

*Final Report*

# **Falling through the net?**

## **A risk management model for home ownership schemes**

authored by

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## **ABBREVIATIONS**

ABS	Australian Bureau of Statistics
AHOS	Aboriginal Home Ownership Scheme
AHURI	Australian Housing and Urban Research Institute
ATSIC	Aboriginal and Torres Strait Islander Commission
CSHA	Commonwealth and State Housing Agreement
CURFS	Confidentialised Unit Record Files
LTV	Loan to Value Ratio
SA	South Australia
SHAs	State Housing Authorities
SHC	State Housing Commission
WA	Western Australia

# GLOSSARY

**Arrears:** An unpaid, over due debt.

**Estate:** The value an owner has in the property, less the amount owing.

**Default:** The failure of the borrower to make a payment of principle or interest when due.

**Foreclosure:** A legal procedure undertaken to permit a creditor to sell property that is collateral for a defaulted loan.

**Loan To Value** ratio (LTV): The percentage of the selling price or appraised value of a property that a lending institution will grant to a borrower.

**Mortgage:** An instrument, which the borrower (the **Mortgagor**) gives the lender (the **Mortgagee**) a lien on property (generally real estate) as security for the payment of an obligation. The borrower continues to use the property and, when the obligation is extinguished, the lien is removed.

**Mortgage in Possession:** When the mortgagee has taken possession of a mortgaged property, usually because the borrower defaulted on a repayment.

## **EXECUTIVE SUMMARY**

Income targeted homeownership assistance programs can play an important role in helping to restore social and economic equity in an environment where the gap between the 'haves' and 'have-nots' is steadily growing. The purpose behind this project is to contribute to the development of analytical tools that will assist such programs make decisions as to the best way to help recipients achieve and maintain homeownership.

### **Aims**

The primary aim was to develop a non-linear econometric model for assessing the risks of income targeted homeownership assistance schemes for both governments and recipients. Accordingly, the research offers two direct contributions. Firstly, the model's development process identifies and investigates the interrelationships between the key variables associated with mortgage defaults. With this information, the recipient pool can be assessed as a whole, to determine the extent to which these risk factors are apparent. Secondly, an understanding of the scale and character of these risk factors within the recipient population can be used to more specifically target enhanced safety net provisions and other relevant policy and program modifications.

### **Modelling Achievements**

An econometric risk assessment model was developed from the literature. It was control tested using ABS Household Survey Data, for Western Australia and South Australia. The pooled records (no identifiers) of the recipients of homeownership assistance programs in Western Australia and South Australia were also used to test the model's capacity to identify key risk variables, and to 'test the waters' in respect to practical applications.

Although the model was quite flexible in its capacity to assimilate a diverse range of variables and data formats, the model's further development, the testing process and the results, were all compromised by the combination of the model's need for very high quality data (across a broad range of demographic, housing, and financial parameters) and the ability of existing data sources to meet this need. While the administrative source data used in this exercise might be consistent and reliable for the administrative purposes of the Government departments, it proved to be insufficiently detailed to undertake the econometric modelling as envisaged.

Statistically meaningful, if not accurate, results were derived from the control and program data sets for the variables that were available. In other words, the model was developed to a point where it was registering the strength of the relationship between the variable and the dependant credit risk, as reflected in each of the data sets analysed. Given the limitations with the data, however, these results should be understood to be indicative of in-progress development, rather than as face value results in their own right.

With better quality data the model would have the capacity to be calibrated to become much more sensitive to the relative impact of each risk factor. However, the experience from this explorative modelling exercise is that the data limitations and challenges that are still to be resolved suggest a long road ahead before the required confidence, sensitivity and reliability is achieved.

This model-oriented research was complemented by research into the operations of the homeownership assistance programs within the broader housing context. A series of interviews with program staff and family/financial counsellors sought reflections on the influence of the key risk variables as well as insights towards refining the programs and the associated safety nets.

## **Policy Implications**

The research value adds to current policy discussions on housing affordability on the one hand, and the impending threat of the real estate ‘bubble’ bursting, on the other. It highlights the tension between the need for property values to increase for low income earners so that they have an asset that accumulates wealth, contrasted with the need for home prices to be affordable for people with low-moderate incomes.

The nation’s few remaining income eligible homeownership assistance programs have had a largely successful track record over the past ten years. They have helped to bridge the affordability gap for recipients who were in most cases not eligible for bank financing. The modelling results suggest that each of the risk factors is heavily represented throughout the pools of recipients. Nevertheless, recent program results indicate very low rates of mortgage possessions. Financial and Family counsellors also report relatively low incidence of mortgage possessions among Keystart recipients, and also generally among mainstream mortgages.

Most directly these findings suggest both the need for, and the potential effectiveness of, homeownership assistance schemes that target low-to-moderate income earners. Although there is a strong argument for expanding the national coverage of such programs, this needs to be qualified by the recognition that the success of such programs is very dependent upon the direction of property values, and they may be set to stabilise or fall. Moreover, the experience in the past suggest that it would be at this point that the model’s potential to identify enhanced safety net provisions and other mechanisms would be most beneficial.

Where there have been mortgage possessions; they were very often found among clusters of assisted mortgages in specific metropolitan or regional locations characterised by stagnant or declining property values. By contrast, where there were clusters of assisted mortgages in areas experiencing rapidly rising values, as was case among several of the New Living estates, there were very few, if any possessions.

In this respect, the implications of land release mechanisms and other government decisions that impact upon property values need to be considered within a broader ‘whole of government’ and human rights framework’. The issues are complex, for example, although there is a strong argument for location conscious risk assessment and protocols within the programs, it is also fraught with pitfalls in respect to such

issues as equity, access and the consequences of longer-term stigmatisation of people and places.

Although different in some important ways, the Indigenous experience also suggests concerns in respect to location and affordability factors. The gap between average incomes and starter home prices is wider, as reflected in considerably lower rates of homeownership. Among the locations with the highest concentrations of mortgage possessions there are pockets of Indigenous homeowners in both regional and metropolitan areas.

More specifically in relation to the comparative Indigenous and non-Indigenous homeownership experience, important cultural differences were found and, while these have to some extent been factored in through programmatic modifications, this does not in itself serve to reconcile the differences between the two groups.

## **Caveats and Ethical Practice**

A key assumption underpinning the project was that the model would ultimately be used within programs that have been put in place to assist people into homeownership, and who have a risk profile generally deemed unacceptable by market based lending institutions. In this respect, to use the model to deny, rather than assist access to mortgage finance would be contrary to the programs' primary intent.

To be clear, the model should not be used to assess individual applicants, in part because the risk lies less with individual 'applicants' and more with their 'applications', which include non-personal factors such as location and housing type. Moreover, the model should not be used to penalise recipients or potential recipients by closing existing mortgages or declining applications, in part because it cannot measure the resourcefulness of individual clients or the interventions of financial counsellors and the program safety nets.

These concerns regarding the ethical limitations of the model are supported by the observation by program staff and external counsellors, that some of the least likely cases succeed, while some of the strongest fail. This finding is reinforced by the modelling results that suggest that each of the risk factors is heavily represented throughout the pools of recipients and yet the homeownership programs have been highly successful in assisting these clients into homeownership.

## **Recommendations**

At the broadest level it needs to be recognised that a series of factors are converging to create a higher risk environment for mortgage foreclosures than has been experienced in the recent past. This situation calls a redoubling of efforts to ensure that the good record of home ownership assistance programs is maintained even during potentially difficult conditions. Accordingly, a range of recommendations are offered below that relate directly to the model and program refinements, mortgage safety net procedures, and ancillary policies impacting on homeownership assistance programs.

## **Modelling**

- Develop the model further into working tools to assist programs anticipate the impact of a change of one or more variables (eg. change in interest rates) on the pool of clients.
- Conduct research into the possibility of incorporating 'success factors' as well as 'risk factors' into the development of program based assessment tools. This could be in the form of a complementary strengths based analysis of the pool of recipients in order to assess and capitalise upon existing client strengths.

## **Program**

- Consider policy and program responses that are sensitive to risks associated with location.
- Provide prospective applicants with greater access to independent advice
- Ensure close monitoring of servicing agents
- Endeavour to develop data management systems that are more flexible in responding to the shifting of program monitoring, review and research functions.

## **Safety Net**

- Consider easier pathways and quicker response times for evoking safety net assistance.
- In cases where there are negative equity situations, consider relatively frequent (3 monthly) reviews of client circumstances to assist recipients cope with their changing needs and challenges.

## **Policy**

- Undertake further and more specific research into the possibility of expanding the national coverage of homeowner assistance programs for low and moderate income households.
- Expand homeownership assistance programs targeting Indigenous populations.
- Encourage closer lender-recipient relationships, recognising that the cost of such additional support mechanisms is returned in the form of reduced losses.

## **Appendices**

A summary of the modeling process together with a presentation of the nature and treatment of the data in a series of tables have been included in the Appendix.

# 1 INTRODUCTION

This research develops, tests out, and reports on an econometric model designed to assess the risks associated with mortgage defaults. In recent years, it has become increasingly common to use logistic regression models to assess credit risk. One of the features that sets this modelling exercise apart is that its application was considered in respect to Australian homeownership assistance programs servicing families on marginal incomes.

The development of a logistic regression model involves calculating the probabilities of a series of risk factors associated with mortgage defaults. The identification of these variables and their statistical treatment within the modelling process was developed from the literature and described in the Positioning Paper – ‘Falling Through the Net? A Risk Management Model for Homeowner Support Schemes, 2003’. This preliminary research identified factors that have contributed to defaults in the past such as income, credit history, demographics, location, and market characteristics. The modelling process began with the assumption that these same risk factors may lead to future defaults.

The control data came from the 1999 Australian Household Survey (ABS, 2001a, Confidential Unit Record Files), which included housing, finance and demographic parameters. The analysis of this data for Western Australia (WA) and South Australia (SA) provided the first round of statistical comparisons that served to highlight any significant departures from what was expected in the literature. The initial findings from this first round of testing of the model were presented in the *Work in Progress* paper, which reported on the availability and the significance of each of the variables found from processing the ABS CURF data.

Since then, a second round of modelling involved the analysis of files and perspectives derived from Western Australian and South Australian homeownership assistance programs. This was only partially successful. The model’s fuller development, the testing process and the results, were all somewhat compromised by the combination of the model’s need for very high quality data (across a broad range of demographic, housing, and financial parameters) and for existing data sources’ incapacity to meet this need. This situation effectively thwarted any further refinement of the model towards any claims of replicability or reliability of its results.

This itself was a significant finding given that the data sets drawn upon were the best available for this specific purpose. The ABS CURF and the South Australian program based data sets were of relatively high quality, but several key variables were either unavailable or in some way limiting for the modelling process. By contrast, the Western Australian program data was found to be unreliable for most variables, however, it did yield valuable insights in relation to the location of mortgage arrears and possessions, and the effect of property values, and Loan To Values ratios.

The exercise of comparing the model’s results using the available data against what was expected from the literature, together with the views of experienced program officials and counsellors served to add to the understanding of the influence and treatment of each of the variables examined. In this way, the combined quantitative

and qualitative perspectives that emerged from this study will be a useful reference for any future attempts to model mortgage risk. The model-oriented results and implications are discussed in Section 3. The Appendix provides the details of the workings - data analysis, limitations and challenges.

Although the development of the mortgage 'risk assessment' model was a primary focus of the research, its application was always linked with income eligible homeownership assistance programs. In this respect, the research directly associated with the model building process was also complemented with research focused on understanding the institutional context (policy and programs), together with the socio-economic characteristics of the housing landscape. This investigative research served to ground the model's input and outputs, ensure greater policy and program relevance, and fed directly into the formulation of a broader set of recommendations.

As discussed in the Positioning Paper, beyond the risk posed to the lending institutions (public or private), which is the usual focus of this type of modelling exercise, the risk of mortgage default, arrears and foreclosures also has serious ramifications for the public institutions that initiate and manage the homeowner assistance programs, and the thousands of current and future participating income eligible homeowner recipients. Consequently this broader policy and program oriented research agenda considered the three questions outlined below.

1. Are current homeownership assistance schemes sound government policy?
2. Are homeownership assistance schemes ultimately beneficial to the recipients?
3. What modifications or new schemes could contribute to the sustainability of long term home ownership?

Accordingly, the approach is to integrate the findings of this research around a discussion of each question in Section 4, and this in turn is followed by set of policy and program related recommendations in Section 6.

## **1.1 Scope of Research**

In the Positioning Paper, seven aims specified what was expected from the study and each of these is reiterated below.

1. To develop a non-linear forecasting model, which provides a risk management assessment of home ownership support schemes.
2. To test the model using data from interstate to establish the model's robustness, replicability and reliability.
3. To identify the variables, which are most likely to lead to circumstances of mortgage default and arrears and those that are likely to lead a household to cope with increased costs of living, interest rates and/or decreased incomes.
4. To examine the impact of increasing living costs and/or decreasing income streams on marginal owner-occupiers, including Indigenous households.

5. To offer an assessment of the economic and social costs and benefits of government backed homeownership support schemes for economically marginal groups and the extent to which the schemes meet the needs of those groups.
6. To evaluate the safety net mechanisms currently designed to help financially troubled recipients of homeownership assistance to retain their homes.
7. To recommend possible modifications to existing schemes and/or to suggest new schemes in order to maximise benefits and minimise the costs identified above.

Collectively these aims define the scope of the research. The first three involve the development of the model; the fourth relates to the application of the model, while those remaining refer to the three policy questions.

## **2 RESEARCH PROCESS**

This section serves to explain the process by which the results and findings were derived. There were both model-oriented and policy-oriented research objectives and findings and as anticipated from the beginning these interconnect on several levels. There are direct implications for policy and program development from the modelling research, and the policy and program related research also held important perspectives for the modelling process, particularly in respect to interpreting the results.

The key risk factors associated with mortgage possessions were first identified in the Positioning Paper. Since then, the relative influence and interrelationship between each of these variables has been investigated further on two fronts. The first involved a series of statistical probability tests indicating the degree of significance of each of the variables in the general population (ABS CURF), and among recipients of homeownership assistance (pooled program-based data from WA and SA). A summary of the model building and the testing procedure is outlined below. A comprehensive discussion of the treatment and analysis of each variable is provided in the Appendix.

This quantitative approach was paralleled by a series of interviews with financial counsellors and program officials by asking for their opinions about the relative influence of each of the risk factors examined. The information gained through this approach also served to underscore the complexity faced by the modellers in their assumptions and treatment of the data. The results from the interviews are compared with those from the modelling process in a comparative matrix and discussed in Section 3.1.

The model-oriented research was complemented with research around the policy and program dimensions associated with income eligible homeownership assistance. The interviews with program staff and financial and family counsellors yielded insights in relation to program operations as they related to the key risk factors associated with foreclosure. The insights developed from these opinions and experiences, together with implications of the modelling results, were used to inform the discussion around the three policy questions in Section 4.

### **2.1 Model Development**

There are four important stages involved in any modelling process – identification of the model, estimation of the model, diagnostic checking and model adequacy (validation of results). The first stage identifies the appropriate independent variables by examining the correlation matrix. The next stage involves the estimation of the parameters. The estimated parameters should ideally be unbiased, efficient, consistent and normally distributed in a classical least squares model. The diagnostic tests help to identify the problems and resolve them. A model may be incorrectly specified for various reasons, such as incorrect functional form, omitted variables, incorrect transformation of variables, incorrect imposition of restrictions, predictive failure, outliers and others (McAleer 1992).

In recent years logistic regression analysis has become an increasingly common choice among credit risk modelers because it has the capacity to explore the relationship between a single dichotomous dependent variable (ie whether default occurs or not) and a set of independent variables (ie possible factgors associated with default). Moreover, the flexibility of logistic regression allows for its use with almost any type of dependence relationship.

As discussed in the Positioning Paper, the literature on credit risk reveals differing ideas and theories as to who is more likely to default on their repayments and under what circumstances.

1. Is it the credit-constrained households in the population, including younger families and low-income households that default on their payments?
2. Is loan to value ratio an important variable in the determinant of credit risk?
3. Does employment status, educational level, occupation and government assistance have any bearing on credit risk?
4. Do demographic variables such as marital status, number of dependents, family type affect the risk of default?
5. What is the role of changing prices, expressed through affordability indicator?
6. Does the locational factor influence default risk?

In the modelling process, these theoretical possibilities become layered matrixes of risk, statistically correlated to indicate the degree of influence each has on the dependant variable – credit risk.

The approach used in developing a logistic model of household loan default experience in this study draws on the procedure adopted by Canner, Gabriel and Woolley (1991). From the perspective of the creditor, predicting future loan 'delinquency' is important. As discussed earlier, there are a number of financial and non-financial factors that are systematically used to assess the credit 'worthiness' of borrowers. Nevertheless, there are other events that are difficult to foresee and therefore cannot be modelled, and these reflected by the unexplained random component ( $\mu_i$ ).

According to Noordewier, Harrison and Ramagopal (2001), from the perspective of the lender, the two types of risks associated with the mortgage housing market are: (1) is the borrower willing and able to fulfil the mortgage requirement and (2) in case the mortgagor defaults because of non-payment of principal and interest on time, what is the collateral value of the property? If the mortgagor defaults due to non-payment, then third parties through the mortgage underwriting industry would independently estimate the residual or collateral value of the property.

In this research, the dependent variable credit risk equals 1 if the household repaid its loans on schedule and 0 if the household defaults. The model is expected to be able to predict the impact that any changes to the variables may have on the program and its recipients. The empirical examination of the influence of income variables, credit history variables, demographic and locational variables (the determinants of residential mortgage loan default) will facilitate in determining the credit risk.

Default risk for the homebuyer can be written as:

$$L_i = \ln \left( \frac{P_i}{1 - P_i} \right) = \delta_0 + \delta_1 Y_i + \delta_2 C_i + \delta_3 D_i + \delta_4 E_i + \delta_5 P_i + \mu_i$$

Where  $Y_i$  is a matrix of variables relating to income

$C_i$  is a matrix of variables relating to credit history

$D_i$  is a matrix of demographic variables

$E_i$  is a matrix of macro economic variables

$P_i$  is a matrix of place/location specific variables

$\mu_i$  refers to the error term

Expressed differently and expanding upon the equation above, it can be stated as:

$$L_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + \beta_8 X_{8i} + \beta_9 X_{9i} + \beta_{10} X_{10i} + \beta_{11} X_{11i} + \beta_{12} X_{12i} + \beta_{13} X_{13i} + \mu_i \quad (2)$$

As becomes apparent, the risk variables are arranged in different ways to reflect the risk matrixes described above. Each of these variables is defined in the table over page. The assumed positive (+) or negative (-) direction of the correlation with credit risk - the determinate - was derived from the literature. The identification and definitions of the 13 identified variables used in the model are listed on the next page.

### Variable Definitions and Expected Signs

$L_1$ = Credit risk	1 if household has repaid loans as scheduled; 0 otherwise
$X_1$ = Household income	Log of household lifetime income (+)
$X_2$ = Age of head of household	age of household at the time of loan (as indicated in the data base) (+)
$X_3$ = Employment status	1 if unemployed; 0 otherwise (–)
$X_4$ = Government assistance	1 if household is not a welfare recipient; 0 otherwise (+)
$X_5$ = Loan to value ratio	Ratio of loan to value of the property (–)
$X_6$ = Marital status	1 if household head is divorced or separated; 0 otherwise (–)
$X_7$ = Children	Number of children under 18 (–)
$X_8$ = Family type	One parent family or couple family: with or without children under 15 and dependent students (–)
$X_9$ = Educational level of head of the household	With post school qualifications or without post school qualifications (+)
$X_{10}$ = Occupation	1 if household head is unskilled; 0 otherwise (–)
$X_{11}$ = Migrant status	Australian born or migrant year of arrival in Australia (+)
$X_{12}$ = Affordability indicator	Home loan affordability indicator adjusted for inflation (+)
$X_{13}$ = Locational indicator	1 if the household is not satisfied with the location; 0 otherwise (–)

There are several methods of estimating the logistic regression. One option is the enter method, where all the variables used in the model are compared with the base model. Forward inclusion is another approach. It is the default in some computer programs, which begins by entering the best variable first, then the second partially for the first, and so on. Backward elimination is the alternative option. It starts with all the variables in the equation, then progresses by eliminating independents one at a time until such an elimination makes a significant difference.

Forward inclusion provides a rationale for intelligent but automated ordering of variables but it will miss the independents that exhibit *suppressor* effects - variables whose significant relationship to the dependent is only apparent when other variables are controlled. For instance, a variable that affects the dependent positively through an intervening variable and negatively through another may seem to have no significant relationship with the dependent and may not be included in the model under forward inclusion. If suppression is suspected, backward elimination should be chosen as the stepwise option. In this study, all these options are used wherever it is appropriate.

## 2.2 Data Limitations and Challenges

Although the logistic model approach at first appeared to have great flexibility in accommodating different data formats across a range of financial and socio-economic parameters, in this case there were significant limitations with the availability and quality of the data. The Work In Progress paper anticipated this finding, but the ensuing difficulties with the data were more problematic than expected.

The ABS CURF data and the SA program data sets were of relatively high quality and according to the results of diagnostic tests they facilitated the systematic comparison of most of the thirteen independent variables (determinants of residential mortgage loan default) within the control populations against their theorised relationship to credit risk. This process highlighted and measured any statistically significant departure from the base line model developed from the literature and provided meaningful analysis in respect to indicating the strength of the relationships with credit risk (see Table 17 in Appendix). There were, however, missing or constrained data for several variables. This effectively meant that the control or normalising role of the analysis, in terms of the model's further development, was compromised.

As well as facilitating the modelling process, the exercise also served to demonstrate some of the flexibility and the pitfalls encountered in working with 'real' data. As noted by Straka (2000) most modellers have experienced a learning curve regarding data analysis of credit risk. For example, it became apparent that even with the relatively high quality CURF data, there were a series of sampling and data attribute/quality issues that would need to be overcome before there could be any claims of accuracy or reliability. The results were nevertheless meaningful in the sense that, the model's capacity to identify the strength of relationship with credit risk was demonstrated to a point where it was the limits of the existing data – rather than the model itself that retarded its further application.

For example, of the 1342 households considered in the WA Control sample, 13.5% were making payments on their second or third home, and the rest of them were first time homebuyers. While this is fine for exploratory purposes, it should be recognised that this sample is neither representative of all WA households, all WA homebuyers nor even all WA first homebuyers. It is also highly likely that those with the worst default track record are among the renters excluded from the sample. Furthermore, the influence of those in the control population who were making payments on their second or third homes (mostly older households) may have had the effect of inflating the influence of the (young) age factor as a significant risk variable.

As well as these types of data quality and sampling issues, greater rigour in the treatment of the data is also necessary for more accurate and reliable results. Upon review it was found that the risk associated with younger age mortgagees had been inadvertently compounded by the way the variable 'lifetime income' had been estimated. That the model is sensitive to these issues is important in terms of its capacity to inform. With better data, this sensitivity is what will eventually enable the model to identify the strength of the relationship to a point where it has the potential

to inform policy and programs. That capacity is to some extent indicated by the LTV results presented in Table 4 where the high and low risk threshold levels have been estimated in a specific enough way to be useful in defining program parameters.

Given that the model's sensitivity will reflect the quality and treatment of the input data, there were several other indicators that were found to be wanting in this regard. The indicators for employment, job type and education level were only collected from the nominal head of household, which as well as reflecting out-dated gender assumptions, undermined the validity of the results in cases where couples are servicing the debt. This problem affected both the control and program data to varying degrees.

The location indicator within the control data set was also less than satisfactory on the grounds that was not direct enough to capture the key risk dimensions of the location factor. The CURF data set used a graded post occupancy assessment of the location by the householder. Although this did provide some interesting comparisons (see Table 20), without other supplementary data, such as how these may relate to the property values or sales volumes, the output can not be sensitive enough to define thresholds with enough detail to usefully inform policy or program adjustments. The program data was better in this respect and because the specific suburbs could be linked with appropriate real estate data.

All of these types of data sampling, quality, treatment and sensitivity issues are practical hurdles in the process of building an econometric model. An appreciation of these issues is the first step towards refining the process, with the expectation that the problems will tend to emerge as the process unfolds (Straka, 2000). As the analysis of the program data revealed, while there is a lot of flexibility in how the model can assimilate disparate data sets, there is still some way to go before (even relatively good) program generated data is up to the task.

Overall, the difficulties experienced during the modelling process suggest that the data requirements for the development of a logistic regression based risk assessment model were found to exceed that which is currently available from the nation's two largest income eligible homeownership assistance programs. It is a finding that reinforces a comment from SA program officials who suggested that there is probably not a big or suitable enough data pool in Australia to work with through to the required level of confidence and sensitivity.

## **2.3 Interview Process**

The modelling results indicating the comparative impact of each risk variable were also contrasted with the opinions and experiences of program staff together with financial and family counsellors familiar with mortgage default cases. The qualitative research results were integrated into a critical discussion structured around each variable and are intended to feed back to inform future modelling exercises as well as program refinements and broader policy questions.

Semi-structured interviews were undertaken with program staff together with financial and family counsellors familiar with mortgage default cases. The topics explored were:

- Risk Variables – character, dynamics, scale of relative influence
- Common issues and problems that clients face in trying to maintain a mortgage
- Possible modifications to existing schemes

An outline of the interview process is described immediately below. A summary of the combined quantitative and qualitative assessment for each of the risk variables is provided in Section 3.

The first round of interviews began in 2002 and was conducted with Homeswest, Keystart and AHOS officials. Initial inquiries sought to ascertain the nature and quality of the available program based digitised data. These discussions with program and information services managers focused on the list of variables required for the modelling exercise, and the prospect of these being satisfied with what data was available. In some cases, this involved protracted discussions reflecting varying degrees of institutional and IT systems capacities.

The second round of stakeholder interviews were semi structured and were largely attuned to gaining insight into policy and program dimensions. Each of the programs represents a complex arrangement of institutional resources, policies and administrative procedures. Those who design, review and manage the programs were asked to recall and reflect upon their experiences. Safety net provisions and procedures, together with trends and distributions in defaults and possessions were important themes in the discussions. Program managers also offered opinions as to their understanding of the importance and interrelationships between each of the variables used in the modelling exercise.

The third round of interviews involved discussions with area based financial and family counsellors familiar with the problems associated with home mortgage possessions — inclusive of Keystart or AHOS mortgages. This line of questioning was structured most directly on the experiential qualitative assessment of the importance and impact of each of the variables utilised in the model. In particular the counsellors were well placed to be able to shed light on the effect of the cocktail of mortgage pressures experienced by individual households. Some counsellors referred to in-house statistics to support their opinions but most drew upon relevant case histories and general observations.

The interviews confirmed the models results in respect to the importance of the LTV variable. This in turn was linked with property value rise and falls, location, and affordability. The level of non-housing related debt was also identified as a key factor – something not well represented in the available modelling data.

### **Interviews**

WA Program Community Relations Officer  
WA Program Information Systems Manage  
WA Program Manager  
WA Homeswest & Program Staff round table discussion  
WA Program - Consultant Systems Administrator  
SA Program Officials  
WA Indigenous Housing Program – Manager  
National Indigenous Home Ownership Program – Manager  
First Nations Bank; Representative  
Financial Counsellors Resource Project; Manager  
Bank Finance/Commentator  
Area based Family & Financial Counsellors  
Central  
South East  
South East  
Northern Family and Financial Counsellors – Focus Group  
North West

This combination of quantitative and qualitative approaches served to round out the research process, reinforcing and complementing the modelling and adding depth to the policy and program analysis. In particular, given the limitations of the quantitative data, the interviews provided very valuable insights into the dynamics of the risk factors and the interrelationships with the workings of the programs.

### **3 MODELLING RISK – RESULTS AND ANALYSIS**

Although the research fell short of delivering a working risk assessment model, the process of modelling ‘real’ data was nevertheless revealing on several fronts. In this section, the results from the tests conducted on the four data sets are analysed. This is followed by a summary of the combined quantitative and qualitative assessment for each of the risk variables; which in turn feeds into a discussion of the implications for homeownership assistance programs.

#### **3.1 Modelling Results**

Most directly, the results from the modelling testing process produced a series of statistical correlations that indicate the relative impact of each risk variable within the control populations and among the applicant pools of homeownership programs in WA and SA. The control data for WA and SA produced indicative results, as did the program data from SA, in respect to discerning between higher and lower level credit risk factors.

Tables 17abc and 21abc in the Appendix provide results from the logistic regression equation for credit risk within WA and SA control data sets. The results for both WA and SA control data were similar. Variables such as loan to value ratio (LTV), lifetime income, and the age of head of household were found to be the more important determinants of default risk both in the control data for WA and SA. The diagnostic tests clearly indicate that the prediction accuracy is reasonably good (overall percentage above 99%) and the independent variables explain 94% of the variation in the dependent variable, credit risk (Nagelkerke R Square = 93.9%).

According to these diagnostic procedures, the results were significant enough not to be due to chance. In other words, the model was developed to a point where it was registering the strength of the relationship between the variable and the dependant credit risk, as reflected in each of the data sets analysed. Given the limitations with the data, however, these results should be understood to be indicative of in-progress development, rather than as face value results in their own right. The point is though, with better quality data the model would have the capacity to be calibrated to become much more sensitive to the relative impact of each risk factor.

Improved data quality and a fuller range of housing, finance and demographic indicators would have enabled more detailed analysis of the dynamics between the variables. For example, the relationship between Location and LTV was identified in the literature as being critically important and complex, but the limited nature and treatment of the location factor within the control data most certainly would have understated the complexity of this relationship (see the discussion around Table 15).

The program data from SA was of relatively high quality and, for the variables that were available, the results were indicative of the level of influence each of these had on credit risk among the pool of recipients (tables 23-39). The WA program data set (Tables 30-34) was too inconsistent (missing fields) to be gainfully analysed. However, the WA program data did reveal the significance of the location factor to a

much greater degree than the other data sets. The degree of clustering in respect to loans and defaults is evident in Table 34.

The results from the analysis of each of the different control and program data sets are summarised in the variable matrix presented below. Although the findings from each source differed to some degree with each other and the expectations derived from the literature, the results were in keeping with the different characteristics of the sample populations and the influence of different program and housing market contexts. That said, the experience from this explorative modelling exercise is that the data limitations and challenges that are still to be resolved suggest a long road ahead before the required confidence, sensitivity and reliability is achieved.

**Variable Matrix**

<i>Variables</i>	<i>WA Control</i>	<i>SA Control</i>	<i>SA Program</i>	<i>WA Program</i>	<i>Qualitative A Keystart</i>	<i>Qualitative WA AHOS</i>
Lifetime income	Yes and Significant	Yes and Significant	No and Not Significant		Not Significant	Not Significant
Age of Householder	Yes and Significant at 90%	Yes and Significant	Yes and Significant		Not Significant	Not Significant
Employment Status	No and Not Significant	Yes and Significant				Not Significant
Government Assistance	Yes but Not Significant	No and Not Significant	No and Not Significant			Not Significant
Loan to Value Ratio	Yes and Significant	Yes and Significant	Yes but Not Significant	Yes and Significant	Yes and Significant	Yes, but Not Significant
Marital Status	Yes and Significant at 90%	Yes but Not Significant	No and Not Significant		No and Not Significant	Not Significant
Number of Dependents	Yes but Not Significant	No and Not Significant	Yes and Significant		No and Not Significant	
Family Type	No and Not Significant	No and Not Significant				
Education Level	Yes and Significant	No and Not Significant				Yes but Not Significant
Occupation	No and Not Significant	Yes but Not Significant				Not Significant
Migrant Status	Yes but Not Significant	Yes but not Significant				
Affordability Indicator	Yes but Not significant	Yes and Significant				
Location Indicator	Yes but Not Significant	Yes but not Significant	Yes but Not Significant	Yes and Significant	Yes and Significant	

## 3.2 Risk Factors and Program Experience

What follows is a summary of what was learned - from the modelling, interviews and ancillary fieldwork - about each of the risk factors. In combination with the tables and associated discussion in the Appendix, this summary provides a useful reference platform for any future research into mortgage risk and homeownership assistance programs.

**Life time Income** - is an important factor but increasingly difficult to estimate given the instability of employment markets.

### *Credit Risk-History*

**Age** – of the head of household has little or no impact on whether a mortgage is maintained. However, program staff did note that some very young couples were sometimes unprepared for the rigors of homeownership, and could do with more/different counselling than they were equipped. The influence of the age factor in the control data modelling results is probably due to the influence of second and third time homebuyers and the size of their deposits. To avoid ambiguity, the term 'primary income earner' would be preferable to 'head of household' in respect to conveying the intended meaning.

**Employment** – job loss was cited as the one of the most common reason for mortgage possessions and was often linked with relationship breakdown, which compounded the risk.

**Government Assistance** – may have relevance in some situations and not others and thus needs to be defined and qualified further particularly with respect to the nature of the assistance. In Western Australia, people on government assistance are unlikely to qualify for a loan because even with the assistance starter home prices are generally out of reach. This is less the case in South Australia. AHOS program staff also highlighted a case where an elderly couple on pensions applied and received an \$11,000 mortgage for a property in a wheatbelt town. Not only did they not default but they also repaid their mortgage ahead of time. The issue therefore is not whether applicants are employed or unemployed but firstly whether they have enough income to buy the house they wish to buy and secondly the loss of income or a downgrade in income can impact on defaulting and possibly mortgage in possession.

**Loan to Value Ratio** – although Australian household debt levels are at an all time high, as are mobile phone and credit card induced bankruptcies, these trends have not been matched by rising numbers mortgage possessions. In the past year, the Keystart program has recorded its lowest number of mortgage possessions since it began. The level of defaults has remained high, however, which suggest that although the negative impact of higher costs and insecure incomes are being felt, something else - very likely a period of increasing property values - has slowed the rate of possessions.

Overall, the evidence points to loan to value ratio as a more significant and complex risk factor in respect to possessions, practically in association with stagnant property values. The literature suggests that in a depressed market it is likely that the higher the loan-to-value-ratios the larger the risk of defaults and default-induced sales. This

was borne out from WA program that revealed a high degree of mortgage defaults in particular suburbs and rural communities, all of which were experiencing stagnant or declining property values.

**Marriage Status** – or more practically, relationship breakdown is often connected with finance issues, irregular incomes and personal debts. However, once the shock has been absorbed, many families will rally to maintain the home despite the added two household cost burden. In other cases it will trigger the selling of the home, with or without children being involved.

**Number of Dependents** – the potential significance of this variable is masked by several factors interrelated with program eligibility rules concerning assessable income, and the prospect that child allowance and other income supports for low income families may have considerable but unaccounted bearing upon their debt servicing capacities.

**Family Type** – although there is an added vulnerability (higher risk) associated with single headed families having to get by on one income, couples who are comparatively more income robust carry the added risk of relationship breakdown. It is the shock of the breakdown, in respect to the sudden added housing cost of two households, relative to the family's combined debt burden that appears to have more significance.

**Education Level** – this was linked to employment flexibility and income stability. It also has an impact in so far as assisting people in understanding financial matters. It was also identified that financial management skills are passed down through generations. This is a particularly relevant issue for Indigenous people, given that many have never had access to loans or mortgages and therefore have not been able to pass on such financial management skills.

**Occupation** – the type of occupation only appears to have an impact in so far as it relates to the stability of employment.

**Migrant Status** – If there are trends, they are often obscured by the diversity both within and between migrant groups. Financial counsellors tell of quite different approaches by different ethnic groups in the way that they approach debts with or without family/community support.

**Affordability** – during the 2001-03 research period, home property values increased by some 9% per annum. The rate of growth in the Perth market was a little slower starting its climb compared with much of eastern Australia but the recent 'heated market' has several significant follow-on effects. Firstly, homes have become more expensive which in turn raised the level of the incomes necessary to access program's benefits. This excludes families on lower income and, it also encumbers those who make the higher cut off point with a bigger mortgage to service, and puts them in a potentially high risk position if property values were to flattens or decline.

**Location** – There are clear indications of clusters of defaults and mortgage in possessions, which highlights the locational dimension to credit risk. Some regional areas generated the biggest losses, when values and housing demand tumbled in the wake of sharp downturn in the mining fortunes of several towns. Several outer

metropolitan suburbs were also affected by relatively stagnant property values, although this subsided to some extent with the added demand generated by the introduction of the First Home Buyer Grant.

Location is also an issue for many Indigenous clients as they are more likely to buy a property that is close to family members and/or in their 'country'. By doing so the clients have support from their family members (inclusive of extended family). However, it can cause problems in rural and remote locations that experience fluctuations or a downward turn in property values.

The way the control data registered the location variable, through survey responses in terms of degrees of satisfaction with the location, proved to be too insensitive to credit risk dynamics. Where program data did provide more specific postcode and suburban locations, trends in sales volumes and property could be identified and the significance of the location factor showed through.

### **3.3 Program Implications**

Overall there is a sense that the programs have performed well during a relatively buoyant period, and which in recent times has become characterised by relatively high property value increases. This in turn has several important implications. Firstly it suggests that the modelling results in respect to assessing the relative influence of each of the risk variables may have been obscured by the strength of the market.

Put another way, the low rate of mortgage possessions experienced within (and external) to the homeownership assistance schemes is more attributable to people being able to sell themselves out of trouble, and less a reflection of the relative insignificance of other risk variables such as job loss and family breakdown. This affect is also likely to have accentuated the influence of the location factor. In such generally buoyant times, the few locations experiencing stagnant or declining property values would be the only ones producing any mortgage possessions.

There are also other important concerns with the analysis arising from the fact that the modelling exercise was run during a period of rapidly rising property values. The implications are that this is very likely have obscured the influence of the other variables. This finding in turn reinforces the ethical concerns related to the inappropriateness of the model in respect to assessing individual applicants. The key point being, that highly influential variables such as location, the direction of property values, and affordability, are not in themselves personal attributes.

This interpretation also suggests that neither the programs nor the safety net operations have really been tested in respect to an extended period of prevailing negative conditions. In other words, it remains to be seen whether the programs can cope with both the scale and the character of the possible problems encountered during periods of high interest rates or declining property values. Moreover, given the possibility of the real estate bubble bursting in Australia (*The Australian* 09/03/03), there is a strong argument for a close and ongoing monitoring of the way the programs perform and adjust over the next few years.

With further development, and with local level contextual grounding, the model has potential to assist programs anticipate the impact of a change of one or more variables (eg. change in interest rates) on the pool of recipients, and with a view to preventing high rates of mortgage in possession and defaults. The current availability and quality of data, however, significantly inhibits the model's capacity to generate accurate and reliable results. In turn, this finding serves to reinforce the need for researches and program officials to work together towards enhanced data systems attuned to program reviews and adjustments, particularly if the Australian housing market is indeed on a precipice with either interest rate rises or declines in property values.

In the Positioning paper job and income losses, small business failure, financial over commitment and relationship breakdown were all identified as the most significant reasons for mortgage possessions (Davis & Dhooge, 1993:37; Ford et al (1995), and Berry et al 1999). These factors are interlinked in complex ways and they feed back onto each other to influence the default-foreclosure outcome (Davis et al, 1993; Nettleton & Burrows, 1997). According to the family and financial counsellors there is no evidence of any significant declines in these events, and the level of personal debt and the number of personal bankruptcies is high. From this perspective, there is a strong case for a very close monitoring of the coping mechanisms of both recipients and programs in the face of any macro economic down turn or property market decline.

## 4 KEY POLICY QUESTIONS

In respect to the contribution to policy and program development, three key questions were identified in the Positioning Paper as leading the research, and these can now be answered as follows:

### 4.1 Are existing homeownership assistance schemes sound government policy?

Over the past 10 or so years, Australian income targeted homeownership assistance programs have proved themselves to reflect sound government policy. The proviso is that a long term whole of government approach needs to be adopted in designing and supporting homeownership assistance programs to help recipients succeed in serving their mortgage and maintaining their homes.

The schemes that were in operation for the duration of the 1980s were subject to extreme interest rate rises that created enormous stress on homeowners generally, and within the programs specifically there were mortgage possessions. This observation created some controversy during the Work In Progress Conference in Adelaide September, 2002. The former NSW program was defended as a largely successful program but subject to the extreme pressures of the day - implying that it was closed down unnecessarily. There was also some debate as to whether the South Australian program had suffered from high interest rates, and subsequent discussions with program staff confirmed the Badcock and Beer (2001:73) account that it did.

By contrast, the South Australian and Keystart programs began during these difficult times (1989, and 1990 respectively) and although they too experienced possessions, they did not have the same scale of exposure. Moreover, since then, these programs have enjoyed the prosperous market in residential mortgages experienced through much of the 1990s to the present times although predictions are being made that the housing 'bubble is about to burst' due to inflated housing prices. It is imperative for the programs to be prepared for such conditions in the housing market and as such offer some degree of protection for funders and recipients. Having a model that could predict the impact of such exogenous shocks would be highly beneficial.

Homeownership assistance programs that are sensitive to changes in broader economic conditions and that can adjust accordingly would offer considerable benefit in defending such schemes. The financial and social cost of systemic failure among government backed homeownership assistance programs is potentially high and multidimensional. Conversely, successful homeownership programs create a wealth of social benefits while reducing government spending through encouraging greater individual and private institutional investment in housing. Conversely the evidence also suggests that home ownership is neither suitable nor attainable for everyone and therefore a range of other tenancy options need to remain available and easily accessible.

The whole of government perspective adopted in assessing this question, anticipated the possibility of tensions emanating from potentially conflicting policy objectives such

as employment generation and socio-economic participation (Commonwealth focus) on the one hand, and land development priorities on the other (State focus). Another potential tension exists between minimising short and long term welfare expenditures as in the case of accessing employment benefits and the difference between rental assistance for renters, and no corresponding assistance for homeowners despite the likelihood of more onerous mortgage payments.

The Keystart program is marketed and administered on the ground through home builders and real estate developers, and clustered in government joint ventures enhancing land release priorities. As useful as these synergies may be, it implies a lack of independent advice for people making the decision to commit to homeownership. This concern is amplified by the results, which indicate that several of these new land release areas on the fringe of metropolitan Perth have been among the worst affected in terms of stagnant property values and concentrations of mortgage in possessions.

This raises a dilemma as it is the low cost of property in new land release areas that make it attractive and affordable to people with low incomes. It can also be a way in which people can enter into the housing market and providing they are able to acquire enough equity in their property they are then able to have greater choices of whether they want to stay in the area or move. In order for this to happen it requires sensible government policies at both federal and state level to ensure stability of interest rates and land value. However, governments need to also look at ways of releasing affordable land/housing for low income people in other places such as redevelopment areas.

By contrast, the Keystart loans in the New Living estates (a state initiative funded by the sale of Homeswest properties & DHW land) redeveloped from older public housing estates have seen far fewer mortgage possessions. As well as highlighting an important success with the New Living program, this finding is significant because it supports the argument that it is not so much concentrations of Keystart mortgages that presents a higher risk, rather, it has more to do with market expectations of a locality's/suburb's/estate's comparative values over time.

Historically, the responsibility for assisted homeownership programs delivering negative results has tended to stay with governments, whether or not the service is privately outsourced, as it is with Keystart. When there have been relatively high rates, or clusters of arrears and possessions among assisted homeowners, the direct and indirect costs to government are high.

Because the costs of homeownership failure (mortgage possessions) incurred by governments, private institutions and families are potentially high, there is a strong economic argument for providing a high degree of assistance and ongoing support to homeowners through difficult times. In many cases, the cost of these concessions could be absorbed over the length of the mortgage or by adding a year or two on to the mortgage period. These costs can also be mitigated if the recipients were more equipped to succeed from the beginning, through independent advice, and, with early intervention when things go wrong.

## **4.2 Are homeownership assistance schemes ultimately beneficial to the recipients?**

The vast majority of the recipients of income targeted homeownership assistance have benefited enormously on many fronts. However, it is also the case that not all homeownership opportunities deliver the assumed benefits such as independence, personal pride and the means to accumulate and distribute wealth. The risk is that some people are buying into a potential poverty trap. Other recipients may never have been equipped to become homeowners and are over-whelmed by the maintenance, land and water rates together with the regime of mortgage payments.

Overall, income targeted homeownership assistance programs operating in WA and in SA since 1989 have facilitated some 80,000 households into homeownership who would otherwise have been denied bank financing. The vast majority of these recipients have experienced the social and economic benefits that home ownership can bring. Program staff and financial/family counsellors also confirmed the degree to which the vast majority of recipients have benefited, and also how they seem to 'hang on' during in times of difficulty.

The largely successful track record in both WA and SA is indicative of efficient administration particularly in respect to offsetting the possible risks with marginal income applicant pools. These programs bridge the affordability gap for recipients, who were not eligible for bank financing, generally because they fell out side of the usual risk assessment parameters. It is also noteworthy that many of the WA program recipients are later 'poached' and refinanced by banks once they have a proven track record and greater equity. In this sense, through accessing homeownership assistance the recipients have effectively shifted from being marginalised into mainstream.

Current research into the New Living program has found that New Living properties have annually appreciated on average 12.5% between 1998 and 2003 with high performance suburbs recording up to 16.1% for the same period. (Shelter WA 2003). Although this has clear benefits for WA program recipients who bought houses early in the development the price increases in some of these suburbs are getting out of the reach of program applicants with the average house price in New Living suburbs rising from \$78,900 in December 1998 to \$134,212 in June 2003 (ibid).

Importantly, Indigenous people remain the most marginalised people on all socio-economic indicators hence homeownership still remains disproportionately low for Indigenous people. Since its inception (1995) the AHOS has assisted 472 Indigenous applicants into home ownership. This does not account for those that have successfully received mortgages through both ATSIC and mainstream lending institutions, which totals 43% (standardised<sup>1</sup>) of Indigenous people across Australia in comparison to 70.5% (standardised) of non-Indigenous people (ABS 2001).

Given the current policy discussions focussed on housing affordability, the research highlights the tension between the importance of property values rising, for low

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<sup>1</sup> Standardisation is an adjustment made by ABS to accommodate for the different age ranges in the populations

income homeowners to have an appreciating asset, and the need to keep property prices within an affordable price range for people with low incomes to access homeownership. There are implications in respect to government decisions on land release and other decisions that impact upon property values and therefore need to be factored into homeownership programs. However, the prospect of location conscious risk assessment and protocols in program administration are also fraught with its own pitfalls in respect to such issues as equity, access and stigmatising people and places.

Although there are some differences between Indigenous and non-Indigenous people highlighted through the qualitative analysis there is a danger of masking the social justice implications through using a deficit approach and hiding it within cultural appropriateness. The key difference that this research asserts is that even though effort has been made to increase home ownership for Indigenous people via ATSIC home ownership program, AHOS and to some degree Keystart there is still an inability of government to meet the aspirations of many Indigenous people who aspire to home ownership. This is highlighted by the low number of Indigenous recipients and the difficulty that a housing officer highlighted by stating that there is a need to further 'Aboriginalise' Indigenous focused programs in order to meet Indigenous needs.

These social justice responsibilities of governments extend beyond the home ownership existence programs to a 'whole of government approach' A correlation has been drawn in areas that have concentrations of mortgage possessions due to the lowering of house prices and pockets of Indigenous homeowners in both regional and metropolitan locations indicating that there may be a high number of Indigenous people losing their houses. The government has a responsibility to investigate this further and to intervene if necessary through its redevelopment arm in order to manage property prices and not exacerbate the inequities that exist.

Moreover, Indigenous peoples' experience suggests concerns in respect to affordability that also require a 'whole of government' response. The gap between average incomes and starter home prices is wider, as indicated by considerably lower rates of homeownership (ABS 2000). Moreover, percentage wise more Indigenous people spend more than 25% of their income on housing costs when buying a home which is significantly higher than non-Indigenous people (ABS 2001). Hence there is greater housing stress on Indigenous people and less opportunities to own their own home.

In order to overcome some of the cultural issues facing Indigenous homeowners the AHOS offers Indigenous people services that are sensitive and understanding of Indigenous cultural needs although the program personnel struggle to 'Aboriginalise' the program further due to funding constraints and programmatic constraints. However, the program provides counselling, education on financial management and a degree of cultural understanding.

Program workers at AHOS also highlighted the many benefits that home ownership can offer Indigenous people. The primary response was that it offers a family asset that can be passed on to future generations. This was stated as having the added

bonus of leading Indigenous people away from 'welfare dependency' and therefore giving them greater control over their life. It was also stated that by maintaining a mortgage Indigenous people learn the skills of budgeting and loan management. Furthermore, home ownership was also stated as offering Indigenous people more control over their immediate environment and prevents 'hassles over rent'. This adds up to self-determination over the local environment which is already bestowed on most non-Indigenous people but remains aloof to most Indigenous people.

The literature also points towards high levels of discrimination in the private rental market (Focus Pty Ltd 2000), which minimises the options of Indigenous people in housing tenures to social and community housing and home ownership. As mentioned above there are many benefits to home ownership but as stated by the Director of the AHOS, 'Home ownership is not for everyone.' And therefore with the limitations on the private rental market there is a need for governments to maintain and expand both social and community housing for Indigenous people, while challenging discrimination in the private rental sector and expanding upon Indigenous home ownership schemes. This becomes increasingly important with the expanding Indigenous population in WA, which has seen an increase of 15.1% between censuses (ABS 2001a).

#### **4.3 What modifications or new schemes could contribute to sustainable home ownership?**

Keystart and AHOS programs have developed a range of strategies and policies that are effective in mitigating the possible risks associated with applicant pools. Nevertheless, there are mortgage defaults (around 6%) and some 2-3% of those assisted will ultimately lose their home.

The relatively low failure rates generated by these programs also reflects the effectiveness of 'safety net' schemes, whereby those struggling to make their payments can apply for various dispensations. With the Western Australian Keystart program, a year of half rate mortgage payments is a basic feature of the safety net scheme. The AHOS has a little more flexibility based on the discretion of the housing officer whereby the safety net can be in place for up to 2 years. In some of the more difficult cases, Western Australia's public housing authority, will buy-out up to 50% of the mortgage so that the home owner remains housed and in possession.

Program staff recognise that although safety net provisions come with costs, the savings to both individuals and lenders means that they are quickly absorbed. There is also a program design dilemma that stems from the need to provide effective safety-net measures, yet without unwittingly promoting over reliance upon these.

From this perspective, the degree of a program's success is a function of maximising the scale and qualitative dimensions of the benefits, while minimising the risks and losses to both recipients and lending institutions. This understanding underscores the value of research into the development of risk assessment models appropriate to the needs of homeownership assistance schemes in Australia.

The largely successful track record is indicative of efficient administration particularly in respect to offsetting the possible risks with marginal income applicant pools. Program staff and financial/family counsellors also confirmed the degree to which the vast majority of recipients have benefited, and also how they seem to 'persevere' during in times of difficulty. The evidence suggests that the West Australian and South Australian homeownership assistance programs are effective. The rates of default (approximately 6%) and Mortgage in Possessions (2-3%) are comparable to those of banks and other mortgage finance sources.

Program refinements over the years have also helped. For example, there is a requirement that Keystart financed homes be fitted out with basic furnishings (carpets and curtains) and externals (driveways, paving). This is a program response to the recognition that new homeowners were being targeted by unscrupulous secondary financing agents who offer credit packages for such items, but in so doing, burden the recipient with added debt and risk. Adding to this, the AHOS program staff stated that they had a preference for recipients to buy established homes as opposed to new housing because of the additional costs of secondary fixtures.

One interviewee noted the persistently high rate of possessions associated with the relatively long-term stagnant property values in the south east metropolitan area. This was then contrasted with the experience of one northern suburb where the initially high rate of possessions declined sharply with the upward movement in property values. The timing and scale of land release, particularly in respect to over supply, could be a potentially important mechanism for minimising the rate of home possessions.

Programs should be designed and operated to ensure that a program's loan approvals system objectively considers an area's risk as distinct from the risk attributed to the applicant. The WA program does recognise this distinction in several regional centres where there have been waves of mortgage possessions, but less so in relation to metropolitan settings. There are also complications arising from the possible stigmatising or 'red lining' of areas, as well as the perpetuation of regional inequities.

During the interviews, almost everyone had a suggestion to make. These covered not only specific ideas for program modification but also for broader policy and institutional change. These ideas and suggestions are reflected in the content of the studies recommendations and also in the program based issues raised below.

### *Independent Advice*

Independent advice is required on such issues as finance (interest rates, the pitfalls of secondary financing, and budgeting for maintenance costs, for land and water rates and for emergency repairs). In most cases (74%) loans are referred to Keystart through independent brokers who should be sourcing the best product for the borrower. However program staff and financial counsellors recalled cases where bankruptcy and mortgage possession were seen as the easy exit option by borrowers without apparent knowledge of the longer-term ramifications.

More controversially there is also a need for independent advice related to the choice of housing type, and particularly location, given its potentially high risk factor. The program's statistics on both mortgage defaults and possessions provide this indicator but it is less clear at what point relatively high rates of default or possessions in a locality would trigger a programmatic response and how this may translate into appropriate advice.

Particular client groups need to be considered. Currently there are three lending institutions that have Indigenous staff trained to offer culturally appropriate advice to potential recipients. These are the First Nations Credit Union, ATSIC and AHOS. Due to the low homeownership rates amongst Indigenous people there is a need to further promote homeownership amongst Indigenous people. The AHOS housing officer felt that interest rates should be minimised or if not waived for Indigenous people to encourage more home ownership.

Some financial counselling services do offer targeted assistance (including but not specifically focussed on housing finance advice) to migrant groups. However these are often on a very limited basis, and largely dependent upon ethnic make-up of the local population.

#### *Closer Monitoring and Earlier Intervention*

Financial counsellors highlighted the need for quicker responses to mortgage defaults in order to confront the general hesitancy among mortgagees to disclose any problems. An AHOS program worker related that 'many Indigenous people feel shame when they fall behind on a loan and therefore will not contact the organisation to ask for assistance'. The worker suggested that 6 monthly reviews should take place in order to identify recipients that may be facing economic difficulties so that the safety net can be implemented as quickly as possible.

This sentiment for safety nets to be activated early was echoed more broadly, as was the need for building referral points into the loan monitoring program and with increased flexibility to respond appropriately to the range of underlying issues. Finance counsellors need to be utilised earlier to help mediate this forbearance dilemma. From Interviews with program staff, it also appears that some mortgage in possessions have generated a profit upon the sale, even after the legal fees (approximately \$4000) have been subtracted, and that this is returned to the former homeowner. In these instances it is clear that different and less legally and financially onerous outcomes may have been possible through earlier intervention, and longer periods of more generous concessions.

The local experience points to an average four year high risk window that closes as the Loan to Value ratio reduces through property appreciation and equity. The window remains open much longer for some, due to property value stagnation or declines, and while it does, the experience is that it is prudent for borrowers to be both closely monitored and effectively and sympathetically assisted.

#### *Improved Data Systems*

New technologies will encourage modellers to develop increasingly robust credit subsidy models (Stanton, 2001). While computerized technology may pose problems

at its inception, the new programs will eventually improve the linkage between government agencies, private financial/lending institutions and housing research institutions.

The availability and quality of the data continues to limit the capacity of the modelling process to generate accurate and reliable results. While these limitations do pose problems, it is also a key finding in that it serves to inform the design of improved program based data management systems. It is also noteworthy that Keystart's existing computer systems have been very recently overhauled, which is a reflection of the internal recognition of these limitations. This has also been complemented with more centralised administration of the servicing functions which allows for a more coordinated approach to record maintenance.

The quality of the South Australian program data provides enough program level housing, finance and personal detail to facilitate further refinements to the development of a basic working model. This capacity can be enhanced through more contextual detail, as it was with the WA analysis, but it is also the case that the overall data needs in respect to developing a highly sensitive risk assessment model still poses a major challenge to modellers and program/system managers.

## 5 ETHICAL POSITION

One of the key issues identified in the Positioning Paper involved the ethical concern related to the possible misuse of the risk assessment model in assessing individual applicants. Interviews with South Australian program officials reinforced this concern. They came to a similar conclusion when presented with the results of the earlier risk assessment study (see Berry, Dalton, Engels & Whiting, 1999). The point that program officials emphasise is that the risk lies less with individual applicants and more with individual applications, which include other non-personal factors such as location and housing type.

This simple restatement of the basic understanding of where the risks lay, removes the punitive orientation away from 'demonising' declined applicants, which itself fosters an unnecessarily higher individual risk profile. Instead, the South Australian approach is to scrutinise higher risk applications towards identifying the nature of the risks together with possible ameliorative strategies, such as other locations and housing types, or increased equity. With this understanding, the risk assessment model converts from a potentially excluding ethical orientation to one that is more enabling, and thus in keeping with the principles outlined in the Positioning Paper.

Given the clustering effect of the programs distribution of recipients and the propensity for some these locations to generate relatively high numbers of mortgage foreclosures, there is another set of ethical questions that emerge. On the one hand there is the fiscal need and perhaps the moral obligation to respond accordingly with due caution. However, this infringes on equity and access and carries with its own problems.

This position seems all the stronger given that the accuracy and reliability of the available program data has to improve significantly before the model can be developed further with the required sensitivity and reliability.

## 6 RECOMMENDATIONS

### *Model*

- Develop the model further as a tool to assist program managers anticipating the impact of a change of one or more variables (eg. change in interest rates) on the pool of clients.
- Avoid the use of such models in assessing individual applicants
- Factor in an enhanced local understanding of the influence of each risk variable towards improving the model's sensitivity.

### *Policy*

- Foster more specific research considering the potential expansion of homeowner assistance programs for low and moderate income households to a national level.
- Expand assistance programs targeting indigenous populations, actively taking a longer-term role in terms of support.
- Encourage closer lender-recipient relationships, with the cost of additional support mechanisms returned in the form of loss control savings.
- Involve more financial/family counsellors earlier with precautionary advice and explanations of options, and also when things wrong activate resources and support services such as Centrelink connections

### *Program Specific*

- Consider policy and program responses sensitive to risks associated with location.
- Provide greater access to independent advice for prospective applicants, including non-ownership options, realistic housing cost assessments (rates, maintenance), and financial guidance.
- Monitor more closely servicing agents, (this responds to the observation that some finance agents and servicing banks are much better for financial counsellors to work with than others even if they are all equal under the same program guidelines and consumer protection obligations).
- Continue investment in IT capacity building to service changes in the government policy, technology, client needs and AHURI research needs, and particularly those aligned with mechanisms for program monitoring and review functions.
- Modify programmes to sell homeownership as consistent with indigenous values. (Workers within the AHOS have struggled to 'Aboriginalise' their program. They believe that part of the reason is due to home ownership being a mainstream value that differs from Indigenous values). The following ideas have been offered:

- Enable two family members the ability to acquire a mortgage and take joint responsibility over its management to accommodate the complex structures of Indigenous families (Currently only individuals or people living in defacto or marriage relationships can enter in to a mortgage through the program).
- Conduct a review of the client's financial circumstances six months after the home purchase in order to anticipate and offer support to clients that may be facing difficulties. This review should to incorporate an education strategy that assists clients with financial management.
- Conduct more frequent monitoring of the changing circumstances of recipients where the client goes into negative equity, and offer scope for early and a broader array of supportive responses.

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## APPENDIX

The main focus here is to show the workings of the data. A brief outline of the procedure involved in logistic regression modelling is followed by an explanation of the limits and challenges encountered when analysing the data. Altogether a series of 32 tables form the basis of the modelling exercise. The analysis begins with the Western Australian (WA) and South Australian (SA) control data, which is followed by the analysis of program data, derived from the income targeted homeownership assistance schemes.

The tables are interspersed with a brief outline of the key dimensions of each risk variable. An explanation of the limits and challenges encountered when processing the data supports the general finding that there is a lot more work required before there can be any claims of accurate or reliable modelling results.

The control data came from the 1999 Australian Household Survey (ABS, 2001a, Confidential Unit Record Files), which included housing, finance and demographic parameters. The analysis of this data for WA and SA provided the first round of statistical comparisons that served to highlight any significant departures from that expected in the literature.

The second round of statistical comparisons involved the analysis of data and perspectives derived from WA and SA homeownership assistance programs. The SA program data was of relatively high quality, however, the application of the WA program data was primarily restricted to insights in respect to influences associated with location.

The two statistical tests that were used to examine the significance of the final model are the chi-square test for the change in the  $-2$  Log likelihood ('-2LL') value from the base model and the Wald statistic to assess the statistical significance of the estimated coefficients for the independent variables and the constant. In assessing overall model fit smaller values of the  $-2LL$  measure indicate better model fit.

The program data sets were derived from Australia's two largest income eligible homeownership assistance schemes. They offered the opportunity to assess the capability of existing data systems to deliver the requisite quality and range of variables for modelling. At the same time, attempting to run the model with program data, serves to inform program and data systems managers in respect to what is needed in the future.

The SA program data was workable while the WA data was too inconsistent to be usefully analysed except in respect to location. Some important variables are not available while others offer only a proxy indication of what was initially sought. There were also some important differences between each of the program data sets in terms of what variables were available. The Work in Progress Paper recognised these limitations and suggested ways that some of these could be mitigated or circumnavigated.

## A.1 Control Data

As a practical reference point, Table 1 serves to highlight the composition of Western Australian and South Australian CURF survey data compared with the rest of the nation.

**Table 1: Types of tenure (households) in different States/Territories**

<i>State or Territory</i>	<i>Owner without a mortgage</i>	<i>Owner with a mortgage</i>	<i>Life tenure scheme</i>	<i>Rent/buy (or shared equity)</i>	<i>Renter</i>	<i>Rent free</i>	<i>Total</i>
NSW	2522	2092	21	32	1500	66	6233
VIC.	2442	1902	19	29	1032	101	5525
Q L.	1644	1750	8	37	1295	79	4813
S.A.	1592	1472	26	16	876	56	4038
W.A.	1224	1303	21	18	800	65	3431
TAS.	795	655	17	16	445	21	1949
N.T.	81	164	—	12	214	5	476
A.C.T.	368	524	—	5	317	9	1223
Total	10668	9862	112	165	6479	402	27688

### *Western Australia*

According to ABS (2001b) almost 40% of Australian households were repaying home loans, apart from loans on other consumption spending on such things as motor vehicles, holidays and personal items in 1999. The amount of debt outstanding secured on housing in Western Australia is around \$88,000 on an average per household. The average market value of dwelling and the average equity on the property was \$199,000 and \$114,000 per household, respectively. The proportion of households with loans and the average debt outstanding declined steadily as households moved into subsequent life-cycle groups and home mortgages were reduced and finally discharged altogether.

The ABS (2001a) dataset also reveals that 1161 out of a sample of 1342 households who are servicing their home loans in WA are first homebuyers. That is 86.5% of the households are first homebuyers in WA, who have not yet had the benefits of tax-free transfer of capital gains.

Table 2 below, gives the mean and the standard error of the variables used in the study. Credit risk is a dummy variable, which measures the presence or absence of risk. The dependent variable credit risk equals 1 if the head of the household repaid his loans on schedule and 0 if the household defaults. The estimated lifetime income is dependent upon the weekly income of a person and their age<sup>2</sup>. Locational indicator

ranges from 1 to 5 and 1 refers to very well satisfied 5 refers to very dissatisfied with the location.

To investigate the characteristics of households, Table 2 provides summary statistics with mean and standard error for all variables for Western Australia. Credit risk ( $L_1$ ) is measured as a dummy variable, 0 referring to default and 1 implying mortgage payment as scheduled. The mean value of credit risk variable is .9303 (std. error = 0.01), which implies that 93.03% of households on an average will repay their loans as scheduled while 6.97% will default on their payments in WA. Lifetime income ( $X_1$ ) is expressed in logarithmic form with  $\bar{x}_1 = 5.93$  with std. error = 0.02. Age of head of household ( $X_2$ ) is measured as a scale variable ranging from 1 (15-19 years) to 13 (75 years and over) with  $\bar{x}_2 = 6.14$  (std. error = 0.06) showing the average age of a household to be around 40 years. Employment status ( $X_3$ ) is a dummy variable showing either employed (0) or unemployed (1) with  $\bar{x}_3 = 0.22$  (std. error = 0.01) and government assistance ( $X_4$ ) is also a dummy variable (0 if welfare recipient and 1 otherwise) with the mean value of 0.50 and std. error being 0.01.

LTV (loan amount as a ratio to the value of the property,  $X_5$ ) is a metric measure with  $\bar{x}_5 = 0.85$  (std. error = 0.01), indicating an average loan to value ratio of 85%. Marital status ( $X_6$ ) is a dummy variable (0 if married /de facto and 1 otherwise) showing an average of 84% of households being either in a married or a de facto relationship. Number of dependents ( $X_7$ ) in a family is a metric measure with an average of one dependent per household, while family type ( $X_8$ ) and migrant status ( $X_{11}$ ) are ordinal measures<sup>3</sup>. Educational level of the head of the household ( $X_9$ ) is a dummy variable (0 indicates without post school qualifications and 1 with post school qualifications) showing an average of 50% of the head of households having some form of post-school qualifications. In addition, occupation ( $X_{10}$ ) is a dummy variable with 0 skilled and 1 unskilled, where households on an average of 69% are either in skilled or in semiskilled occupation. Affordability indicator ( $X_{12}$ ), a metric measure is derived from housing costs and household income and this indicator examines the effect of changing prices and their influence on housing affordability with  $\bar{x}_{12} = 17.40$  (std. error = 1.49). Locational indicator ( $X_{13}$ ) is a scale variable with 1 (very satisfied with the location) to 5 (very dissatisfied with the location) with  $\bar{x}_{13} = 1.61$  (std. error = 0.02), an indication of good level of satisfaction with the location for majority of households.

**Table 2: Descriptives for Western Australia**

	<i>Mean</i>	<i>Std. error</i>
L <sub>1</sub> = Credit risk variable (dummy variable)	0.93	0.01
X <sub>1</sub> = Lifetime income (logarithm) (metric measure)	5.93	0.02
X <sub>2</sub> = Age of head of household (scale 1-13)	6.14	0.06
X <sub>3</sub> = Employment status (dummy variable)	0.22	0.01
X <sub>4</sub> = Government assistance (dummy variable)	0.50	0.01
X <sub>5</sub> = Loan to value ratio (metric measure)	0.85	0.01
X <sub>6</sub> = Marital status (dummy variable)	0.16	0.01
X <sub>7</sub> = Number of dependents (metric measure)	1.16	0.03
X <sub>8</sub> = Family type (ordinal)	4.77	0.09
X <sub>9</sub> = Educational level of head of household (dummy variable)	0.50	0.01
X <sub>10</sub> = Occupation (dummy variable)	0.69	0.01
X <sub>11</sub> = Migrant status (ordinal)	0.83	0.04
X <sub>12</sub> = Affordability indicator (metric measure)	17.40	1.49
X <sub>13</sub> = Locational indicator (scale 1-5)	1.61	0.02

**Table 3: Loan To Value Ratio for WA**

	<i>Number</i>	<i>Percent</i>
LTV less than 0.65	863	64.31
LTV lies between 0.66 and 0.95	347	25.86
LTV more than 0.96	64	4.77
Total	1274	94.93
System Missing	68	5.07
Total	1342	100.00

The loan to value ratio is calculated for the purpose of determining the customer's equity in a property. It is the percentage of the loan amount compared to the market value of the property. The higher the LTV and the debt service ratios (measured as a ratio of monthly mortgage commitments to gross monthly income) the greater the risk of default. It is evident from Table 3 that 64 households from a sample of 1342 households have LTV ratio higher than 95%.

**Table 4: LTV Yes and No Risk Thresholds**

<i>LTV Thresholds</i>	<i>LTV &lt; 65</i>	<i>LTV 65 and 95</i>	<i>LTV above 95</i>
No Credit Risk%	100	93.36	0.00
Yes Credit Risk%	0	6.65	100

Table 4 indicates that the credit risk is highest for households with LTV greater than 95% in Western Australia. Default risk is zero for households with LTV less than 65%. These households will not foreclose, since the put option is in money. Even the households with LTV between 65% and 95% are in a less risky position (credit risk being 6.65%) the put option could be in the money as in the group with LTV less than 65%.

Tables 5 and 6 give the distribution of value of property and the distribution of debt among the sample households in WA.

**Table 5: Distribution of Value of Property for WA**

	<i>Number</i>	<i>Percent</i>
Value less than 50000	30	2.23
Value between 50001 and 100000	188	14.01
Value between 100001 and 200000	691	51.49
Value between 200001 and 500000	394	29.36
Value above 500000	27	2.01
Total	1330	99.11
System Missing	12	0.89
Total	1342	100.00

**Table 6: Distribution of Debt for WA**

	<i>Number</i>	<i>Percent</i>
Debt less than 50000	421	31.37
Debt between 50001 and 100000	477	35.54
Debt between 100001 and 200000	329	24.52
Debt between 200001 and 500000	64	4.77
Debt above 500000	4	0.30
Total	1295	96.50
System Missing	47	3.50
Total	1342	100.00

Table 6 indicates that about ninety five percent of the households have debt amounts ranging from \$50,000 to \$200,000 and less than 5% have debts above \$200,000.

The Federal Insolvency and Trustee Service, Australia reveals that Western Australia is one of the worst affected regions for bankruptcies. Though the number of bankruptcies declined from 618 in September quarter 2001 to 524 in June quarter 2002, this trend is reversed with the rise in the number of bankruptcies to 617 in September quarter, 2002 in WA (Thornhill and Butler, 2002).

To be clear, these bankruptcies are not specifically related to housing. Rather, they are indicative of very high rates of mostly individual (non commercial) bankruptcies and largely due to small business failure and personal debts arising from credit card and mobile phone bills. The key point is that the historically high level of debt and bankruptcy has not been matched by high rates of possessions. As suggested earlier, this finding appears to be closely related with the strength of the housing market, whereby people can sell or refinance their home in times of financial stress.

Borrowers may experience adverse situations, which cause difficulties in paying their loan obligations. Default on a mortgage (perhaps leading to foreclosure) tends to only take place when the mortgagor is unable to pay the loan obligation and the current market value of the property is less than its original purchase price. Recent models (Straka, 2000; Wheaton, Torto, Southard & Hopkins, 2001) have expressed default as the end result of some trigger event, which makes homeownership economically untenable. In such circumstances negative equity makes it advantageous to default rather than sell at a loss. Loan default may also be used by the mortgagor as a short term solution to manage finances, that is as a form of negative geared banking in the belief that over time the equity will increase in the longer term offsetting penalty costs in the short term. Research has been undertaken to investigate the effects of trigger events such as marriage/relationship breakdown upon housing (Flatau; Hendershott; Watson; and Wood (2003).

### *Income Descriptives for WA*

Although, as mentioned earlier, several factors have been identified as contributing to households entering into mortgage arrears, the main cause for mortgage default is a fall in household income (Pennington-Cross, Yezer & Nicholas, 2000). Much of the empirical research on income factors takes the consumption function as the starting point (Keynes, 1936, Hall and Mishkin, 1982, Hayashi, 1982.) The major durable consumption expenditure for households is housing expenditure (mortgage repayments). Given that the demand for debt increases with the increased demand for consumer durables such as housing, low-income and low-wealth families could be credit constrained.

The work of Hall and Mishkin (1982), Hayashi (1982) and Peter & Kerr, 2001) provides evidence that the time path of consumption expenditures for households that are credit constrained differs from that of families for which borrowing constraints may not be binding. A limitation of these studies, however, is that the data used does not directly identify credit-constrained and unconstrained marginal (low-income) households. Instead, these studies presume that families with either low wealth-to-income ratios or low savings rates are credit constrained, while high wealth families are not (Pennington-Cross, Yezer & Nicholas, 2000). This is a major assumptive flaw for modelling purposes and, it contrasts with the experiences relayed by financial counsellors.

The income measure for credit risk of homebuyers was estimated from examining economic studies on household consumption. According to Ando and Modigliani (1963) lifetime income is the most suitable measure for consumption of durable goods, such as buying a home. There are a number of theories that explain consumption and savings behaviour. Broadly speaking, this empirical research on consumption/savings can help us to test competing theories and to estimate the value of crucial parameters. Most economy-wide models examine the aggregate consumption function with disposable income, wealth and other income variables (such as labour income, property income) as the independent variables (Peter & Kerr, 2001). These parameters from the consumption function are used to derive the credit risk function.

In the model, a measure of household income ( $X_1$ ) is estimated from the cross-section of homebuyers following the procedure adopted by life cycle/permanent income theories. A person on average can actively work up to a maximum age of 55-60 years. Lifetime income is estimated as weekly income multiplied by 52 (number of weeks in a year) and then multiplied by 40 years if age of the head of the household is between 15-19 years, multiplied by 52 and then by 35 years if age is between 20-24 years, and so on.

It is noteworthy that upon review, it was realised that this approach at estimating the lifetime income was flawed because it should have been weighted to account for the typical bell shaped relationship between age and earnings. As a consequence, the risk associated with younger aged homeowners defaulting (Table 12a) was inadvertently compounded.

**Table 7: Distribution of Lifetime Income**

	<u>Number</u>	<u>Percent</u>
Lifetime income less than 10,000	11	0.8
Lifetime income less than 100,000	106	7.9
Lifetime income less than 1,000,000	482	35.9
Life-time income more than 1,000,000	727	54.2
Total	1326	98.8
System Missing	47	1.2
Total	1342	100.0

Table 7 gives the lifetime income of households in Western Australia. From an examination of the relationship between the log of lifetime income and default rate, it is evident that both these variables increases initially and then default rate declines with highest income levels. Generally, there is a direct relationship between the log of lifetime income and repayment of mortgage commitments as scheduled.

Employment status is coded as ( $X_3$ ) and permanent employment reduces risk of default while it increases with unemployment. Furthermore, it is presumed that the unemployed who receive government assistance ( $X_4$ ) are more likely to default than others due to liquidity and wealth constraints.

It is generally believed that permanent employment reduces risk of default while unemployment increases it. It is presumed that the unemployed who receive government assistance are more likely to default than others due to liquidity and wealth constraints.

It is evident from Tables 8 & 9 below that 15% of WA households were below the 20% quintile (disadvantaged either socially or economically) and most of them in this group are recipients of one of the government assistance schemes. As Table 9 shows the government assistance schemes comprise of Australian age pension, new start allowance, youth allowance, service pension, disability support pension, partner allowance and carer payment. The other 85% of households (not applicable in Table 9) are either employed full time, part time or living on their savings and accumulated wealth and a quarter of these are in the upper quintile.

**Table 8: Index of Relative Socio-Economic Disadvantage for WA**

	<i>Number</i>	<i>Percent</i>
Lowest 20%	194	14.46
Second quintile	202	15.05
Third quintile	272	20.27
Fourth quintile	320	23.85
Highest 20%	354	26.38
Total	1342	100.00

**Table 9: Government Assistance**

	<i>Number</i>	<i>Percent</i>
Australian age pension	23	1.71
New Start Allowance	22	1.64
Youth allowance	19	1.42
Service Pension	6	0.45
Disability Support Pension	21	1.56
Partner Allowance	4	0.30
Other, Carer Payment	11	0.82
None of these	93	6.93
Total	1342	100.00

### *Demographic Descriptions for WA*

After controlling for income, credit and locational default risks, however, it is generally argued that minority/disadvantaged households, most of them poorly educated and unskilled workers and recent immigrants to Australia may be more likely to default than Australian-born homebuyer. However, this argument has not been borne out in our findings. Demographic factors in the present study include the age of head of household ( $X_2$ ), marital status ( $X_6$ ), number of children ( $X_7$ ), household/family type ( $X_8$ ) level of education of head of household ( $X_9$ ) occupation ( $X_{10}$ ) and year of arrival in Australia ( $X_{11}$ ). Research indicates that the risk of poverty measured by these demographic factors is an important indicator of housing stress, which leads to loan default (ABS, 2001a, cat. no. 1301.0). Although separate data was not available for Indigenous households it is important to note that Indigenous households are likely to be included within the Australian born, low income variables.

**Table 10: Labour Force Status and Full-time or Part-time Status**

	<i>Number</i>	<i>Percent</i>
Employed: working full time	745	55.5
Employed: working part time	302	22.5
Unemployed: looking for full-time work	41	3.1
Unemployed: looking for part-time work	14	1.0
Not in the labour force	240	17.9
Total	1342	100.0

An examination of the participation in the work force reveals that more than half of the households (55.5%) are engaged in full time work, while 22.5% are employed part time (Table 10). Nearly 18% are not in the labour force and the reasons for not being in the labour force has not been specified but would include those receiving Government assistance such as age pensions.

In terms of marital status, 68% are either married or in a defacto relationship, 24% are never married and 6% are divorced or separated (Table 11).

**Table 11: Marital Status**

	<i>Number</i>	<i>Percent</i>
Married/de facto	918	68.4
Divorced/separated	81	6.0
Widowed	19	1.4
Never married	324	24.1
Total	1342	100.0

As can be seen in the Table 12 below, 23% of the heads of households are less than 35 years of age. More than half of households are over 35 years and under 55 years of age and approximately 12% are more than 55 years old.

**Table 12: Age of Head of Household**

	<i>Number</i>	<i>Percent</i>
15-19 years	2	0.15
20-24 years	37	2.76
25-29 years	98	7.30
30-34 years	164	12.22
35-39 years	217	16.17
40-44 years	250	18.63
45-49 years	233	17.36
50-54 years	186	13.86
55-59 years	83	6.18
60-64 years	41	3.06
65-69 years	23	1.71
70-74 years	3	0.22
75 years and over	5	0.37
Total	1342	100.00

Several studies (Ford, Kempson & Wilson, 1995, Pennington-cross, Yezer & Nicholas, 2000, Boheim & Taylor, 2000) have shown that households with younger heads are at a higher risk of default and they are also 'more likely to be laid off than older persons and therefore experience more inconsistent income streams' Boheim & Taylor (2000: 289). It is also argued that middle-aged households would have already accumulated certain level of assets or savings and these could be used to meet unforeseen financial circumstances.

From interviews with financial counsellors, however, it is clear that some of these assumptions are problematic. In an era of corporate 'downsizing' and 'layoffs' there have been frequent media reports of people over forty years of age experiencing difficulties in obtaining new employment. Moreover, shifts in government policy which increased the age of dependents to 25 years old, and the high rate of unemployment in the 19-25 year old age group and corresponding increase in the number of people studying in that age group may have created a far greater financial responsibility for 40-55 year old households than previously experienced. These are areas, which require further research and may help to explain some of the results in Table 12a below.

A simple statistical procedure was adopted to identify the credit risk among different age groups. The analysis of cross tabulation shows that the percentage of defaults among the younger age group is higher compared to the middle-aged group. For example among the age group 30-34 years, 'Yes' credit risk is 20% and 'No' credit risk is only 6.2%, while for the middle-aged group 45-49 years, 'Yes' credit risk is 11.1% and 'No' credit risk is 19.7%. Also note worthy, is that the 'Yes' credit risk was actually highest for the 40-44 year old age group at the same time as a 16% registering 'No' credit risk.

**Table 12a: Percentage Credit Risk By Age**

Age	20- 24	25- 29	30- 34	35- 39	40- 44	45- 49	50- 54	55- 59	60- 64	65- 69	70- 74
%Yes Credit Risk	2.20	3.30	20.00	13.30	22.20	11.10	10.00	10.00	7.80	0.00	0.00
%No Credit Risk	0.00	1.90	6.20	12.60	16.20	19.30	17.30	14.40	6.30	2.90	1.90

Other studies have shown that the younger households (whose income is less than the average income) tend to be adversely affected by increasing burden of mortgage payments caused by volatility in prices and interest rates than middle-aged households. The heaviest burden of rise in mortgage payments usually falls more heavily on young first-time homebuyers who have not shared the benefits of house price appreciation and the possible realisation of tax-free transfer of capital gains from one property to another (Florida, 1986). As mentioned earlier, the risk associated with younger homeowners was inadvertently compounded by the way that lifetime income was estimated.

Table 13 below reveals that some 40% of the households have no dependents, whereas 44% have either one or two dependents and 14% have three or more dependents. About 2% have not revealed the details about the number of dependents in their households.

**Table 13: Number of Dependents Per Household (including students under 25)**

	<i>Number</i>	<i>Percent</i>
No dependents under 25	549	40.91
1 dependent	243	18.11
2 dependents	345	25.71
3 dependents	143	10.66
4 dependents	32	2.38
5 or more dependents	8	0.60
Total	1320	98.36
System Missing	22	1.64
Total	1342	100.00

Data on education qualifications are important for the assessment of the skill level of the labour force and are therefore valuable for estimating future labour income<sup>4</sup>. The questions on level of educational attainment in ABS (2001a) questionnaire are designed to identify details of the highest qualification obtained by a person. On Table 14 over page, an examination of the educational attainments reveals that 15%

of the sample respondents have either a degree or higher degree qualifications. Nearly 35% have some form of post-school qualifications. About 16% have year 12 or equivalent, while 34% have less than year 12 qualifications. It is likely that less educated, with less than 10 year of schooling (8.64% of households) are more likely to default than others.

**Table 14: Level of Educational Attainment**

	<i>Number</i>	<i>Percent</i>
<i>With post-school qualifications:</i>		
Higher degree qualifications	20	1.49
Postgraduate diploma qualifications	23	1.71
Bachelor degree qualifications	152	11.33
Undergraduate diploma qualifications	77	5.74
Associate diploma qualifications	70	5.22
Skilled vocational qualification	274	20.42
Basic vocational qualification	54	4.02
Other qualification	2	0.15
<i>Without post-school qualifications:</i>		
Year 12 or equivalent	209	15.57
Year 11 or equivalent	113	8.42
Year 10 or equivalent	232	17.29
Completed less than Year 10 or equivalent	116	8.64
Total	1342	100.00

### *Location and Macro Economic Factors*

In most cases, indicators of increased risk are associated with the location of the borrower. This is especially true for indicators that would affect the willingness of the borrower to pay their mortgage in the future due to decline in the value of the property. The model includes variables that capture equity, ability-to-pay and willingness to pay. A major consideration is the behaviour of the transaction volume of sales. Several studies have shown that a historic transaction volume of sales is negatively related to property value uncertainty. Appraisal uncertainty is high in localities where the volume of transactions is low, especially in underserved (poor social amenities/services) areas (Van Order & Zorn, 2000). According to Mills and

Lubuele (1997), in developed countries, locational factors play a crucial role in determining property value uncertainty. These findings were borne out in the apparent clustering of the mortgage possessions in the Western Australian context (see table 33).

As noted by Nadler, Rabb, Rosenberg & Ford (1993), locational factors are important not only for homebuyers but also for mortgage lenders who find regional differences play a major role in determining foreclosure rates. Regional differences in foreclosure rates are determined by regional unemployment, personal disposable income, home loan affordability, industry diversification, population growth, and other factors that influence the economic development of the region.

In this research, the locational factor is represented by a dummy variable ( $X_{13}$ ) equal to 1, indicating that the purchaser is not satisfied with the location of the property based on survey responses. This format has the advantage of maintaining locational anonymity, while giving credence to householders' assessment of their own locational circumstances. However, by itself, this indicator will not directly reflect either sales volumes or the direction of property values. Moreover without more specific input parameters, the model's output can not be any more specific in terms of defining location related high or low risk thresholds.

**Table 15: Level of Satisfaction with Location**

	<i>Number</i>	<i>Percent</i>
Very satisfied	707	52.68
Satisfied	519	38.67
Neither satisfied nor dissatisfied	64	4.77
Dissatisfied	47	3.50
Very dissatisfied	5	0.37
Total	1342	100.00

In regard to location of the dwelling in WA, nearly 98% of those who participated in the survey owned residential blocks, while others lived in farms, retirement village and other dwelling. 53% of households were highly satisfied with their location and only 4% were not satisfied with the location of their property (Table 15).

The influence of macro economic factors such as changes in cost of living index also have an impact on the risk of default. Although most housing markets rose and then crashed in the late 1990s in the US with the Asian financial crisis, it is wrong to view them as one real estate cycle that behaves uniformly across all regions (Torto and Wheaton 1999).

The median property prices rose by 12.3% during the period September 2001 to September 2002. The Western Australia economy forecast depicted a strong housing market in 2002 and into 2003 due to the strength of the local economy, such as rises in gold prices, lower building costs, lower value of property and others. The State's domestic product is growing steadily, albeit, at a moderate pace with low

interest rates and strong productivity rates. Sustained employment gains and low interest rates keep driving the housing market. At the national level, property prices have risen, interest rates are low and gross domestic product (GDP) is growing at a healthy, steady, albeit lower pace.

In spite of the healthy trends in property markets in Western Australia, it would seem that low-moderate income households have gained little from property market cycles. Defaults vary greatly due to overall macro-economic and regional effects. For example, for a given loan-to-value ratio, the probability of a loan having negative equity varies with house price inflation, which varies greatly across location and time. With job uncertainty among low-income households, the danger of rising housing costs may exceed the true market values of their homes causing considerable concern about the propensity for defaults.

The ABS data set reveals a rise in affordability problems with increases in cost of living. It can be observed from Table 16a below that the cost of living index has shown a gradual increase from 120.1 in 1998-99 to 133.1 in 2001-02, a hike in prices by 13 points during the period 1998-99 to 2001-02. The price hike is higher in Adelaide (i.e. 14 points) from 123.2 in 1998-99 to 137.2 in 2001-02. The price rise in Adelaide is comparatively higher than the weighted average of all the major capital cities in Australia. As price increases, affordability problems for low-income households increase.

**Table 16a: CPI For Perth, Adelaide and Australia's Capital City Average**

	<i>1998/99</i>	<i>1999/00</i>	<i>2000/01</i>	<i>2001/02</i>
Perth	120.1	122.9	129.6	133.1
Adelaide	123.2	126.3	133.5	137.2
Australian Capital Average	121.8	124.7	132.2	136

The rise in price of essentials has adversely affected low-income households and has led to financial stress. More than 10% of homebuyers with mortgages in Western Australia and South Australia have housing costs greater than 30% of their disposable income.

As indicated by Table 16b, 12% of the households are under housing stress and changes in cost of living affect this group of households. Recipients of Keystart loans are on relatively low-moderate incomes and rising commodity prices adversely affects this section of this society, since a large portion of their income is spent on essential food and housing. Housing costs have also increased and this is mirrored in the home loan affordability indicator. This indicator clearly shows a decline in the loan affordability.

**Table 16b: Cost of Living Indicator**

	<i>Number</i>	<i>Percent</i>
No affordability problem	1071	79.81
Yes affordability problem	155	11.55
Total	1226	91.36
System Missing	116	8.64
Total	1342	100.00

Note: the definition of the cost of living indicator used in ABS Australian Social Trends, 2002, pg.188 is used for estimation of affordability.

As it is evident from Table 16c below, the percentage of homebuyers who are facing affordability problem in Western Australia is 12.65%, while it is 12.23% in South Australia. By comparing these figures with the national figures for 1995 and 1998 (ABS, cat. 4102.0, Australian Social trends 2002) it appears that there has been a steady increase in the financial stress caused by rising housing costs (affordability problem). The percentage of households with affordability problem has risen from 10.6% in 1995 to 11.3% in 1998 and to more than 12% in 1999. The Table below shows that the affordability problem in WA and SA.

**Table 16b: Percentage Households with Affordability Problems**

WA	87.35	12.65
SA	87.77	12.23

**Table 17a: Logistic Regression Equation for Credit Risk with Wald Statistics<sup>5</sup>**

	$\beta$	S.E.	Wald	Significance	Sign as expected or not
X <sub>1</sub> = Lifetime income (logarithm)	5.48	1.93	8.08	0.00	yes and significant
X <sub>2</sub> = Age of head of household	0.40	0.24	2.78	0.10	yes and significant at 90%
X <sub>3</sub> = Employment status	1.84	1.92	0.92	N.S	no & not significant
X <sub>4</sub> = Government assistance	0.89	1.43	0.39	N.S	yes but not significant
X <sub>5</sub> = Loan to value ratio	-0.67	0.13	25.95	0.00	yes and significant
X <sub>6</sub> = Marital status	-4.00	2.46	2.64	0.10	yes and significant at 90%
X <sub>7</sub> = Number of dependents	-0.02	0.51	0.00	N.S	yes but not significant
X <sub>8</sub> = Family type	0.35	0.29	1.47	N.S	no & not significant

	$\beta$	S.E.	Wald	Significance	Sign as expected or not
X <sub>9</sub> = Educational level of head of household	1.87	0.91	4.24	0.04	yes and significant
X <sub>10</sub> = Occupation	0.13	0.17	0.57	N.S	no & not significant
X <sub>11</sub> = Migrant status	0.23	0.34	0.47	N.S	yes but not significant
X <sub>12</sub> = Affordability indicator	0.03	0.03	0.97	N.S	yes but not significant
X <sub>13</sub> = Locational indicator	-0.40	0.40	1.02	N.S	yes but not significant
Constant	22.73	9.44	5.80	0.02	

**Table 17b: Model Summary for Table 17a**

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
57.452	.358	.922

The results for tests such as the –2 log likelihood, Cox and Snell R square and Nagelkerke R Square were reasonably good. The Nagelkerke R-square is greater than 90%, indicating that 92.2% of the variation in the dependent variable (default risk), has been explained by the independent variables.

**Table 17c: Classification Table for Table 17a**

Observed		Predicted		
		L1 = Loan Default Variable		Percentage Correct
		'Yes' Default Risk	'No' Default Risk	
L1 = Loan Default Variable	'Yes' Default Risk	73	7	91.3
	'No' Default Risk	3	1110	99.7
Overall Percentage				99.2

The classification table above shows that the percentage of correct prediction is above 99%, overall and 91.3% for 'Yes' default risk and 99.7% for 'No' default risk. From these results it can be concluded that the model's 'Yes' and 'No' default classification is statistically accurate and is not due to chance factor.

There is an issue though with the uncertainty in the way that defaults may or may not translate into mortgage possessions. Neither is it clear whether defaults represent genuine economic stress and borrower distress in the housing market or a deliberate attempt by borrowers (including investors) to manage short term credit constrained situations with the expectation of long term wealth acquisition. The influence of macro economic factors is also potentially significant. The second option, for example is only realistically available during times of relatively rapid appreciation of home property values, as been the case in recent years.

The model also appears to have greater accuracy in predicting 'No' Default risk than 'Yes' Default risk.

### *South Australia*

The question here is whether the factors that contribute to credit risk among marginal income homeowners in Western Australia are similar for South Australia?

**Table 18: Descriptives for South Australia**

<i>Variables and measurement</i>	<i>Mean</i>	<i>Std. error</i>
L <sub>1</sub> = Credit risk variable (dummy variable)	0.93	0.01
X <sub>1</sub> = Lifetime income (logarithm) (metric measure)	5.75	0.01
X <sub>2</sub> = Age of head of household (scale 1-13) <sup>6</sup>	6.25	0.05
X <sub>3</sub> = Employment status (dummy variable)	0.11	0.01
X <sub>4</sub> = Government assistance (dummy variable)	0.83	0.01
X <sub>5</sub> = Loan to value ratio (metric measure)	0.49	0.01
X <sub>6</sub> = Marital status (dummy variable)	0.16	0.01
X <sub>7</sub> = Number of dependents (metric measure)	1.18	0.03
X <sub>8</sub> = Family type (ordinal)	4.69	0.09
X <sub>9</sub> = Educational level of the head of the household (dummy variable)	0.47	0.01
X <sub>10</sub> = Occupation (dummy variable)	0.72	0.01
X <sub>11</sub> = Migrant status (ordinal)	0.50	0.03
X <sub>12</sub> = Affordability indicator (metric measure)	0.18	0.01
X <sub>13</sub> = Locational indicator (scale 1-5)	1.57	0.02

Table 18 provides the descriptives for all the 13 variables that are identified from literature as determinants of credit risk. The description of variables and their measurement is already explained in the previous section. The mean values of credit risk variable, income variable, age of head of household variable, loan to value ratio and others for Western Australia is similar to the mean values for these variables in the case of South Australia.

Table 19a below indicates that the percentage of default is highest for the age group 35-39 years. On an average, the percentage of risks of defaults is marginally higher for the age group (20 to 39 years) compared to the older group (40 to 75 years and over) Source: ABS, 1999 AHS (CURFS) for South Australia.

**Table 19a: Age and Credit Risk**

Age	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
%Risk	3	7	12	28	18	11	15	4	0

The results of the study show that as the age of the head increases, the chances of repaying the mortgages on time increases (No credit risk) (Age coefficient = 1.32 and  $\rho = .01$ ) for South Australia and (Age coefficient = 0.40 and  $\rho = .10$ ) for Western Australia. That is the risk of default is higher among younger households (less than 40 years) compared to older households (above 40 years). Although this result may appear consistent with the earlier findings of Ford, Kempson & Wilson, 1995, Pennington-cross, Yezer & Nicholas, 2000, Boheim & Taylor, 2000, it is clear that a closer examination of the separate age cohorts reveals contrasting results.

Both the 40-44 years and 45-49 years combined suggest a far greater risk of default than the 25-29 years and 30-34 years combined. The 30-34 years and 45-49 are almost equal in risk. This suggests that some of the factors such as the increased age for dependent status and mid-life employment uncertainty, discussed earlier may also influence the SA situation. Other life cycle changes such as marriage breakdown, illness and loss of a partner may also explain the persistence of risk evident in the older age groups.

As well as helping to reframe the aggregated findings from previous studies (Ford, Kempson & Wilson, 1995, Pennington-cross, Yezer & Nicholas, 2000, Boheim & Taylor, 2000). These findings are important in respect to policy considerations given that some 65% of borrowers are in the 35-54 year old age group in both SA and WA.

It is evident from this empirical study that the higher the LTV ratio, the greater the risk of default and vice versa.

**Table 19b: Loan to Value Ratio and % of Defaults**

<i>Loan to value ratio</i>	<i>No defaults Number</i>	<i>Yes defaults Number</i>	<i>Total Number</i>	<i>Percentage of yes Defaults</i>
LTV less than 65%	1043	0	1043	0.00
LTV between 65% and 95%	302	29	331	8.76
LTV more than 95%	0	73	73	100.00
Total	1345	102	1447	7.04

Table 19b shows that the credit risk is highest for households with LTV greater than 95% in South Australia. Default risk is zero for households with LTV less than 65%. These households will not foreclose, since the put option is in money. Even the households with LTV between 65% and 95% are in a less risky position (credit risk being 8.76%) the put option could be in money as in the group with LTV less than 65%. The loan to value variable is highly significant at 95% level of significance.

**Table 20: Degree of Satisfaction with Location and % Defaults)**

<i>Degree of satisfaction</i>	<i>No defaults Number</i>	<i>Yes defaults Number</i>	<i>Total Number</i>	<i>Percentage of yes defaults</i>
Very satisfied	816	45	861	5.23
Satisfied	467	45	512	8.79
Neither satisfied nor dissatisfied	56	4	60	6.67
Dissatisfied	52	8	60	13.33
Very dissatisfied	12	0	12	0.00
Total	1403	102	1505	6.78

On an average, households are satisfied with the location with  $\bar{x}_{13} = 1.57$  (std. error = 0.02), implying that they are satisfied or very satisfied with the location of their property in respect to proximity to shopping centre, schools for children and work place (Table 18). Moreover, Table 20 shows the default rates among those who are satisfied with their location and those who are dissatisfied. No decisive conclusion can be drawn from the above results, although the number of defaults are higher among those who are dissatisfied with the location (13.3%), this does not appear to be the case among the very dissatisfied. Further, when results for satisfied/very satisfied are combined the percentage of defaults is actually higher at (14.02%) than when combined for dissatisfied/very dissatisfied (13.3%) which suggests that satisfaction actually plays an indeterminate role in default behaviour.

The logistic regression results and the diagnostic tests clearly shows that the prediction accuracy is reasonably good (Overall percentage above 99%) and the independent variables explain 94% of the variation in the dependent variable, credit risk (Nagelkerke R Square = 93.9%). These results are similar to the WA findings in Table 17 with variables, such as lifetime income, age of head of household and loan to value ratio found to be the most important determinants of default risk both cases. It is also noteworthy that employment status was also identified as significant is the SA data.

**Table 21a: Logistic Regression Equation for Credit Risk with Wald Statistics**

	$\beta$	S.E.	Wald	Significance	Sign as expected or not
X <sub>1</sub> = Lifetime income (logarithm)	6.99	3.22	4.70	0.03	yes and significant
X <sub>2</sub> = Age of head of household	1.32	0.51	6.73	0.01	yes and significant
X <sub>3</sub> = Employment status	-5.49	2.78	3.90	0.05	yes and significant
X <sub>4</sub> = Government assistance	-1.91	1.37	1.95	N.S	no & not significant
X <sub>5</sub> = Loan to value ratio	-70.52	13.66	26.66	0.00	yes and significant
X <sub>6</sub> = Marital status	-1.37	1.46	0.89	N.S	yes but not significant
X <sub>7</sub> = Number of dependents	0.12	0.43	0.08	N.S	no & not significant
X <sub>8</sub> = Family type	0.14	0.18	0.67	N.S	no & not significant
X <sub>9</sub> = Educational level of the head	-0.49	0.91	0.29	N.S	no & not significant
X <sub>10</sub> = Occupation	-0.88	1.29	0.47	N.S	yes but not significant
X <sub>11</sub> = Migrant status	0.70	0.57	1.52	N.S	yes but not significant
X <sub>12</sub> = Affordability indicator	13.10	5.19	6.36	0.01	yes and significant
X <sub>13</sub> = Locational indicator	-0.39	0.49	0.66	N.S	yes but not significant
Constant	14.66	18.77	0.61	0.43	

**Table 21b: Model Summary for Table 21a**

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
52.772	.371	.939

**Table 21c: Classification Table for Table 21a**

<i>Observed</i>		<i>Predicted</i>		
		<i>L1=Loan default variable</i>		
		Yes, credit risk	No, credit risk	Percentage Correct
L1=Loan default variable	Yes, credit risk	91	2	97.8
	No, credit risk	1	1253	99.9
Overall Percentage				99.8

## A.2 Program Data

The program data from South Australia (Tables 22-30) was found to be of relatively high quality for some of the identified risk variables but not all. For the variables that were available, the results are indicative of the level of influence each of these has on credit risk among the pool of recipients. By contrast the WA program data (Tables 29-34) was found to be too inconsistent to be usefully analysed. The important exception was in respect to the factor of location where there were readily identifiable concentrations of mortgage defaults and possessions.

### *South Australia: Program Data*

The analysis of program data provided meaningful results from seven of the identified 13 risk variables. Data related to several of the missing risk variables had been collected but required a larger sample set, some further working before it could reliably interpreted. For example, with further effort, more could have been interpreted from the job type data that was available, in terms of extrapolating about from the level of education, which was a variable not collected.

**Table 22: Household Income and % of Defaults**

<i>Class of household income</i>	<i>No defaults</i>	<i>Yes defaults</i>	<i>Total</i>	<i>Percentage of yes defaults</i>
	<i>Number</i>	<i>Number</i>	<i>Number</i>	
\$7500-\$10000	110	5	115	4.35
\$10001-\$15000	179	12	191	6.28
\$15001-\$20000	414	23	437	5.26
\$20001-\$25000	321	25	346	7.23
\$25001-\$30000	258	25	283	8.83
\$30001-\$35000	218	15	233	6.44
\$35001-\$40000	144	13	157	8.28
\$40001-\$45000	101	10	111	9.01
\$45001-\$50000	47	2	49	4.08
Above \$50001	65	3	68	4.41
Total	1857	133	1990	6.68

There is no significant difference ( $\chi^2 = 7.45$  and  $p = .59$ ) between the income groups regarding the default. The default rates within the different household groups vary between 4% (\$45001 - \$50000) and 9% (\$40001 - \$45000). There are 25 households who have defaulted in the income group \$25001 - \$30000, that is 8.8%.

**Table 23: Government Subsidy and % of Defaults**

	<i>No defaults</i>	<i>Yes defaults</i>	<i>Total Number</i>	<i>Percentage of yes defaults</i>
	<i>Number</i>	<i>Number</i>		
No subsidy	267	19	286	6.64
Yes subsidy	1599	114	1713	6.65
Total	1866	133	1999	6.65

The data set from the SA program does not reveal any discernible trend between government subsidy and default. This finding is important in terms of policy related questions raised in this research in that programs designed to provide loan assistance low-to-moderate income and the associated risks for both the lender and borrower.

**Table 24: Age of Household Head and %of Defaults**

<i>Age</i>	<i>No defaults</i>	<i>Yes defaults</i>	<i>Total</i>	<i>Percentage of 'yes' defaults</i>
	<i>Number</i>	<i>Number</i>	<i>Number</i>	
18-20	43	4	47	8.5
21-23	184	13	197	6.6
24-26	194	10	204	4.9
27-29	192	18	210	8.5
30-32	215	20	235	8.5
33-35	202	22	224	9.8
36--38	179	11	190	5.7
39-41	129	14	143	9.7
42-44	123	8	131	6.0
45-47	114	6	120	5.
48-50	76	1	77	1.2
51-53	46	1	47	2.1
54-56	46	1	47	2.1
57-59	34	0	34	0.00
60-62	31	0	31	0.00
63-65	21	0	21	0.00

Table 24 highlights some of the same patterns as in the WA data although the risk of default is much less in the 45-55 year old bracket than in WA. The results in Table 25 show that there is a broad age span of some 20 years where, perhaps for different life cycle reasons, the risk of default remains relatively similar. Between 27 and 35 years there a consistently high risk of default percentage of defaults still evident in 39-41 year age group. The default rate only appears to reduce discernibly after 40 years of age.

**Table 25: Marital status and % of Defaults**

<i>Marital status</i>	<i>No defaults</i>	<i>Yes defaults</i>	<i>Total</i>	<i>Percentage of 'yes' defaults</i>
	<i>Number</i>	<i>Number</i>	<i>Number</i>	
Couple	683	50	733	6.82
Single	1183	83	1266	6.56
Total	1866	133	1999	6.65

Table 25 above shows that the number of singles (1266 households) is larger than the couples (733) in the program data set. There is no significant relationship between marital status and the percentage of default.

**Table 26: Number of Dependents and % of Defaults**

<i>Number of dependents</i>	<i>No defaults</i>	<i>Yes defaults</i>	<i>Total</i>	<i>Percentage of 'yes' defaults</i>
	Number	Number	Number	
No dependents	931	44	975	4.51
1 dependent	393	29	422	6.87
2 dependents	358	32	390	8.21
3 dependents	129	16	145	11.03
4 dependents	37	9	46	19.57
5 dependents	11	0	11	0.00
6 dependents	7	1	8	12.50
7 dependents	0	1	1	100.00
8 dependents	0	1	1	100.00

There is a significant difference between the number of dependents and the credit risk of default ( $\chi^2 = 27.54$  and  $p = .00$ ). However given the small sample of households with 5 or more dependents it is difficult to draw a meaningful conclusion. Especially in households with 7 and 8 dependents where the single instance of default skews the results. Leaving aside these instances it is still evident that the risk of default increases substantially as the number of dependents increases. This contrasts with the findings of the model in Table 17 where the logistic regression results were not significant for dependents.

**Table 27: Loan to Value Ratio and % of Defaults**

<i>Loan to value ratio</i>	<i>No defaults</i>	<i>Yes defaults</i>	<i>Total</i>	<i>Percentage of 'yes' defaults</i>
	Number	Number	Number	
LVR less than 25	15	0	15	0.00
LVR between 25 and 50	102	6	108	5.56
LVR between 50 and 75	350	16	366	4.37
LVR between 75 and 95	1398	111	1509	7.36
LVR above 95	1	0	1	0.00
Total	1866	133	1999	6.65

There is a mild negative correlation between LVR and the number of defaults ( $r = -0.1$  and  $p = .05$ ). As we can see from the table given above, the number of defaults has risen from 6 (LVR between 25 and 50) to 111 (LVR between 75 and 95). However, the only household with LVR greater than 95% has not defaulted in its repayments.

**Table: 28 Defaults by Location**

<i>Suburb</i>	<i>No defaults</i>	<i>Yes defaults</i>	<i>Yes default % within suburb</i>
	<i>Number</i>	<i>Number</i>	
Suburb 1	18	3	14.29
Suburb 2	13	2	13.33
Suburb 3	17	4	19.05
Suburb 4	20	3	13.04
Suburb 5	24	3	11.11
Suburb 6	7	3	30.00
Suburb 7	16	2	11.11

Note: these represent the most significant results in terms of both the total number of loans and the highest percentage of defaults among 256 locations

### *Western Australian Program Data*

The data set for the Western Australian program has found to have a large number of missing values. Although there are almost 40,000 records, the sample of available data for each variable was generally derived from much smaller number (2,000-20,000) of records. This situation compromised the statistical confidence of the results in respect to the relative significance of each of the variables, and also in respect to comparisons with both the CURF and SA program data. Nevertheless, the process of analysing the data served to demonstrate the flexibility of the model, and also its vulnerability in terms of data quality. The most statistically significant and reliable result was the readily apparent clustering effect of concentrated pockets of mortgage in possessions (Table 34).

**Table 29: Loan To Value Ratio**

	<i>Number</i>	<i>Percent</i>
LTV less than 0.65	58	2.57
LTV lies between 0.66 and 0.95	2166	95.80
LTV more than 0.96	37	1.64
Total	2261	100.00
System Missing	37369	
Total	39630	

The above table containing Keystart dataset reveals that more than 95% of households have LTV ratio between 0.66 and 0.95%, while it is only 26% for the ABS Australian Housing Survey (CURF) data (Table 1). This is to be expected as it reflects that Keystart mortgage assistance is targeted for low-moderate income and granted on low deposit ratio compared with mainstream practices.

**Table 30: Loan to Value Ratio and % of Defaults**

<i>Loan to value ratio</i>	<i>No defaults</i>	<i>Yes defaults</i>	<i>Total</i>	<i>Percentage of yes defaults</i>
	Number	Number	Number	
LTV less than 0.65	52.00	6.00	58.00	10.34
LTV between 0.65 and 0.95	2012.00	154.00	2166.00	7.11
LTV more than 0.96	34.00	3.00	37.00	8.11
Total	2098.00	163.00	2261.00	7.21

Table 30 above indicates that the number of homebuyers with LTV greater than 0.96 is 37 from a sample of 2261 households. In this category of LTV greater than 0.96, only 3 households have defaulted from a total of 37 (8.1%). Keystart data set also shows that the number of households with LTV less than 0.65 is 58 and 6 of them have defaulted in this category (10.3%). However, the percentage of defaults in the category of LTV between 0.65 and 0.95 is 7.1%. At face value these results differ from both the model prediction and the data in the CURFS sample used for comparative purposes that suggested the higher the LTV the greater the risk. Given the acknowledged irregularities within the data set there can be no confidence in this result.

**Table 31: Marital Status of Homebuyers**

	<i>Number</i>	<i>Percent</i>
Married/de facto	1531	59.55
Divorced/separated	201	7.82
Widowed	7	0.27
Never married	832	32.36
Total	2571	100.00
System Missing	37059	
Total	39630	

**Table 32: Number of Dependents (including students under 25)**

	<i>Number</i>	<i>Percent</i>
No dependents under 25	4191	19.99
1 dependent	6054	28.88
2 dependents	6308	30.09
3 dependents	2948	14.06
4 dependents	1060	5.06
5 or more dependents	402	1.92
Total	20963	100.00
System Missing	18667	
Total	39630	

The variable number of dependents in the dataset reveals that 20% of homebuyers did not have any dependents, 29% with one dependent, 30% with two dependents, 14% with 3 dependents, 5% with 4 dependents and 2% with 5 or more than 5 dependents. Again, if there could be more confidence with these results, it would be have been useful to link this information regarding dependants with the percentage of defaults to determine whether there is any relationship as indicated by the SA data in Table 26. Moreover, with further research it would also be useful to be able to comment on whether policy decisions which have resulted in changes to Austudy, Abstudy and Youth Allowance eligibility for dependents under 25 years old.

**Table 33: Locations With Greater Than 200 Defaults**

<i>Post Code</i>	<i>Yes Default</i>	<i>No default</i>	<i>Total</i>	<i>%of yes defaults</i>
NW Perth1	452	1282	1734	26
2	231	358	589	39
NE Perth 3	486	844	1330	37
4	294	617	911	32
5	176	231	407	43
6	436	852	1288	34
SE Perth 7	351	517	868	40
8	200	351	551	36
9	322	374	696	46
10	602	733	1335	45
11	305	256	561	54
12	833	1041	1874	44
S Perth 13	200	224	424	47
SW Perth 14				
15	240	666	906	26
16	648	629	1277	51
17	313	557	870	36
18	467	1148	1615	29
18	128	195	323	40
19	403	793	1196	34
SW town 20	235	71	306	77
E Town 21	270	239	509	53
E Town 32	211	215	426	50
N Town 33	406	344	750	54

Every time a default occurs it is recorded and some properties will often have a track record of defaults prior to becoming a Mortgage in Possession. A default for a month or less, in a generally steady payment history is considered a 'blip' but it is nevertheless recorded, which is one of the reasons why the overall figures are so high. An examination of the Mortgage In Possession (MIP) data set from the WA program revealed that some suburbs and towns have more than 30 homes under MIP, and that these are invariably the same areas with high concentrations of

defaults. The property values in these areas have on average grown much less compared to other locations in metropolitan Perth, which has resulted in defaults leading to foreclosure. In respect to the towns exhibiting high concentrations of defaults, three of the four towns identified in the east and south west are mining towns which have experienced rapid declines in property values in recent years due to the declines in commodity prices and or mine production.

As discussed by Torto and Wheaton (1999), along with the macro economic determinants for credit risk and business cycles, local economic events and situations also play crucial role in the determinant of credit risk. In other words, what appears as a similar economic environment will have different implications for housing performance, depending on whether one is discussing housing market in different states, Perth or Sydney or among different suburbs in Perth. The increased socio-spatial polarisation implications of the literature on socio-economic restructuring (Winter and Stone, 1999) suggests that the difference between areas of high and low amenity will be increasingly reflected in significantly different rates of property value appreciation and time.

Quartile Property Network 2003 contains changes in property prices in different localities. Suburbs with high concentrations of mortgage possessions were found to be all under performers relative to market averages.

**Table 34: Perth Housing Market**

	<i>March 2001 quarter median</i>	<i>September 2002 quarter median</i>	<i>% change Sep 01- Sep 02</i>
House Price	\$180,100	\$188,700	12.3
Unit Price	\$133,500	\$144,300	16.9
Vacancy Rate	4.2	4.4	-0.2
House Rent	\$167 per week	\$178 per week	7.2
Unit Rent	\$139 per week	\$140 per week	3.7

Source: Quartile Property Network, 2003: 1

The house property yield in September 2002 (4.9%) is marginally higher than in March 2001 (4.8%). However, the high vacancy rate of 4.4% causes concern regarding the sustainability of property yield.

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