i.e. if inflation is say 2.5% and cost growth is 1% real then $100 becomes

- 100+{100* ((1+0.01)*(1+0.025)-1))} = 103.525
- or if real cost growth is –1%

- 100+{100* ((1-0.01)*(1+0.025)-1))} = 101.475.

The process is repeated for the second year and so on. Figures should be inserted as percentages. If CPI increases are assumed, zero is inserted in each of the three boxes.

The Model provides for up to three automatic and six manual economic scenarios to be tested.

These Scenario options will be modified to include scenarios generated by the probability analysis.

Results

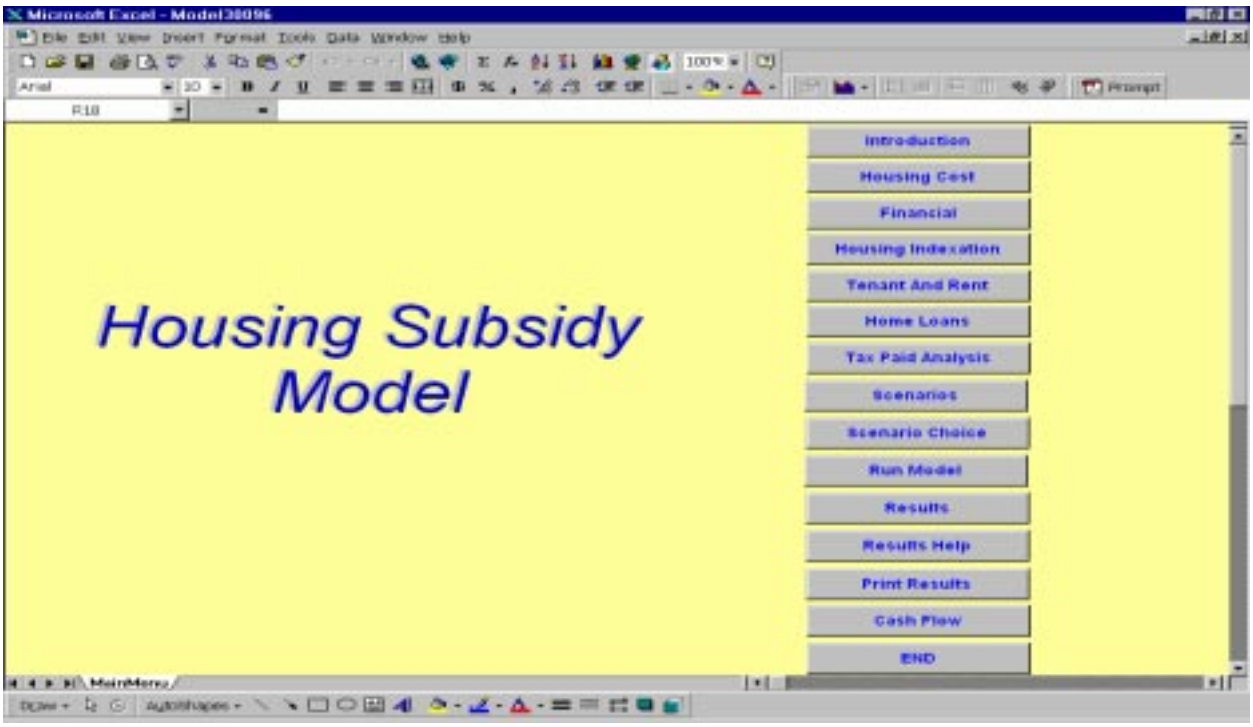
The results analysis sets out all of the details for the particular option and case and the quantified outcomes. These outcomes essentially comprise three components.

The outputs are:

- gross capital contribution required per $100M of dwelling acquisition;
- the present value subsidy per tenant year per $100M of dwelling acquisition; and
- net capital contribution after extra direct tax receipts per $100M of dwelling acquisition.

Diagram 1 sets out the model components.

Diagram 1: Model Components



3. Housing Cost Data

Public housing and home purchase cost information is required as necessary inputs for the starting day of the Model simulation.

In the Stage 4 Report for the Affordable Housing National Research Consortium data was obtained from all States on housing cost.

The housing cost variables (for which the definitions are set out in Attachment 1) are:

- initial average dwelling price;
- other purchasing expenses (the cost of legal and procurement costs);
- initial maintenance and rates costs (the operating cost of public housing minus interest expenses);
- initial administration costs (is the administration cost of public housing);
- other selling expenses (is the cost of legals and other disposal costs); and
- tenant vacancy rates.

South Australia, Victoria and NSW have been requested to provide relevant updated data but to date the information has not been received. Additional information is also required on home purchase origination and administration costs (excluding defaults and subsidies) and these are based on averages for typical State secondary mortgage operations.

However, the updated cost data is not critical to the analysis in that the primary purpose of the current research is to examine the impact on the subsidy outcomes for each of the different assistance options of the changes to the systematic risk variables over the full term of any transaction.

We have therefore used, for purposes of the analysis summarized in the next chapter, the definitions and housing cost data for NSW, Victoria and Queensland which were used in the Affordable Housing National Research Consortium's work and which are summarized below and in Attachments 1 and 3.

Table 1: Common Initial Assumptions

Assumptions And Inputs	Number
Initial Purchasing Expenses	1.2%
Final Selling Expenses	1.2%
Stamp Duty On Purchase To Account Of Transaction	None
Loan Origination Costs (% Of Initial Loan Principal)	0.35%
Loan Administration Costs (% Of Loan Principal Outstanding)	0.53%

Table 2: State Initial Housing Cost Inputs

Variable	New South Wales	Victoria	South Australia
Initial Dwelling Value 000's[1]	149.5	140.5	110.0
Operating Cost % p.a.[2]	1.5	0.7	1.9
Administration Cost % p.a.[2]	0.8	0.6	0.9
Vacancy Rate Public %[4]	0.31	1.06	2.59

Source: Tables 1-4, Attachment 3
1 Table 1 Attachment 3,
2 Table 2 Attachment 3,
3 Table 3 Attachment 3,
4 Table 4 Attachment 3,
5 Derived from Model.

4. Systematic Risk Data

As previously outlined the main systematic risk data are:

- Consumer Price Index (CPI);
- Real income growth rates i.e. real percentage changes in Average Weekly Ordinary Time Earnings (All Persons) (AWOE); and
- Debt borrowing rates, i.e. Commonwealth Bond Rates;
- Real dwelling price growth;
- Rental yields; and
- Real cost growth.

Definitions and sources of the systematic risk data are outlined in Attachment 4.

Tables setting out the systematic risk variables (absolute numbers and real percentage change per annum, except for rental yields) are set out in Attachment 5.

Tenant relocation and dwelling disposal rates are independent of this analysis, remain the same in all cases and are derived from the earlier housing cost data.

5. Preparation of Data for Simulations

The probability analysis generates a 100 simulations for each metropolitan area of the requisite risk data for inputting into the Model. Hence, the study encompasses 300 simulations, in total.

The production of the simulations has been achieved by the use of a software program called @RISK, Version 3.5.2, which produces automatic simulations from the actual data inputted in an EXCEL spreadsheet.

Because it is important to ensure the simulations replicate the characteristics, range boundaries and relationships inherent in the past data, @RISK requires users to specify two main conditions before running:

- the type of frequency distribution exhibited by the actual past data; and
- any correlations or inverse correlations between the different actual past data series, i.e. between, say CPI and AWE, and the correlation value that applies, i.e. say 0.4. or 0.5 etc.

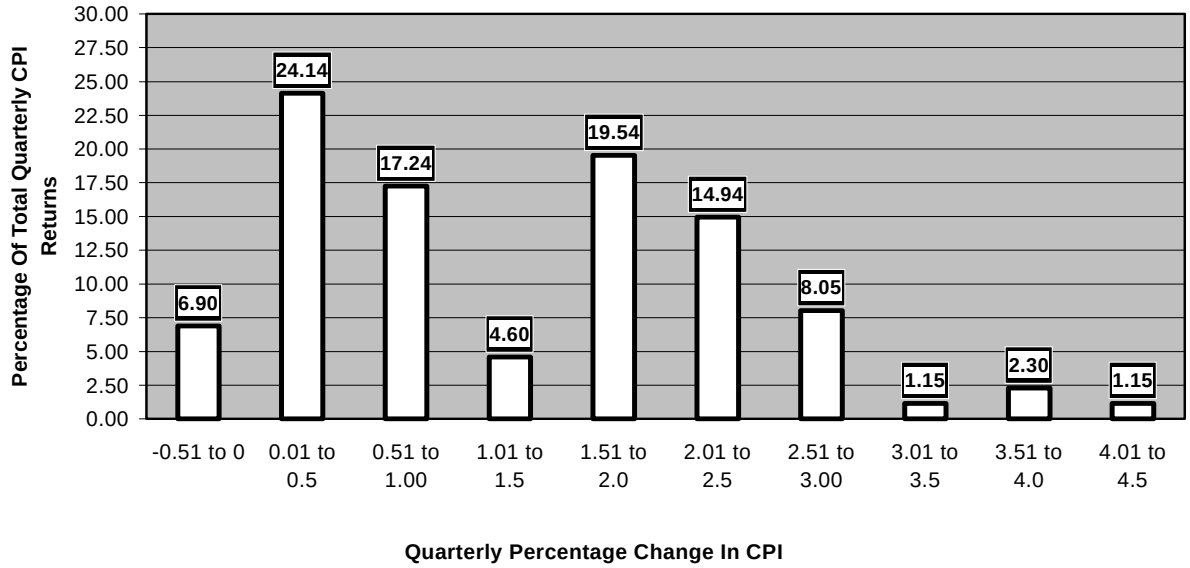
6. Frequency Analysis

The frequency of a data score is simply the number of times a particular score appears in a data set. For example, the real percentage change in house prices may score –0.5%, 20 times. This is the frequency of that data value. The frequency distribution of a data series is simply the number of times a data score occurs at each value in the distribution. A frequency distribution is formed by calculating the range of data i.e. say –12.0% to +18%, constructing identical interval sets, i.e. 3% will give 10 intervals, and plotting the number of times a data score occurs at each interval. Now a 'normal' distribution produces a bell shaped graph, that is the greatest number of scores occurs at the mid point (mode) in the data range. However, distributions can vary substantially from the 'normal' and be distributed or 'skewed' towards one or other end of the range, or it might be binomial i.e. there are two points in the range where very high incidences of data scores occur.

Graph 1 sets out the frequency distribution for the CPI for Sydney.

GRAPH 1.

SYDNEY: DISTRIBUTION OF QUARTERLY CHANGE IN CPI's: 1982 - 2001



Source: Australian Bureau Of Statistics: 6401.0 Consumer Price Index : Table 1b, All Groups Index Numbers (quarter) (a)

It is clear that CPI in Sydney does not have a 'normal' distribution but is closer to a binomial distribution. These distributional characteristics for each data set are incorporated in the Simulation Modeling of systematic risk variables.

Attachment 6 contains a complete set of graphs of the frequency distributions for all systematic risk data series for Adelaide, Melbourne and Sydney.

When one examines this data it provides a clue that the likely results of the subsidy analysis will be very different in the three metropolitan areas, because the distributions for particular risk variables are unique to that city. For example, with CPI, Adelaide's distribution is slightly

skewed towards the lower values, whilst Melbourne's distribution is much more evenly distributed. In the case of Sydney, there is almost a classic binomial distribution.

Similarly, the distributions for Average Weekly Ordinary Time Earnings, Established Dwelling Prices and Median Rental Yields are also very different for each of the selected metropolitan areas.

7. Correlations

> The Pearson Product-Moment Correlation Coefficient (r), or correlation coefficient for short is a measure of the degree of linear relationship between two variables, usually labeled X and Y. While in regression the emphasis is on predicting one variable from the other, in correlation the emphasis is on the degree to which a linear model may describe the relationship between two variables. In regression the interest is directional, one variable is predicted and the other is the predictor; in correlation the interest is non-directional, the relationship is the critical aspect.
> The correlation coefficient may take on any value between plus and minus one. The sign of the correlation coefficient (+ , -) defines the direction of the relationship, either positive or negative. A positive correlation coefficient means that as the value of one variable increases, the value of the other variable increases; as one decreases the other decreases. A negative correlation coefficient indicates that as one variable increases, the other decreases, and vice-versa.
>
> Taking the absolute value of the correlation coefficient measures the strength of the relationship. A correlation coefficient of r=.50 indicates a stronger degree of linear relationship than one of r=.40. Likewise a correlation coefficient of r=-.50 shows a greater degree of relationship than one of r=-.40.
>
> It is possible for two variables to be related (correlated), but not have one variable cause another (Stockburger, 1996).

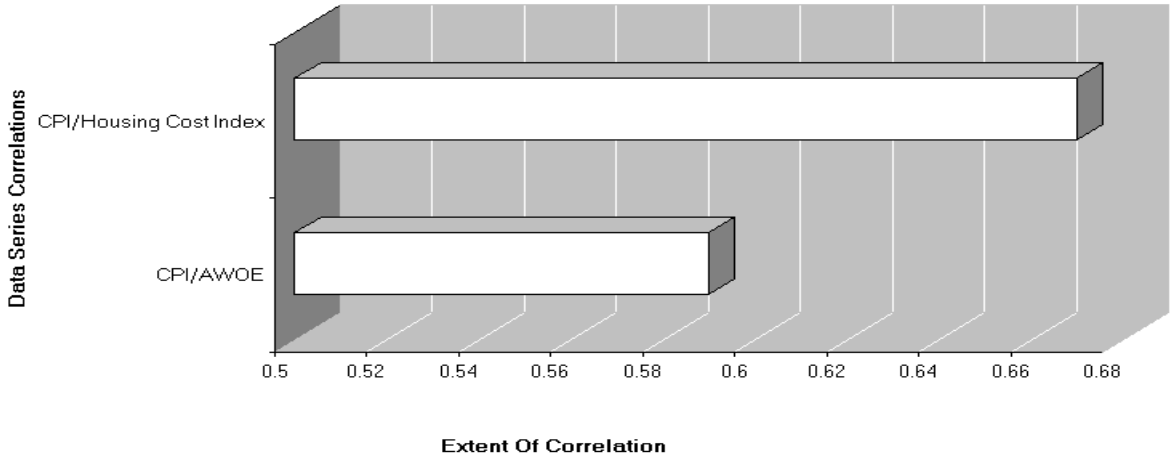
It is likely that there are relationships between systematic risk variables which need to be replicated in the simulations. For example, common sense would suggest that if the percentage growth of dwelling prices is very high and very rapid, rental yields will fall and an inverse correlation will occur. However, if the extent and pace of any increase in dwelling prices is more muted, then rents may adjust and yields might be maintained.

Therefore an analysis of the possible correlation of every data series with every other data series has been conducted. Formal statistical analysis suggests that any correlation of 0.5 or above signifies a potentially significant relationship, so it is necessary to isolate those positive or negative correlations at or above 0.5.

Graphs 2, 3 and 4 set out the statistically significant correlations between systematic risk variables that have been identified for Adelaide, Melbourne and Sydney.

GRAPH 2

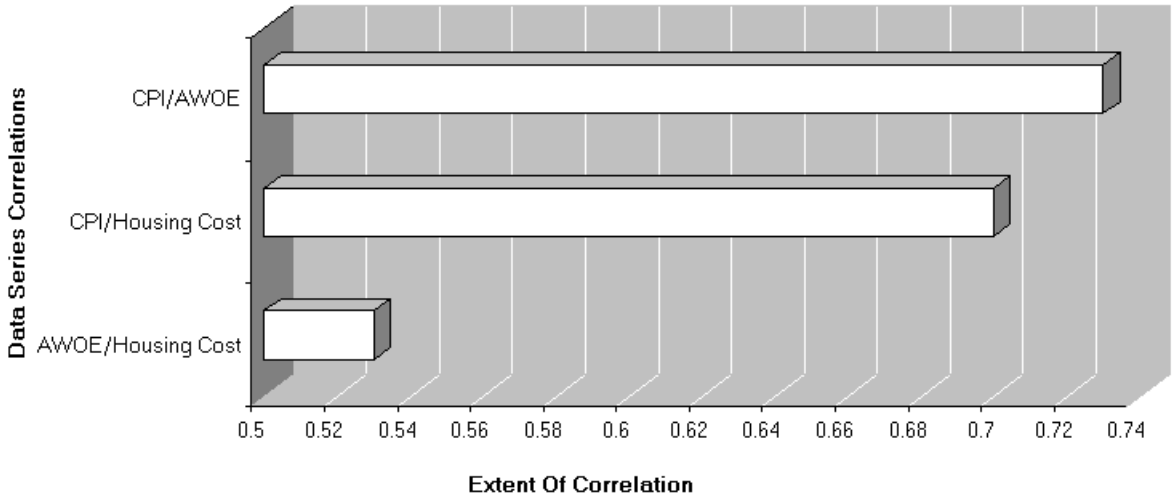
ADELAIDE: ANNUALISED QUARTERLY PERCENTAGE CHANGE: CORRELATIONS BETWEEN SYSTEMIC RISK VARIABLES 1980-2001



Source: Derived From Risk Data Tables Contained In Attachment 5

GRAPH 3

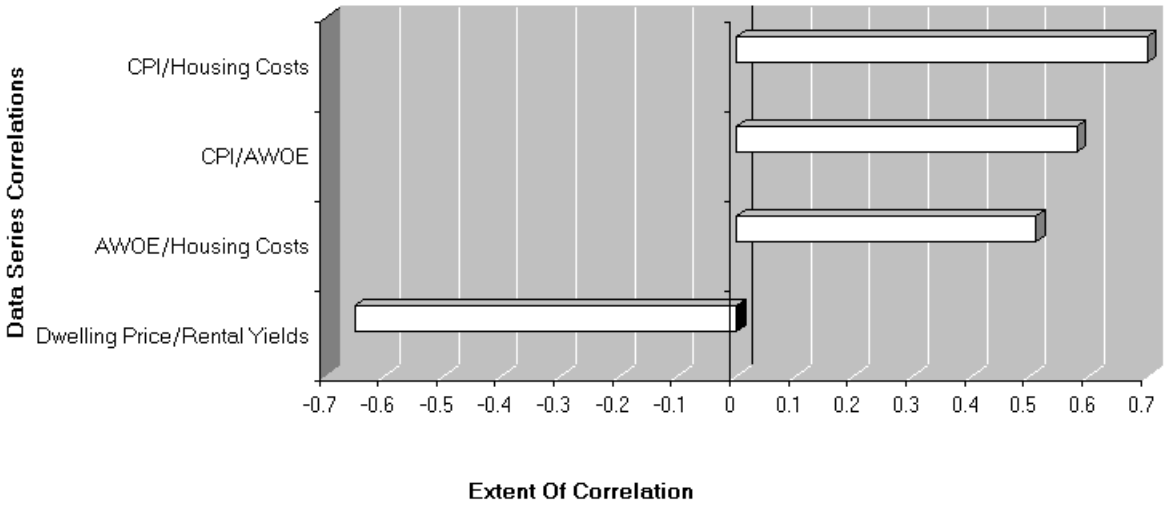
MELBOURNE: ANNUALISED QUARTERLY PERCENTAGE CHANGE: CORRELATIONS BETWEEN SYSTEMIC RISK VARIABLES: 1980-2001:



Source: Derived From Risk Data Tables Contained In Attachment 5

GRAPH 4:

SYDNEY: ANNUALISED QUARTERLY PERCENTAGE CHANGE: CORRELATIONS BETWEEN SYSTEMIC RISK VARIABLES: 1980-2001



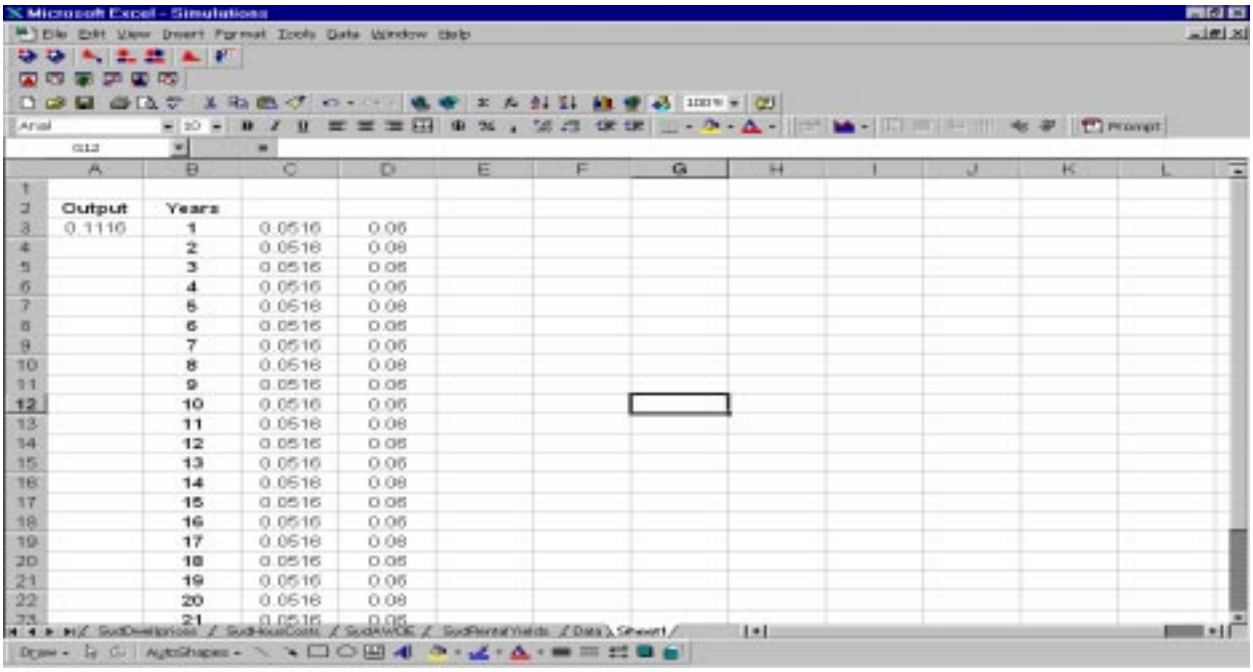
Source: Derived From Risk Data Tables Contained In Attachment 5

These correlations have been entered into the simulation process for the @RISK modeling.

8. Carrying Out the Simulations

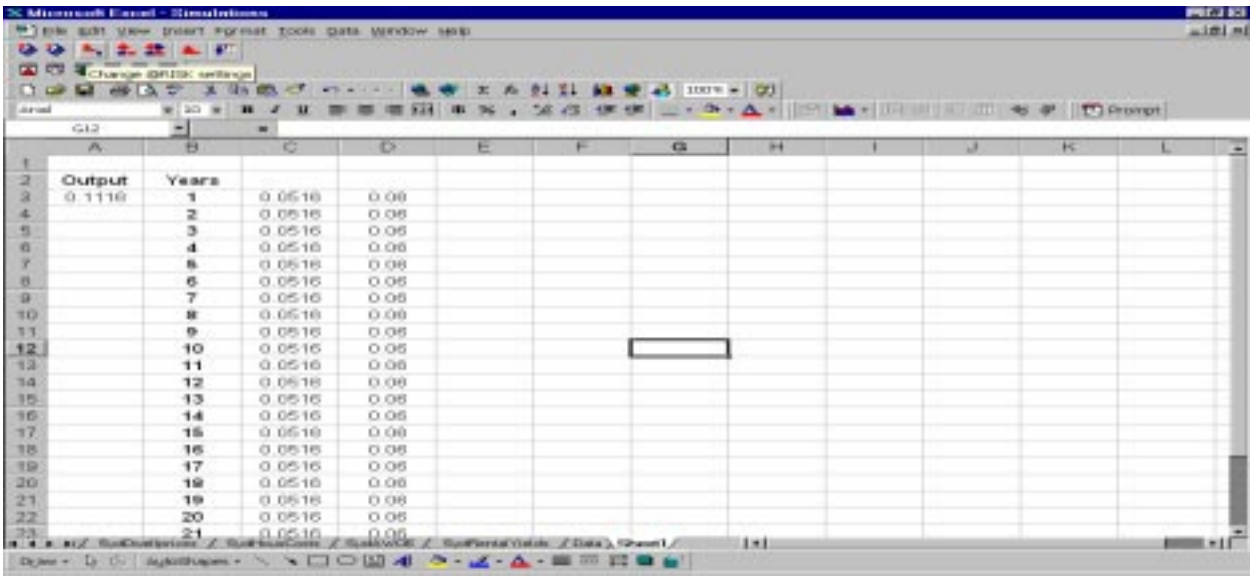
The first step in carrying out the simulations is to set the various requirements in the @RISK add in to Excel boxes. Diagram 2 below shows how the Excel screen looks with @RISK installed.

Diagram 2: The @RISK Screen



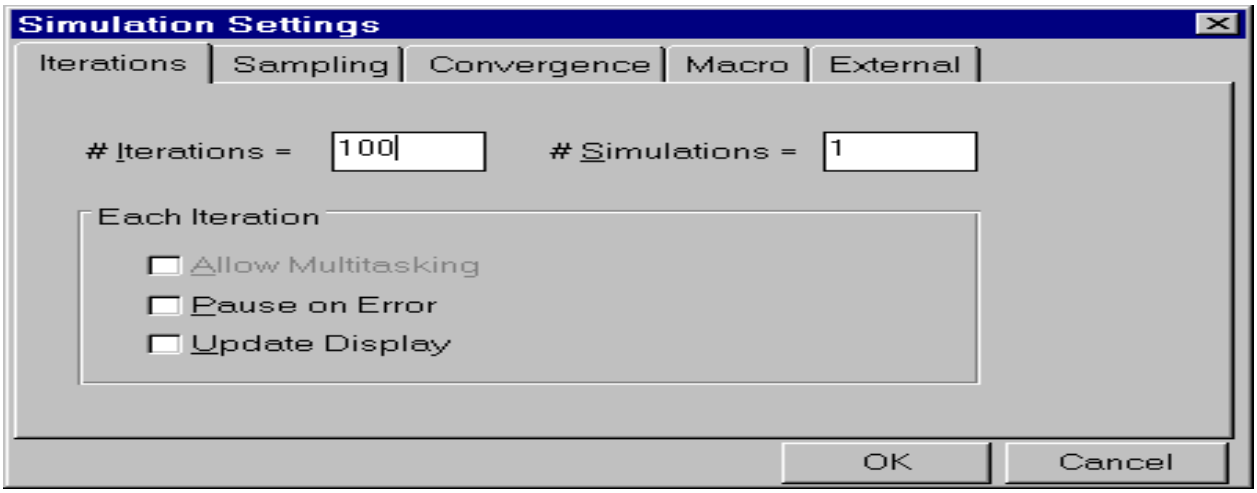
The first step is to click on the *"Change @RISK settings"* menu button which is the third red button in the top @RISK menu bar. This is set out in Diagram 3 below.

Diagram 3: The Change Settings Button



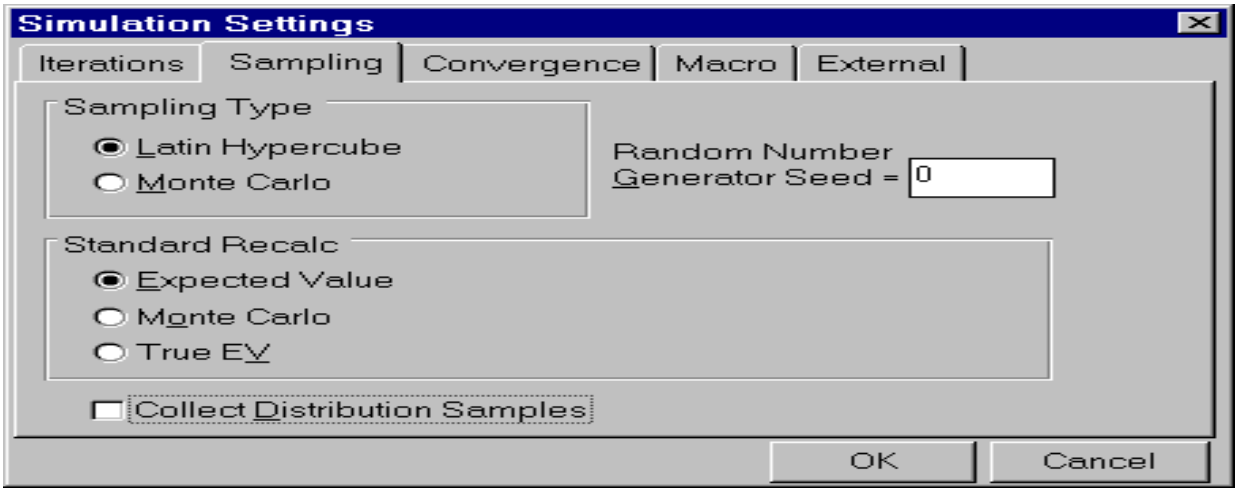
The next step is to open the *"Iterations"* Menu in the Settings Box and set the number of iterations which is required to be simulated (in this case 100). Diagram 4 sets out the procedure.

Diagram 4: Setting Iterations



Next the *"Sampling"* menu bar is selected and either Monte Carlo of Latin Hypercube sampling method is chosen (Latin Hypercube providing a 'smoother' distribution). Diagram 5 sets out the procedure.

Diagram 5: Sampling Characteristics

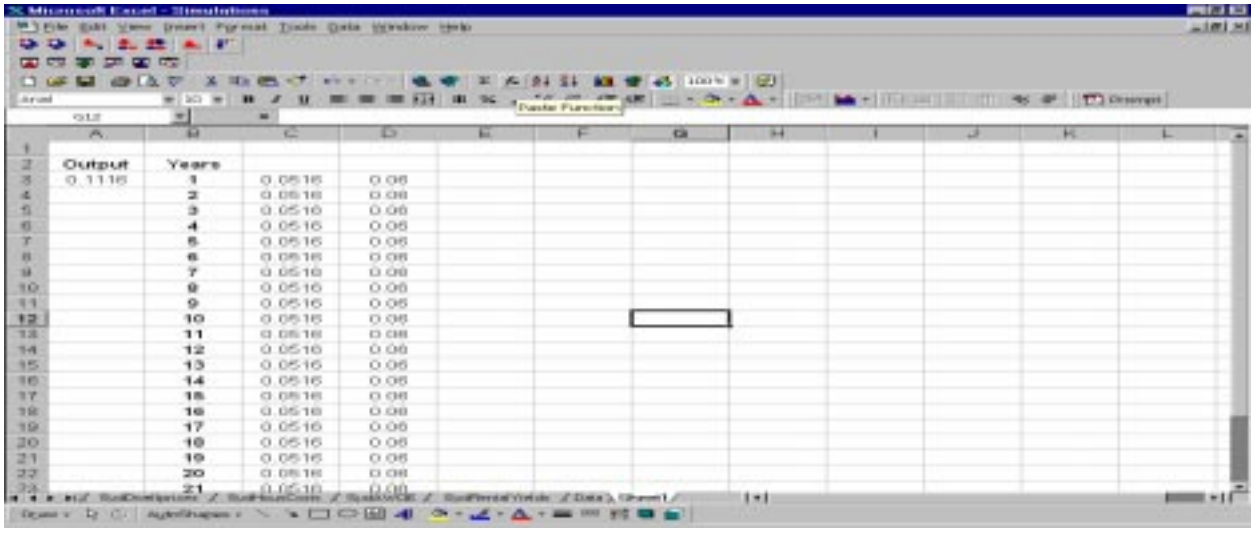


The next three menu bars in the Settings box are optional and are only required if special simulations are being conducted.

After finalising the Simulation settings we established the Minimum, Most Likely, (i.e. most frequently occurring), Mean and Maximum Values for the 18 data series for Adelaide, Melbourne, and Sydney (6 in each) to be simulated.

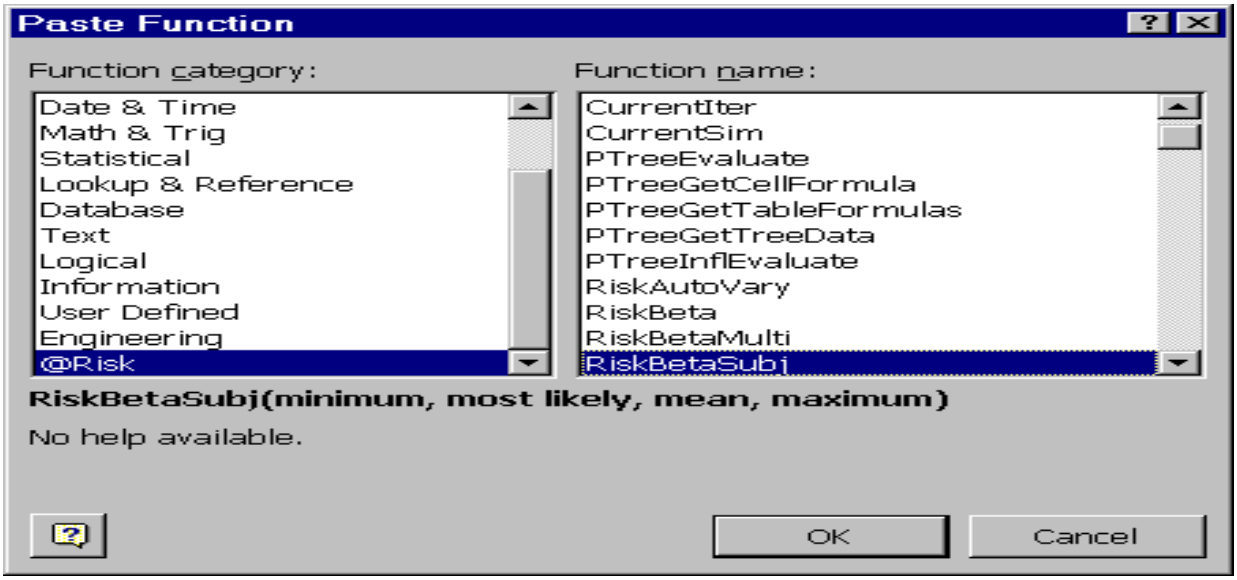
Next we click on the “Function” (*fx),* button in Excel;

Diagram 6: Function Button



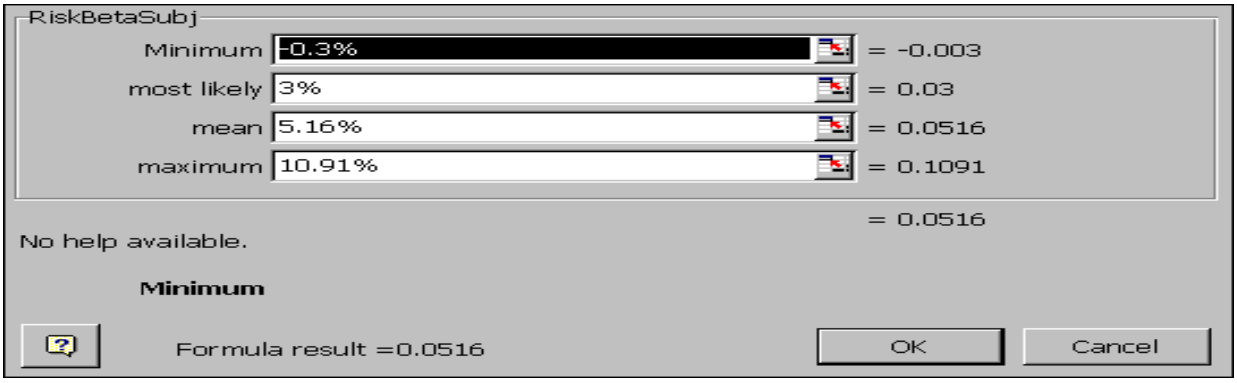
For each data series we select the risk frequency distribution formula which best replicates the frequency distribution for the data series being simulated. Diagram 7 shows the risk function being selected.

Diagram 7: Risk Frequency Formula Selection



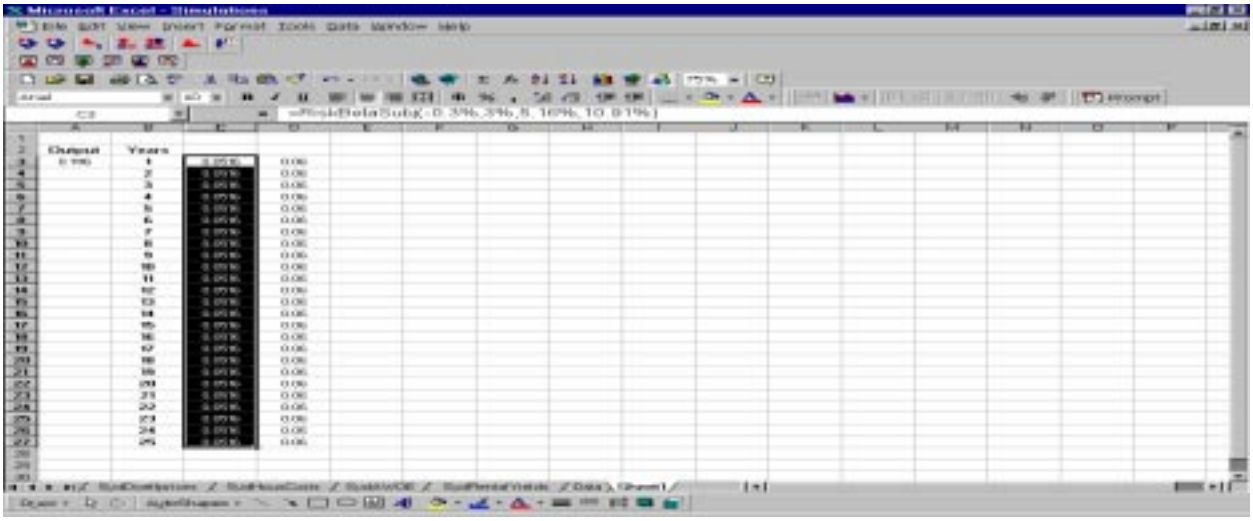
Next we insert the appropriate values in the frequency distribution formula dialog box.

Diagram 8: Risk Frequency Formula Dialog Box



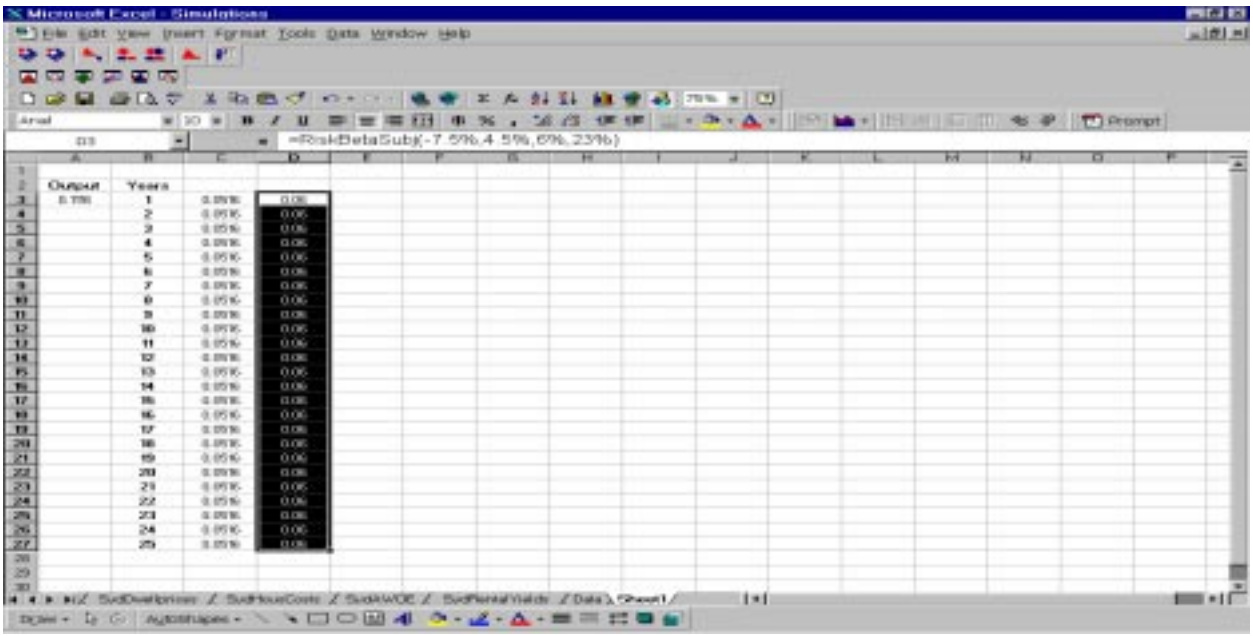
Then we copy the formula down the spreadsheet for the number of data points (periods) for which we wish to simulate.

Diagram 9: Period Simulation



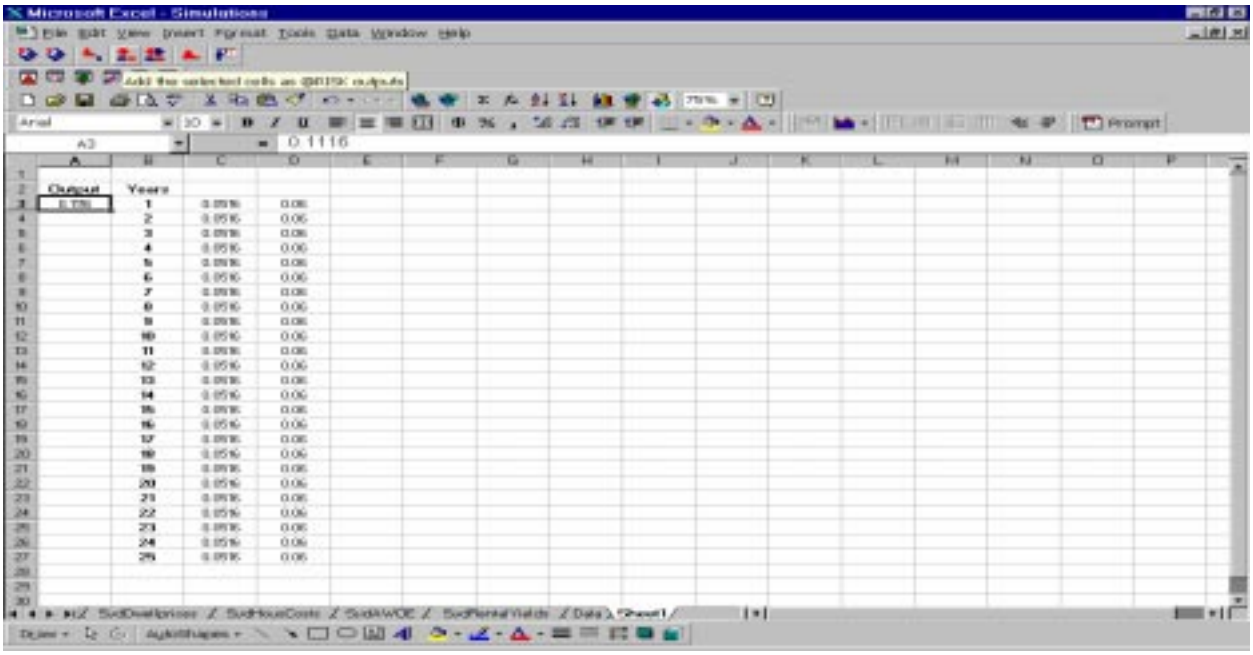
This process is replicated in the next column for any data series with which the first is correlated.

Diagram 10: Correlated Series



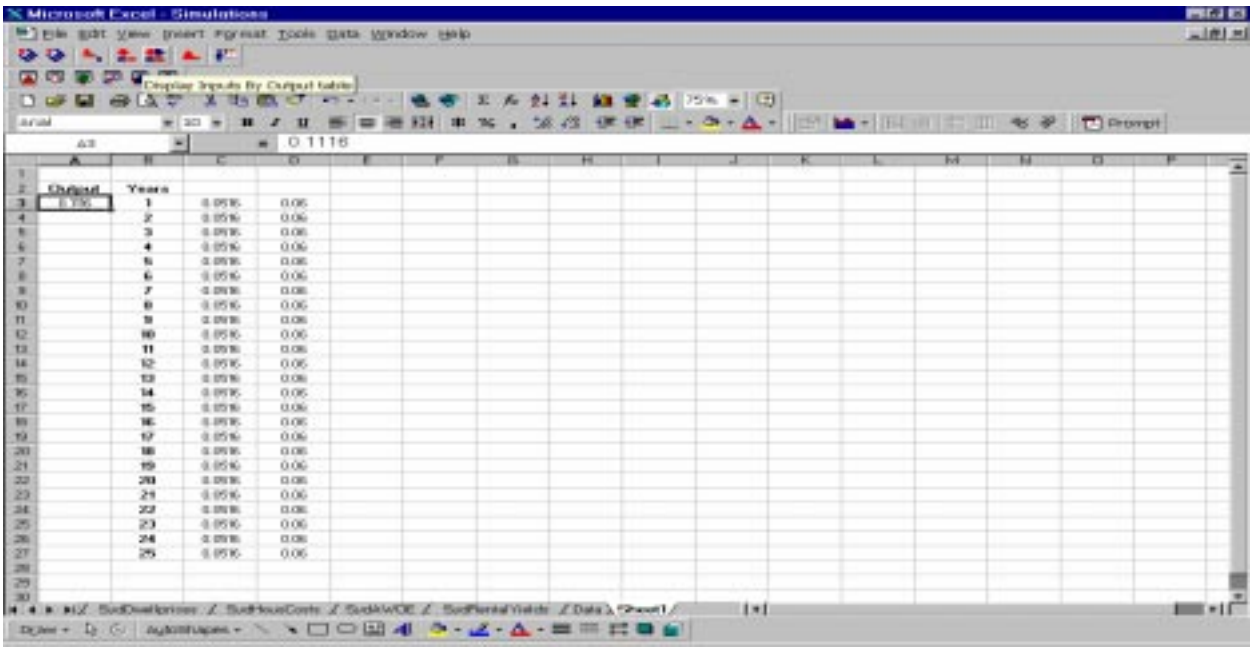
The @RISK process only requires three more steps before being run. We established an output Cell and insert any value at all. We then selected the *"Add the selected cells as @RISK outputs"* button and click on it, Diagram 11 shows the procedure.

Diagram 11: Selecting The Outputs Procedure



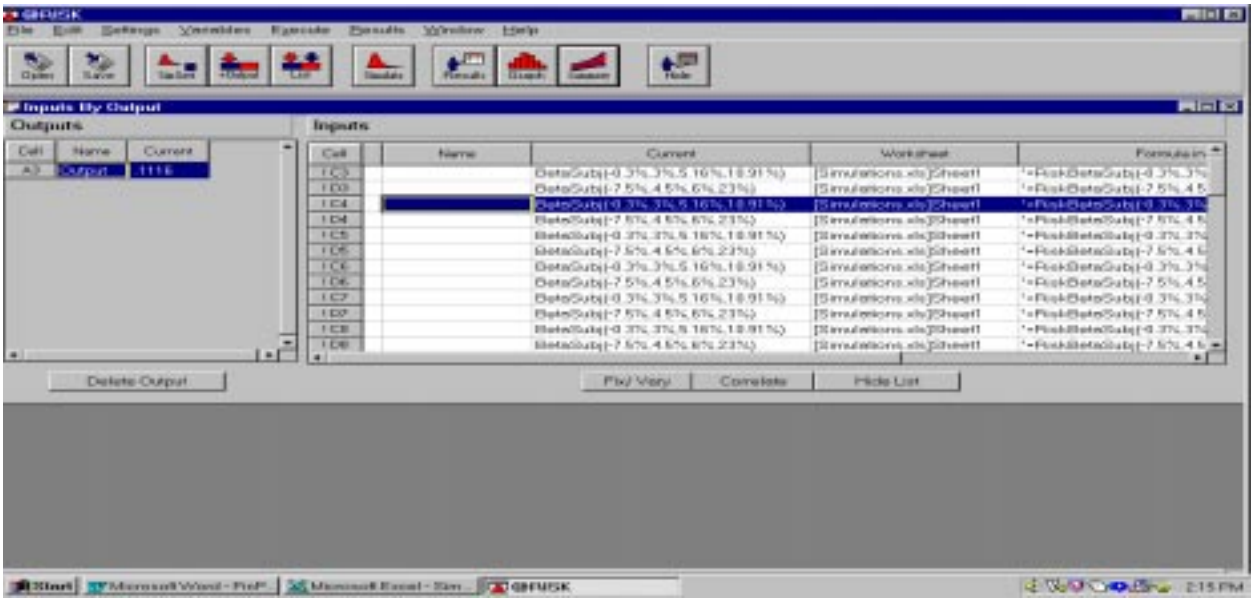
Then we selected the "*Display Input By Outputs Table"* button in the @RISK menu bar. Diagram 12 sets out the procedure.

Diagram 12: Selecting The Input Outputs Table



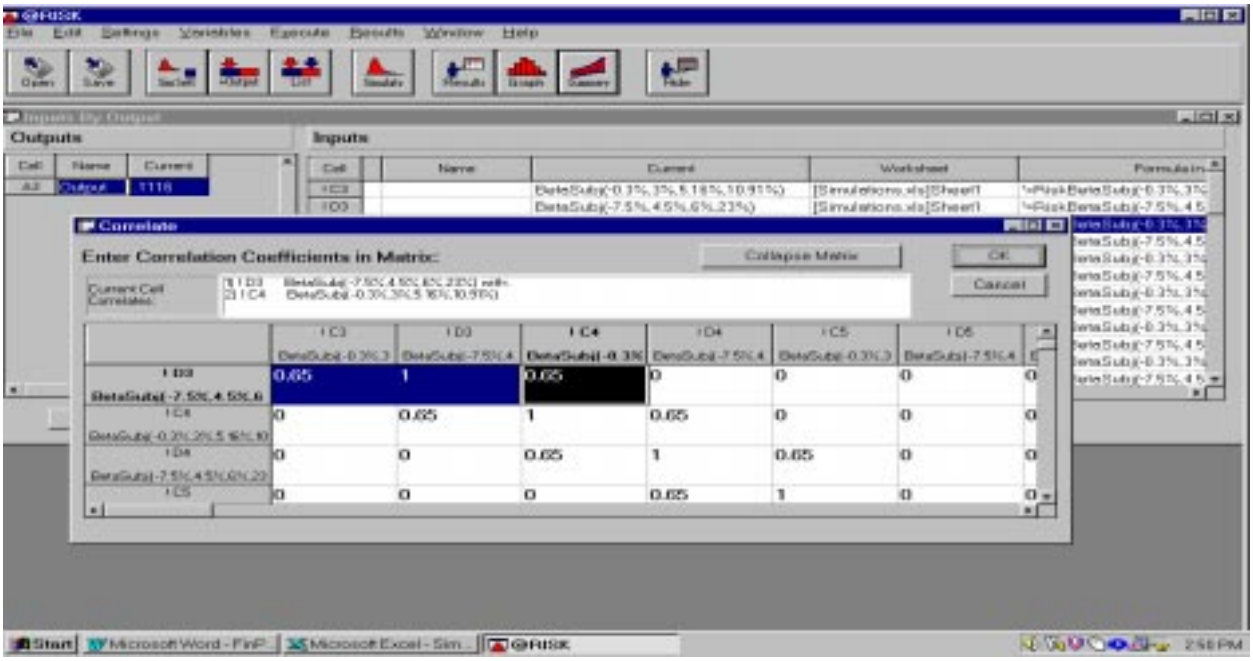
This will display the Inputs By Outputs Table shown below.

Diagram 13: Input Outputs Table



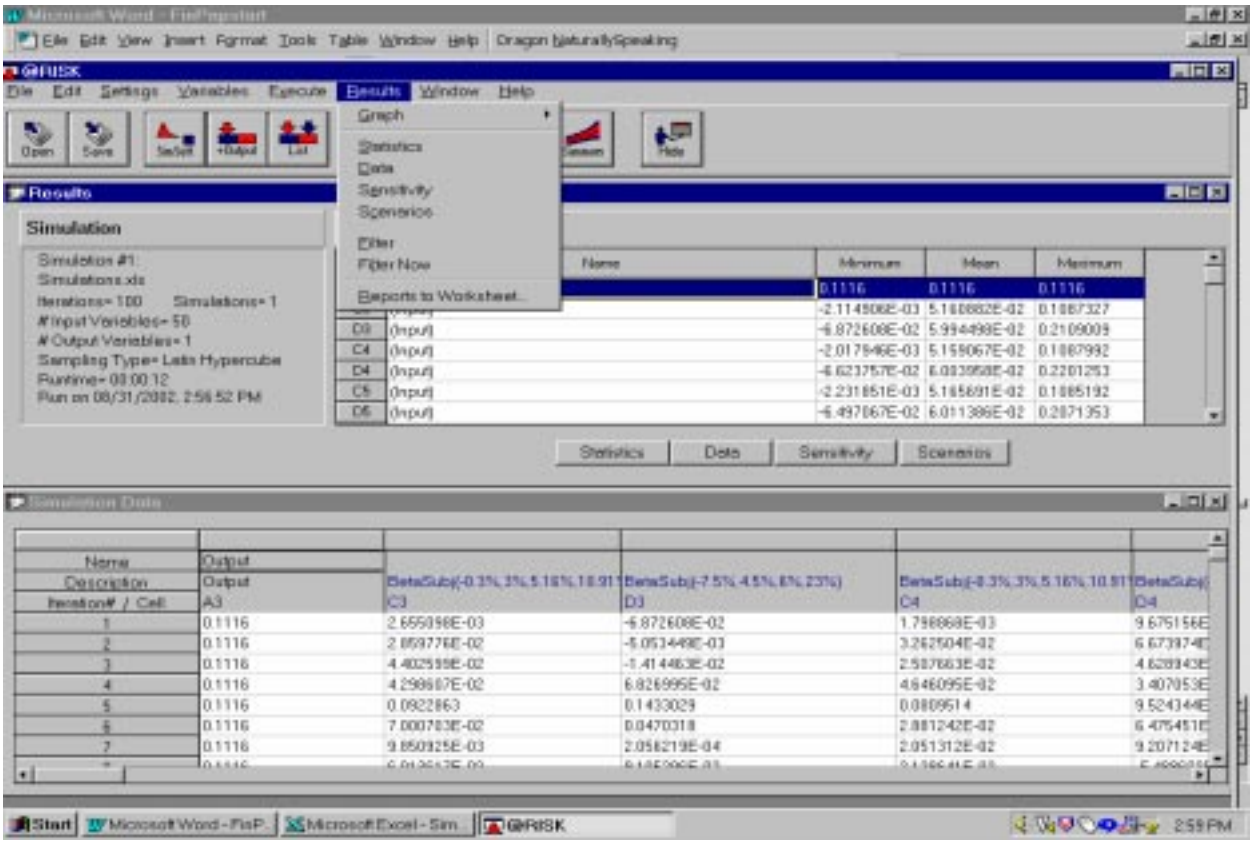
Finally, for those data series which are correlated we click on the *"Correlate"* button and enter the correct correlation in the relevant cells in the matrix table. Diagram 14 sets out the process.

Diagram 14: Correlations



At this point we run the simulations. This is done by clicking on the *"Simulate"* button on the Input Output Table Menu Bar. Next we copy the output to a spreadsheet ready for insertion in the Model. This is done by clicking on the *"Results"* button on the Menu Bar and then clicking on the "*Reports to Worksheet"* drop down menu. Diagram 15 shows the procedure.

Diagram 15: Getting The Results



This will generate the *"Reports To Worksheet" Dialog Box".* We then click on *"Data"* and the simulation results are copied to the worksheet ready for copying into the Cash Flow Model. Diagram 16 shows the procedure.

Diagram 16: Copying To Worksheets

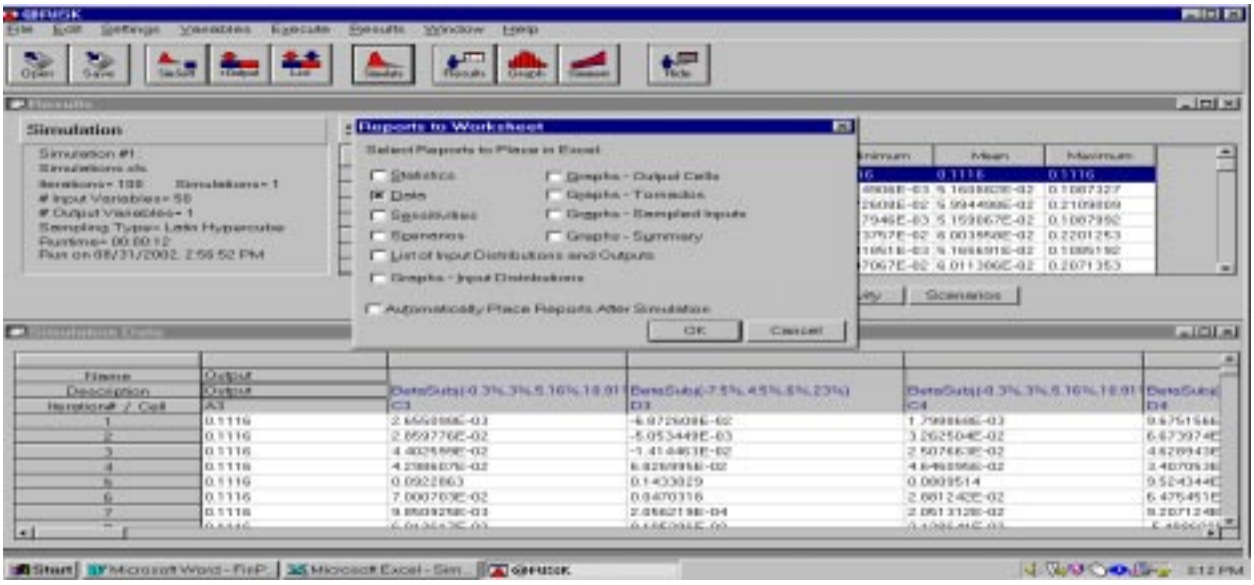
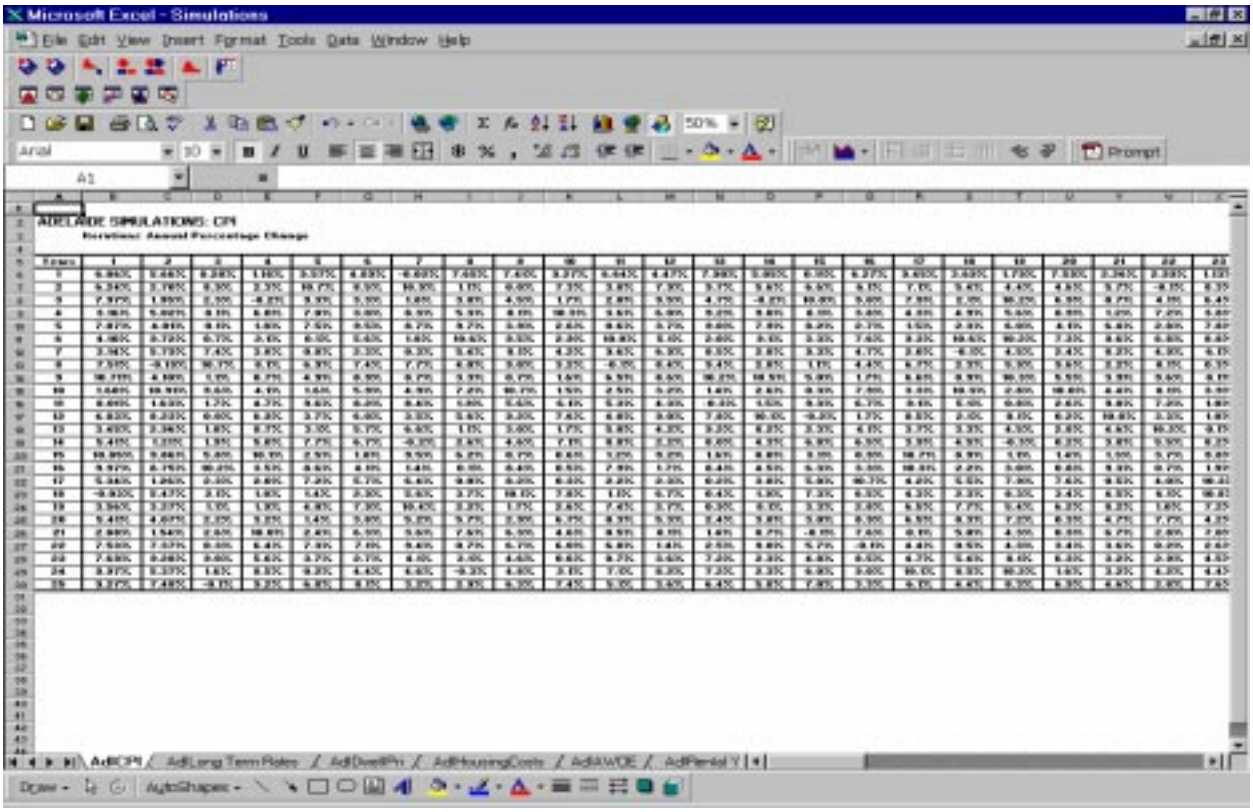


Diagram 17 sets out the finished simulation for CPI for Adelaide.

Diagram 17: Finished Simulations



This process is repeated for each of the eighteen data series applying and the detailed 1,800 iterations are set out in the excel file 'simulations.xls' attached to this report.

Diagram 18 below sets out the systematic risk variable (or "scenario") input component of the Cash Flow Model.

Diagram 18: Risk Variables In The Model

	A	B	C	D	E	F	G	H	I	J	K	L	M
20	Year	CPI	RIR	NIR	Dis Rate	RDP	RMR	RA	RTI	GPR	Term	TRR	DDR
21	1	2.57%	3.65%	6.31%	6.31%					6.25%	20		
22	2	2.57%	3.65%	6.31%	6.31%					6.25%	20		
23	3	2.57%	3.65%	6.31%	6.31%					6.25%	20		
24	4	2.57%	3.65%	6.31%	6.31%					6.25%	20		
25	5	2.57%	3.65%	6.31%	6.31%					6.25%	20		
26	6	2.57%	3.65%	6.31%	6.31%					6.25%	20		
27	7	2.57%	3.65%	6.31%	6.31%					6.25%	20		
28	8	2.57%	3.65%	6.31%	6.31%					6.25%	20		
29	9	2.57%	3.65%	6.31%	6.31%					6.25%	20		
30	10	2.57%	3.65%	6.31%	6.31%					6.25%	20		
31	11	2.57%	3.65%	6.31%	6.31%					6.25%	20	5.00%	5.00%
32	12	2.57%	3.65%	6.31%	6.31%					6.25%	20	5.00%	5.00%
33	13	2.57%	3.65%	6.31%	6.31%					6.25%	20	5.00%	5.00%
34	14	2.57%	3.65%	6.31%	6.31%					6.25%	20	5.00%	5.00%
35	15	2.57%	3.65%	6.31%	6.31%					6.25%	20	5.00%	5.00%
36	16	2.57%	3.65%	6.31%	6.31%					6.25%	20	5.00%	5.00%
37	17	2.57%	3.65%	6.31%	6.31%					6.25%	20	5.00%	5.00%
38	18	2.57%	3.65%	6.31%	6.31%					6.25%	20	5.00%	5.00%
39	19	2.57%	3.65%	6.31%	6.31%					6.25%	20	5.00%	5.00%
40	20	2.57%	3.65%	6.31%	6.31%					6.25%	20	5.00%	5.00%
41	21												
42	22												
43	23												
44	24												
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56	36												
57	37												
58	38												
59	39												
60	40												

The systematic risk variables and the columns to which they relate are:

- CPI (Column B);
- Real Income Growth (Column I);
- Real Interest Rates {Column C = [(1 + Bond Rate) Divided By (1+ CPI)] –1};
- Nominal Interest Rates (Column D -Commonwealth Bond Rates plus any margin);
- Real Dwelling Prices (Column F);
- Rental Yields (Column J); and
- Real Cost Growth (Columns G and H).

Each iteration for each risk variable for each city is entered into the cash flow Model to generate 100 scenarios (i.e. iteration 1 for each series is entered into the table above). This process is repeated 100 times for each city and then the results of a mixed strategy (i.e. 25% of each option added together); and the best two assistance options (50% of the best two added together); compared with a single option and the current Commonwealth funding mix (see Table 9, below). To the extent that the polycentric option is more efficient than the monocentric or current Commonwealth funding mix in a statistically significant number of cases, then the efficiency argument is proven. The average difference in the total number of better cases will be the extent of the efficiency gain so achieved.

9. Assumption Issues and The Standard Case

The Standard Case

Notwithstanding the use of appropriate data it will still be necessary to make a series of assumptions which, in order to ensure option neutrality, are common to all options tested. These common assumptions are:

- the systematic risk in the future is the same as that which applied to the past;
- defaults apply to all options at the vacancy rate provided for public housing;

- the commencing dwelling value is that provided by all States for public housing average costs;
- prepayments are the same in every case;
- the maximum payment of the client including maintenance and rates expenditure is 25% of gross income p.a;
- the term of the standard case transaction is 25 years;
- 4% of the tenants/purchasers leave and 4% of the dwellings are sold (where relevant), at the same rate every year until the end of the transaction.

Specific Assumptions

The assumptions that must be specific are:

For the home loan option the margin for loan origination is set at 0.35% of the original loan principal (once off) and for management costs, at 0.53% pa recurring of the principal outstanding. This cost is added to the real interest rate assessed for the borrower and is expected to be fully recovered. This is the average cost over a period of years derived from the Annual Reports of Homestart (South Australian Government Home Lending Authority), the Department of Human Services, Victoria and the Home Purchase Assistance Authority of New South Wales.

Variations to Be Tested

For each capital city the mean, first, and third quartile cases arising out of the simulations has also been tested for:

- 15 and 35 years;
- household incomes of
  - $15,000 per annum; and
  - $35,000 per annum.

ATTACHMENT 3 HOUSING COST: DATA SOURCES

Table 1: Dwelling Prices: $000's December 2000

Variable	NSW	Vic.	Q'ld	W.A.	S.A.	Tas.	ACT	N.T.
Construction Cost	91	109	100	104	79	89	140	151
Purchasing Cost	171	125	133	103	125	117	104	117
Mean/Median	131	117	117	104	102	103	122	134
Indexed Value	149.5	140.5	118.7	111.9	110.0	112.0	141.6	146.7

PRODUCTIVITY COMMISSION, 2000, *Report On Government Services*, Table 15.4 Page 1390
REAL ESTATE INSTITUTE OF AUSTRALIA, 2000, *Market Facts, December 2000,*Table 3, Page 4

Table 2: Operating And Administration Cost Percentages.

Variable	NSW	Vic.	Q'ld	W.A.	S.A.	Tas.	ACT	N.T.
Market Val. Public Housing: $M's	12,976	5,374	4,005	2,452	3,063	695	1,207	785
Total Pub. Housing Dwellings: 000's	123.3	64.5	48.5	31.3	51.4	12.9	11.2	7.0
Av. Dwell. Val. $000's	105.2	83.2	82.5	78.2	59.6	53.8	108.1	112.4
Operating Costs Per Dwelling, Inclusive	2,664	1,956	2,558	2,685	2,991	3,326	3,347	6,472
Int. Cost $M's	68.6	67.5	13.3	67.8	53.4	15.9	6.60	39.52
Disposals Cost $M's	2.03		2.80					
Operating Costs - Interest & Disposals	2,091	911	2,226	523	1,951	2,092	2,756	814
Administration Costs Per Dwelling	1,054	749	845	834	912	1,492	944	389
Operating Costs % Of 1999 Dwelling Value	2.0	1.1	2.7	0.7	3.3	3.9	2.5	0.7
Administration Costs % Of 1999 Dwelling Value	1.0	0.9	1.0	1.1	1.5	2.8	0.9	0.3
2000 Dwelling Value	149.5	140.5	119.0	111.9	110.0	112.0	141.6	146.7
Operating Costs % Of Dec. 2000 Dwell. Val.	1.5	0.7	2.0	0.5	1.9	2.0	2.1	0.6
Administration Costs % Of Dec 2000 Dwell. Val.	0.8	0.6	0.8	0.8	0.9	1.4	0.7	0.3

Source: PRODUCTIVITY COMMISSION, 2000, *Report On Government Services*, Housing Attachment, Table 15A.2 Page 1421
PRODUCTIVITY COMMISSION, 2000, *Report On Government Services,* Table 15.5 Page 1392
PRODUCTIVITY COMMISSION, 2000, *Report On Government Services*, Table 15.4 Page 1390
REAL ESTATE INSTITUTE OF AUSTRALIA, 2000, *Market Facts, December 2000,*Table 3, Page 4
DEPARTMENTS OF HOUSING ALL STATES, 1999/2000 Annual Reports & Unpublished data.

Table 3: Private Market Rental Yields And Vacancy Rates: December 20000

Variable	NSW	Vic.	Q'ld	W.A.	S.A.	Tas.	ACT	N.T.
Median Dwelling Prices: $000's	305.0	270.0	145.0	137.0	158.2	187.0	115.0	179.8
Median Rents: $000's p.a.	16.38	12.39	10.05	9.62	8.00	11.31	8.15	12.50
Median Rental Yields: %	5.37	4.59	6.93	7.02	5.06	6.05	7.08	6.94
Vacancy Rates: %	2.80	3.50	2.50	3.20	3.80	2.40	2.30	7.00

Source: REAL ESTATE INSTITUTE OF AUSTRALIA, 2000, *Market Facts, December 2000*, Pages 9-25

Table 4: Public Tenant Vacancy And Relocation Rates. 1999-2000

Variable	NSW	Vic.	Q'ld	W.A.	S.A.	Tas.	ACT	N.T.
Total Public Dwellings; 000's	127.5	66.0	50.6	32.7	53.5	13.4	11.7	7.4
Occupied & Untenantable Dwellings: 000's	127.1	65.3	50.3	32.4	52.1	13.2	11.6	7.4
Effective Vacancy Rate %	*0.31*	*1.06*	*0.65*	*0.91*	*2.60*	*1.60*	*0.68*	*0.38*
Households Transfering: 000's	5.628	2.242	1.713	1.776	1.043	0.363	0.357	0.305
Tenant Relocation Rate %	*4.41*	*3.40*	*3.38*	*5.43*	*1.95*	*2.71*	*3.04*	*4.09*

Source: PRODUCTIVITY COMMISSION OF AUSTRALIA, 2001, *Report On Government Services 2001*, Attachment 16A, Table 16A.1

ATTACHMENT 4 DATA DEFINITIONS: SYSTEMATIC RISK DATA

"Commencing Nominal Long Term Interest Rates"

Is the interest rate used for the fixed rate bond and home loan bonds as derived from the Reserve Bank Of Australia Bulletin (F) F Group Financial Markets Monthly Series 1983- December 2001 and then derived from the Latin Hypercube simulation of this series.

"Fixed Interest Rate"

Is the coupon applying to 10 year Commonwealth Fixed Rate Bonds as specified in the Reserve Bank Of Australia Bulletin (F) F Group Financial Markets Monthly Series 1983- December 2001 and then derived from the Latin Hypercube simulation of this series, and is the same as the first period number in the Commencing Nominal Long Term Interest Rates.

"Home Loan Interest Rate"

Is the interest rate used for the fixed rate bond and home loan bonds, as derived from the Reserve Bank Of Australia Bulletin (F) F Group Financial Markets Monthly Series 1983- December 2001 plus the annual percentage of mortgage principal outstanding attributed to mortgage administration costs and then derived from the Latin Hypercube simulation of this series.

"Short Term Interest Rate"

is the interest rate applying to ninety day bank bills as specified in the Reserve Bank Of Australia Bulletin (F) F Group Financial Markets Monthly Series 1983- December 2001 and then derived from the Latin Hypercube simulation of this series and as used to calculate the either short term interest earnings or the interest charged on short term borrowings.

"Consumer Price Index"

Is the inflation rate for each of the capital cities derived from the Australian Bureau Of Statistics Data Series 6401.0 Consumer Price Index Australia for the three capital cities for the period 1982 –2001, and then derived from the Latin Hypercube simulation of this series.

"Household Income Index"

Is an Index created from the figures for Average Weekly Ordinary Time Earnings as derived from the Australian Bureau Of Statistics Data Series 6302 Average Weekly Earnngs Australia for the States of New South Wales, Victoria and South Australia (Tables 13a, 13b and 13d) for the period 1982 –2001, and then derived from the Latin Hypercube simulation of this series.

"Housing Cost Index"

Is the producer price index for materials used in house building for each of the capital cities derived from the Australian Bureau Of Statistics Data Series 6427.0 Producer Price Indexes Australia, Table 18, for the three capital cities for the period 1982 –2001, and then derived from the Latin Hypercube simulation of this series.

"Gross Private Rental Yields"

are the mean of the median weekly rents for both houses and units multiplied by 52 and divided by the mean of the median houses and unit prices, (expressed as an annual percentage), for the three capital cities and as set out in the Real Estate Institute of Australia's Market Facts, series 1982 December 2001 and then derived from the Latin Hypercube simulation of this series.

"Real Interest Rate"

is the difference between the assumed CPI and the nominal long term interest rate generated by each of the simulations and expressed as the formula

(1+NIR)/(1+CPI)-1

where:

NIR equals the nominal long term interest rate for the period; and
CPI equals the Consumer Price Index for the period.

For example if the nominal long term interest rate is 6.31% and CPI is 2.57% the result is

(1+0.0631)/(1+0.0257)-1 =3.646%

"Real Income Growth Rates"

are the housing income percentage change per quarter as derived from the Index created from the figures for Average Weekly Ordinary Time Earnings as derived from the Australian Bureau Of Statistics Data Series 6302 Average Weekly Earnngs Australia for the States of New South Wales, Victoria and South Australia (Tables 13a, 13b and 13d) for the period 1982 –2001, This series is then subject to Latin Hypercube simulations and the resultant house price index number is then derived from the combination of the derived CPI and the derived income growth Index expressed as the formula:

(1+IGI)/(1+CPI)-1

where:

IGI equals the percentage change in incomes for the period; and

CPI equals the Consumer Price Index for the period.

For example if the percentage change in incomes for the period is 4% and CPI is 2.57% the result is

(1+0.04)/(1+0.0257)-1 =1.394%

"Real House Prices"

are the house price percentage change per quarter for Adelaide Melbourne and Sydney as derived from the Australian Bureau Of Statistics series 6416.0 Table 2B, established house price index: eight capital cities, June 1986 December 2001. This series is then subject to Latin Hypercube simulations and the resultant house price index number is then derived from the combination of the derived CPI and the derived house price Index expressed as the formula:

(1+HPI)/(1+CPI)-1

where:

HPI equals the percentage change in house prices for the period; and
CPI equals the Consumer Price Index for the period.

For example if the percentage change in house prices for the period is 5% and CPI is 2.57% the result is

(1+0.05)/(1+0.0257)-1 =2.369%

"Real Maintenance and Administration Cost Rates"

are the housing cost percentage change per quarter as derived the producer price index for materials used in house building for each of the capital cities derived from the Australian Bureau Of Statistics Data Series 6427.0 Producer Price Indexes Australia. This series is then subject to Latin Hypercube simulations and the resultant house price index number is then derived from the combination of the derived CPI and the derived housing cost index expressed as the formula:

(1+HCI)/(1+CPI)-1

where:

HCI equals the percentage change in housing costs for the period; and
CPI equals the Consumer Price Index for the period.

For example if the percentage change in housing costs for the period is 1.5% and CPI is 2.57% the result is;

(1+0.015)/(1+0.0257)-1 = -1.043%

"Discount Rate: Public Housing"

In order to ensure absolute consistency in the analysis it is important that the discount rate for capital funding exactly replicates the cost of funds in the debt option.

As the debt model calculates a capital injection such that the balance at the end is zero in essence the cost of funds in each period is the weighted average of the bond interest payment and the short term borrowing payment (if any). The annual effective cost of funds can be represented by the formula:

((BIP/(BIP+STI))*(BIR) + ((STI/(BIP+STI))*(STR)

where

BIP = Bond Interest Payment Amount

STI = Short Term Interest Payment Amount

BIR = Annual Bond Interest Rate

STR = Annual Short Term Interest Rate

So for example if the Bond Interest Payment Amount is $100, Short Term Interest Payment Amount is $50, the Annual Bond Interest Rate is 6.17% and the Annual Short Term Interest Rate is 6.62% the weighted average cost of funds for the quarterly period is:

100/150= 0.66*6.17% = 4.11% + 50/150= 0.33*6.62% = 2.220% = 6.333% and for the quarterly rate divide by 4 = 1.583%

The weighted average cost of funds for the debt model is calculated for each quarter and for that quarter this is the cost of funds allocated as the discount rate for the capital funding option. If the cost of funds varies from period to period, for any particular period the model automatically calculates the cumulative weighted average discount rate to apply to the present valuing of the capital funding model net cash flow. In this way the cost of funds for the capital funding model is maintained exactly the same as the cost of funds in the debt funded option.

"Discount Rate Tax Receipts"

is the annual percentage rate assumed for the purposes of discounting the value of the direct tax receipts received by government to a present value.

ATTACHMENT 5 SYSTEMATIC RISK DATA: TIME SERIES

Table 1: Adelaide: 1980-2001

Date	CPI[1]	AWOE[2]: $	10 Year Bonds[3] %	Stan. Var. Rate Home Loans[4] %	Estab Dwelling Price Index[5]	Median Rental Yields[6]	Housing Cost Index[7]
Mar-80	46.00						43.7
Jun-80	47.40						45.2
Sep-80	48.00						47.2
Dec-80	49.00						48.4
Mar-81	50.30		13.10	11.50			49.6
Jun-81	51.50		13.10	11.50			50.6
Sep-81	52.60		14.63	11.83			51.8
Dec-81	54.70		15.00	12.50			52.9
Mar-82	55.50		15.08	12.67			54.8
Jun-82	56.90		16.00	13.50			57.00
Sep-82	58.90		16.03	13.50			58.90
Dec-82	60.50		14.38	13.50			60.00
Mar-83	62.20		13.67	12.83		9.65	61.50
Jun-83	63.90		13.97	12.50		10.04	63.10
Sep-83	64.80		14.55	12.33		10.15	64.00
Dec-83	66.10	337.80	13.37	12.00		10.19	65.00
Mar-84	66.10	342.20	13.87	11.50		9.89	66.40
Jun-84	66.20	352.20	13.93	11.50		9.23	67.80
Sep-84	66.90	359.00	13.02	11.50		8.74	69.40
Dec-84	68.30	362.20	13.28	11.50		8.38	70.70
Mar-85	69.30	366.70	13.53	11.50		7.99	71.60
Jun-85	71.10	371.20	13.75	12.00		7.94	74.20
Sep-85	72.60	376.20	13.72	12.67		7.69	75.60
Dec-85	74.10	385.60	14.82	13.50		7.61	76.70
Mar-86	75.20	393.50	13.47	13.50		7.72	77.50
Jun-86	76.70	397.50	12.62	15.50	100.00	7.81	78.60
Sep-86	79.00	409.50	14.05	15.50	98.60	7.94	79.50
Dec-86	81.00	409.10	13.53	15.50	99.49	8.05	80.50
Mar-87	82.40	412.00	13.75	15.50	99.98	8.12	81.60
Jun-87	83.70	418.00	12.95	15.50	98.88	8.20	82.50
Sep-87	84.70	428.20	12.80	15.17	100.37	8.27	82.80
Dec-87	86.40	434.10	13.27	14.17	101.97	8.22	83.70
Mar-88	87.60	442.70	12.20	13.67	103.27	8.23	86.40
Jun-88	89.10	448.50	11.92	13.50	104.62	8.13	88.70
Sep-88	90.80	453.10	11.90	14.50	105.66	7.91	90.70
Dec-88	92.30	462.70	12.40	14.67	110.46	7.53	92.00
Mar-89	94.20	467.50	13.53	15.50	110.90	7.42	94.10
Jun-89	96.00	479.60	13.60	16.33	111.13	7.22	96.10
Sep-89	97.70	487.60	13.32	17.00	115.83	7.20	97.30
Dec-89	99.20	494.60	13.18	17.00	120.58	7.05	99.30
Mar-90	100.60	502.30	13.18	17.00	118.89	7.18	100.60
Jun-90	102.50	513.10	13.56	16.50	121.09	7.41	102.90
Sep-90	103.80	522.80	13.43	16.42	122.90	7.42	103.70
Dec-90	106.90	535.70	12.55	15.50	124.62	7.54	104.90
Mar-91	106.70	546.20	11.48	14.50	130.22	7.38	105.50
Jun-91	107.30	546.90	10.97	13.83	124.62	7.18	106.00
Sep-91	108.00	551.80	10.66	13.00	123.00	7.09	105.80
Dec-91	108.80	564.50	9.66	12.33	124.20	7.00	105.10
Mar-92	109.50	574.70	10.01	11.33	127.56	6.95	103.70
Jun-92	109.40	580.30	9.15	10.83	125.64	6.94	103.30
Sep-92	110.10	582.90	8.74	10.17	126.14	6.85	104.00
Dec-92	110.70	584.40	8.98	10.00	124.50	6.63	104.40
Mar-93	111.60	584.30	8.13	10.00	129.36	6.58	106.50
Jun-93	112.30	589.80	7.54	9.67	134.86	6.43	110.10
Sep-93	112.70	603.30	6.79	9.25	125.42	6.37	114.40
Dec-93	112.80	599.40	6.66	8.75	124.67	6.47	117.20
Mar-94	113.60	596.70	7.12	8.75	126.67	6.38	118.20
Jun-94	114.40	600.50	8.95	8.75	127.55	6.33	118.50
Sep-94	114.90	602.20	9.75	9.00	130.62	6.32	118.30
Dec-94	116.00	599.10	10.34	9.85	128.42	6.28	118.80
Mar-95	117.80	619.10	10.03	10.50	129.31	6.30	119.40
Jun-95	118.80	612.10	9.28	10.50	128.80	6.37	118.80
Sep-95	120.10	613.50	8.99	10.50	127.70	6.36	118.40
Dec-95	121.10	617.00	8.38	10.50	124.76	6.40	118.00
Mar-96	121.60	625.30	8.49	10.50	125.01	6.47	118.00
Jun-96	122.00	634.10	8.82	10.25	125.21	6.43	118.30
Sep-96	122.20	632.30	8.05	9.42	125.08	6.57	119.60
Dec-96	122.60	640.50	7.31	8.75	123.83	6.69	120.40
Mar-97	122.60	648.40	7.70	7.78	126.23	6.63	120.80
Jun-97	121.90	656.20	7.45	7.32	125.85	6.61	121.50
Sep-97	121.20	663.70	6.35	6.87	126.74	6.48	122.40
Dec-97	121.20	655.40	6.07	6.70	127.64	6.43	122.90

Table 1: Adelaide: 1980-2001 (continued)

Date	CPI[1]	AWOE[2]: $	10 Year Bonds[3] %	Stan. Var. Rate Home Loans[4] %	Estab Dwelling Price Index[5]	Median Rental Yields[6]	Housing Cost Index[7]
Mar-98	121.70	682.20	5.88	6.70	131.34	6.49	123.70
Jun-98	122.40	681.10	5.62	6.70	130.94	6.63	124.10
Sep-98	123.00	695.00	5.51	6.70	130.44	6.80	124.40
Dec-98	123.60	702.50	4.99	6.63	130.31	6.82	125.20
Mar-99	122.70	697.90	5.35	6.50	131.09	6.96	125.10
Jun-99	123.60	701.30	5.93	6.50	133.59	6.98	125.20
Sep-99	125.10	702.50	6.30	6.55	137.74	6.87	125.50
Dec-99	125.70	705.00	6.74	6.72	139.94	6.88	126.00
Mar-00	126.80	721.30	6.72	7.13	141.24	6.76	127.50
Jun-00	127.60	728.90	6.27	7.72	145.05	6.75	129.70
Sep-00	132.30	745.90	6.24	7.97	145.92	6.86	129.80
Dec-00	132.50	765.40	5.80	8.05	145.62	6.71	129.70
Mar-01	134.10	768.30	5.28	7.63	152.32	6.75	129.40
Jun-01	135.10	783.40	5.95	6.80	156.28	6.63	129.50
Sep-01	135.30	792.00	5.71	6.72	159.38	6.51	128.40
Dec-01	136.60	795.00	5.61	6.22	165.92	6.46	130.10

SOURCES

1 Australian Bureau Of Statistics: 6401.0 Consumer Price Index : Table 1b, All Groups Index Numbers (quarter) (a)
2 Australian Bureau Of Statistics: 6302.0 Average Weekly Earnings, Table 12d, South Australia, Seasonally Adjusted
3 Reserve Bank Of Australia Bulletin (F) F GROUP Financial Markets Monthly Table f02 - capital market yields…
4 Reserve Bank Of Australia Bulletin (F) F GROUP Financial Markets Monthly Table f05 – indicator lending rates …..
5 Australian Bureau Of Statistics: 6416.0 House Price Indexes: Eight Capital Cities: Table 2B, Established House Price Indexes –percentage changes
6 Real Estate Institute Of Australia, "Market Facts", 1982 – 2001
7 Australian Bureau Of Statistics: 6427.0 Producer Price Indexes, Australia, Table 18 Materials Used In House Building (a) percentage changes.

Table 2: Melbourne: 1980-2001

Date	CPI[1]	AWOE[2]: $	10 Year Bonds[3] %	Stan. Var. Rate Home Loans[4] %	Estab Dwelling Price Index[5]	Median Rental Yields[6]	Housing Cost Index[7]
Mar-80	45.20						43.20
Jun-80	46.60						45.20
Sep-80	47.50						47.20
Dec-80	48.50						47.80
Mar-81	49.60		13.10	11.50			49.00
Jun-81	50.70		13.10	11.50			50.00
Sep-81	51.80		14.63	11.83			50.90
Dec-81	54.10		15.00	12.50			51.90
Mar-82	54.80		15.08	12.67			53.70
Jun-82	56.10		16.00	13.50			55.60
Sep-82	58.10		16.03	13.50			57.00
Dec-82	59.60		14.38	13.50			57.60
Mar-83	60.90		13.67	12.83		10.18	59.30
Jun-83	62.60		13.97	12.50		9.78	60.40
Sep-83	63.60		14.55	12.33		9.53	61.50
Dec-83	65.50	343.70	13.37	12.00		9.64	63.20
Mar-84	65.10	352.40	13.87	11.50		9.51	65.20
Jun-84	65.30	365.50	13.93	11.50		9.33	67.30
Sep-84	66.30	369.60	13.02	11.50		8.97	68.50
Dec-84	67.10	372.30	13.28	11.50		8.65	69.20
Mar-85	67.90	375.20	13.53	11.50		8.54	70.00
Jun-85	69.90	381.90	13.75	12.00		8.30	71.90
Sep-85	71.40	388.30	13.72	12.67		8.26	73.20
Dec-85	72.60	394.80	14.82	13.50		8.15	74.40
Mar-86	74.60	401.80	13.47	13.50		7.93	75.70
Jun-86	75.70	407.70	12.62	15.50	101.60	7.86	76.40
Sep-86	77.70	416.20	14.05	15.50	103.23	7.88	77.40
Dec-86	80.00	426.10	13.53	15.50	103.84	7.93	78.80
Mar-87	81.50	432.70	13.75	15.50	105.54	8.02	79.40
Jun-87	82.80	440.70	12.95	15.50	105.86	8.03	81.10
Sep-87	84.30	448.00	12.80	15.17	111.58	8.22	82.40
Dec-87	85.70	452.30	13.27	14.17	113.18	7.94	84.40
Mar-88	87.00	465.40	12.20	13.67	115.55	7.74	86.50
Jun-88	88.60	470.00	11.92	13.50	125.84	7.38	89.20
Sep-88	89.90	477.20	11.90	14.50	137.54	6.85	91.10
Dec-88	91.50	485.10	12.40	14.67	150.06	6.71	93.10
Mar-89	92.70	494.30	13.53	15.50	153.66	6.41	95.30
Jun-89	95.20	501.40	13.60	16.33	153.36	6.33	97.40
Sep-89	97.30	510.20	13.32	17.00	155.50	6.10	97.90
Dec-89	99.20	518.50	13.18	17.00	154.26	6.03	99.40
Mar-90	100.70	525.30	13.18	17.00	154.86	5.96	100.60
Jun-90	102.70	537.40	13.56	16.50	148.05	5.81	102.00
Sep-90	103.50	545.50	13.43	16.42	150.27	5.80	102.70
Dec-90	106.60	556.00	12.55	15.50	145.77	5.69	103.00

Table 2: Melbourne: 1980-2001 (continued)

Date	CPI[1]	AWOE[2]: $	10 Year Bonds[3] %	Stan. Var. Rate Home Loans[4] %	Estab Dwelling Price Index[5]	Median Rental Yields[6]	Housing Cost Index[7]
Mar-91	106.10	564.00	11.48	14.50	147.95	5.76	104.00
Jun-91	106.80	565.20	10.97	13.83	154.76	5.77	104.10
Sep-91	107.60	568.70	10.66	13.00	152.96	5.73	103.90
Dec-91	108.40	579.40	9.66	12.33	146.08	5.81	102.40
Mar-92	108.30	583.30	10.01	11.33	143.88	5.82	102.30
Jun-92	108.20	583.50	9.15	10.83	144.78	5.96	102.80
Sep-92	107.90	590.30	8.74	10.17	148.26	6.06	103.60
Dec-92	108.20	586.80	8.98	10.00	146.04	6.03	104.50
Mar-93	109.50	593.90	8.13	10.00	147.24	6.05	106.20
Jun-93	110.10	595.30	7.54	9.67	147.38	5.92	108.50
Sep-93	110.50	603.00	6.79	9.25	150.48	5.80	110.30
Dec-93	110.80	600.10	6.66	8.75	149.38	5.77	111.70
Mar-94	111.20	603.70	7.12	8.75	151.77	5.63	112.70
Jun-94	112.00	615.90	8.95	8.75	153.13	5.62	113.60
Sep-94	112.20	617.50	9.75	9.00	153.83	5.60	114.40
Dec-94	113.10	626.80	10.34	9.85	153.99	5.56	115.60
Mar-95	115.00	633.80	10.03	10.50	154.91	5.59	116.50
Jun-95	116.20	641.70	9.28	10.50	153.21	5.59	117.00
Sep-95	117.60	645.40	8.99	10.50	153.82	5.72	115.90
Dec-95	118.50	652.60	8.38	10.50	153.52	5.81	115.30
Mar-96	118.30	659.20	8.49	10.50	155.62	5.81	115.10
Jun-96	119.20	664.70	8.82	10.25	156.08	5.97	115.10
Sep-96	119.60	662.80	8.05	9.42	158.89	6.05	114.90
Dec-96	119.90	679.90	7.31	8.75	158.99	6.06	115.20
Mar-97	120.10	687.70	7.70	7.78	162.65	6.09	115.10
Jun-97	119.90	692.40	7.45	7.32	169.32	6.08	115.80
Sep-97	119.50	710.90	6.35	6.87	174.62	5.76	116.10
Dec-97	119.80	706.70	6.07	6.70	177.94	5.70	116.60
Mar-98	119.60	716.80	5.88	6.70	185.05	5.67	117.60
Jun-98	120.30	724.00	5.62	6.70	185.85	5.55	118.00
Sep-98	120.40	729.80	5.51	6.70	191.06	5.64	118.60
Dec-98	120.80	735.30	4.99	6.63	196.60	5.61	118.10
Mar-99	121.00	728.80	5.35	6.50	200.60	5.48	117.70
Jun-99	121.50	740.50	5.93	6.50	206.82	5.27	117.40
Sep-99	122.70	741.60	6.30	6.55	216.12	4.44	119.20
Dec-99	123.50	749.60	6.74	6.72	217.62	4.21	120.50
Mar-00	124.70	761.10	6.72	7.13	226.33	4.02	122.90
Jun-00	125.60	766.00	6.27	7.72	214.33	3.90	124.20
Sep-00	130.40	782.10	6.24	7.97	224.03	4.42	123.20
Dec-00	130.80	775.80	5.80	8.05	230.08	4.36	123.40
Mar-01	132.20	793.90	5.28	7.63	246.42	4.29	122.80
Jun-01	133.00	799.80	5.95	6.80	254.42	4.17	123.10
Sep-01	133.60	817.10	5.71	6.72	257.98	3.96	124.30
Dec-01	134.80	829.10	5.61	6.22	296.86	3.85	124.40

SOURCES

1 Australian Bureau Of Statistics: 6401.0 Consumer Price Index : Table 1b, All Groups Index Numbers (quarter) (a)
2 Australian Bureau Of Statistics: 6302.0 Average Weekly Earnings, Table 12b, Victoria, Seasonally Adjusted
3 Reserve Bank Of Australia Bulletin (F) F GROUP Financial Markets Monthly Table f02 - capital market yields…
4 Reserve Bank Of Australia Bulletin (F) F GROUP Financial Markets Monthly Table f05 – indicator lending rates …..
5 Australian Bureau Of Statistics: 6416.0 House Price Indexes: Eight Capital Cities: Table 2B, Established House Price Indexes –percentage changes
6 Real Estate Institute Of Australia, "Market Facts", 1982 – 2001
7 Australian Bureau Of Statistics: 6427.0 Producer Price Indexes, Australia, Table 18 Materials Used In House Building (a) percentage changes.

Table 3: Sydney: 1980-2001

Date	CPI[1]	AWOE[2]: $	10 Year Bonds[3] %	Stan. Var. Rate Home Loans[4] %	Estab Dwelling Price Index[5]	Median Rental Yields[6]	Housing Cost Index[7]
Mar-80	45.50						44.90
Jun-80	46.70						46.80
Sep-80	47.60						48.20
Dec-80	48.60						49.10
Mar-81	49.90		13.10	11.50			50.00
Jun-81	50.90		13.10	11.50			51.30
Sep-81	51.80		14.63	11.83			52.10
Dec-81	53.90		15.00	12.50			53.10
Mar-82	54.90		15.08	12.67			54.70
Jun-82	56.50		16.00	13.50			56.20
Sep-82	58.50		16.03	13.50			57.20
Dec-82	60.30		14.38	13.50			57.90
Mar-83	61.60		13.67	12.83		7.40	58.60
Jun-83	62.80		13.97	12.50		7.21	59.80
Sep-83	63.60		14.55	12.33		7.12	60.40
Dec-83	64.90	375.40	13.37	12.00		7.15	60.90
Mar-84	64.60	382.20	13.87	11.50		7.34	62.30
Jun-84	64.60	393.20	13.93	11.50		7.55	63.80
Sep-84	65.40	401.00	13.02	11.50		7.70	64.80
Dec-84	66.40	406.70	13.28	11.50		7.82	66.00

Table 3: Sydney: 1980-2001 (continued)

Date	CPI[1]	AWOE[2]: $	10 Year Bonds[3] %	Stan. Var. Rate Home Loans[4] %	Estab Dwelling Price Index[5]	Median Rental Yields[6]	Housing Cost Index[7]
Mar-85	67.40	409.50	13.53	11.50		7.85	67.20
Jun-85	68.80	412.90	13.75	12.00		8.09	69.50
Sep-85	70.30	416.60	13.72	12.67		8.45	70.60
Dec-85	71.90	426.30	14.82	13.50		8.63	71.50
Mar-86	73.60	436.70	13.47	13.50		8.79	72.20
Jun-86	74.90	440.10	12.62	15.50	100.00	8.41	73.20
Sep-86	76.70	454.70	14.05	15.50	100.60	8.23	74.50
Dec-86	78.90	457.20	13.53	15.50	101.71	8.18	76.20
Mar-87	80.50	458.70	13.75	15.50	103.94	8.44	76.80
Jun-87	81.80	462.70	12.95	15.50	105.34	9.28	78.00
Sep-87	83.20	469.70	12.80	15.17	109.03	9.54	79.30
Dec-87	84.60	477.00	13.27	14.17	115.90	9.53	81.00
Mar-88	86.50	486.80	12.20	13.67	123.00	9.07	83.10
Jun-88	87.80	497.30	11.92	13.50	135.92	8.03	86.60
Sep-88	90.10	504.50	11.90	14.50	155.08	7.05	88.30
Dec-88	92.40	522.30	12.40	14.67	166.38	6.50	91.50
Mar-89	92.50	531.10	13.53	15.50	180.85	6.06	93.40
Jun-89	94.80	545.20	13.60	16.33	181.40	5.67	96.00
Sep-89	97.40	563.40	13.32	17.00	180.90	5.53	98.20
Dec-89	99.20	566.70	13.18	17.00	176.37	5.55	99.30
Mar-90	100.90	574.50	13.18	17.00	178.14	5.61	100.20
Jun-90	102.50	584.60	13.56	16.50	178.44	5.77	102.30
Sep-90	103.10	589.80	13.43	16.42	178.44	5.94	103.50
Dec-90	105.50	603.40	12.55	15.50	177.19	6.15	104.70
Mar-91	105.70	615.10	11.48	14.50	178.39	6.32	105.30
Jun-91	105.40	600.90	10.97	13.83	180.71	6.39	105.60
Sep-91	106.00	618.80	10.66	13.00	185.41	6.29	105.20
Dec-91	107.10	631.60	9.66	12.33	185.61	6.10	104.90
Mar-92	107.00	649.60	10.01	11.33	185.79	5.92	104.70
Jun-92	106.50	649.00	9.15	10.83	187.65	5.90	105.30
Sep-92	106.90	640.40	8.74	10.17	185.65	5.94	105.80
Dec-92	107.40	641.20	8.98	10.00	187.32	5.95	105.70
Mar-93	108.20	636.50	8.13	10.00	190.88	5.94	106.40
Jun-93	108.40	644.30	7.54	9.67	190.58	5.91	109.20
Sep-93	108.70	653.70	6.79	9.25	192.49	5.79	110.30
Dec-93	108.80	651.40	6.66	8.75	191.91	5.77	110.70
Mar-94	109.10	664.90	7.12	8.75	194.01	5.73	111.40
Jun-94	110.00	672.80	8.95	8.75	197.69	5.60	112.70
Sep-94	111.00	679.50	9.75	9.00	202.83	5.55	113.60
Dec-94	111.80	694.30	10.34	9.85	201.13	5.50	114.80
Mar-95	113.70	707.10	10.03	10.50	205.56	5.49	115.50
Jun-95	115.40	723.20	9.28	10.50	202.48	5.53	116.10
Sep-95	117.30	732.10	8.99	10.50	204.78	5.60	116.40
Dec-95	118.30	741.10	8.38	10.50	203.75	5.66	115.60
Mar-96	119.10	740.80	8.49	10.50	204.16	5.70	115.50
Jun-96	119.90	753.00	8.82	10.25	205.26	5.65	116.20
Sep-96	120.20	763.60	8.05	9.42	206.70	5.58	115.90
Dec-96	120.40	761.90	7.31	8.75	207.52	5.37	115.80
Mar-97	120.60	769.00	7.70	7.78	208.72	5.13	116.00
Jun-97	120.20	770.40	7.45	7.32	210.60	5.10	117.30
Sep-97	119.80	779.20	6.35	6.87	216.08	5.00	117.80
Dec-97	120.10	788.90	6.07	6.70	217.18	4.95	119.40
Mar-98	120.70	793.50	5.88	6.70	227.38	4.95	120.80
Jun-98	121.40	797.00	5.62	6.70	233.52	4.83	120.70
Sep-98	121.90	809.50	5.51	6.70	232.62	4.76	120.80
Dec-98	122.40	818.60	4.99	6.63	238.91	4.78	121.80
Mar-99	122.60	830.80	5.35	6.50	242.49	4.71	122.00
Jun-99	123.00	842.30	5.93	6.50	245.19	4.68	121.80
Sep-99	124.10	839.10	6.30	6.55	250.58	4.67	123.70
Dec-99	124.70	860.90	6.74	6.72	260.36	4.59	124.40
Mar-00	125.80	871.90	6.72	7.13	263.66	4.58	128.00
Jun-00	127.00	888.90	6.27	7.72	266.82	4.56	131.20
Sep-00	131.60	900.00	6.24	7.97	273.49	4.56	130.00
Dec-00	132.20	903.70	5.80	8.05	272.29	4.58	129.80
Mar-01	134.00	899.50	5.28	7.63	278.28	4.59	129.80
Jun-01	135.00	936.10	5.95	6.80	285.79	4.56	130.20
Sep-01	135.40	956.00	5.71	6.72	292.19	4.48	130.50
Dec-01	136.60	964.80	5.61	6.22	306.80	4.34	131.40

SOURCES

1 Australian Bureau Of Statistics: 6401.0 Consumer Price Index : Table 1b, All Groups Index Numbers (quarter) (a)

2 Australian Bureau Of Statistics: 6302.0 Average Weekly Earnings, Table 12a, New South Wales, Seasonally Adjusted

3 Reserve Bank Of Australia Bulletin (F) F GROUP Financial Markets Monthly Table f02 - capital market yields…

4 Reserve Bank Of Australia Bulletin (F) F GROUP Financial Markets Monthly Table f05 – indicator lending rates …..

5 Australian Bureau Of Statistics: 6416.0 House Price Indexes: Eight Capital Cities: Table 2B, Established House Price Indexes –percentage changes

6 Real Estate Institute Of Australia, "Market Facts", 1982 – 2001

7 Australian Bureau Of Statistics: 6427.0 Producer Price Indexes, Australia, Table 18 Materials Used In House Building (a) percentage changes.

Table 4:
Adelaide: Real Annual Percentage Changes In Systematic Risk Variables: 1982-2001

Date	AWOE/INCOME	10 Year Bonds	Estab. Dwelling Price Index	Housing Cost Index
1981		3.78		1.20
1982		4.08		1.55
1983		2.68		-0.84
1984		9.04		3.89
1985	-1.27	6.19		1.27
1986	-1.19	4.41		-2.36
1987	-2.78	4.67	-6.80	-3.28
1988	0.08	5.07	-0.96	1.42
1989	-0.77	5.41	0.47	0.49
1990	0.56	5.88	-0.45	-0.32
1991	2.32	6.29	-1.05	-1.55
1992	2.99	7.01	-1.64	-3.65
1993	0.13	4.96	-0.13	5.56
1994	-1.16	6.79	-2.15	3.66
1995	-1.42	4.85	-4.44	-3.79
1996	0.63	5.81	-4.36	-1.82
1997	3.93	7.22	1.78	2.69
1998	4.41	4.68	2.47	1.22
1999	0.37	4.72	2.37	-0.41
2000	1.03	1.75	2.05	-1.40
2001	1.69	1.33	5.22	-3.94

Source: Derived from Table 1, Attachment 5.

Table 5:
Melbourne: Real Annual Percentage Changes In Systematic Risk Variables: 1982-2001

Date	AWOE/INCOME	10 Year Bonds	Estab. Dwelling Price Index	Housing Cost Index
1981		3.80		0.30
1982		4.07		0.07
1983		3.05		-1.22
1984		8.66		5.83
1985	-1.21	6.69		0.31
1986	-1.88	3.77		-2.55
1987	-1.08	4.26	-2.99	-2.22
1988	0.19	4.98	13.35	2.96
1989	-0.92	5.34	9.30	0.68
1990	-0.64	5.20	-9.74	-2.68
1991	1.45	6.69	-3.11	-2.16
1992	2.05	8.28	-3.91	-1.14
1993	0.14	5.26	0.06	3.69
1994	1.25	7.19	1.33	2.74
1995	0.25	4.78	-3.59	-2.24
1996	1.50	5.96	0.21	-2.97
1997	4.42	6.38	8.18	0.23
1998	3.49	5.10	10.44	1.50
1999	0.30	4.43	9.15	-1.03
2000	-0.43	1.53	1.73	-0.63
2001	0.63	1.23	13.02	-4.00

Source: Derived from Table 2, Attachment 5.

Table 6:
Sydney: Real Annual Percentage Changes In Systematic Risk Variables: 1982-2001

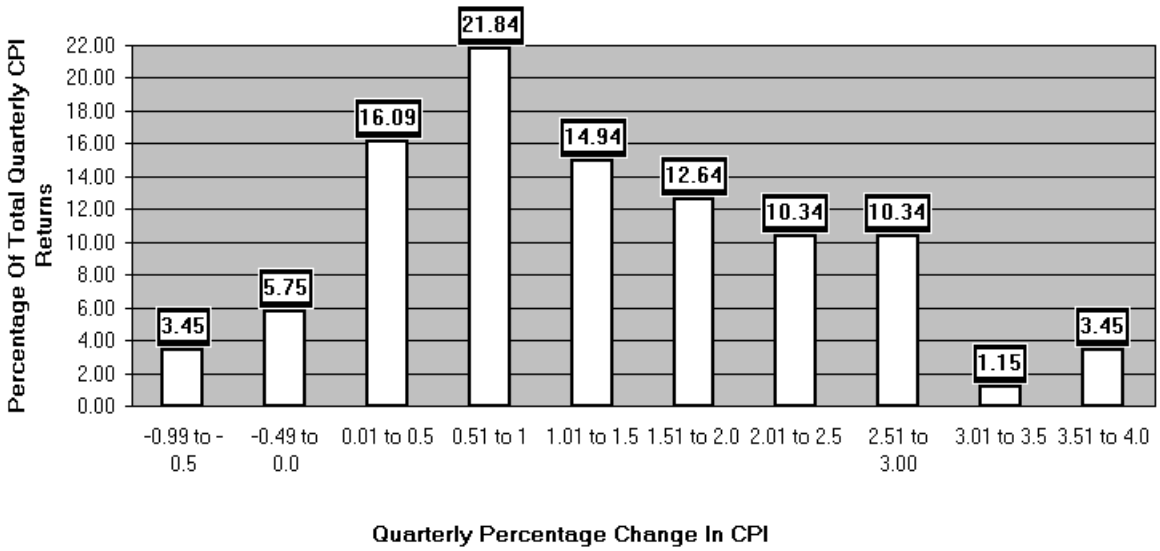
Date	AWOE/INCOME	10 Year Bonds	Estab. Dwelling Price Index	Housing Cost Index
1981		3.98		-0.27
1982		3.51	-10.28	-1.81
1983		3.60	-9.03	-3.50
1984		9.98	-3.12	3.82
1985	-1.35	6.85	-6.24	1.75
1986	-1.67	3.84	-8.45	-2.76
1987	-3.80	4.26	-1.52	-1.98
1988	-0.41	3.73	23.33	2.60
1989	1.98	5.41	16.91	2.93
1990	-0.66	5.43	-7.79	-1.10
1991	1.83	7.49	-0.45	-0.43
1992	3.77	8.30	1.40	-0.72
1993	-1.22	5.72	1.12	2.07
1994	3.01	7.12	2.06	1.82
1995	1.83	3.82	-2.37	-2.56
1996	0.75	4.79	-2.28	-3.16
1997	2.69	6.65	3.27	1.30
1998	2.36	4.26	8.09	1.69
1999	3.11	4.36	5.35	-0.03
2000	1.15	1.70	3.20	0.99
2001	0.58	0.84	3.14	-4.00

Source: Derived from Table 3, Attachment 5.

ATTACHMENT 6 FREQUENCY DISTRIBUTIONS OF SYSTEMATIC RISK DATA

GRAPH 1

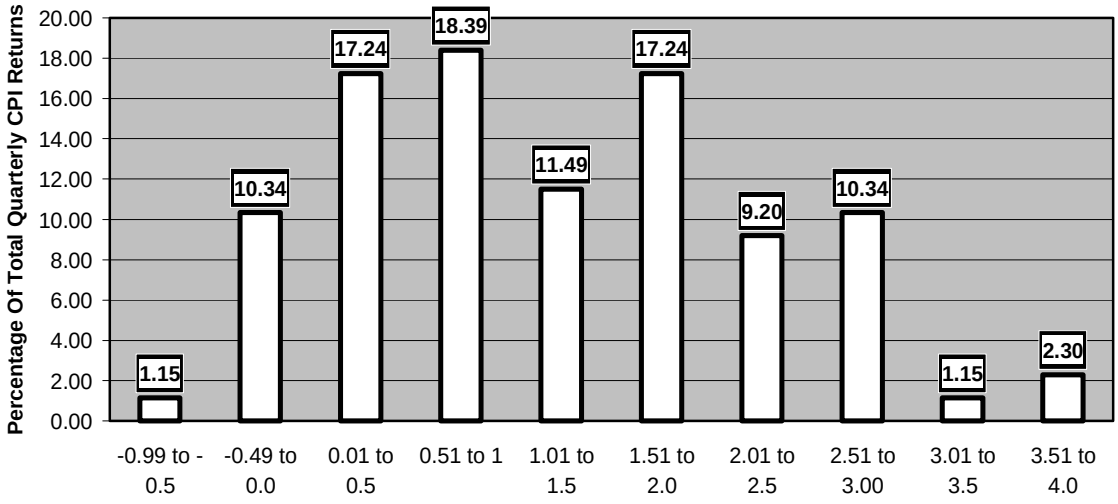
ADELAIDE: DISTRIBUTION OF QUARTERLY CHANGE IN CPI's: 1982 - 2001



Source: Australian Bureau Of Statistics: 6401.0 Consumer Price Index : Table 1b, All Groups Index Numbers (quarter) (a)

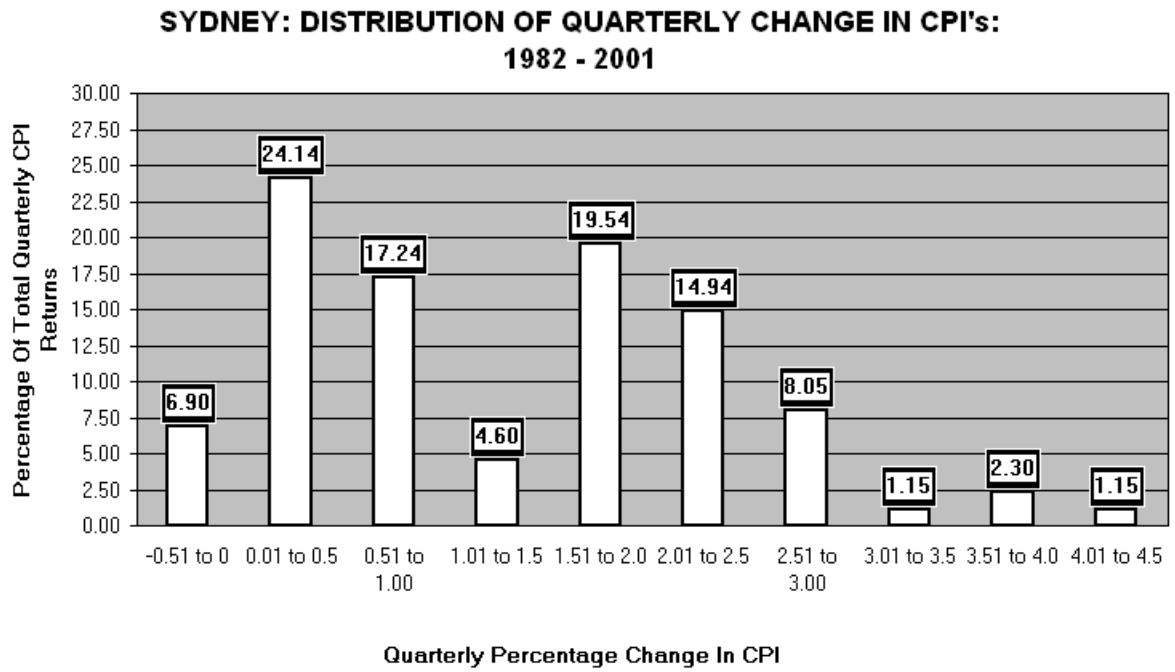
GRAPH 2

MELBOURNE: DISTRIBUTION OF QUARTERLY CHANGE IN CPI's: 1982 - 2001



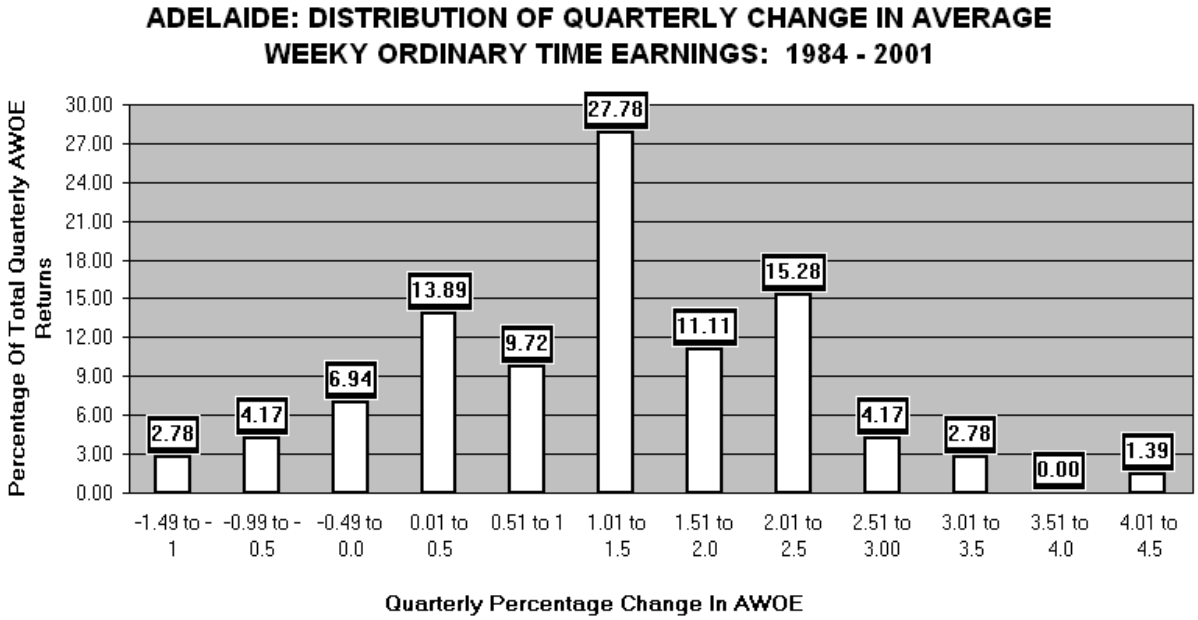
Source: Australian Bureau Of Statistics: 6401.0 Consumer Price Index : Table 1b, All Groups Index Numbers (quarter) (a)

GRAPH 3



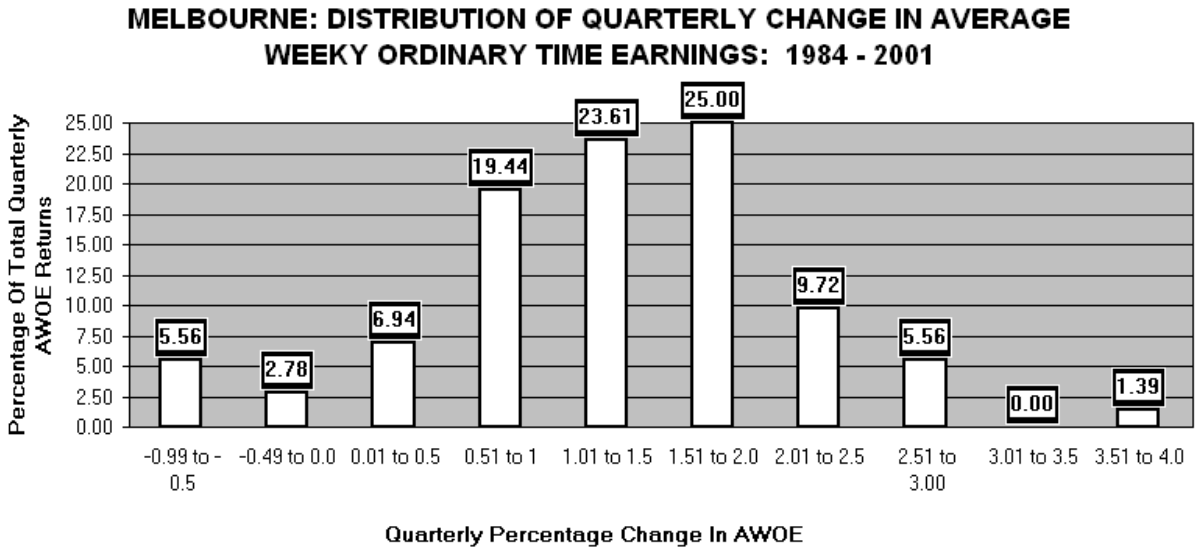
Source: Australian Bureau Of Statistics: 6401.0 Consumer Price Index : Table 1b, All Groups Index Numbers (quarter) (a)

GRAPH 4



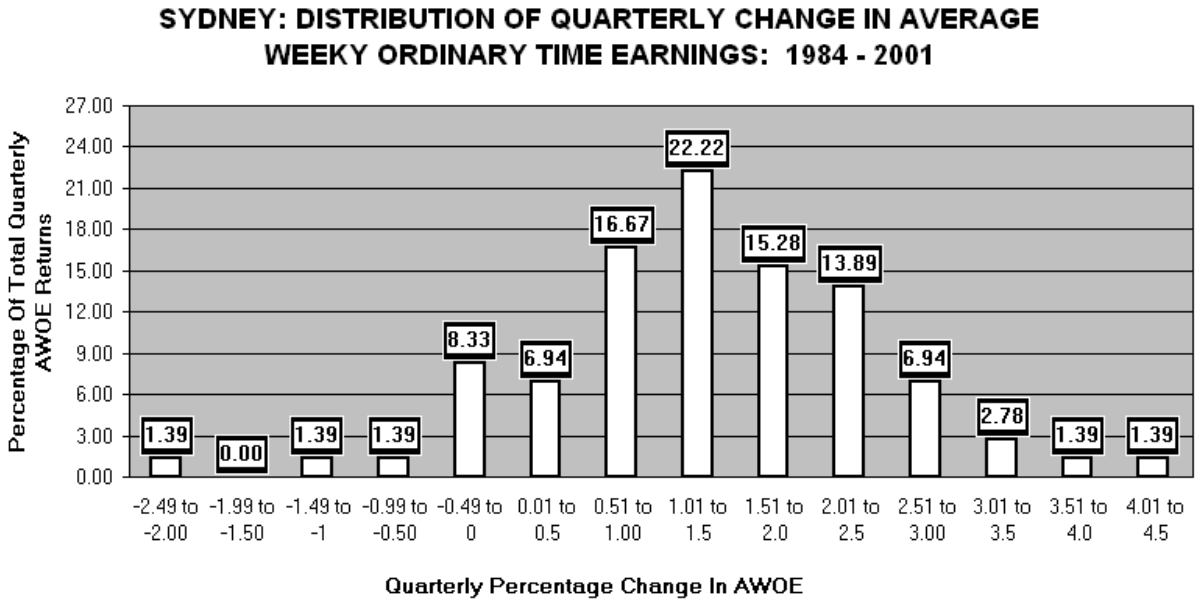
Source: Australian Bureau Of Statistics: 6302.0 Average Weekly Earnings, Table 12d, South Australia, Seasonally Adjusted

GRAPH 5



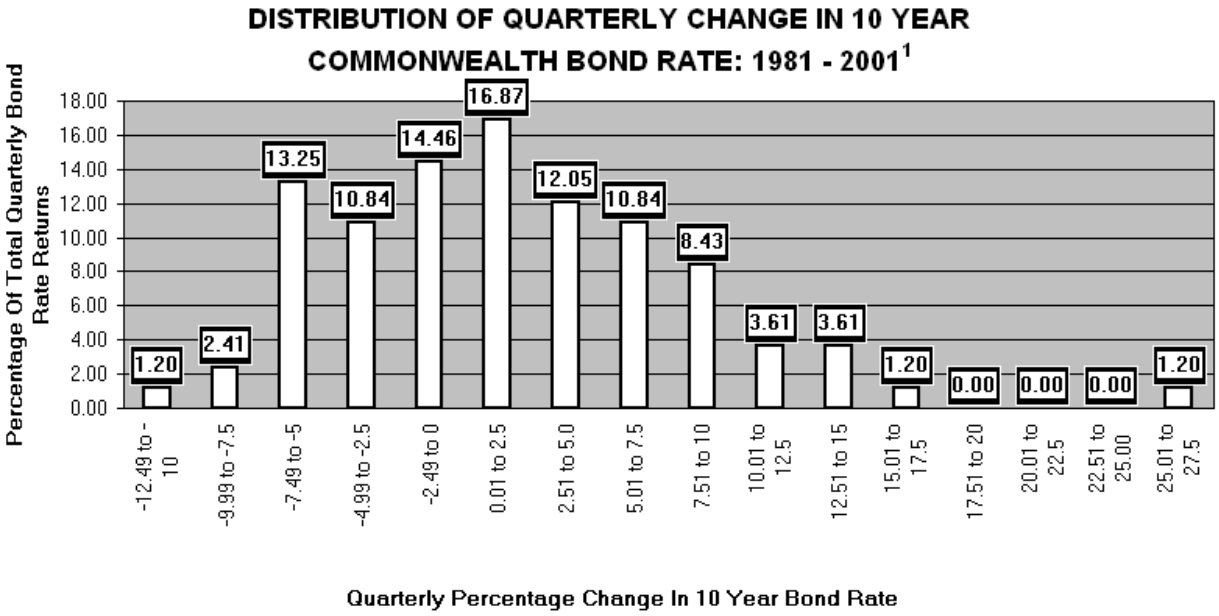
Source: Australian Bureau Of Statistics: 6302.0 Average Weekly Earnings, Table 12b, Victoria, Seasonally Adjusted

GRAPH 6



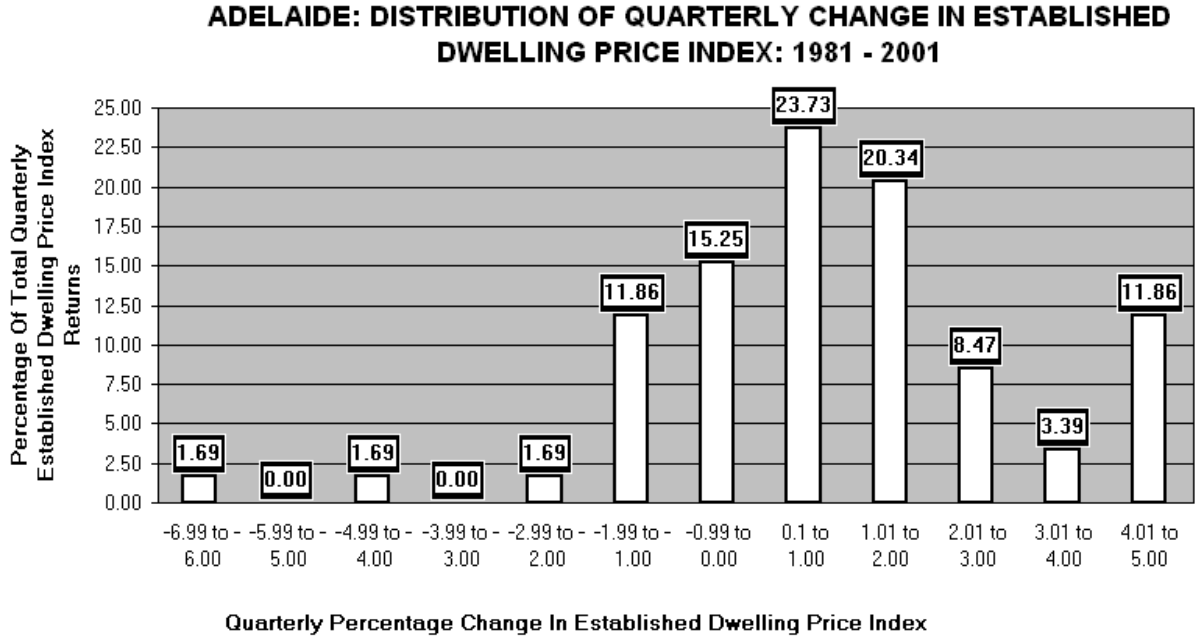
Source: Australian Bureau Of Statistics: 6302.0 Average Weekly Earnings, Table 12a, New South Wales, Seasonally Adjusted

GRAPH 7



Source: Reserve Bank Of Australia Bulletin (F) F GROUP Financial Markets Monthly Table f02 - capital market yields…
1 NOTE: The10 Year Commonwealth Bond Rate is a national series so the data equally applies in Melbourne and Sydney and is not, therefore, reproduced for these two metropolitan areas.

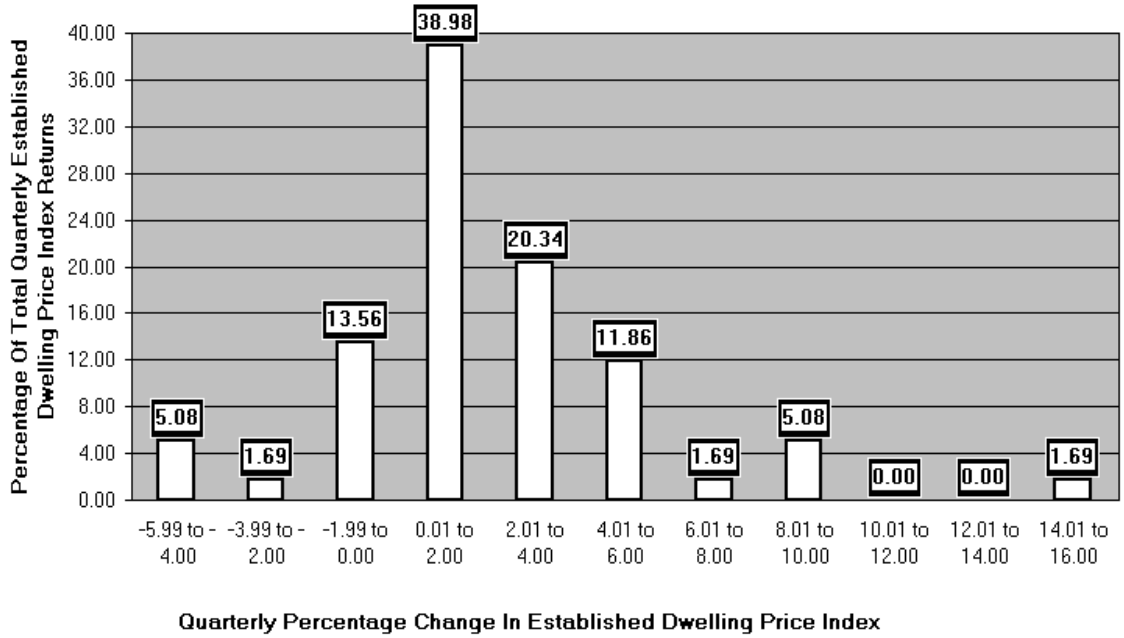
GRAPH 8



Source: Australian Bureau Of Statistics: 6416.0 House Price Indexes: Eight Capital Cities: Table 2B, Established House Price Indexes –percentage changes

GRAPH 9

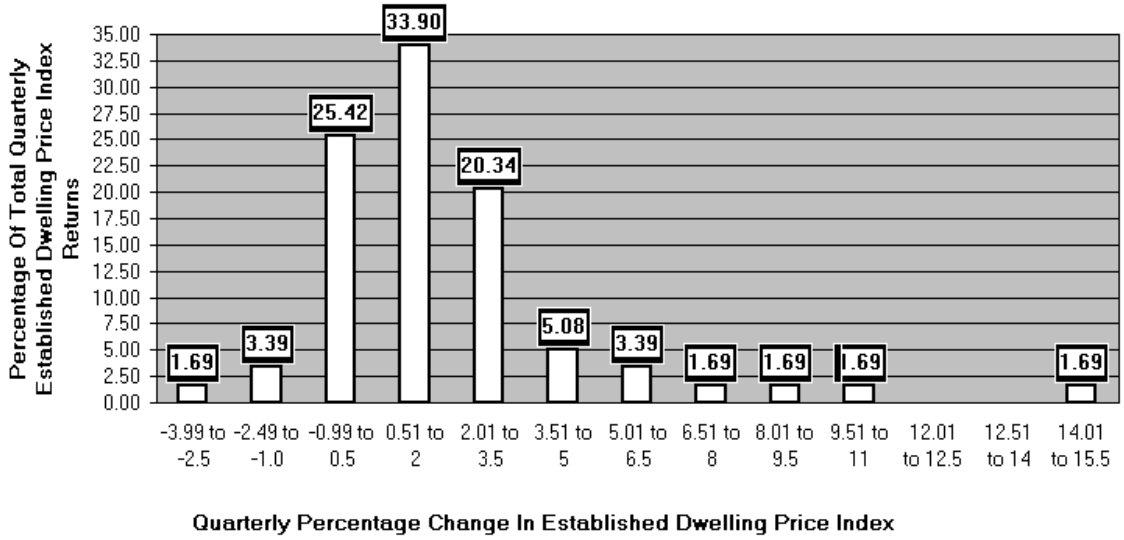
MELBOURNE: DISTRIBUTION OF QUARTERLY CHANGE IN ESTABLISHED DWELLING PRICE INDEX: 1981 - 2001



Source: Australian Bureau Of Statistics: 6416.0 House Price Indexes: Eight Capital Cities: Table 2B, Established House Price Indexes –percentage changes

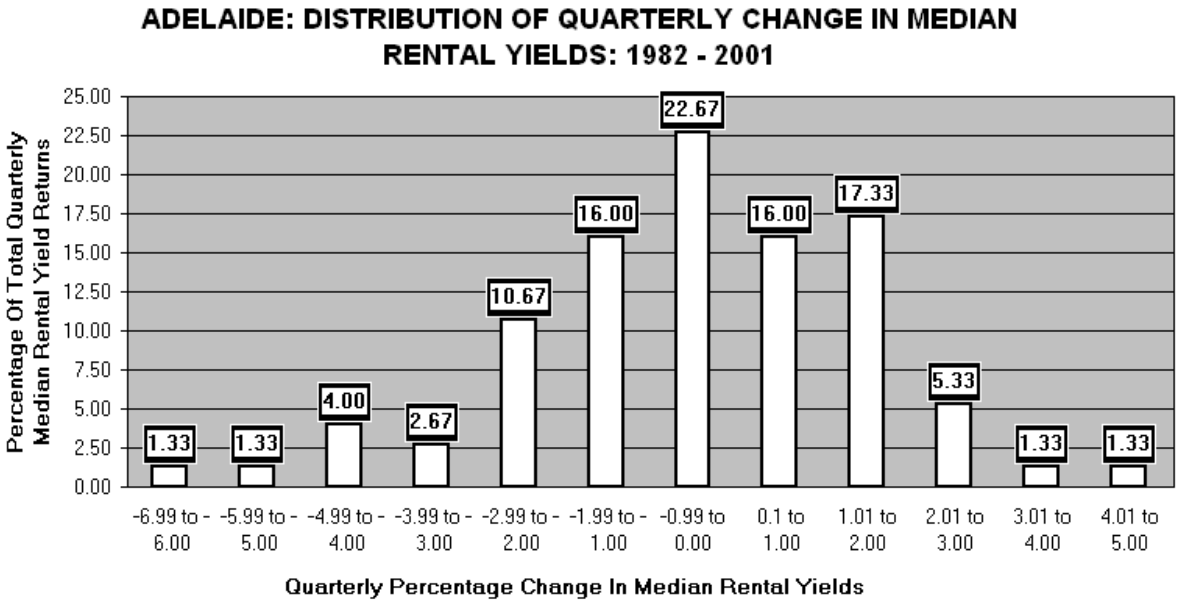
GRAPH 10

SYDNEY: DISTRIBUTION OF QUARTERLY CHANGE IN ESTABLISHED DWELLING PRICE INDEX: 1981 - 2001



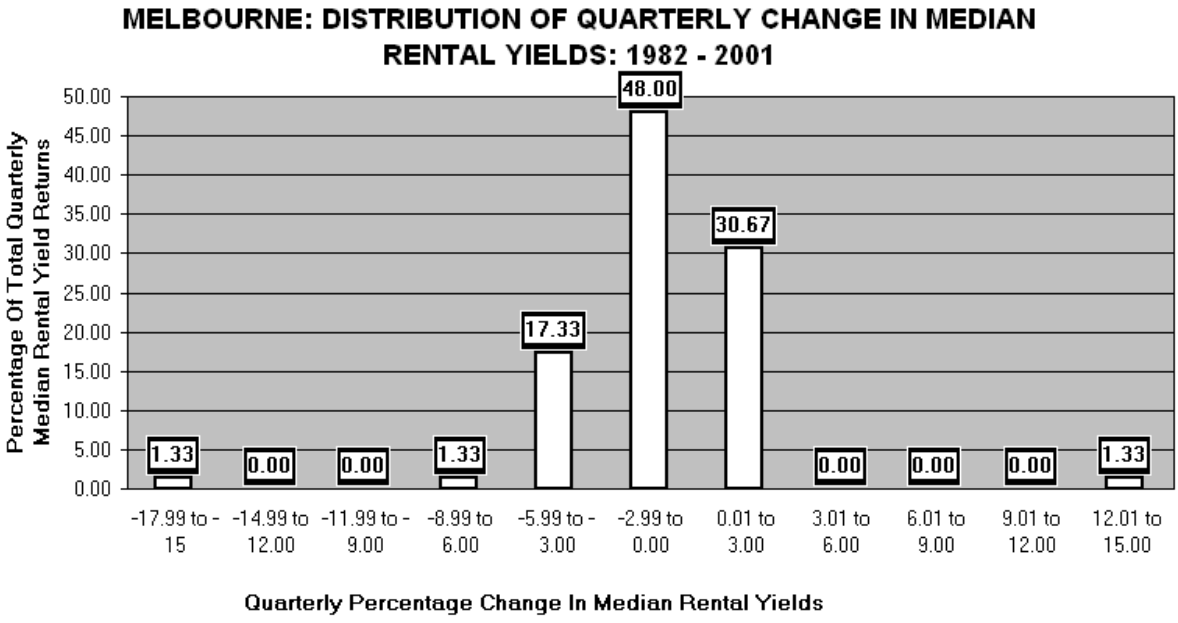
Source: Australian Bureau Of Statistics: 6416.0 House Price Indexes: Eight Capital Cities: Table 2B, Established House Price Indexes –percentage changes

GRAPH 11



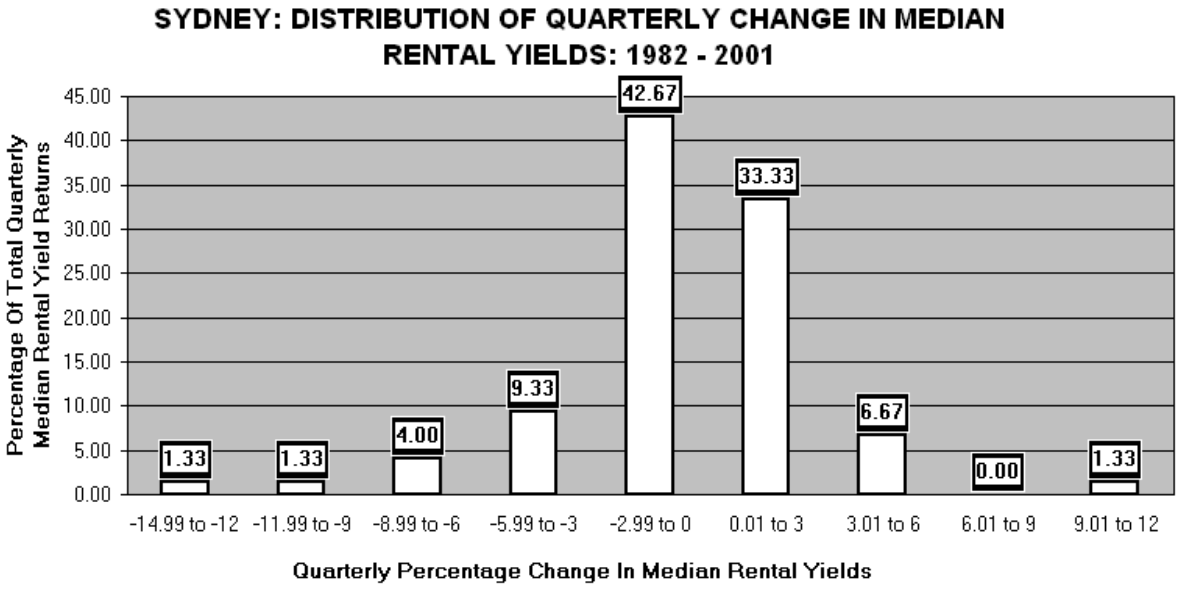
Source: Real Estate Institute Of Australia, "Market Facts", 1982 – 2001

GRAPH 12



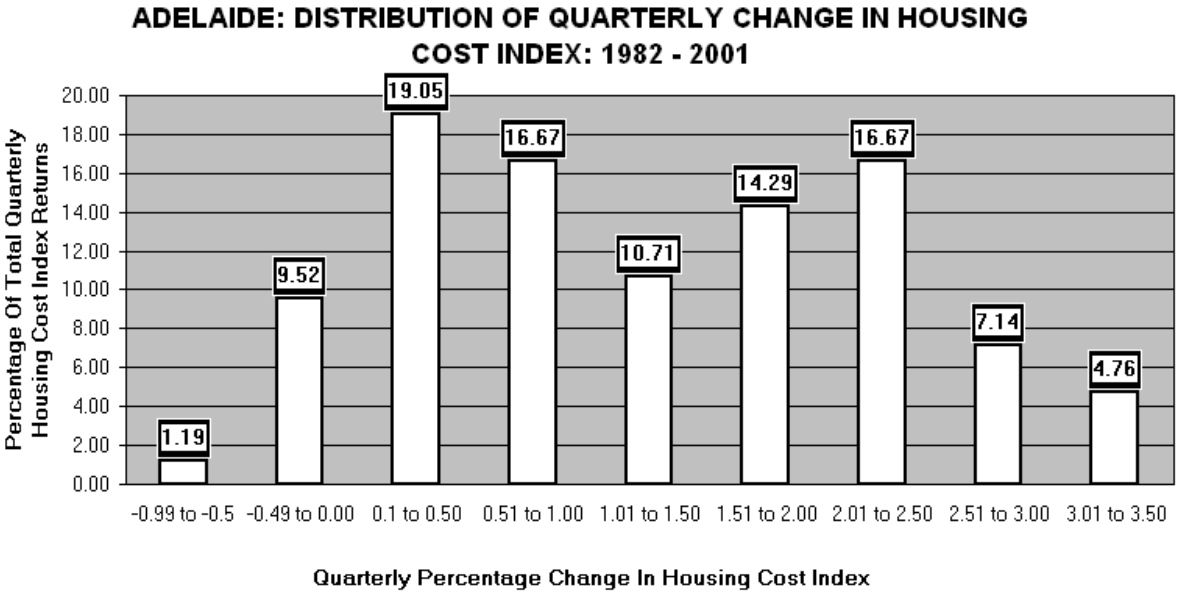
Source: Real Estate Institute Of Australia, "Market Facts", 1982 – 2001

GRAPH 13



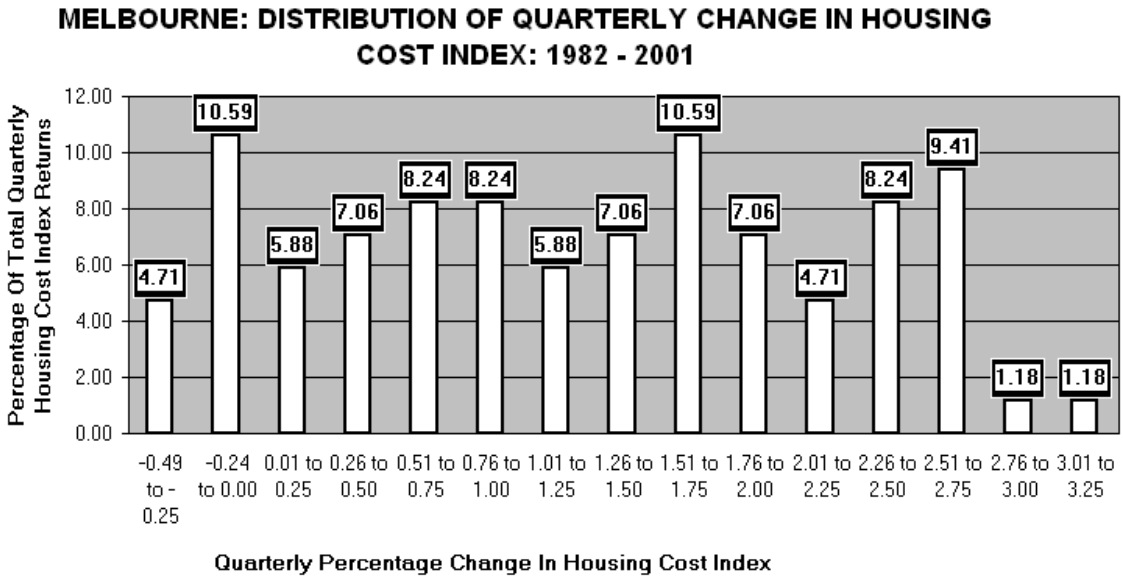
Source: Real Estate Institute Of Australia, "Market Facts", 1982 – 2001

GRAPH 14



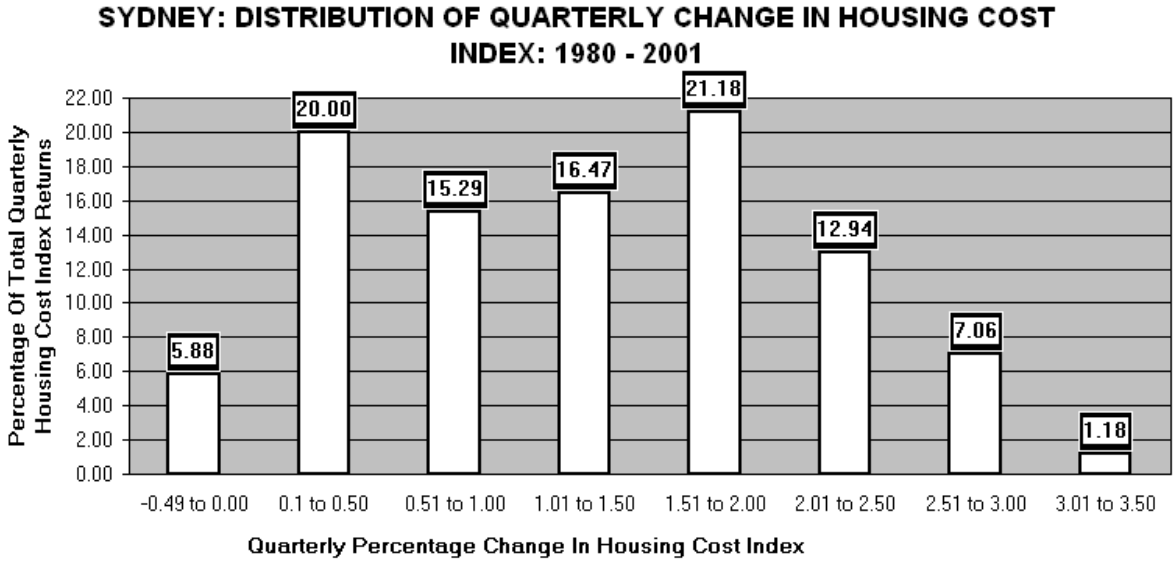
Source: Australian Bureau Of Statistics: 6427.0 Producer Price Indexes, Australia, Table 18 Materials Used In House Building (a) percentage changes.

GRAPH 15



Source: Australian Bureau Of Statistics: 6427.0 Producer Price Indexes, Australia, Table 18 Materials Used In House Building (a) percentage changes.

GRAPH 16



Source: Australian Bureau Of Statistics: 6427.0 Producer Price Indexes, Australia, Table 18 Materials Used In House Building (a) percentage changes.

ATTACHMENT 7 SIMULATION RESULTS

Table 1: Adelaide: Simulation Results: All Cases: Present Value Subsidy Per Tenant Year

Case	Bonds	Rent Assistance	Home Loans	Pub Housing	Shared Equity	Mean: All Cases
1	5,337	203	5,475	3,474	4,475	3,793
2	1,427	693	961	1,860	1,410	1,270
3	4,209	406	3,182	3,524	3,353	2,935
4	1,907	675	1,446	2,403	1,925	1,671
5	-4	841	497	389	443	433
6	3,677	202	2,845	3,481	3,163	2,673
7	2,238	771	2,519	2,043	2,281	1,971
8	4,550	531	3,453	3,551	3,502	3,118
9	3,200	768	2,861	2,770	2,816	2,483
10	5,603	661	4,544	3,871	4,208	3,777
11	3,255	715	2,991	3,098	3,044	2,621
12	3,499	637	2,572	3,168	2,870	2,549
13	136	1,250	952	197	575	622
14	1,824	934	2,240	1,732	1,986	1,743
15	3,382	697	2,705	3,014	2,859	2,531
16	1,953	717	1,568	2,048	1,808	1,619
17	821	1,105	1,136	1,125	1,130	1,063
18	3,724	737	2,913	3,217	3,065	2,731
19	5,329	507	4,899	3,952	4,426	3,823
20	5,357	900	4,887	3,659	4,273	3,815
21	2,763	1,024	2,392	2,410	2,401	2,198
22	1,061	642	641	1,874	1,257	1,095
23	3,040	786	3,299	2,444	2,871	2,488
24	1,303	260	1,009	1,734	1,371	1,135
25	2,910	454	2,269	2,912	2,590	2,227
26	2,915	1,167	2,668	2,374	2,521	2,329
27	3,053	820	2,422	2,756	2,589	2,328
28	2,439	1,453	2,174	2,160	2,167	2,078
29	4,635	608	4,397	3,516	3,957	3,422
30	6,032	653	4,974	4,029	4,502	4,038
31	279	1,141	1,305	1,015	1,160	980
32	2,156	1,134	2,183	1,859	2,021	1,871
33	2,865	872	2,663	2,129	2,396	2,185
34	5,392	871	5,070	3,635	4,353	3,864
35	187	524	764	975	870	664
36	-131	720	236	697	467	398
37	1,746	768	1,488	2,087	1,788	1,575
38	2,054	765	1,945	1,951	1,948	1,733
39	3,888	1,216	3,644	2,810	3,227	2,957
40	3,163	765	3,096	2,330	2,713	2,414
41	2,247	967	2,801	1,902	2,351	2,053
42	3,026	1,476	3,030	2,883	2,957	2,675
43	1,439	973	1,650	1,547	1,598	1,441
44	-1,247	1,156	-730	1,057	164	80
45	5,668	531	4,606	4,043	4,324	3,834
46	1,315	500	1,388	1,592	1,490	1,257
47	2,873	1,332	2,603	2,376	2,490	2,335
48	4,226	490	4,103	3,390	3,746	3,191
49	4,315	621	4,374	3,186	3,780	3,255
50	1,864	1,179	1,836	1,726	1,781	1,677

Case	Bonds	Rent Assistance	Home Loans	Pub Housing	Shared Equity	Mean: All Cases
51	40	1,397	1,150	776	963	865
52	3,084	723	2,594	2,627	2,611	2,328
53	5,031	760	4,447	3,846	4,147	3,646
54	196	346	319	1,194	756	562
55	-159	983	746	625	685	576
56	996	302	653	1,777	1,215	989
57	809	407	289	2,052	1,170	945
58	-643	473	404	817	610	332
59	-967	1,113	-727	1,529	401	270
60	1,065	1,512	2,720	653	1,687	1,527
61	4,439	1,105	3,703	3,524	3,614	3,277
62	1,131	953	1,157	1,500	1,328	1,214
63	1,727	859	1,757	1,552	1,655	1,510
64	2,280	765	1,980	2,269	2,125	1,884
65	4,986	193	4,589	3,699	4,144	3,522
66	-1,471	735	177	-569	-196	-265
67	12	921	-251	1,609	679	594
68	5,069	542	4,586	4,076	4,331	3,721
69	3,058	539	2,735	3,046	2,891	2,454
70	1,146	934	953	1,830	1,391	1,251
71	835	1,009	819	1,338	1,078	1,016
72	-328	377	96	1,268	682	419
73	2,232	432	1,415	2,551	1,983	1,722
74	118	511	198	1,428	813	614
75	-1,629	814	-281	99	-105	-220
76	5,567	1,021	5,086	3,808	4,447	3,986
77	1,535	504	1,344	2,152	1,748	1,457
78	2,862	236	1,997	2,846	2,421	2,072
79	1,738	857	1,844	1,546	1,695	1,536
80	-1,306	1,882	161	521	341	320
81	4,833	34	3,584	4,128	3,856	3,287
82	4,818	1,109	4,744	3,276	4,010	3,591
83	-562	611	-249	925	338	213
84	3,974	667	3,566	3,190	3,378	2,955
85	4,985	238	4,406	3,568	3,987	3,437
86	-1,172	1,289	-352	465	57	57
87	4,691	847	4,646	3,496	4,071	3,550
88	6,624	553	5,971	4,204	5,088	4,488
89	-1,081	1,137	-192	169	-11	5
90	4,902	982	4,252	3,473	3,862	3,494
91	4,381	962	4,212	3,445	3,829	3,366
92	1,816	608	1,443	1,932	1,688	1,498
93	-321	668	367	593	480	357
94	-729	1,131	-130	1,771	820	573
95	-1,609	352	-1,321	1,590	134	-171
96	4,255	561	3,375	3,592	3,484	3,053
97	-33	747	-143	1,703	780	611
98	2,389	841	2,122	2,341	2,231	1,985
99	-1,816	1,079	-162	375	106	-84
100	4,485	462	4,236	3,558	3,897	3,328

Table 2: Melbourne: Simulation Results: All Cases: Present Value Subsidy Per Tenant Year

Case	Bonds	Rent Assistance	Home Loans	Pub Housing	Shared Equity	Mean: All Cases
1	6,186	1,993	8,141	3,815	5,978	5,222
2	-1,845	1,759	1,691	-1,355	168	84
3	2,531	2,715	5,327	1,674	3,501	3,150
4	-995	3,049	2,166	-192	987	1,003
5	-5,371	4,127	1,748	-4,718	-1,485	-1,140
6	2,539	2,242	5,243	1,986	3,614	3,125
7	-1,268	4,154	4,080	-1,704	1,188	1,290
8	3,398	2,548	6,024	2,282	4,153	3,681
9	-954	4,057	4,666	-1,786	1,440	1,484
10	4,475	3,773	7,295	2,868	5,081	4,699
11	2,529	1,627	4,760	2,119	3,440	2,895
12	2,017	2,434	4,607	1,384	2,995	2,688
13	-2,899	4,422	2,429	-2,848	-210	179
14	-1,064	2,481	3,112	-1,212	950	853
15	2,563	2,037	4,517	2,117	3,317	2,910
16	-900	2,633	2,635	-878	879	874
17	655	3,073	2,906	879	1,893	1,881
18	2,416	2,774	4,800	1,669	3,235	2,979
19	5,549	2,536	7,273	3,932	5,602	4,979
20	2,556	3,722	7,367	1,066	4,216	3,785
21	624	3,308	3,776	260	2,018	1,997
22	-1,729	2,267	2,241	-646	797	586
23	807	3,167	4,351	95	2,223	2,129
24	-1,797	4,281	2,786	-1,425	681	905
25	-37	3,387	3,880	-238	1,821	1,762
26	751	3,238	4,608	162	2,385	2,229
27	163	2,791	4,336	-335	2,000	1,791
28	-1,556	4,040	4,323	-1,855	1,234	1,237
29	4,496	1,647	6,057	3,245	4,651	4,019
30	4,838	2,648	7,345	3,046	5,196	4,615
31	-962	3,211	1,997	-48	974	1,035
32	-559	4,578	4,550	-991	1,780	1,872
33	1,744	3,463	5,356	815	3,085	2,893
34	2,395	4,221	7,512	960	4,236	3,865
35	-2,413	2,202	1,097	-1,418	-161	-139
36	-1,106	2,272	2,193	-33	1,080	881
37	462	3,025	2,752	860	1,806	1,781
38	588	2,601	3,538	327	1,932	1,797
39	1,705	3,117	6,379	728	3,554	3,097
40	1,627	3,165	5,367	601	2,984	2,749
41	-1,262	4,235	3,883	-1,577	1,153	1,286
42	1,713	2,774	4,490	1,354	2,922	2,651
43	-780	2,288	2,586	-685	951	872
44	-3,450	3,250	-132	-406	-269	-201
45	-2	4,627	7,334	-1,185	3,074	2,770
46	-2,430	2,923	2,191	-2,435	-122	25
47	2,844	2,286	4,939	2,213	3,576	3,172
48	3,224	3,332	5,997	2,158	4,078	3,758
49	3,247	3,883	6,261	1,940	4,101	3,886
50	1,412	2,270	3,215	1,280	2,248	2,085

Case	Bonds	Rent Assistance	Home Loans	Pub Housing	Shared Equity	Mean: All Cases
51	622	1,912	2,359	1,510	1,934	1,667
52	1,849	2,613	4,331	1,255	2,793	2,568
53	2,622	2,537	6,289	1,527	3,908	3,377
54	-3,895	4,383	2,174	-2,694	-260	-59
55	-2,517	3,470	1,490	-1,446	22	204
56	-2,805	3,256	1,516	-2,159	-322	-103
57	-2,884	3,364	734	-1,063	-164	-3
58	-1,482	692	681	-271	253	-26
59	-4,453	4,119	-114	-1,246	-680	-475
60	1,802	1,806	3,957	1,295	2,626	2,297
61	3,204	2,817	5,740	2,211	3,976	3,590
62	-3,229	3,270	2,135	-2,575	-220	-124
63	-1,992	3,598	3,697	-2,150	773	785
64	1,495	1,569	3,288	1,375	2,331	2,012
65	2,659	3,840	7,624	1,085	4,355	3,913
66	-4,222	3,840	1,097	-3,090	-996	-674
67	-4,067	2,991	172	-1,728	-778	-682
68	3,713	3,111	6,654	2,737	4,696	4,182
69	2,293	2,809	4,103	2,096	3,100	2,880
70	-805	3,015	2,553	-101	1,226	1,178
71	-4,319	3,522	1,590	-3,295	-852	-671
72	-4,618	2,720	463	-2,727	-1,132	-1,059
73	-1,428	2,689	3,000	-1,049	976	838
74	-3,335	3,014	757	-1,447	-345	-271
75	-3,377	3,847	978	-1,368	-195	-23
76	5,125	2,518	6,972	3,331	5,152	4,620
77	-3,422	3,649	1,696	-2,377	-340	-159
78	2,436	2,631	4,077	2,260	3,169	2,915
79	42	2,937	3,588	199	1,894	1,732
80	-4,515	3,818	-36	-1,989	-1,012	-787
81	4,228	1,395	5,469	3,344	4,406	3,768
82	4,409	3,535	8,057	2,706	5,382	4,818
83	-4,197	3,346	749	-2,215	-733	-610
84	2,222	2,985	5,975	1,301	3,638	3,224
85	4,453	1,763	6,816	2,834	4,825	4,138
86	-2,650	1,931	697	-544	76	-98
87	3,540	3,739	6,730	2,215	4,473	4,139
88	3,373	4,505	8,376	1,479	4,928	4,532
89	-2,813	3,193	769	-1,104	-167	-24
90	3,237	3,798	6,510	1,944	4,227	3,943
91	4,277	1,517	6,167	3,256	4,711	3,986
92	75	2,672	3,107	380	1,743	1,595
93	-2,027	3,617	1,866	-861	502	619
94	-3,892	2,562	-192	-414	-303	-448
95	-7,690	5,042	-1,289	-3,282	-2,286	-1,901
96	4,244	1,599	5,368	3,435	4,402	3,810
97	-4,081	2,899	264	-1,758	-747	-685
98	-58	4,065	3,397	-89	1,654	1,794
99	-4,511	3,893	-180	-1,587	-883	-654
100	-2,321	3,260	895	-71	412	435

Table 3: Sydney: Simulation Results: All Cases: Present Value Subsidy Per Tenant Year

Case	Bonds	Rent Assistance	Home Loans	Pub Housing	Shared Equity	Mean: All Cases
1	3,778	4,793	9,021	1,997	5,509	5,019
2	-3,841	5,314	2,151	-3,196	-522	-19
3	2,334	3,945	5,848	1,496	3,672	3,459
4	759	3,620	3,406	1,531	2,469	2,357
5	-2,522	4,240	2,487	-1,932	277	510
6	3,261	3,288	5,305	2,668	3,986	3,701
7	-371	4,627	3,743	-887	1,428	1,708
8	2,786	4,411	6,659	1,646	4,153	3,931
9	3,254	4,164	5,630	2,497	4,064	3,922
10	5,558	3,383	8,041	3,807	5,924	5,343
11	2,127	4,146	4,954	1,627	3,291	3,229
12	1,334	4,420	4,825	696	2,760	2,807
13	-1,915	4,182	2,976	-1,901	538	776
14	-208	4,310	4,209	-358	1,926	1,976
15	977	4,044	4,659	557	2,608	2,569
16	1,307	3,440	3,840	1,291	2,565	2,489
17	-1,041	3,085	2,903	-605	1,149	1,098
18	2,185	4,791	5,751	1,256	3,503	3,497
19	5,423	3,979	8,062	3,787	5,924	5,435
20	5,379	3,426	8,618	3,619	6,119	5,432
21	-623	4,239	3,919	-932	1,494	1,619
22	-3,206	4,361	1,602	-1,968	-183	121
23	1,154	4,285	5,558	359	2,959	2,863
24	-1,353	4,306	3,697	-993	1,352	1,402
25	-449	3,804	3,989	-619	1,685	1,682
26	3,297	3,692	6,058	2,588	4,323	3,991
27	-1,535	4,813	4,709	-2,079	1,315	1,445
28	769	3,578	4,141	452	2,297	2,247
29	753	4,978	6,721	190	3,455	3,220
30	5,169	4,367	9,189	3,331	6,260	5,663
31	-719	3,951	2,473	-348	1,062	1,284
32	644	4,530	4,865	162	2,513	2,543
33	1,985	4,096	5,423	966	3,195	3,133
34	3,189	4,403	8,158	1,757	4,958	4,493
35	-3,794	4,398	1,381	-2,717	-668	-280
36	-2,167	3,979	2,629	-817	906	906
37	-2,101	4,187	2,457	-1,655	401	658
38	342	3,283	3,911	88	2,000	1,925
39	3,119	4,004	6,250	1,963	4,106	3,888
40	118	4,212	5,963	983	3,473	2,950
41	1,059	3,220	4,451	588	2,520	2,367
42	1,707	3,327	5,004	1,326	3,165	2,906
43	-950	4,487	3,031	-792	1,119	1,379
44	-4,846	3,547	-330	-1,479	-905	-802
45	2,907	4,636	7,679	1,474	4,577	4,255
46	-2,277	4,580	2,563	-2,266	149	550
47	3,791	3,326	5,604	3,151	4,378	4,050
48	4,827	3,049	7,299	3,588	5,444	4,841
49	4,953	2,955	7,587	3,562	5,575	4,926
50	-2,215	4,117	3,031	-2,301	365	600

Case	Bonds	Rent Assistance	Home Loans	Pub Housing	Shared Equity	Mean: All Cases
51	-2,372	4,187	1,948	-1,235	356	577
52	1,335	4,517	5,420	650	3,035	2,992
53	3,283	3,978	7,245	2,081	4,663	4,250
54	-1,095	3,888	2,052	-103	974	1,143
55	-3,819	5,085	1,517	-2,682	-583	-96
56	-2,926	4,789	1,548	-2,220	-336	171
57	-3,169	3,982	965	-1,173	-104	100
58	-2,954	3,669	1,153	-1,134	9	149
59	-5,051	3,723	-453	-1,621	-1,037	-888
60	-800	4,299	3,987	-1,284	1,352	1,511
61	3,577	3,611	6,802	2,463	4,632	4,217
62	-1,683	4,474	2,613	-1,013	800	1,038
63	-960	4,566	3,764	-1,119	1,323	1,515
64	147	3,954	3,678	145	1,911	1,967
65	3,996	4,320	7,491	2,224	4,857	4,578
66	-4,772	5,348	2,158	-3,597	-719	-316
67	-3,372	3,986	430	-821	-195	6
68	4,545	3,994	7,566	3,401	5,483	4,998
69	943	3,160	4,085	822	2,454	2,293
70	-320	3,993	2,448	633	1,541	1,659
71	-3,611	4,840	1,960	-2,587	-314	58
72	-6,167	4,641	259	-4,163	-1,952	-1,476
73	-1,755	4,418	2,810	1,244	783	1,002
74	-3,925	3,561	1,374	-1,872	-249	-222
75	-3,289	3,898	768	-1,102	-167	22
76	2,709	4,696	7,713	1,333	4,523	4,195
77	-2,463	4,901	2,075	-1,386	344	694
78	513	3,752	3,939	383	2,161	2,149
79	-46	4,142	4,677	-398	2,140	2,103
80	-3,369	4,339	873	-866	4	196
81	2,522	3,334	6,300	1,676	3,988	3,564
82	3,764	4,002	7,846	2,186	5,016	4,563
83	-3,315	4,156	1,068	-1,256	-94	112
84	2,869	3,858	6,472	1,874	4,173	3,849
85	3,640	4,484	8,222	2,062	5,142	4,710
86	-2,663	3,206	1,047	-402	323	302
87	1,863	5,123	6,897	488	3,893	3,613
88	5,097	4,993	8,600	2,975	5,787	5,490
89	-4,858	4,580	842	-3,008	-1,083	-705
90	2,300	4,161	6,831	1,001	3,916	3,642
91	2,116	4,173	5,871	1,159	3,515	3,367
92	-2,074	4,771	2,898	-1,718	590	893
93	-1,520	4,248	2,150	-195	978	1,132
94	-4,999	3,931	-190	-1,213	-701	-634
95	-5,083	3,923	-727	-559	-643	-618
96	1,529	4,371	5,491	702	3,097	3,038
97	-3,015	4,313	751	-611	70	302
98	995	4,671	4,147	916	2,531	2,652
99	-4,106	4,244	120	-974	-427	-228
100	-2,026	3,453	1,157	322	739	729

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Australian Housing and Urban Research Institute
Level 7 20 Queen Street, Melbourne Victoria 3000
Phone +61 3 9613 5400 Fax +61 3 9629 8536
Email information@ahuri.edu.au Web www.ahuri.edu.au