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Macroeconomic Conditions and Australian Financial Risk Attitudes, 2001–2010

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Abstract This paper employed panel data from the 2001–2010 waves of the Household, Income, and Labor Dynamics in Australia (HILDA) survey to investigate the financial risk attitudes of 10,000 individuals across 6,839 households. Ordered logit models including individual and household random effects tested for changes in risk tolerance while focusing on the impact of transitory macroeconomic conditions and controlling for individual demographic and socioeconomic characteristics. We found Australians generally reduced their tolerance for risk over time, though higher levels of education, wealth, good health, and being self-employed indicated the increased likelihood of risk tolerance. We also found macroeconomic conditions were jointly significant in determining financial risk attitudes. However, the innate demographic and socioeconomic characteristics of individuals were more important at the margin.

Keywords Risk attitudes · Risk aversion · Household, Income and Labor Dynamics in Australia (HILDA) survey · Ordered logit

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Introduction

The preferences of households for financial risk-taking exert a major influence on household financial decision-making, and thereby the composition of household portfolios, and concomitantly wealth outcomes. At its simplest, more risk-averse individuals are likely to limit their portfolios to relatively safe (lower yielding) assets, such as saving deposits and government bonds, whereas individuals with less aversion to risk will tend to include riskier (higher yielding) financial assets in their portfolios, such as stocks and corporate bonds. Consequently, the financial risk-taking stance of households influences household portfolio diversification and both the level and riskiness of household wealth. It is for this reason that these attitudes to financial risk are of major importance to both policymakers and the financial services industry in seeking to understand how they determine financial decision-making, given their substantial impact on current and future household financial outcomes and household wellbeing.

In general, the presumption is that demographic and socioeconomic factors determine household financial risk-taking, and that by their nature, these factors are generally slow to change. Accordingly, financial planners assess their client's attitudes to financial risk-taking prior to development of an investment strategy, but rarely formally reassess risk attitudes after an initial consultation. This approach ignores the fact that attitudes to financial risk-taking may change as the household moves through its lifecycle. For example, households with young children or those close to retirement may be more risk averse than those with grown children at their income earning peak. Likewise, the literature identifies many personal characteristics that determine attitudes to financial risk-taking, and these are potentially subject to change over time.

Households may also change their attitude to financial risk-taking in response to changes in general economic or market conditions. Psychology offers some theoretical basis for this hypothesis, including emotional disposition, regret theory, and the recency effect. For example, individuals with negative attitudes are likely to be more risk averse, and so the economic climate may influence the emotional disposition of people generally. In addition, in challenging economic climates where financial losses are experienced by investors, there may be more instances of feeling regret, a negative emotion many people attempt to avoid. Avoidance of regret may then increase overall risk aversion, particularly in bear markets. Similarly, the economic environment may affect risk preferences, as individuals commonly form expectations about the future from recent trends. Thus major macroeconomic events, such as the recent Global Financial Crisis (GFC), which has had profound adverse impacts on asset markets and general market conditions, could cause individuals and households to downgrade their attitudes for financial risk-taking. This is because they have become more pessimistic, are suffering financial losses and therefore feeling regret, and because as a relatively recent occurrence it has temporary dominance in framing financial decisions.

This study investigates whether Australian household risk tolerance levels change over time using the Household, Income, and Labor Dynamics in Australia (HILDA) survey. We hypothesize that innate household demographic and socioeconomic characteristics that are generally slow to change, along with current macroeconomic conditions that are typically transitory, jointly determine attitudes to financial risk-taking. The contributions of this paper to the body of literature on financial risk tolerance are threefold. First, as far as the authors are aware, no previous study has considered the variation over time in the financial risk tolerance measure provided in this comprehensive survey of the Australian population. Second, this study contributes to the small but growing literature on the impact of macroeconomic conditions on risk tolerance, which is timely considering the globally felt repercussions of the GFC. It therefore complements recent work by Yao and Curl (2011) in this journal on the role of the recency effect determining attitudes to financial risk-taking in the US. Finally, this study complements existing international research on the demographic and socioeconomic determinants of financial risk tolerance, including in the US, Italy, Germany, and Japan.

In terms of the importance of this analysis, investigation of the financial risk tolerance of Australian households provides valuable insights for financial education and investment advice in Australia, as well as public policy. For instance, financial advisors need to be cognizant of changing risk attitudes as investors move through their lifecycle, as well as the impact of adverse macroeconomic conditions, such as the GFC, on the psyche of investors. Marsden et al. (2011), for example, found that people that consulted a financial advisor reported increasing both the contribution amount and the risk level of their existing retirement accounts in order to take advantage of price reductions immediately following the GFC. Thus, independent and tailored financial advice may assist investors to make better financial decisions during periods of macroeconomic volatility. Further, the capacity of retirees to be self-funded is a function of their investment decisions, which in turn depends on their tolerance for financial risk-taking. Along with relying on pensions during retirement, insufficient levels of wealth disadvantage households with regard to their quality of life, living standards, access to credit, and financial hardship during periods of unemployment and ill health. The resulting government budget burden for those who have not accumulated sufficient wealth is consequently an ongoing concern for public policy.

The remainder of the paper is divided into five main areas. Second section briefly reviews the literature on the analysis of the determinants of risk aversion. Third section explains the empirical methodology and the data employed in the analysis. Fourth section discusses variable specification and Fifth section presents the results and contains a discussion of the main findings.

Literature Review

Past studies have employed a variety of methods to measure individual aversion to risk. Problematically, individual risk aversion is a personal trait that is inherently unobservable. Consequently, some studies have inferred risk tolerance from individual stock holdings (Paas et al. 2007; Wang and Hanna 2007) or from the risk profile of superannuation (retirement) accounts (Olivares et al. 2008; Watson and McNaughton 2007). Others have utilized household survey panel data that include questions on individual attitudes to financial risk. Conventionally, these questions can comprise either hypothetical scenarios about income gambles (such as in the US Health and Retirement Survey) or a scaled question about willingness to take risk (including the US Survey of Consumer Finances, German Socioeconomic Panel, and the Australian HILDA Survey). While there are issues as to whether respondents properly understand scaled questions, and there may be measurement error because individuals potentially select a different response over time even though they may not have changed their actual risk preference, respondent preferences still provide important information (Yao and Curl 2011).

An extensive body of literature has also investigated the determinants of risk aversion. These determinants include

demographic, socioeconomic, and attitudinal factors. In particular, studies that have assessed the impact of lifecycle factors, such as age, education, income, wealth, marital status, and household structure, on risk aversion have highlighted important relationships related to the lifecycle. In brief, as individuals move through their lifecycle, they typically move from completing education and beginning working life to raising a family. These early stages typically entail relatively lower incomes and larger financial commitments, such as mortgages and the costs association with raising children. Conversely, as individuals approach the later stages of their lifecycle, they tend to have relatively higher incomes and commensurately lower financial commitments with the decrease in mortgage payments and child-related costs.

The typical lifecycle phase therefore implies a positive correlation between aging and wealth accumulation. In addition, factors that contribute to increasing incomes, such as higher levels of education, also positively correlate with wealth, while household structure factors, such having children, may have a negative impact on wealth. Thus, the relationship between wealth and risk aversion is an important key to understanding the relationship between risk aversion and its determining factors. Existing studies have generally found that there are behavioral changes in relation to risk attitudes in each tail of the wealth distribution. At a higher bound, and once individuals reach a certain level of financial security, they believe they can tolerate additional financial risk, whereas at the lower bound, individuals with negligible wealth tolerate financial risk, but as they accumulate savings, are generally less inclined (Halek and Eisenhauer 2001; Jianakoplos and Bernasek 2008). Therefore, the middle of the wealth distribution is generally risk averse.

It is then not surprising given the correlation between wealth, income, and education, that increasing levels of income and education are generally positively associated with the willingness to take risk (Jianakoplos and Bernasek 2008). Intuitively, higher incomes lead to greater disposable income and financial literacy because of learning to make long-term decisions through employment and earnings. For example, recent research has concluded that individuals with precautionary savings (often defined as liquid financial assets in excess of 3 months of income) have a greater tolerance for risk (Gutter and Fontes 2006; Yao et al. 2005). Similarly, individuals with higher levels of education, and therefore greater human capital, may be more likely to have a greater financial cushion should a loss occur, and therefore can afford to be more risk tolerant (Yao and Curl 2011). In addition, some researchers have postulated that higher levels of education may be particularly important for facilitating a higher tolerance for financial risk-taking, as it leads individuals to acquire skills in gathering and processing information about financial markets (Lusardi and Mitchell 2007). In reality, there may be a multitude of reasons (socialization and cognitive ability to name a few) why education is consistently positively associated with risk tolerance (Hartog et al. 2002; Yao and Curl 2011).

Generally, most studies have found that risk tolerance tends to increase with age until retirement (around 65 years), and thereafter decreases (Halek and Eisenhauer 2001; Olivares et al. 2008; Yao and Curl 2011). The reasons for the risk aversion of older households may be the many uncertainties faced, including those relating to health and lifespan (Yao et al. 2004). In addition, financial advisors may recommend decreased holdings in riskier assets to ensure a certain stream of income (Ameriks and Zeldes 2004). However, Kim et al. (2012a, b) have also found that cognitive ability and the strength of the bequest motive strongly related to stock ownership, at least among elderly households.

Anecdotal evidence of the relationship between risk aversion and gender has also suggested that women are more risk averse than men. A number of studies have confirmed this finding, even when controlling for the effects of other individual characteristics, such as age, education, and wealth (Olivares et al. 2008; Yilmazer and Lyons 2010). Marital status in particular has some interesting effects for both men and women. For example, Riley and Chow (1992) found that widowed and separated women were more risk averse than married women, who in turn were more risk averse that women that had never married. Yilmazer and Lyons (2010) also found that married women who had more control over financial resources or married to older men were less likely to invest in risky assets. This contradicted a study by Jianakoplos and Bernasek (2008) who found that when women had more bargaining power in their marriage (in terms of higher spousal earnings) there was no evidence of these households holding less risky investments. For the most part, men appear to mitigate their aptitude for financial risk-taking during marriage, just as married couples and couples with children are more likely to be risk averse than single men, but revert to riskier investment options following divorce (Euwals et al. 2004; Love 2010). There is further evidence of the interaction between gender and marital status in a study estimating the shortfalls of retirement income in that single women expected larger shortfalls than single men and married individuals of both sexes (Hershey and Jacobs-Lawson 2012).

Homeownership may also indirectly affect individual attitudes to financial risk-taking. Because of the prominent role played by residential property in most household portfolios, and given the associated credit constraint and the effect of home ownership on consumption and saving,

investment in other financial assets may be "crowded out" (Cocco 2005; Yao and Zhang 2005). For example, Becker and Shabani (2010) concluded that households with a mortgage were 10 % less likely to own stocks and 37 % less likely to own bonds compared to similar households with no mortgage debt, and that 26 % of households should technically forgo equity market participation on account of the high interest rates paid on debt.

A few studies have also examined the risk attitudes of people of different nationalities, religions, and even religious denominations. For instance, Werwatz et al. (2006) established that Germans were generally risk adverse, Halek and Eisenhauer (2001) concluded that Black-Americans and Hispanic-Americans were more risk tolerant than White-Americans, while Brumagim and Wu (2005) found that Chinese-Americans consistently demonstrated risk-seeking preferences. More recently, Kim et al. ((2012a, b)) studied the investment patterns of recently immigrated Asian-Americans and showed significant variances in asset ownership by ethnic group. In general, Indian- and Korean-Americans displayed higher levels of business asset ownership while Indian- and Chinese-Americans were more likely to own financial assets, both demonstrating higher levels of risk tolerance. Korean, and Filipino immigrants were also more likely to be homeowners, thereby demonstrating greater risk aversion. Lastly, Bartke and Schwarze (2008) found that religious faith exerted a strong influence on individual risk propensity, with individuals with a religious affiliation significantly less risk-tolerant than atheists or agnostics. Muslims and Protestants also exhibited relatively higher risk aversion (Bartke and Schwarze 2008).

Conventional wisdom also asserts that relatively risk-averse individuals are less likely to be self-employed, as entrepreneurship involves making risky decisions. In fact, some studies have concluded that risk tolerance is a significant determinant of being self-employed (Hartog et al. 2002; Polkovnichenko 2005; Yao et al. 2004). However, others have found wealth to be a more significant determinant than risk tolerance (Kan and Tsai 2006). Evidence from the asset portfolios of business owners has suggested that these households tend to hold less of their wealth in stocks than similarly wealthy households, perhaps because of the greater background income risk faced (Heaton and Lucas 2000).

In relation to Australian studies of financial risk tolerance, the extant research is very limited. In early work, Hallahan et al. (2004) used a psychometric attitude test and a sample of individuals mostly sourced from the clients of financial planners. They found that gender, income, and wealth are significantly positively associated with financial risk tolerance with a negative relationship between risk tolerance and age and marital status. Australian researchers have also demonstrated some targeted interest in gender differences in risk tolerance. For example, both Jefferson and Ong (2010) and Austen et al. (2010) used data from the 2006 HILDA Survey and found less diversified asset portfolios for single women than single men. This implied a higher risk preference, though this approach did not necessarily consider the liquidity constraints single women also faced. In addition, Watson and McNaughton (2007) observed that women generally chose more conservative investment strategies than their male counterparts.

There are no studies of the influence of macroeconomic conditions on financial risk tolerance in Australia, while overseas work remains limited. Some studies have investigated the impact of asset class market returns on reported risk tolerance levels. For example, Yao et al. (2004) used the US Survey of Consumer Finances over the period 1983–2001 and found that financial risk tolerance changed in line with stock returns. Yao and Curl (2011) found identical results using the US Health and Retirement Study over the period 1992–2006, while Grable et al. (2004) used an internet-based investor survey and concluded that risk tolerance increased after stock market rises and decreased after market falls. Shefrin (2000) likewise reported a positive relation between the risk-tolerance levels of institutional investors and financial advisors and market returns. Finally, Bilias et al. (2010), using the US Survey of Consumer Finances, concluded that falls in the stock market generally encouraged individual investors to permanently remain rather than just temporarily remove themselves from the market.

Conceptual Framework

Traditional finance theory assumes that individuals make rational financial decisions based on mathematical reasoning, and that they can accurately model their preference for risk-taking to maximize utility. However, this assumption does not translate well to human behavior. The incorporation of psychological concepts into studies of financial decision-making has helped to explain phenomenon where emotion may override rational judgment. Emotional dispositions, the avoidance of regret and recent experiences may all influence personal attitudes to financial risk-taking, and thereby investment decisions.

Emotional Disposition

There is much support in the literature that emotional disposition affects investment decisions and risk tolerance. The conjecture is that an individual is in a good mood because of recent experience or current position in life, and this brings a positive outlook to a task, allowing better

performance, better organization, and creative problem solving (Ackert et al. 2003). An example of this concept as applied to financial markets is Hirshleifer and Shumway (2003), who found that sunny days (when people are more optimistic) lead to higher stock returns, as people may be more inclined to buy stocks when they are feeling optimistic. Studies that have investigated the impact of the relationship between mood and risk tolerance are more mixed. For example, Ackert et al. (2003) found that respondents adjusted their risk tolerance because of mood, where negative moods incurred higher levels of risk aversion, while better moods incurred higher levels of risk tolerance. The state of the economy in which the individual immerses may therefore affect their emotional disposition. If rising unemployment, price levels, and interest rates regularly feature in news bulletins, fear and stress may also alter their disposition and hence financial decisions.

Regret Theory

Regret is a powerful negative emotion that may also influence individual risk tolerance and financial decisions. Regret theory assumes that agents are rational but base their decisions not only on expected payoffs but also on expected regret (Michenaud and Solnik, 2008). In seminal work, Kahneman and Tversky (1979) found that investors potentially sell winning stocks too early because of the pride and elation of making a profit, but hold on to losing stocks too long because of the feeling of regret associated with making a loss. Individuals therefore have a strong desire to avoid regret.

Regret theory may also help to explain momentum in markets (Ackert et al. 2003). When market prices are rising, momentum investors speculate that prices will continue to move higher. In effect, risk tolerance for momentum investors increases as prices increase because the fear of missing any future gains outweighs the potential psychic and economic benefits of moving against the trend (Grable et al. 2004). In contrast, when prices move down, the herding instinct can cause investors to sell into the trend. This effectively shows that certain investors wish to minimize losses and avoid the regret associated with holding a security as it falls in value. Importantly, such bias may produce suboptimal results over the longer term, as it causes investors to increase their risk tolerance in good economic climates, leading to additional risky asset holding. Equally, lead investors sell their riskier assets in poorer economic climates as risk aversion rises (Grable et al. 2004).

Recency Effect

Experiences also influence individual decision-making, but not all past experiences are the same. In particular, experiences that are more recent have a momentary advantage in informing decision-making (Miller and Campbell 1959). Therefore, the recency effect posits that the most recent market conditions have the greatest impact on individual memory and consequently investment decisions. Evidence has duly suggested that recent historical returns may unduly influence individuals when making investment choices (Clark-Murphy et al. 2009). Investors predict that asset returns will continue to experience high returns if they have done so in the recent past, and buy accordingly. On the other hand, they divest when returns have been negative in the recent past. From an economic perspective, this behavior contradicts the random walk hypothesis of independently generated rates of return and the rational investor seeking to "sell high and buy low" (Rieskamp 2006). Instead, investors look for trends and patterns, and extrapolate these into the future, even when informed that these events are purely random (Grable et al. 2004).

Hypotheses

In sum, two main hypotheses are proposed. First, individuals change their attitudes to financial risk-taking over time. Because the GFC was a major contractionary macroeconomic event that took place within our sample period (2001–2010) and is likely to invoke a negative emotional response, we hypothesize that overall risk tolerance is likely to fall. Second, we test for the significance of macroeconomic indicators on financial risk-taking, while controlling for individual and household demographic and socioeconomic characteristics. We hypothesize that individuals absorb information about the economy from indicators reported on television and in the print and other media in the recent past, and adjust their attitudes for financial risk-taking accordingly. If macroeconomic indicators suggest conditions are weak, individuals will be less inclined to take financial risks. Conversely, if macroeconomic indicators suggest strong conditions, individuals will be more comfortable with financial risk. Thus, we expect that macroeconomic conditions as a whole significantly influence financial risk attitudes.

Research Method and Data

We employed longitudinal data over the period 2001–2010 from the HILDA survey in this analysis. The panel data are of very high quality and follow some 13,969 people across 7,682 households throughout their lives. Nonetheless, the HILDA sample is necessarily complex given the need to track individuals in participant households and to refresh the sample when individuals choose to leave the survey.

For example, of the original Wave 1 survey respondents, by Wave 10 9,002 individuals (64 %) across 6,727 households (88 %) remained, joined in Waves 2–10 by 4,524 new individuals (Summerfield et al. 2011).

For the descriptive analysis, we employed a balanced panel, weighting the data using the sample weights provided to adjust for nonresponse bias such that the results are representative of the Australian population. For the multivariate analysis, we drew a random sample of 10,000 respondents (across 6,839 households) and employed an unbalanced panel given that weighting regression analyses when the weights are endogenous is arguably suspect for hypothesis testing. The dependent variable is the attitude to financial risk-taking. The following question appears in the HILDA self-completion questionnaire administered to every adult member of the household that also completed a person questionnaire:

Which of the following statements comes closest to describing the amount of financial risk that you are willing to take with your spare cash? That is, cash used for savings or investment.

[1] I take substantial financial risks expecting to earn substantial returns.
[2] I take above-average financial risks expecting to earn above-average returns.
[3] I take average financial risks expecting average returns.
[4] I am not willing to take any financial risks.
[5] I never have any spare cash.

We adjusted this raw variable before the analysis. First, persons selecting response [5] were excluded (8,520 person-year responses) because it is questionable as to how this option relates to financial risk-taking. It is worth noting that this question is otherwise identical to the corresponding question in the US Survey of Consumer Finances. This left 62,740 person-year observations for our dependent variable. Second, this question was included in the survey in 2001, 2002, 2003 and 2004 (corresponding to Waves 1, 2, 3, and 4) and biannually thereafter in 2006, 2008 and 2010 (Waves 6, 8 and 10). For the ordered logit analysis, we extrapolated the missing observations for financial risk-taking (in 2005, 2007, and 2009) using a lag. That is, if the respondent chose option [3] in 2004, we imputed this for 2005. However, we omitted this imputation from the descriptive analysis, leaving 40,360 observations for the balanced panel of responses to options [1]–[4].

Third, the benefit of the ordered logit model is that it implies a ranking. With the question left in its original form, the ordered logit would imply moving from being significantly less risk averse ("I take substantial financial risks") to being risk averse ("I am not willing to take any financial risks"). To make better conceptual sense of the findings, we recoded the responses to reverse this order, so that the interpretation is from relatively risk averse through to substantially less risk averse. Table 1 provides details on the distribution of responses for the original and recoded attitudes to financial risk-taking. We abbreviated the recoded responses as "no risk" (NR), "average risk" (AR), "above-average risk" (AAR), and "substantial risk" (SR).

The model employed is an ordered logit panel data model including individual and household random effects. An add-on package for STATA provided the estimates. We hypothesized that while individuals change their attitudes over time in response to changing conditions, they nest within the same person and the dependency within

Table 1 Response frequency for attitude to financial risk

Original survey coding	Regression analysis recoding	2001	2002	2003	2004	2006	2008	2010	Total
[–] Refused/not stated/no self completed questionnaire	Omitted	1,124	1,165	1,182	1,167	1,483	1,838	1,750	9,709
		8 %	9 %	9 %	9 %	11 %	14 %	13 %	11 %
[1] Takes substantial risks expecting substantial returns	[4] Substantial risk (SR)	201	181	161	185	209	201	188	1,326
		1 %	1 %	1 %	1 %	2 %	2 %	1 %	1 %
[2] Takes above-average risks expecting above-average returns	[3] Above-average risk (AAR)	769	736	707	690	739	646	662	4,949
		6 %	6 %	6 %	6 %	6 %	5 %	5 %	5 %
[3] Takes average financial risks expecting average returns	[2] Average risk (AR)	4,350	4,101	4,073	4,097	3,963	3,835	4,056	28,475
		31 %	31 %	32 %	33 %	31 %	30 %	30 %	31 %
[4] Not willing to take financial risks	[1] No risk (NR)	4,725	4,527	4,404	4,344	4,526	4,328	4,881	31,735
		34 %	35 %	35 %	35 %	35 %	34 %	36 %	35 %
[5] Never has any spare cash	Omitted	2,800	2,331	2,201	1,925	1,985	1,937	1,989	15,168
		20 %	18 %	17 %	16 %	15 %	15 %	15 %	17 %
Total		13,969	13,041	12,728	12,408	12,905	12,785	13,526	91,363
		100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %

individuals over time needs to be recognized. We also controlled for household effects as different individuals nest in the same household. Each respondent's attitude to financial risk serves as the dependent variable in a regression with demographic and socioeconomic characteristics and macroeconomic conditions as predictors. This analytical technique is also appropriate as the dependent variable is discrete (that is, it can only take values of 1, 2, 3 or 4), and the values in each category have a meaningful sequential order, that is, risk aversion increases as we move from 1 to 4 through 2 and 3 (Worthington 2006). In addition, it is likely that the distances between these values are not equal. For example, the distance between AR and AAR may be shorter than the distance between AAR and SR.

An alternative would have been to use a multinomial logistic model, but when the response variable is ordinal, information is discarded as it ignores the ordered aspect of the outcome (Cameron and Trivedi 2009). The ordered logit model estimates an underlying score as a linear function of the independent variables and a set of cut-points (Cameron and Trivedi 2009), and the probability of observing outcome i corresponds to the probability that the estimated linear function plus random error is within the range of the cut-points estimated for the outcome:

$$\Pr\left(outcome_j = i\right) = \Pr\left(k_{i-1} < \beta_1 x_{1j} + \beta_2 x_{2j} + \cdots + \beta_k x_{kj} + u_j \leq k_i\right)$$

where u_j is logistically distributed in the ordered logit, x_{kj} is a vector of control variables with estimated coefficients β_1, β_2, …β_k, and cut-points k_1, k_2, …$k_{k\text{-}1}$, where k is the number of possible outcomes, k_0 is taken as $-\infty$, and k_k is taken as $+\infty$. The estimated coefficients β and the cut-point parameters are obtained using maximum likelihood methods. The sign of the estimated coefficients can be immediately interpreted as determining whether the dependent variable increases with the independent variables (Cameron and Trivedi 2009). Predicted probabilities and marginal effects are also calculated.

The control variables in the ordered logit regression model comprised demographic and socioeconomic factors. The demographic and socioeconomic characteristics are generally comparable to those employed in earlier studies of financial risk-taking. We used publicly available market data to establish the link between financial risk-taking and changes in the market. We included 12 demographic and socioeconomic characteristic variables. Table 2 provides details of the variable specification and selected descriptive statistics. The demographic variables included the age of the respondent, age-squared, the level of education of the respondent, religious affiliation, gender/marital status of the respondent, presence of children under 15 years of age in the household, employment status of the respondent,

Table 2 Variable definitions, expected signs and descriptive statistics

Variable	Expected sign	Mean	SD
Age			
Age dummy (25–34 years)			
<25 years = 1	–	0.066	0.249
35–44 years = 1	+	0.284	0.451
45–54 years = 1	+	0.289	0.453
55–64 years = 1	+	0.155	0.362
>65 years = 1	–	0.032	0.177
Age-squared	+	2,008.072	1,050.229
Education			
Education dummy (Year 12)			
Bachelor's degree or higher = 1	+	0.295	0.456
Vocational qualification = 1	–	0.341	0.474
Year 11 = 1	–	0.224	0.417
Marital status/gender			
Marital status/gender dummy (married male)			
Married female = 1	–	0.290	0.454
Single female = 1	–	0.201	0.401
Single male = 1	+	0.182	0.386
Household status			
Household status dummy (no children, older children)			
Children <15 years = 1	–	0.577	0.494
Employment type			
Employment type dummy (employee, not employed)			
Self-employed = 1	+	0.117	0.321
Housing tenure			
Housing tenure dummy (Renter)			
Homeownership = 1	–	0.771	0.420
Country of birth			
Country of birth dummy (Oceania)			
Europe = 1	–	0.098	0.297
Asia = 1	+	0.042	0.200
Other country of birth = 1	–	0.030	0.170
Health status			
Health status dummy (good health)			
Excellent health = 1	+	0.118	0.322
Very good health = 1	+	0.401	0.490
Fair health = 1	–	0.093	0.291
Poor health = 1	–	0.008	0.091
Religious affiliation			
Religious affiliation dummy (christian)			
Non-christian = 1	–	0.045	0.206
Non-religious = 1	+	0.298	0.457
Income			
Annual household income ($)	+	66,676.890	42,887.380

Table 2 continued

Variable	Expected sign	Mean	SD
Net wealth			
Net wealth dummy ($500,000–$999,999)			
<$499,999 = 1	–	0.517	0.500
$1,000,000–$1,499,999 = 1	+	0.073	0.260
>$1,500,000 = 1	+	0.083	0.276
Macroeconomic conditions			
Cash rate	–	5.231	1.116
ASX200	+	4,330.598	933.238
10-year Treasury bond rate	–	5.666	0.408
Unemployment rate	–	5.231	0.670
CPI	–	154.041	11.314
Consumer confidence	+	118.767	10.334

Dummy variable reference categories in brackets. All monetary units in Australian dollars (A$1 = US$1.05). For the education dummies, in Australia Year 11 corresponds to primary and secondary education and the first secondary education qualification, Year 12 is attainment of an additional 2 years of secondary education necessary for university matriculation, vocational is vocational-specific education following either Year 11 or Year 12, bachelor's degree is 3-year program equivalent to university, polytechnic or liberal arts college elsewhere

home-ownership, health status of respondent and ethnicity. For the age category, gender, and homeownership variables, imputation was required for the 2001 values, as these three variables were not included in the first survey. Similarly, religious affiliation was only included in the 2004 and 2007 surveys. As religious affiliation is relatively static (at least in the short run), the responses for the missing years are filled in with the responses from 2004 to 2007.

The socioeconomic variables included the level of annual household income and wealth categories. Annual household income is the household financial year disposable income, adjusted in constant 2001 dollars (all monetary units in Australian dollars). Wealth is included in the model as net worth (total assets less total debts) of the household. Households provide estimates to interviewers of the values of various assets and debts in the "Wealth Module" conducted in Waves 2, 6 and 10 of the HILDA survey (2002, 2006, and 2010, respectively). Total assets included both financial (equity investments, cash investments, trusts, bank accounts, redeemable insurance policies, superannuation/retirement accounts), and nonfinancial assets (estimated values of the home, other property, collectibles, businesses and vehicles). Total debt comprised property, business, credit card, and other debt, and from Wave 6 onwards, overdue household bills. To preserve confidentiality, HILDA applies a weighted mean to households within wealth thresholds. Accordingly, net worth is a series of dummy variables for these wealth thresholds.

We particularly focused on whether individuals differ in their willingness to take financial risks depending on changes in exogenous macroeconomic conditions. Accordingly, we included six indicators of market conditions and consumer confidence. The first indicator included is the ASX200 stock price index from the Australian Securities Exchange (ASX). The financial literature postulates that stock prices reflect the entire set of value-relevant information available to investors, including economic forecasts. There is also evidence that people use movements in stock prices as a leading indicator of future economic activity (Otoo 1999). The next two indicators are the official cash rate target and 10-year Australian government bond rates from the Reserve Bank of Australia. Changes in the cash rate provide important signals about the state of the economy and the monetary policy response, and receive widespread news coverage. This is because in Australia, banks traditionally pass on cash rate changes to their variable mortgage rates, which in turn directly affected the financial commitments of mortgage holders and/or the financial returns of debt holders. Similarly, public news announcements significantly influence the price of 10-year government bonds, so changes in bond rates also provide useful information about the economy (Balduzzi et al. 2001).

Both the unemployment rate and the CPI are from the Australian Bureau of Statistics, both representing indicators of the state of the economy with natural links to consumer spending and job security. Lastly, the Roy Morgan Consumer Confidence Rating compiled by Roy Morgan Research (a weekly telephone interview of approximately 1,000 respondents, with responses to five questions about future financial expectations) is used to proxy retail consumer/investor confidence, with an increase in the index indicating increasing consumer confidence. Variation in consumer confidence indexes have been particularly shown to be affected by labor market conditions, inflation and stock prices, with just four lags of these variables and the index itself explaining nearly 90 % of the variation (Garner 2002). Therefore, the Roy Morgan Consumer Confidence Rating is included to reflect the persistence of these past events in attitudes to the market. In consideration of testing the recency effect, we used the July values for each macroeconomic indicator this allows time for respondents to consider this information by the time the HILDA survey fieldwork begins in August.

We used variance inflation factors (VIFs) to test for multicollinearity between the macroeconomic variables, yielding a VIF of 10.02 for the cash rate, 19.08 for the ASX200, 33.85 for the unemployment rate, 2.65 for the Roy Morgan Consumer Confidence Rating, 3.84 for the CPI, and 2.42 for the government bond rates. As a rule of thumb, VIFs greater than ten warrant further examination

(O'Brien 2007). Consequently, we dropped the unemployment rate and reran the tests. This resulted in much lower VIFs for the remaining five macroeconomic variables: 3.29 for the cash rate, 4.07 for the ASX200, 2.31 for the Roy Morgan Consumer Confidence Rating, 3.68 for the CPI and 2.18 for the government bond rate. We therefore excluded the unemployment rate to improve the precision of our estimates. We also tested the demographic and socioeconomic factors for multicollinearity, but found the VIFs to be universally very small (less than 1.2).

Table 2 provides the hypothesized signs of the estimated coefficients and descriptive statistics of the variables used. The specific model used in this paper is:

$$\Pr\left(Risk\ aversion_j = i\right) = \Pr\left(\begin{array}{l} ki-1<\beta_{1-5}Age+\beta_6 Age\text{ - squared}+\beta_{7-9}Education \\ +\beta_{10-12}Martial\ status/gender+\beta_{13}Household\ status+\beta_{14}Employment\ type+\beta_{15}Housing\ tenure \\ +\beta_{16-18}Country\ of\ birth+\beta_{19-22}Health\ status+\beta_{23-24}Religious\ affliation+\beta_{25}Income \\ +\beta_{26}Net\ wealth+\beta_{27-32}Macroeconomic\ conditions+u_j\le k_i \end{array}\right)$$

Empirical Findings

Transition Analysis

Using the discrete-response data, we examined the length of time respondents spent in the different categories. These corresponded to the survey waves (and their corresponding years). In order to examine the transition of respondents between the various categories of attitudes to financial risk-taking over the ten-year period, we employed a 1-year lag. Thus, we lose the values for 2001. In addition, we generated a second lag for financial risk attitude for 2006, 2008 and 2010, to represent the transition between risk attitude categories in these later years (and because the 2005, 2007, and 2009 waves omitted the question on financial risk attitude). For example, if the respondent chose AR in 2008, this is also the value in 2010. We utilized a balanced panel. Table 3 reports the results.

Consider those respondents that selected NR in the survey. Of these, 76.44 % subsequently choose NR again, that is, 76.44 % remained in the NR category over the ten-year period. The remaining 21.87 % of respondents transitioned to AR in the next period, while 1.11 % and 0.58 % transitioned to AAR and SR, respectively. Similarly, while 70.59 % of the respondents that had chosen AR for at least one period remained at AR for the next period, 21.73 % transitioned to NR. This indicates that there is flexibility between these categories of financial risk-taking in both directions and of approximately equal proportions.

For respondents that had chosen AAR for one period during the survey, 45.44 % remained in that category for the next period and 42.21 % transitioned to AR. Potentially, this high transition rate may reflect some measurement error because of the subjectivity of the description, that is, what is the actual difference between average and above-average risk-taking. As a result, respondents may be inconsistent in their responses over time. Nonetheless, there is no similar transition for respondents choosing AR to AAR in the next period, that is, there is less transition up the risk tolerance scale, and there is a definite preference for the downgrading of risk tolerance. The transition rates for the substantial risk category appear to verify this, where 31.19 % remained in this category throughout the various survey waves, while 29.68 % transitioned down the scale to AAR, a further 25.33 % transitioned further down to AR, and 13.80 % transitioned even further down to defining themselves as NR.

Table 3 Transition in financial risk attitudes

Financial risk attitude in year t	Financial risk attitude in year $t+1$				
	NR	AR	AAR	SR	Total
NR	10,381	2,970	151	79	13,581
	76.44 %	21.87 %	1.11 %	0.58 %	100 %
AR	3,146	10,221	987	125	14,479
	21.73 %	70.59 %	6.82 %	0.86 %	100 %
AAR	151	1,033	1,112	151	2,447
	6.17 %	42.21 %	45.44 %	6.17 %	100 %
SR	73	134	157	165	529
	13.80 %	25.33 %	29.68 %	31.19 %	100 %
Total	13,751	14,358	2,407	520	31,036
	44.31 %	46.26 %	7.76 %	1.68 %	100 %

NR no risk, *AR* average risk, *AAR* above-average risk, *SR* substantial risk

Calculating variations to the attitude to financial risk response over time for each individual and between different individuals provides some insight into whether this risk preference is stable over time for individuals and whether individuals differ significantly in their risk preferences. The variation for within individuals was 37.8 %, calculated as the difference between the actual response and the individual mean response in all periods. The variation between different individuals was 62.2 %, calculated as the difference between the individual mean and the overall mean in all periods. Therefore, most of the variation in attitudes to financial risk arises, much as expected, to differences in the characteristics of individuals. However, the relatively large percentage of within-variation shows that we should not automatically assume fixed risk preferences for all individuals across all periods. In the relatively short period of 10 years, 37.7 % of individuals varied their risk attitude response from their mean response.

These findings show that while we expect risk attitudes to differ between individuals according to their unique characteristics and experiences, a relatively high proportion of individuals revise their own risk attitude over time. Over the 10-year period included in this study, there appears a definite preference for downgrading the level of risk tolerance. Reasons for this may be the GFC, aging and other changes in the population, or some combination of the two. This has significant implications for financial planners, as individuals may declare a higher tolerance for risk initially, and may revise their risk tolerance downwards over time, perhaps because of changes in their lifecycle or macroeconomic factors. An investment strategy set based on the risk preference declared during an initial consultation may then not be suitable over an extended horizon.

Ordered Logit Results

Table 4 provides the estimated coefficients, standard errors, and marginal effects of the ordered logit regression. The F-test rejected the null hypothesis that all slope coefficients are zero at the 0.001 level, implying that the model is appropriate for predicting financial risk attitudes. Separate Wald tests of the sets of macroeconomic variables (F-stat. = 17.33, $p < 0.001$) and demographic and socioeconomic variables (F-stat. = 38.36, $p < 0.001$) indicate that the coefficients are significantly not jointly equal to zero. Thus, including both sets of variables (demographic and socioeconomic factors and macroeconomic conditions) creates a statistically significant improvement in model fit.

The signs of the estimated coefficients indicate the effect on risk tolerance. If the coefficient is positive, then an increase in the independent variable necessarily decreases the probability of being in the lowest risk attitude category (NR), and increases the probability of being in the highest risk attitude category (SR) (Cameron and Trivedi 2009). The signs on the estimated coefficients indicated that increasing age, having an educational attainment of a vocational qualification or higher, being self-employed, being in very good or excellent health, increasing household income, and having a net wealth over $1 million contributes to having a greater likelihood of a higher level of risk tolerance (significant positive coefficients).

Conversely, being under 25 years of age, having an educational attainment to Year 11 or lower, being female (either single or married), having children in the household under 15, being born in Europe, being of fair or poor health, and having a net wealth of less than $499,999 exerted a greater likelihood of a low level of financial risk-taking (significant negative coefficients). The direction and significance of these variables appeared to agree with the existing literature. Households with low levels of disposable income, such as younger households completing studies or starting working careers, households that have reduced employment opportunities because of a low level of education, households with the expense of rearing young children, households with health expenses, and females are perhaps consuming most of their budget on day-to-day expenses. This leaves little to satisfy savings motives. The reduced savings, and arguably lower levels of financial literacy, infer that respondents with these characteristics are unlikely to consider risk-taking behavior. Meanwhile, it is those households with greater resources and concomitantly less pressure on the household budget, such as being in good health, that are able to afford variability in asset returns. Conversely, the significance of European origin for the increased likelihood of financial risk aversion implies that cultural differences factor into the formation of risk attitudes.

Of the five macroeconomic indicators, increases in Australian government bond rates and the CPI were found to be individually statistically significant for an increased likelihood of being in lower risk categories. Increases in bond rates infer a contractionary macroeconomic environment and so risk-taking behavior is reduced. Similarly, as the price of consumables rises there is uncertainty about the future that reduces risk-taking behavior. Reasons for the lack of significance of the remaining macroeconomic indicators could be misspecification of the model or the indicator, or simply because individuals may not have immediately reevaluated their attitudes to financial risk-taking. Considering the within-variation of 37.7 %, individuals are apt to have reevaluated their attitude to financial risk. In addition, the transition of survey respondents between risk categories shows a greater likelihood of a downward revision in risk attitude over the period 2001–2010. This is not surprising given the GFC takes

Table 4 Ordered logit parameter estimates and marginal effects

Parameter	Estimated coefficient	SE	Change	Marginal effect on predicted probability			
				NR	AR	AAR	SR
Age <25 years	−0.212**	0.089	0–1	0.053	−0.041	−0.010	−0.002
Age 35–44 years	0.200	0.080	0–1	−0.030	0.023	0.005	0.001
Age 45–54 years	0.094	0.091	0–1	−0.023	0.018	0.004	0.001
Age 55–64 years	0.146	0.114	0–1	−0.037	0.028	0.007	0.002
Age > 65 years	−0.135	0.152	0–1	0.034	−0.026	−0.006	−0.002
Age-squared	<0.000***	0.000	Marginal	<0.001	<0.001	<0.001	<0.001
Bachelor's degree or higher	0.568***	0.071	0–1	−0.142	0.109	0.026	0.007
Vocational qualification	0.064†	0.067	0–1	−0.160	0.123	0.029	0.008
Year 11	−0.396***	0.067	0–1	0.098	−0.076	−0.018	−0.005
Married female	−0.607***	0.063	0–1	0.152	−0.117	−0.028	−0.007
Single female	−0.747***	0.071	0–1	0.187	−0.144	−0.034	−0.009
Single male	−0.038	0.072	0–1	0.009	−0.007	−0.002	0.000
Children <15 years	−0.199***	0.049	0–1	0.050	−0.038	−0.009	−0.002
Self-employed	0.445***	0.078	0–1	−0.111	0.086	0.020	0.005
Homeownership	0.069	0.059	0–1	−0.017	0.013	0.003	0.001
Europe	−0.313***	0.069	0–1	0.078	−0.060	−0.014	−0.004
Asia	−0.051	0.106	0–1	0.013	−0.10	−0.002	−0.001
Other country of birth	−0.196	0.133	0–1	0.048	−0.037	−0.009	−0.002
Excellent health	0.224**	0.068	0–1	−0.056	0.043	0.010	0.003
Very good health	0.202***	0.049	0–1	−0.050	0.039	0.009	0.002
Fair health	−0.159**	0.072	0–1	0.040	−0.031	−0.007	−0.002
Poor health	−0.494**	0.169	0–1	0.123	−0.095	−0.022	−0.006
Other religion	0.361	0.242	0–1	−0.090	0.07	0.016	0.004
Nonreligious	0.067	0.049	0–1	−0.017	0.013	0.003	0.001
Annual household income	<0.001***	<0.001	Marginal	<0.001	<0.001	<0.001	<0.001
Wealth <$499,999	−0.495***	0.049	0–1	0.124	−0.095	−0.023	−0.006
Wealth $1–$1,499,999	0.505***	0.086	0–1	−0.126	0.097	0.023	0.006
Wealth > $1,500,000	0.590***	0.084	0–1	−0.147	0.114	0.027	0.007
Cash rate	0.203	0.181	Marginal	−0.051	0.039	0.009	0.002
ASX200	<0.001	<0.001	Marginal	<0.001	<0.001	<0.001	<0.001
Government bond rate	−0.275**	0.135	Marginal	0.084	−0.064	−0.015	−0.004
CPI	−0.010†	0.006	Marginal	0.002	−0.002	<0.001	<0.001
Consumer confidence	0.004	0.008	Marginal	−0.001	0.001	<0.001	<0.001

Marginal effects indicate the effect on the probability of being in a given risk category. Standard normal density function used for the continuous variables; the marginal effects for the dummy variables compare the probabilities that result when the variable takes its two different values (0, 1) with other variables held at means. Marginal effects for predicted probabilities sum to zero across categories

NR no risk, *AR* average risk, *AAR* above-average risk, *SR* substantial risk

† $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

place from late 2007 onwards. For example, of those respondents that had previously chosen the average risk category, approximately 21 % reevaluated themselves to a lower risk category (NR), and only about 7 % transitioned to a higher risk category (AAR or SR).

Similarly, of those respondents that chose the AAR category in a previous period, approximately 48 % revised their preference to a lower risk category (AR or NR) while only 6 % revised to a higher risk category (SR). The suggestion is that demographic and socioeconomic factors determine the changes, if any, in risk attitudes over time, not macroeconomic conditions. However, it is unlikely that the demographic and socioeconomic characteristics of households have changed so rapidly and so consistently across the sample. That said, it may take some time for individuals to respond to changes in the market environment, so one direction for future research may be to incorporate lags and/or a longer sample period as data become available.

Calculating the predicted probabilities showed that the model had an absolute improvement (in terms of correct predictions) of 3.92 %, and a relative improvement (in terms of incorrect predictions) of 2.65 %. Across the risk tolerance categories, the model under predicted respondents choosing the AR category by 5.35 %, AAR by 46.37 % and SR by 46.25 %, but over predicted NR by 18.99 %. This implies that the model was very good at predicting a low level of risk tolerance, but was less accurate for high levels of risk tolerance. Put differently, the demographic and socioeconomic characteristics included in the model do not appear to have adequately captured the characteristics of households that chose the above-average risk or substantial risk categories with sufficient predictive power. Further research is required to refine the model, although these characteristics may be unobservable.

To facilitate further comparability, we calculated marginal effects. The marginal effects measure the effect on the conditional mean of the probability of each category of attitude to financial risk of a change in one of the independent variables. For categorical variables, the marginal effect shows how the attitude to financial risk changes as the categorical variable changes from 0 to 1, holding all other variables at their means. For the continuous variables, the marginal effect measures the instantaneous rate of change.

Consider the under 25 years of age category. Being in this category decreased the probability of being in the highest category of attitude to financial risk (SR) by 0.2 %, being in the AAR category by 1.0 %, and being in the AR category by 4.1 %. There was a 5.3 % probability of being in the NR category. By comparison, a university education increased the probability of being in the AR category by 10.9 %, the AAR category by 2.6 %, and the SR category by 0.7 %, and lowered the probability of being in the NR category by 14.2 %. Being female also increased the probability of being in the NR category, by 18.7 % for singletons and 15.2 % for married females. In contrast, being a married (single) female reduced the probability of being in the AR category by 11.7 % (14.4 %), in the AAR category by 2.8 % (3.4 %), and in the SR category by 0.7 % (0.9 %).

Increasing wealth also increased the probability of financial risk tolerance. Being in the net wealth category of above $1,500,000 ($1,000,000–$1,499,999) decreased the probability of being in the NR category by 14.7 % (12.6 %). The probability of financial risk tolerance in these higher net wealth categories increased by 11.4 % (9.7 %) for AR, 2.7 % (2.3 %) for AAR and 0.7 % (0.6 %) for SR for the above $1,500,000 ($1,000,000–$1,499,999) net wealth category. From the marginal effects in Table 4, it appears that being in the two highest net wealth categories, having a university education or vocational qualification and being self-employed has the most positive effect on being in the highest risk tolerance categories. Conversely, being female (single or married), being in the lowest wealth category, being in poor health having an educational attainment of Year 11 or lower has the greatest impact on being risk averse.

Discussion

We first used transition analysis to test whether households changed their attitudes to financial risk-taking over time. Given that the GFC occurred during the same period, we hypothesized that the overall level of risk tolerance would likely decline. Investigation of the transition between categories of the attitude to financial risk-taking showed that over the period 2001–2010, there was less transition up the risk tolerance scale (that is, toward increased risk tolerance), and a definite preference for a downgrading of risk tolerance at the population level. Put differently, Australians have become less tolerant of financial risk during the past decade. Respondents also exhibited a greater tendency to remain in the categories of lowest risk-tolerance (76.44 % for the NR category and 70.59 % for the AR category) over time, in comparison to only 45.44 % of respondents remaining in the AAR category and 31.19 % in the SR category.

In addition, we found that while most of the variation in the attitude to financial risk-taking arose from the differing demographic and socioeconomic characteristics of individuals, the relatively large percentage of within-variation shows that we should not automatically assume fixed risk preferences for individuals across time. This is because we found that in the relatively short period of 10 years, individuals varied their responses 37.7 % from their mean response. However, there is no evidence from this analysis to support that this downgrading of risk tolerance was because of the GFC alone. Longitudinal studies, such as Yao and Curl (2011), typically found an age effect, that is, that risk tolerance declines with age. Regardless, that nearly 40 % of this sample of the Australian population changed their risk preference has important implications for the financial planning industry. Accordingly, we recommend planners should periodically revise assessment of their clients' risk preferences.

We then focused on the effects of macroeconomic conditions, after controlling for demographic and socioeconomic characteristics, on attitudes to financial risk-taking. As emotions associated with poor economic conditions, such as that experienced during the GFC, may affect financial risk-taking, we hypothesized macroeconomic conditions would help determine attitudes to financial risk-taking. The ordered logit analysis showed that

attitudes to financial risk-taking in Australia varied strongly according to certain demographic and socioeconomic characteristics. In sum, the findings suggested a higher likelihood of risk tolerance was associated with having an education attainment of a vocational qualification or higher, being self-employed, being in very good or excellent health, and having net wealth in excess of $1 million. Conversely, a higher likelihood of risk aversion was found to be associated with being young (under 25 years), having an educational qualification of Year 11 or lower, being female, having children in the household, being born in Europe, being of fair or poor health and being in the lowest net wealth category. Marginal effects showed that being in the highest net wealth category exerted the greatest single positive effect on being in the highest risk tolerance category, while being female (single or married) had the greatest impact on being risk averse. We found these results to be consistent with existing studies.

However, only two of the five macroeconomic indicators specified (Bond rates and CPI) exerted statistically significant individual influences. One possible reason for this result is that the study tested the recency effect, that is, that individuals use recent information to formulate their preferences for risk-taking. Accordingly, the observations for the economic indicators were only for the month before the start date of the survey fieldwork. It is then possible that individuals will take some time to reevaluate their attitude to financial risk-taking. In addition, we specified the macroeconomic indicators in levels and this may not well reflect the situation if individuals derive information about the state of the economy through the magnitude of change. Nonetheless, the results of this study suggest that individual demographic and socioeconomic characteristics are far more influential on attitudes of financial risk-taking than general market conditions.

This study utilized a longitudinal data series and controls for the ages of respondents. One possible direction for future research would then be to control for cohort effects as this further complicates the effects of age on risk aversion. For example, a baby boomer couple (born 1946–1964) may hold a higher risk profile portfolio than their parents at the same age (the so-called silent generation, born 1925–1945), which could be because of their age or the increased financial conservatism of the parental cohort during the depression and wartime era. For instance, several studies have found that individuals that have experienced generally low stock market returns or heightened macroeconomic uncertainty throughout their lives have a lower willingness to assume financial risk (Fukuda 2009; Jianakoplos and Bernasek 2006; Malmendier and Nagel 2011). However, such memories fade over time. For example, Malmendier and Nagel (2011) found that the generational memory of events such as the Great Depression did not fully coincide with risk aversion, although the memory can last for a considerable time.

Further directions for future research include investigation into the factors that contribute to individual attitudes to financial risk-taking. A dynamic model of attitudes to financial risk would also provide insight into the effect of past attitudes on current attitudes and the persistence of respondent attitudes. It would also be interesting to investigate the linkage between high net worth individuals and higher risk tolerance. Insight into the nature of this relationship would contribute further to financial planning and wealth accumulation strategies. Another extension could be to focus on comparing the results of the attitudinal measure of risk tolerance with other measures of risk tolerance, such as those based on portfolio composition or scenario-type surveys. For the financial planning and fund management sectors, studies of this nature help to ensure that individuals are comfortable with their portfolio risk, and for public policy, information on those segments of the population to target for wealth accumulation education.

This is important work for a number of reasons, all of which depend on the degree of financial risk aversion prevailing in the population, and its impact on the investment decisions of households. Consider, for example, the ongoing retirement of Australia's baby boomers and concerns about the extent to which mature-age Australians now have, or may have in the future, a capacity for financial self-reliance during retirement. In part, this capacity is a function of the investment decisions made by these households, which in turn depends on the tolerance households have for financial risk. The resulting government budget burden for those who have not accumulated sufficient wealth for retirement is an ongoing concern for public policy, in both Australia and elsewhere.

However, wealth not only infers benefits for retirement in that it provides general economic security for adverse conditions, including periods of unemployment and ill health. It also enables households to gain access to credit for future investment in human capital or asset accumulation. In addition, the benefits afforded from investments in wealth-generating assets, such as cash income or capital appreciation, also contribute to the quality of life and standard of living of households. Therefore, research on attitudes to financial risk-taking in households is important as it helps inform financial advisors and public policy on how households make forecasts that affect their financial welfare.

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