

The Distribution of Financial Literacy in Australia

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Abstract

Ordered logit models are used to predict financial literacy on the basis of individual demographic, socioeconomic and financial characteristics. The data is drawn from the 2003 ANZ Survey of Adult Financial Literacy in Australia and relates to 3,548 respondents. Financial literacy is defined, amongst other things, in terms of standard mathematical ability and understanding of basic and advanced financial terms. Factors examined include gender, age, ethnicity, occupation, educational level and family structure, along with household income, savings (including superannuation), and mortgage and non-mortgage debt. The evidence suggests that financial literacy is highest for respondents aged between 50 and 60 years, professionals, executives, business and farm owners, and those who have completed university or college with higher levels of income, savings and debt. Financial literacy is lowest for females, the unemployed and other non-workers, those from a non-English speaking background, and those with only the lowest levels of secondary education. The models best predict the highest and lowest levels of financial literacy.

Keywords Financial literacy; ordered logit; demographic, socioeconomic and financial characteristics.

Introduction

In the last few decades, and in most developed economies, numerous factors have combined to create complex, specialised financial services markets that require consumers to be more knowledgeable if they are to manage their finances effectively. Financial deregulation and the ensuing boost in competition and access to credit, proliferation in financial products, innovation in marketing and technological change have led to consumers being faced with a bewildering array of intricate financing and investment opportunities. Consumers' responsibilities for retirement investment have also grown, with governments encouraging citizens to move from public pensions into private pensions, and employers persuading employees to shift from defined-benefit plans into defined-contribution plans and responsibility for their own investment strategies.

Problematically, the profile of consumers requiring knowledge to deal with these markets has also changed. Changes in demography with ageing and ethnically-diverse populations has seen language, educational and cultural barriers arise that may hinder the access of some of these populations to new financial opportunities, and expose others less knowledgeable to questionable marketing practices and the possibility of devastating borrowing and investment

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exposures. In the last few years alone, mortgage debt and consumer credit as a share of disposable income has grown to record highs with allied concerns raised over the financial knowledge of demand-side market participants. This is because when combined with low levels of emergency funds, high debts have exposed many households to adverse financial outcomes, including debt repayment problems, delinquencies, and bankruptcy [see Worthington (2004a; 2004b) for respective discussion of emergency finance and financial stress in Australian households].

In response to these developments, financial literacy – the ability to make informed judgements and to take effective decisions regarding the use and management of money – has risen on the agenda for educators, community, business and consumer groups, and government agencies and policymakers throughout the world. In the United States, the Federal Reserve Board-founded *Jumpstart Coalition for Personal Financial Literacy* annually surveys the financial literacy of high school students and the response, at least in part, has been a proliferation of state legislation mandating personal finance in school curricula (Anonymous 2003c). More recently, the Senate Committee on Banking, Housing and Urban Affairs (2002) has conducted hearings into the state of financial literacy and education and the Department of Treasury (2002) has created the Office of Financial Education with a specific focus on improving financial literacy.

Likewise, there has been a surging interest in financial literacy by US financial institutions and their associations. For example, in 2003 some ninety-eight percent of US banks sponsored financial literacy programs, and seventy-two percent offered their own programs (Anonymous 2003a), with the goals of ‘reaching youth’, ‘stemming the rise in bankruptcies’, ‘thwarting predatory lending’ and ‘boosting communities’ (Ginovsky 2003). The Consumer Bankers Association’s (2003) *Survey of Bank-Sponsored Financial Literacy Programs* regularly assesses the impact of these industry sponsored or supported financial education programs. Concern about the state of US financial literacy by yet other professional associations and the media include Lamb (2002), Grace and Hauptert (2003), Jackson (2003), Kim (2003) and Tossaint-Comeau (2003).

Similarly, in the United Kingdom the Financial Services Authority has recently called for a summit of industry leaders and consumer activists “...to come together to develop a strategy to take forward consumer education, information and generic financial advice [in] response to its identification of a pressing need to foster financial literacy as the gap between people’s long-term needs and their savings widens” (Burgess 2003: 26). Educational charity, Personal

Finance Education Group's flagship *Excellence and Access* project aims to raise the competence of those involved in teaching personal finance education, along with parallel efforts by the Citizens Advice Bureaux and the Stewart Ivory Foundation to raise the level of financial knowledge in the broader community. Other financial literacy initiatives throughout the world include the Canadian Bankers Association's *Building a Better Understanding* program implemented as a result of findings in the *Survey of Canadians' Economic and Financial Understanding* and the *New Zealand Financial Literacy Programme* developed by Enterprise New Zealand Trust in cooperation with schools and business.

In Australia too, a number of reports have highlighted the need to better understand and improve financial competencies. The 1997 Australian Law Reform Commission's *Seen and Heard* report found that young people were ill informed about a wide range of consumer services, while the 2003 ANZ Bank's *Survey of Adult Financial Literacy in Australia* showed that while most Australians have basic financial literacy, young consumers and those from low socioeconomic backgrounds were at a disadvantage in making informed decisions about money management. Similarly, the 2003 Australian Securities and Investments Commission's *Financial Literacy in Schools* report championed financial literacy programs inside and outside of schools, and the 2004 Consumer and Financial Literacy Taskforce's *Australian Consumers and Money* stocktake of initiatives by public, private and community sector bodies found that while there was no shortage of consumer information, a good proportion of that material was either not known, not properly targeted or not used by Australian consumers. As in the United Kingdom, there have been recurrent calls in Australia for a national partnership of stakeholders to improve financial literacy levels, especially of the elderly, youth and socially disadvantaged (Anonymous 2003d).

Regrettably, these government and industry initiatives aimed at understanding financial literacy have not been mirrored by academic research, at least in Australia. This is unfortunate since such research can assist and advance the good intentions of financial literacy stakeholders through the better design and targeting of education programs. The purpose of the present paper is to add to this small but evolving literature an analysis of financial literacy using the ANZ Bank's *Survey of Adult Financial Literacy in Australia*. This valuable resource focuses on the demographic, socioeconomic and financial characteristics of Australians and can be linked with their level of financial literacy. It thereby provides an important input into current educational policy regarding the distribution of financial literacy in Australia, and a useful point of comparison for overseas work in this area.

The paper itself is divided into four main areas. The first section briefly reviews the literature regarding the definition, measurement and analysis of financial literacy. The second section explains the empirical methodology and data employed in the analysis. The third section discusses variable specification, and the fourth section presents the results. The paper ends with some concluding remarks.

Literature review

It goes without saying that financial literacy means different things to different people, and this is reflected most clearly in the many definitions used in the literature. For some it is quite a broad concept, encompassing an understanding of economics and how household decisions are affected by economic conditions and circumstances. For others, it focuses quite narrowly on basic money management: budgeting, saving, investing and insuring (Hogarth 2002). Likewise, financial literacy can be absolute, comprising some standard of knowledge assumed common or desirable for all consumers, or relative, where the standard varies according to personal skills, needs and experiences. In this case, the benchmark of financial literacy changes according to the degree of current and possible interaction with financial services markets. Of course, any definition of ‘personal’ financial literacy used here plainly differs from the ‘professional’ financial literacy expected of directors and audit committee members, where financial literates are typically regarded as having an understanding of financial statements, cash flows and management compensation, internal control mechanisms and corporate governance [see, for instance, McDaniel et al. (2002)].

As just one example, the National Foundation for Educational Research (1992) in the United Kingdom defined financial literacy as “the ability to make informed judgements and to take effective decisions regarding the use and management of money”. Several operationalisations of this definition are known. Roy Morgan Research (2003a, 2003b, 2003c), for example, agreed that financial literacy was about people being informed and confident decision makers in all aspects of their budgeting, spending and saving, but that measures of financial literacy should reflect individual circumstances, and were therefore relative. As such, knowledge is “...only to be tested against an individual’s needs and circumstances rather against the entire array of financial products and services, some of which they will neither use nor need” (Roy Morgan Research 2003c: 2).

Schagen and Lines (1996) and later Beal and Delpachitra (2003) also augmented the National Foundation for Educational Research (1992) definition by arguing that the financially-literate

would not only have the ability to understand key concepts in money management, a working knowledge of financial institutions, systems and services and a range of analytical skills, but would also possess a facilitating attitude to the effective and responsible management of financial affairs. This particular operationalisation of financial literacy thus comprises a skill base incorporating both cognitive (knowledge) and psychological (willingness and confidence) concepts. Most generally, in a recent survey article Hogarth (2002: 15) found that a consistent theme running through most definitions of financial literacy included being: “1) knowledgeable, educated and informed on the issues of money and assets, banking, investments, credit, insurance and taxes; 2) understanding the basic concepts underlying the management of money and assets (e.g. the time value of money in investments and the pooling of risks in insurance); and 3) using that knowledge and understanding to plan and implement financial decisions”.

The literature concerning financial literacy itself may be categorised into two areas: (i) attempts to explain the differing patterns of financial literacy in the population; and (ii) efforts to evaluate the efficacy of individual financial literacy programs. While these two streams of research can, and often are, regarded as distinct, they are closely related in that any evaluation of an individual program aimed at improving financial literacy must take into account the level of knowledge pre-existing outside these programs and derived from non-program sources.

To start with, a variety of large scale surveys aimed at establishing the level and distribution of financial literacy have been conducted. Most well known is the Jumpstart Coalition for Personal Financial Literacy’s bi-annual tests of high school seniors in the United States [see Mandell (1998) for the baseline survey and Jumpstart Coalition for Personal Financial Literacy (2002) for the most recent results]. Questions are divided into four categories – income, money management, saving and investing, spending and credit – and cover a variety of multiple choice responses on insurance choices, saving and spending behaviours, and investment in stocks and bonds. Students are given an overall score based on the percentage of questions answered correctly. The results of these surveys have made depressing reading: “In the 1997-98 school year, students answered just 57.3% of questions correctly. Two years later, this score had declined to 51.9% and most recently, the score declined again to 50.2% (Mandell 2003). While adults taking identical tests generally score better, the timing of the tests (at graduation) suggests that they overstate the true level of financial literacy, at least among students, if not the total population (Howarth 2002).

Interestingly, not only has the observed level of financial literacy declined since the earliest surveys, such literacy varies across socioeconomic and demographic groups each year. For example, in 1997/98 female students scored slightly higher on average than male students (but were under represented towards the uppermost end of the distribution), and Native, African, Hispanic and Asian-Americans scored lower than others. Differences in scores were found to be not very dependent upon family income. The results of these and a number of other US surveys are surveyed in Howarth (2002), including studies conducted by and for the Consumer Federation of America and American Express, Americans for Consumer Education and Competition, and the American Savings Education Council, amongst others. Howarth (2002: 18) concluded on the basis of the combined evidence that: “the results of these various financial literacy surveys make it seem that there is a problem. However, it may be that actions speak louder than words (or, in this case, test scores) [since] none of these surveys tried to match knowledge with behaviour, which is perhaps the truest test of how financially literate US households are”.

A number of financial literacy surveys outside of the United States have also been undertaken; including Schagen and Lines (1996) and Roy Morgan Research (2003a, 2003b, 2003c) are notable. Shagen and Lines (1996) conducted a survey of financial literacy in the UK for the NatWest Group Charitable Trust, with particular attention paid to younger people, students, single parents, and people living in subsidised housing. The respondents were asked a variety of question about their attitudes to buying and saving, their use of financial institutions, money management and confidence with dealing with money matters, along with questions testing knowledge of financial markets and instruments, financial decision-making, problem-solving and planning. For the most part, the survey indicated that most people were confident with their financial affairs, though this was lower for some groups, especially single parents and to a lesser extent, students. In Australia, Roy Morgan Research (2003a, 2003b, 2003c) conducted a similar survey of financial literacy on behalf of the ANZ Bank. Drawing on the Shagen and Lines (1996) study for definitions and context this study concluded that the lowest levels of financial literacy were characterised by lower levels of educational attainment, income and employment, were frequently younger and mostly single, and possessed lower than average levels of debt and savings. More specifically, language and mathematical literacy (apart from multiplication) appeared to be adequate, and basic financial terms were easily understood, though the level of understanding of advanced financial terms was much less.

Apart from these surveys of adult populations, much of the remaining work concerning the level and distribution of financial literacy has focused on high school or university students. Williams-Harold and Smith (1999) reported the results of a survey of 500 students which concluded only 31 percent were able to balance a bank account (just 12 percent were confident of their ability to choose between different bank accounts), 23 percent were familiar with credit cards (and only 9 percent with debit cards) and just 7 percent were aware of current interest rates. This was despite 56 percent of the sample having taken a money management class.

Chen and Volpe (1998) also examined financial literacy across 924 students at 14 colleges and related these scores to a set of demographic and socioeconomic characteristics. Chen and Volpe (1998) concluded that the less (financially) knowledgeable group was more likely not to be studying business, have less work experience, and was usually younger and female. Race and income were not significant factors. An earlier study by Volpe, Chen and Pavlicko (1996) focusing on investment literacy had similar conclusions, along with the observation that finance business majors out-performed non-finance business majors. Most recently, Beal and Delpachitra (2003) surveyed students at an Australian regional university and found that most respondents scored reasonably well for basic financial literacy concepts. However, financial literacy was found to vary with work experience and income, and business students generally outperformed those in other disciplines, irrespective of age.

The second, much smaller, area of research into financial literacy has been concerned with the changes in knowledge associated with a particular program aimed at improving financial literacy. Huddleston and Danes (1999), for example, examined the impact of a high school financial planning program in the United States. Huddleston and Danes (1999) concluded that personal finance could indeed be taught, and moreover, had a positive impact on financial behaviour in both student and adult life. Conversely, Chatzky (2002) found that while the number of high school students exposed to financial literacy programs was small, those in such programs did not appear to retain much content. Garman et al. (1999) provide an analysis of a workplace financial education program and the positive impacts on financial wellness. Apart from these, Braunstein and Welch (2002) present a generally positive appraisal of homebuyer counselling programs, savings initiatives and workplace programs in the United States, while the Consumer Bankers Association (2003) documents the growth in financial literacy programs provided by US banks, especially those covering mortgages and homeownership.

When examining existing research on financial literacy, a number of salient points emerge. First, almost all of this work has been undertaken in the United States and, to a lesser extent, the United Kingdom. Relatively little attention has been paid to populations outside of these financial milieus, not least in Australia. Second, there has been an overwhelming emphasis in most studies of financial literacy in high school and college/university students and rather less attention paid to adult populations. Certainly, programs aimed at improving financial literacy should yield the largest benefits at an early age, but it obscures vital knowledge of the extent of financial literacy in other demographic groups. This is especially important given the aging populations in all developed economies. Moreover, while raising the level of financial literacy through targeted programs is one way of ensuring a more informed population, it ignores the fact that deficiencies in literacy may be overcome immediately through, say, more intensive consumer protection, disclosure and guarantee. It also ignores the possibility that the benefits of literacy programs may have a very long time horizon i.e. subsequent generations may benefit from improvements in financial literacy by their parents or even grandparents. Finally, much of the existing literature, especially from industry and government studies, has focused on simple descriptive relationships between demographic, socioeconomic and financial characteristics and the level of financial literacy. These ignore the complex interrelationships likely to exist between many of these factors, and their potential impact upon modelling as an input into policy design. It is with these considerations in mind that the present study is undertaken.

Research method and data

A convenient consumer behaviour model put forward by the Consumer and Financial Literacy Taskforce (2004) hypothesises that external events, socioeconomic background, personal characteristics, skill levels and choices of information all shape the way decisions in financial services markets are made. First, economic, regulatory, cultural and political factors shape the external environment facing consumers. These comprise market forces regarding the price and non-price characteristics of products available, and non-market impacts such as government regulation concerning the information made available to consumers, including product disclosure, consumer protection and opportunities for redress. Second, the consumer's own socioeconomic and personal characteristics also affect the decision-making process. These include education, age, gender, health status and cultural background along with needs and aspirations.

Third, there are the events that have happened in each consumer's life. In the context of financial services markets, these include past experiences (both good and bad) with particular products and services. Finally, there are things consumers can learn to assist consumption. These may include prerequisite skills (such as literacy and numeracy), planning skills (comprising budgeting, saving and spending), and risk management skills (including insurance and portfolio management). They may also include knowledge as to where information and advice may be obtained. Sources of information and advice can be formal or informal and they can be direct or intermediated. Clearly, financial literacy may result from any or all of these sources, and so attempts to model the distribution of financial literacy should take into account the different demographic, socioeconomic and financial backgrounds of consumers.

The data used in this study is from the ANZ Survey of Adult Financial Literacy in Australia (2003): a national telephone survey of 3,548 respondents. The use of this unpublished data is thought to be entirely appropriate, not least that the economic model of consumer behaviour is only theoretically sound at the individual level, but because the primary focus of studies of this type is invariably on predictions for individual behaviour. The data is composed of three sets of information. The first set consists of each respondent's answers to a set of eighty questions aimed at measuring adult financial literacy. The financial literacy framework used includes four categories of knowledge: (i) mathematic literacy and standard literacy questions were incorporated to test essential mathematical, reading and comprehension skills; (ii) financial understanding questions were included to evaluate understanding of what money is how it is exchanged and where it comes from and goes; (iii) questions on financial competence were added to check understanding of basic financial services, financial records, awareness of risk and return and attitudes to spending and saving; and (iv) questions on financial responsibility were integrated to confirm knowledge of life choices, rights and responsibilities and confidence when resolving problems. An abridged list of these questions is tabled in Appendix 1.

An overall measure of financial literacy was calculated using the responses to these questions. Where responses were drawn from a scale of options, points ranging from 2 to -2 were allocated depending on the level of financial knowledge discerned. Where responses were on a non-rating scale, 2 points were awarded for correct answers and -2 for incorrect answers. Given the number of questions administered varied in line with financial services products the respondent had experience with, individual score averages were calculated. All respondents

were then assigned to financial literacy deciles on the basis of these scores. For the purposes of analytical brevity in this study, the financial literacy deciles were further condensed into quintiles, ranging from 1 (lowest quintile of financial literacy scores) to 5 (highest quintile of financial literacy scores).

The analytical technique employed is to specify each respondent's financial literacy as the dependent variable in a regression with demographic, socioeconomic and financial characteristics as predictors. The nature of the dependent variable (financial literacy quintiles) indicates discrete dependent variable techniques are appropriate. However, although the outcomes of the dependent variable are discrete for each of the respondents, multinomial logit or probit models would fail to account for the ordinal nature of the dependent variable; that is, higher quintiles are associated with better financial literacy. The technique also needs to be invariant to the coding used and needs to account for the fact that the financial literacy categories are evenly distributed (as against, say, lower or higher values being more probable). Accordingly, an ordered logit model is specified.

Specification of explanatory variables

The next two sets of information are specified as explanatory variables in the ordered logit regression model. The first of these relates to demographic and socioeconomic characteristics, and the second to financial characteristics. The first set of information is generally comparable to that employed in earlier studies of financial literacy. The second set of information is used to identify financial characteristics as a means of establishing a connection between financial literacy and respondent characteristics beyond these factors.

The set of demographic and socioeconomic variables upon which the financial stress indicators are regressed are first examined. The definition and coding of these dummy variables is detailed in Table 1. Whilst there is no unequivocal rationale for predicting the direction and statistical significance of many of these independent variables, their inclusion is consistent with both past studies of the determinants of financial literacy (as variously defined) and the presumed interests of educators, policy-makers and other parties. For example, Beal and Delpachitra (2003) included gender, household status, age, educational and employment status and time spent in the workforce, while Chen and Volpe (1998) added race and nationality, academic discipline and class rank.

<TABLE 1 HERE>

The first nine variables relate to the sex, geographical location, ethnic background and age of the respondent. These are used as proxies for characteristics exposing respondents to financial literacy including stage of life cycle, access to labour and credit markets, exposure to marketing and information campaigns, language skills and the level of financial responsibility. Chen and Volpe (1998: 114), for example, found that "...the percentages of correct answers from the female participants (50.77%) are lower than those from male participants (57.40%)" as did Goldsmith and Goldsmith (1997). Similarly, Chen and Volpe (1998) concluded that the less (financially) knowledgeable group was also more likely to be younger and female, while the Jumpstart Coalition for Personal Financial Literacy (2002) established that Native, African, Hispanic and Asian-Americans scored lower than other (White) students. Negative coefficients are hypothesised for gender, region and language with age coefficients being negative for younger and older respondents and positive for middle-aged respondents.

The next four variables indicate whether the respondent is non-working and looking for work (unemployed), non-working and a student, non-working and engaged in home duties, non-working and retired, and non-working for any other reason. Beal and Delpachitra (2003) also included variables indicating employed and unemployed respondents. Possible reasons for differences in financial literacy for non-working respondents include lack of exposure to financial transactions such as pay slips and superannuation statements, simpler sources of income, less exposure to work-related literacy campaigns, and fewer synergies between work-related and personal literacy. It is reasoned that all categories of non-working respondents will have lower levels of financial literacy: negative coefficients are hypothesised. Following this eleven categories of occupation are specified. It is generally argued that white collar occupations are associated with higher levels of financial literacy, with some occupations having more reliance on skills included within financial literacy, say, mathematical skills. Positive coefficients are hypothesised for white collar occupations, especially those involving business management or ownership; negative coefficients for blue collar occupations, primarily those in semi-skilled and unskilled trades.

The next four variables categorise respondents according to the highest level of education attained: namely, 4th Form/Year 10 or lower (corresponding in most Australian states to eleven years of primary and secondary education and the first secondary education qualification), HSC/VCE/6th Form/Year 12 (an additional two years of secondary education necessary university matriculation), technical/commercial/TAFE certificate or diploma

(vocational specific education following either of the above), and university/CAE degree (three-year programs equivalent to university, polytechnic or liberal arts college elsewhere). All other things being equal, mathematical and language literacy skills attained in secondary and tertiary education should be useful for the purposes of financial literacy, with higher levels of educational attainment associated with higher financial literacy. Positive coefficients are hypothesised.

The following two variables indicate whether the household structure is a single parent or a couple with children at home and follows suggestions that single parent household are at most risk through a lack of financial literacy skills. Finally, the next three variables indicate whether the principal residence is owned outright, being bought or rented. It is generally the case that a residential mortgage is the largest financial transaction entered into by most Australian household so that experience with dealing with such products may serve to improve financial literacy, especially in the context of budgeting, saving and spending and consumer rights and responsibilities. A positive coefficient is hypothesised for respondents who own outright or are buying their own home.

The final four variables in Table 1 are quantitative variables for household income, investments and debt. Financial literacy is argued to increase with exposure to financial services markets and the opportunity cost of a lack of financial literacy should increase as income, debt and investment increase, thereby providing an incentive for improving skills. By comparison, Chen and Volpe (1998) and Beal and Delpachitra (2003) specified personal income alone. The financial variables are household income, household savings (including superannuation but excluding home value), household mortgage debt and household non-mortgage debt in thousands of Australian dollars. A positive coefficient is hypothesised when financial literacy is regressed against all four variables.

Empirical findings

The estimated coefficients and standard errors of the parameters for the ordered logit regression are provided in Table 2. The standard errors and *p*-values employ corrections for heteroskedasticity. Care must still be taken when interpreting estimated coefficients in this model. While a positive (negative) coefficient indicates a shift in likelihood to a rightward (leftward) cell, the impact on the intervening cells are ambiguous and depend on the particular density functions. Nevertheless, some comment can be made on the levels of significance of the probability density shifts, and the interpretative limitations overcome by the calculation of

marginal effects. Also included in Table 2 is the Nagelkerke R^2 as an analogue for that used in the linear regression model, the Hannan-Quinn criteria as a guide to model selection, the log-likelihood ratio statistic as a test of the null hypothesis that all slope coefficients are zero, and the Pearson goodness-of-fit test for model misspecification?

A model employing the entire set of explanatory variables was initially estimated (columns 2, 3 and 4), followed by a refined specification (columns 5, 6 and 7) obtained by redundant variable testing. The refined model is preferred in terms of the trade-off between comprehensiveness and complexity (given the lower value of the Hannan-Quinn criteria) so only the refined model is discussed in detail. This allows a focus on the most significant factors affecting financial literacy. Regardless, both the full and refined models appear appropriate to the data examined and the values of the Nagelkerke R^2 are adequate. The log-likelihood ratio tests reject the null hypotheses that all slope coefficients are zero and the Pearson goodness-of-fit tests fail to reject the null hypotheses of no functional misspecification (that is, there is not a significant difference between the observed and predicted cell counts) so we may conclude that both models are appropriate for predicting financial literacy in Australian adults.

<TABLE 2 HERE>

In the refined model, the estimated coefficients for twenty-three variables are significant at the 10 percent level of significance or lower and conform to *a priori* expectations. The estimated coefficients indicate that female, non-English speaking, unemployed and non-working respondents, farm workers and persons whose highest level of educational attainment is Year 10, Year 12 or technical education have a greater likelihood of a low level of financial literacy. Being female increases the log odds of a low level of financial literacy by 0.57, while speaking a language other than English at home or a Year 10 education or lower increases the log odds of a low level of financial literacy by 0.37 and 0.78, respectively. Put differently, the odds (e^x) of a low level of financial literacy if female is 1.77 times the estimated odds for males, 1.45 times the estimated odds for English-speaking respondents if non-English speaking, and 2.18 times the estimated odds for other education levels if the highest level attained is Year 10 or lower.

On the other hand, being aged 40-49, 50-59 and 60-69 increases the likelihood of higher financial literacy (log odds of 0.81 and odds of 2.25 times for the 60-69 years age group over other age groups), as does being a professional, owner or executive, small business owner,

sales or farm owner (log odds of 1.16 and odds of 3.19 times for professionals over other occupations) and having a university education (log odds of 0.20 and odds of 1.23 times for university graduates over other levels of educational attainment). The estimated coefficients on income, savings and mortgage debt are positive and significant indicating financial literacy increases non-linearly, but monotonically, with dollar value. Moreover, they also indicate that an increase in the dollar value of savings increases the log odds of higher financial literacy more than income and mortgage debt and in turn that the log odds of income is greater than mortgage debt.

<TABLE 3 HERE>

To facilitate further comparability, marginal effects are calculated. These indicate the marginal effect of each variable on the probability of each category of financial literacy (ranked from 1 to 5 in quintiles, with 5 being the highest level of financial literacy and 1 the lowest). These are presented in Table 3. In order to calculate the marginal effects for the continuous variables, the standard normal density function is used. Note that the marginal effects sum to zero; this follows from the requirement that the probabilities add to one. However, this approach is not appropriate for evaluating the marginal effects of dummy variables. In this case, the probabilities that result when the variable takes its two different values with those that occur with the other variables held at their sample means are used.

Consider gender. Being female decreases the probability of being in the highest category of financial literacy by 7.8 percent and the next-to-highest category by 5.5 percent. There is then only a small probability of being in the middle level of financial literacy (less than one percent) with a much higher probability of being in the lowest (7.9 percent) and next-to-lowest (5.5 percent) categories. By comparison, consider where a language other than English is mostly spoken at home. This reduces the probability of being in any but the lowest and next-to-lowest financial literacy quintiles (where it increases by 5.6 and 3.3 percent, respectively). Lastly, a university education decreases the probability of the lowest financial literacy by 2.7 percent, the next-to-lowest by 2.0 percent and the middle by 0.1 percent, and shifts these to a greater probability of the next-to-highest and highest financial literacy by 2.0 and 2.9 percent, respectively. Using the marginal effects in Table 3, it appears that being professional or a business owner or executive has the greatest positive impact on having the highest literacy, professional or other white collar occupation on the next-to-highest financial literacy, female or semi-skilled tradesman on the middle financial literacy, non-workers, Year

10 education and female on the next-to-lowest financial literacy and non-workers, Year 10 education and female on the lowest financial literacy.

<TABLE 4 HERE>

Table 4 presents the predicted and cumulative probabilities for three selected variables assuming that all others are held at their base values. Once again, consider gender. The probability of being in the lowest financial literacy category is 20.8 percent for females as compared to 12.9 percent for males. Conversely, the probability for the highest level of financial literacy is just 12.9 percent for females and 20.7 for males. Similarly, speaking a language other than English at home increases the probability of being in the lowest financial literacy from 16.0 percent to 21.6 percent, and decreases the probability of being in the highest category of literacy from 16.9 percent to 12.3 percent. Finally, being a non-worker for any reason other than being unemployed nearly doubles the probability of having the lowest financial literacy (from 16.2 to 30.9 percent) and more than halves the probability of being in the highest financial literacy category (from 16.7 to 8.0 percent).

<TABLE 5 HERE>

As a final requirement, the ability of the model to accurately predict financial literacy is examined. Table 5 provides the results for the refined model with the predicted number in each of the five categories of financial literacy. To start with, consider the predictions for the lowest category of financial literacy. Of the 709 respondents, the estimated model correctly predicts 389 as being in this financial literacy category and incorrectly predicts 222 as being in the next-to-lowest, 194 in the middle, 105 in the next-to-highest and 59 in the highest categories of financial literacy. This represents the correct prediction of 54.87 percent of cases and the incorrect prediction of 45.3 percent of cases. By comparison, predicting the lowest category of financial literacy based on the sample proportion (a constant probability model) would yield just 141 correct predictions (19.9 percent) and 568 incorrect predictions (80.1 percent). Accordingly, the estimated model has an absolute improvement of 174.60 percent over the constant probability model (in terms of the number of correct predictions) and a relative improvement of 43.60 percent (in terms of the number of incorrect predictions).

Predictions for the highest level of financial literacy deliver a comparable level of correct and incorrect outcomes. The model correctly predicts 366 respondents as being in the highest financial literacy, and incorrectly predicts 237 as the next-to-highest literacy, 146 as middle literacy, 120 next-to-lowest literacy and 36 as the lowest literacy. This means the model

correctly predicts 51.40 percent of respondents: an absolute improvement of 156.13 percent and a relative improvement of 39.20 percent over the constant probability model. However, the estimated model is not particularly accurate at predicting outcomes in the next-to-lowest, middle and next-to-highest financial literacy categories, underperforming the constant probability model in absolute terms by between 0.88 and 11.46 percent and in relative terms by 0.22 and 2.83 percent. Nonetheless, the estimated model correctly predicts 32.47 percent of all respondent's financial literacy; an absolute improvement of 62.34 percent and a relative improvement of 15.59 percent over the constant probability model. Of course, these are 'in-sample' predictions and the results could differ if 'out-of-sample' data was made available.

Concluding remarks and policy recommendations

The present study uses ordered logit models to investigate the role of demographic, socioeconomic and financial characteristics in determining the distribution of financial literacy in Australian adults. To start with, it has been shown that the distribution of financial literacy in Australia varies strongly according to demographic and socioeconomic characteristics. All other things being equal, males, older persons, people whose occupations are professional, business owners and executives, small business and farm owners and semi-skilled trades, those with a university education and those with higher levels of income, savings and mortgage debt have a greater likelihood of a high level of financial literacy.

Conversely, females, the unemployed and other non-working persons, people with the occupation of farm worker, and those whose highest educational level is Year 10 or lower, Year 12 or technical college have a greater likelihood of a low level of financial literacy. Key determining factors appear to be the occupations of professional and business owner or executive for high levels of literacy and Year 10 education, female and non-workers for low levels of financial literacy. These results give clear guidance as to how and where financial literacy programs can best be designed and targeted. It has also been proven that financial literacy increases, albeit non-linearly, with the dollar value of income, savings and mortgage debt in each household. This at least allays fears that currently high levels of mortgage debt are concentrated in the hands of person who may not be knowledgeable of the position in which they have placed themselves.

Generally, the models specified satisfactorily predict financial literacy outcomes. However, they are most accurate at predicting the very lowest and the very highest levels of financial literacy. While the former is consistent with the natural focus of literacy studies of this type,

the inability to predict very accurately the financial literacy of the middle sixty percent of the population remains a challenge. Certainly, predictive power could be improved with refinement of the set of demographic, socioeconomic and financial factors and covariates. For example, the highest level of educational attainment is included in the current study, but no details are known about the subjects studied or the level of performance (other than completion). Likewise, while several financial covariates, including income, savings and debt, are included in the study, few details are known about their composition and whether this contributes differently to financial literacy acquired over time. For example, financial literacy may be higher for those who have had a series of mortgages rather than a single mortgage in their lifetime, or savings portfolios that include equity, debt and property may be associated with greater knowledge than cash deposited into a bank account. Unfortunately, it is not possible to add such refinements using the current data set.

There are, of course, a number of additional limitations in this study, all of which suggest further areas of research. To start with, there is no attempt in this, or indeed any, financial literacy study to explicitly link financial literacy with financial behaviour and actual financial outcomes. For instance, it is quite possible that some aspects of financial literacy are more or less significant in an economic sense in determining good or bad financial behaviour, and consequently, good or bad financial outcomes. One area of research could then focus on the components of financial literacy to find which the most and least critical to financial success is and weight measures of overall financial literacy accordingly. The internal reliability of standard financial literacy questions could also be examined within the scope of this research.

Another extension could focus more broadly on the possible sources of financial knowledge. For example, most studies in this area employ standard measures of educational attainment, such as completion of secondary school or university. It is likely that financial literacy is gained from very many other sources, including the Internet, magazines (especially consumer associations), television, newspapers, along with information packages provided by financial institutions and regulators. Further work should find some way of gathering details on these direct and indirect sources of information. Finally, rather than focusing on financial literacy and financial services markets as a whole, attempts could be made to examine particular financial services products in more detail. For instance, valuable insights could be had from studies that choose to concentrate on financial literacy as it relates specifically to superannuation, consumer banking and mortgages.

References

- Anonymous (2003a) Banks stepping up financial literacy efforts, *Community Banker*, 12(6), 71-72.
- Anonymous (2003b) Financial literacy education becomes child's play, *American Banker*, 168(70), 4.
- Anonymous (2003c) State legislation puts higher priority on financial literacy in schools, *CBA Reports*, 83(6), 4.
- Anonymous (2003d) Financial literacy levels grim, *CA Charter*, 74(5), 18
- Beal, D.J. and Delpachtra, S.B. (2003) Financial literacy among Australian university students, *Economic Papers*, 22(1), 65-78
- Braunstein, S. and Welch, C. (2002) Financial literacy: An overview of practice, research and policy, *Federal Reserve Bulletin*, November, 445-457
- Burgess, K. (2003) FSA to tackle financial literacy, *FT Money*, 30 August, 26
- Chen, H. and Volpe, R.P. (1998) An analysis of personal financial literacy among college students, *Financial Services Review*, 7(2), 107-128
- Consumer and Financial Literacy Taskforce (2004) *Australian Consumers and Money*, Commonwealth of Australia, <http://www.cfltaskforce.treasury.gov.au/>
- Consumer Bankers Association (2003) *2003 Survey of Bank-Sponsored Financial Literacy Programs*, <http://www.cbanet.org/>
- Garman, E.T. Kim, J. Kratzer, C.Y. Brunson, B.H. and Joo, S.H. (1999) Workplace financial education improves personal financial wellness, *Financial Counselling and Planning Journal*, 10(1), 79-99.
- Givonsky, J. (2003) Financial literacy: The case for banker involvement, *ABA Bankers News*, 11(14), 1-2.
- Grace, H.S. and Hauptert, J.E. (2003) Financial literacy, *The CPA Journal*, June 8
- Goldsmith, E. and Goldsmith, R.E. (1997) Gender differences in perceived and real knowledge of financial investments, *Psychological Report*, 80(?), 236-238.
- Huddleston, C.A. and Danes, S.M. (1999) Impact evaluation of a financial literacy program: Evidence for needed educational policy changes, *Consumer Interests Annual*, 45, 109-115.
- Jackson, B. (2003) ABA immigrant-market tips, *American Banker*, 168(89), 1-2.
- Kim, J.K. (2003) Home-schooling helps students manage their money in college, *The Wall Street Journal*, 20 August, 1.
- Lamb, E.C. (2002) The financial literacy boom, *Community Banker*, 11(5), 26-31
- Mandell, L. (1998) *Our Vulnerable Youth: The Financial Literacy of American 12th Graders*, Jumpstart Coalition for Personal Financial Literacy, Washington.
- Mandell, L. (2003) Plotting the future, *Credit Union Magazine*, January, 14A-15A
- Jumpstart Coalition for Personal Financial Literacy (2002) *2002 Personal Financial Literacy Survey*, <http://www.jumpstart.org/>
- McDaniel, L. Martin, R.D. and Maines, L.A. (2002) Evaluating financial reporting quality: The effects of financial expertise vs. financial literacy, *Accounting Review*, 77(?), 139-167.
- Roy Morgan Research (2003a) *ANZ Survey of Adult Financial Literacy in Australia: Final Report*, <http://www.anz.com.au/>.
- Roy Morgan Research (2003b) *ANZ Survey of Adult Financial Literacy in Australia: Stage 2: Telephone Survey Report*, <http://www.anz.com.au/>.
- Roy Morgan Research (2003c) *ANZ Survey of Adult Financial Literacy in Australia: Stage 3: In-Depth Interview Survey Report*, <http://www.anz.com.au/>.
- Tossaint-Comeau, M. (2003) Changing Hispanic demographic: Opportunities and constraints in the financial market, *Chicago Fed Letters*, 192(?), 1
- Volpe, R.P. Chen, H. and Pavlicko, J.J. (2001) Personal investment literacy among college students: A survey, *Financial Practice and Education?* (?), 86-94.
- US Senate Committee on Banking, Housing and Urban Affairs (2002) *Hearings on the State of Financial Literacy and Education in America*, <http://www.senate.gov/>
- US Department of Treasury (2002) *Treasury Department Announces Office of Financial Education*, press release 7 March, <http://www.treas.gov/>
- Worthington, A.C. (2004a) Emergency funds in Australian households: An empirical analysis of capacity and sources, *Financial Counselling and Planning*, 15(1), 21-30.
- Worthington, A.C. (2004b) Debt as a source of financial stress in Australian households, *International Journal of Consumer Studies* (forthcoming).

TABLE 1 Variable definitions and statistics

Variable	Definition	Mean	Std. dev.
Lowest financial literacy	1 if financial literacy score in lowest quintile	19.98	–
Next-to-lowest financial literacy	2 if financial literacy score in next-to-lowest quintile	19.79	–
Middle financial literacy	3 if financial literacy score in middle quintile	20.21	–
Next-to-highest financial literacy	4 if financial literacy score in next-to-highest quintile	19.95	–
Highest financial literacy	5 if financial literacy score in highest quintile	20.07	–
Gender	1 if female; 0 male	50.56	50.00
Region	1 if rural, regional or non-capital city household; 0 metropolitan	37.80	48.49
Language	1 if language spoken most often at home is non-English; 0 English	10.01	30.01
Age 18-24	1 if aged 18-24 years; 0 otherwise	12.80	33.41
Age 25-29	1 if aged 25-29 years; 0 otherwise	9.13	28.81
Age 30-39	1 if aged 30-39 years; 0 otherwise	20.24	40.18
Age 40-49	1 if aged 40-49 years; 0 otherwise	19.59	39.69
Age 50-59	1 if aged 50-59 years; 0 otherwise	15.39	36.09
Age 60-69	1 if aged 60-69 years; 0 otherwise	11.92	32.41
Unemployed	1 if non-working and looking for work (unemployed); 0 otherwise	4.26	20.19
Student	1 if non-working and principally engaged as student; 0 otherwise	3.38	18.08
Home duties	1 if non-working and principally engaged in home duties; 0 otherwise	7.22	25.88
Retired	1 if non-working and principally retired; 0 otherwise	21.03	40.76
Non-worker	1 if non-working and not student, home duties or retired; 0 otherwise	2.37	15.21
Professional	1 if principal occupation is professional; 0 otherwise	11.02	31.32
Owners or executives	1 if principal occupation is business owner or executive; 0 otherwise	1.63	12.68
Small business owner	1 if principal occupation is small business owner; 0 otherwise	4.59	20.94
Sales	1 if principal occupation is sales; 0 otherwise	6.54	24.72
Semi-professional	1 if principal occupation is semi-professional; 0 otherwise	11.95	32.44
Other white collar	1 if principal occupation is other white collar; 0 otherwise	22.13	41.51
Skilled trades	1 if principal occupation is skilled tradesman; 0 otherwise	17.19	37.74
Semi-skilled trades	1 if principal occupation is semi-skilled tradesman; 0 otherwise	11.22	31.56
Unskilled trades	1 if principal occupation is unskilled tradesman; 0 otherwise	7.69	26.65
Farm owner	1 if principal occupation is farm owner; 0 otherwise	1.10	10.43
Farm worker	1 if principal occupation is farm worker; 0 otherwise	0.87	9.31
Year 10	1 if highest level of education is 4 th Form/Year 10 or lower; 0 otherwise	28.27	45.04
Year 12	1 if highest level of education is HSC/VCE/6 th Form/Year 12; 0 otherwise	15.76	36.44
Technical	1 if highest level of education completed is technical/commercial/TAFE; 0 otherwise	9.67	29.56
University	1 if highest level of education completed university/CAE; 0 otherwise	25.48	43.58
Single parents	1 if household structure is single parent with children at home; 0 otherwise	6.85	25.26
Couples	1 if household structure is couple with children at home; 0 otherwise	36.27	48.09
Owned outright	1 if residency is owned outright; 0 otherwise	42.56	49.45
Paying off	1 if residency is being paid off; 0 otherwise	33.20	47.10
Rented	1 if residency is being rented; 0 otherwise	22.80	41.96
Income	Total household income (\$000s)	61.84	23.23
Savings	Total household savings incl. superannuation but excluding home value (\$000s)	40.88	24.30
Mortgage debt	Total household mortgage debt (\$000s)	52.75	116.26
Non-mortgage debt	Total household non-mortgage debt (\$000s)	15.38	54.77

TABLE 2 Parameter estimates and statistics

Variable/statistic	Full model			Refined model		
	Estimated coefficient	Standard error	p-value	Estimated coefficient	Standard error	p-value
Gender	-0.536	0.069	0.000	-0.570	0.066	0.000
Region	0.006	0.066	0.929	–	–	–
Language	-0.397	0.105	0.000	-0.371	0.103	0.000
Age 18-24	-0.125	0.197	0.526	-0.114	0.143	0.426
Age 25-29	0.047	0.195	0.808	-0.020	0.140	0.884
Age 30-39	0.419	0.184	0.023	0.359	0.125	0.004
Age 40-49	0.565	0.184	0.002	0.547	0.127	0.000
Age 50-59	0.719	0.171	0.000	0.783	0.132	0.000
Age 60-69	0.780	0.146	0.000	0.811	0.143	0.000
Unemployed	-0.330	0.173	0.056	-0.344	0.170	0.043
Student	0.244	0.201	0.225	–	–	–
Home duties	-0.127	0.124	0.307	–	–	–
Retired	-0.208	0.146	0.155	–	–	–
Non-worker	-0.827	0.236	0.001	-0.833	0.236	0.007
Professional	1.179	0.202	0.000	1.159	0.199	0.000
Owners or executives	0.824	0.307	0.007	0.808	0.301	0.000
Small business owner	0.815	0.228	0.000	0.812	0.225	0.005
Sales	0.750	0.203	0.000	0.731	0.202	0.000
Semi-professional	0.545	0.195	0.005	0.538	0.190	0.072
Other white collar	0.885	0.178	0.000	0.867	0.174	0.648
Skilled trades	0.330	0.181	0.069	0.322	0.179	0.719
Semi-skilled trades	0.097	0.186	0.603	0.084	0.184	0.044
Unskilled trades	-0.023	0.196	0.907	-0.070	0.195	0.854
Farm owner	0.594	0.318	0.062	0.643	0.320	0.000
Farm worker	-0.078	0.416	0.851	-0.080	0.435	0.103
Year 10	-0.748	0.097	0.000	-0.781	0.095	0.078
Year 12	-0.147	0.101	0.146	-0.164	0.100	0.037
Technical	-0.187	0.118	0.113	-0.207	0.117	0.000
University	0.213	0.098	0.030	0.203	0.097	0.000
Single parents	-0.179	0.132	0.175	–	–	–
Couples	-0.170	0.078	0.029	–	–	–
Owned outright	0.129	0.253	0.611	–	–	–
Paying off	0.012	0.256	0.961	–	–	–
Rented	-0.328	0.259	0.205	–	–	–
Income	0.006	0.002	0.000	0.006	0.001	0.000
Savings	0.006	0.001	0.000	0.007	0.001	0.000
Mortgage debt	0.002	0.000	0.000	0.002	0.000	0.000
Non-mortgage debt	0.000	0.001	0.463	–	–	–
Lowest financial literacy	-0.659	0.347	0.057	-0.503	0.218	0.021
Next-to-lowest financial literacy	0.479	0.346	0.167	0.625	0.217	0.004
Middle financial literacy	1.456	0.347	0.000	1.595	0.218	0.000
Next-to-highest financial literacy	2.613	0.349	0.000	2.746	0.221	0.000
Log-likelihood ratio	918.935	–	0.000	885.521	–	0.000
Pearson goodness-of-fit	13843.612	–	0.822	12829.179	–	0.850
Hannan-Quinn criteria	3.009	–	n/a	3.007	–	n/a
Nagelkerke R ²	0.238	–	n/a	0.230	–	n/a

Huber/White heteroskedasticity robust standard errors and p-values reported; literacy category parameters are limit points; the null hypothesis for the log-likelihood ratio test statistic is no difference between an intercept only and estimated model; the null hypothesis for the Pearson goodness-of-fit test is that the observed data are consistent with the fitted model; the Hannan-Quinn criteria reflects the trade-off between model complexity and comprehensiveness with lower values indicating a better model; the Nagelkerke R² is analogous to that used in the linear regression model; n/a – not applicable.

TABLE 3 Marginal effects

Variable	Change	Lowest financial literacy	Next-to-lowest financial literacy	Middle financial literacy	Next-to-highest financial literacy	Highest financial literacy
Gender	0 to 1	0.079	0.055	0.001	-0.055	-0.078
Language	0 to 1	0.056	0.033	-0.006	-0.038	-0.046
Age 18-24	0 to 1	0.016	0.011	0.000	-0.011	-0.015
Age 25-29	0 to 1	0.003	0.002	0.000	-0.002	-0.003
Age 30-39	0 to 1	-0.046	-0.036	-0.005	0.034	0.053
Age 40-49	0 to 1	-0.067	-0.055	-0.010	0.049	0.084
Age 50-59	0 to 1	-0.090	-0.079	-0.023	0.064	0.128
Age 60-69	0 to 1	-0.091	-0.081	-0.027	0.064	0.135
Unemployed	0 to 1	0.052	0.031	-0.006	-0.035	-0.042
Non-worker	0 to 1	0.146	0.059	-0.033	-0.085	-0.087
Professional	0 to 1	-0.118	-0.113	-0.051	0.074	0.208
Owners or executives	0 to 1	-0.085	-0.081	-0.033	0.058	0.141
Small business owner	0 to 1	-0.087	-0.082	-0.031	0.060	0.140
Sales	0 to 1	-0.081	-0.074	-0.025	0.057	0.122
Semi-professional	0 to 1	-0.065	-0.054	-0.012	0.047	0.084
Other white collar	0 to 1	-0.102	-0.086	-0.023	0.072	0.139
Skilled trades	0 to 1	-0.041	-0.032	-0.004	0.030	0.047
Semi-skilled trades	0 to 1	-0.011	-0.008	0.000	0.008	0.012
Unskilled trades	0 to 1	0.010	0.007	0.000	-0.007	-0.009
Farm owner	0 to 1	-0.071	-0.065	-0.022	0.051	0.107
Farm worker	0 to 1	0.011	0.008	0.000	-0.008	-0.011
Year 10	0 to 1	0.120	0.068	-0.013	-0.079	-0.096
Year 12	0 to 1	0.023	0.016	-0.001	-0.017	-0.022
Technical	0 to 1	0.030	0.019	-0.002	-0.021	-0.027
University	0 to 1	-0.027	-0.020	-0.001	0.020	0.029
Income	Marginal	-0.001	-0.001	0.000	0.001	0.001
Savings	Marginal	-0.001	-0.001	0.000	0.001	0.001
Mortgage debt	Marginal	0.000	0.000	0.000	0.000	0.000

Marginal effects from refined model in Table 2 indicate the effect of each outcome on the probability of being in a given literacy category; the standard normal density function is used for the continuous variables; the marginal effects for the dummy variables are analysed by comparing the probabilities that result when the variable takes its two different values with those that occur with the other variables held at their sample means; probabilities for all categories sum to zero.

TABLE 4 Selected predicted and cumulative probabilities

Type	Variable	Value	Lowest financial literacy	Next-to-lowest financial literacy	Middle financial literacy	Next-to-highest financial literacy	Highest financial literacy
Predicted probability for given category	Gender	0	0.129	0.185	0.233	0.245	0.207
		1	0.208	0.240	0.234	0.190	0.129
	Language	0	0.160	0.211	0.238	0.223	0.169
		1	0.216	0.244	0.232	0.184	0.123
	Non-worker	0	0.162	0.212	0.238	0.221	0.167
		1	0.309	0.271	0.205	0.136	0.080
Cumulative probability for categories < or = given category	Gender	0	0.129	0.314	0.547	0.793	1.000
		1	0.208	0.447	0.681	0.871	1.000
	Language	0	0.160	0.371	0.608	0.831	1.000
		1	0.216	0.460	0.692	0.877	1.000
	Non-worker	0	0.162	0.375	0.612	0.833	1.000
		1	0.309	0.580	0.784	0.920	1.000

Predicted probabilities from refined model in Table 2 calculate the predicted probabilities at the specified values with other variables held at their base values, cumulative probabilities are the sum of predicted probabilities for categories less than or equal to given category.

TABLE 5 Observed and predicted values

Observed and predicted	Number and percentage	Lowest financial literacy	Next-to-lowest financial literacy	Middle financial literacy	Next-to-highest financial literacy	Highest financial literacy	Total
Observed	Number	709	702	717	708	712	3548
	Percentage	19.98	19.79	20.21	19.95	20.07	100.00
Lowest financial literacy	Number	389	222	194	105	59	969
	Percentage	54.87	31.62	27.06	14.83	8.29	27.31
Next-to-lowest financial literacy	Number	138	123	113	86	62	522
	Percentage	19.46	17.52	15.76	12.15	8.71	14.71
Middle financial literacy	Number	80	123	134	140	85	562
	Percentage	11.28	17.52	18.69	19.77	11.94	15.84
Next-to-highest financial literacy	Number	66	114	130	140	140	590
	Percentage	9.31	16.24	18.13	19.77	19.66	16.63
Highest financial literacy	Number	36	120	146	237	366	905
	Percentage	5.08	17.09	20.36	33.47	51.40	25.51
Total correct	Number	389	123	134	140	366	1152
	Percentage	54.87	17.52	18.69	19.77	51.40	32.47
Total incorrect	Number	320	579	583	568	346	2396
	Percentage	45.13	82.48	81.31	80.23	48.60	67.53
Improvement	Absolute	174.60	-11.46	-7.53	-0.88	156.13	62.34
	Relative	43.60	-2.83	-1.91	-0.22	39.20	15.59

Number is the predicted literacy by category; percentage is predicted literacy by category as a percentage of the observed category; the predictions correspond to the refined model in Table 2; percentage correct is the number of correct predictions as a percentage of the total observed; absolute improvement is the number and percentage improvement in correct predictions over the probability of correctly identifying responses on the basis of their proportion in the sample; relative improvement is the number and percentage improvement in incorrect predictions over the probability of correctly identifying values on the basis of their proportion in the sample.

APPENDIX 1

Questions contributing to the financial literacy scoring

- 1) A person keeps their PIN number on a piece of paper in their wallet, along with their ATM or bankcard. If the wallet is stolen and the card and PIN number are used to take money from an account, who is liable for the lost money?
- 2) An investment with a high return is likely to have higher than average risk. True, false.
- 3) As far as you are aware is superannuation taxed at a lower, higher or the same rate than other investments?
- 4) Consumers have duty of honest disclosure when taking out a financial service or product and may face penalties for not doing so. Would you strongly agree, agree, disagree or strongly disagree with this statement?
- 5) Do you receive a pay advice? If so, do you read your pay advice at all and how well do you understand it? Very well, fairly well, not very well, not at all, can't say
- 6) Do you receive _____? If so, how well do you understand these _____? Read and understand very well, read and understand fairly well, read but don't understand very much, read but don't understand at all, don't read, can't say.

ATM receipts	
bank statements	
credit card or store card statements	
insurance policy or renewal notices	
investment statements	
loan statements	
superannuation statements	
- 7) Employees cannot make Superannuation payments additional to any payments by their employer. True, false.
- 8) Employers are required by law to make superannuation payments on behalf of employees. True, false.
- 9) How confident are you that you would know how to make an effective complaint against a bank or financial institution? Are you very confident, confident, not very confident or not at all confident?
- 10) How well do you know about the fees and charges that apply to _____? Very well, fairly well, not very well, not at all, can't say

bank accounts	BPay
credit cards	debit cards
EFTPOS	Internet banking
Loans	managed investments
Mortgages	shares
store cards	superannuation
telephone banking	term deposits
your own bank's ATMs	Early termination fee
redraw facility	
- 11) I am clear about my rights if I have a problem with a financial institution. Would you strongly agree, agree, disagree or strongly disagree with this statement?
- 12) I don't think it really matters about superannuation or planning and saving for retirement because the government will make up the gap. Strongly disagree, disagree, uncertain, agree, strongly agree.
- 13) I'm going to read out a list of financial terms. For each one, please tell me whether you understand the term very well, fairly well, not very well or not at all.

charge-back on a credit card	guarantor
co-borrower	indicative rate
bank cheque	direct debit
broker	compound interest
capital guaranteed	under-insurance
master trust	
- 14) If a lottery win of \$18,000 is shared equally between six people, how much will each person receive?
- 15) If a person pays for goods valued at \$165 with four \$50 notes, how much change would they receive?
- 16) If a person spent \$13 on lunch one day but only \$8 the next day, how much did they spend on lunch over the two days?
- 17) If a person takes home \$1,400 a month and 50% of this goes on rent, what is their monthly rent?
- 18) If a refrigerator priced at \$1,000 is discounted by 10% at a sale, how much would it cost?
- 19) If each of 20 share-holders was paid a dividend of \$350, what is the total amount paid out in dividends?
- 20) If providers of professional advice about financial products may receive a commission as a result of their advice, they are required by law to tell this to their clients. True, false.
- 21) If two people jointly take out a loan, which one of the following most accurately describes the responsibility for repayment of the loan? Both persons are responsible for repayment of the entire loan, each person is responsible for repayment of half the loan, only one person must be responsible for repayment of the entire loan, the older of the two persons is responsible for the repayment of the entire loan, can't say.
- 22) If you experienced difficulty with a banking-type product, such as a credit card or loan that you were unable to resolve with the provider of that service, who would you contact? Who else? Anyone else?
- 23) If you experienced difficulty with a _____ that you were unable to resolve directly, who would you contact? Who else? Anyone else?
 - a) financial planner or adviser
 - b) managed fund or superannuation fund
 - c) insurance company
- 24) If you, as a primary holder of a credit card, arrange for a second person to be provided with a card in your name, which one of the following most accurately describes your responsibility for debt incurred by that person on the card? You are entirely responsible for any debt the other person incurs of the card, you and the other person are each responsible for half the total debt on the card, you are only responsible for the debt incurred on the card by the other person if they are less than 18 years old, you are not responsible for any debt the other person incurs on the card – they are, can't say
- 25) Nearly all aspects of the financial services industry are covered by government legislation that protects consumers. Would you strongly agree, agree, disagree or strongly disagree with this statement?
- 26) Only licensed financial businesses are allowed to sell financial products. True, false.
- 27) Providers of financial products and services have a legal duty to provide clear information to consumers. Would you strongly agree, agree, disagree or strongly disagree with this statement?
- 28) The Australian Securities and Investments Commission checks the accuracy of all prospectuses lodged with it. True, false.
- 29) Thinking about debts and borrowing money, which one of the following is most likely to give someone a bad credit rating? Being more than 60 days late with the minimum payment on a credit card, taking out a second mortgage to buy your own home, borrowing from an organisation other than a bank, asking the bank for an increased overdraft, can't say
- 30) Thinking about investing over five years or more, how important do you consider diversification of your funds across different types of investments?" Very important, quite important, of some importance, not at all important, can't say.
- 31) Thinking about superannuation or investments, how important do you consider tax implications when making decision? Very important, quite important, of some importance, not at all important, can't say.
- 32) What percentage of an employee's salary is an employer required by law to make on behalf of an employee?
- 33) This of the following is most important when arranging superannuation or an investment. The amount of return left after the fees are taken out, the return, the fees, the per-unit cost, can't say.
- 34) Which one of the following is the most accurate statement about fluctuations in market value? Short-term fluctuations in market value can be expected, even with good investments, good investments are always increasing in value, investments that fluctuate in value are not good in the long-term, can't say.
- 35) Which one of the following would you recommend for an investment advertised as having a return well above market rates and no risk? Consider it 'too good to be true' and not invest, invest lightly to see how it goes before investing more heavily, invest heavily to maximise your return, can't say.
- 36) Would you find checking or reconciling a (n) _____ very easy, easy, difficult or very difficult to do?
 - a) bank statement
 - b) annual statement for a superannuation fund

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