

PAPERS FROM THE PERSONAL FINANCE AND INVESTMENTS RESEARCH SYMPOSIUM 2013

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PERSONAL ATTRIBUTES

and financial risk-taking in Australia

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Using a bootstrapped sample of respondents from the Household Income and Labour Dynamics in Australia (HILDA) survey, we employ canonical correlation analysis to examine the relationships between financial risk-taking (as measured by self-reported financial risk-taking attitude, direct share ownership, and business ownership) and age, gender, education, household structure, income and wealth. Though all three measures are good indicators of financial risk-taking, we find direct share ownership is influential as a whole, followed by self-reported risk-taking, and finally business ownership. Of the personal attributes identifying financial risk-taking, the most important positive correlates are wealth, followed at some distance by income and then education.¹

The preferences of individuals for financial risk-taking have a major influence on financial decision-making. For instance, more risk-averse individuals are likely to select relatively safe (lower-yielding) financial assets for investment, such as term deposits and government bonds, whereas individuals with less aversion to risk will tend to choose riskier (higher-yielding) financial assets, such as stocks and corporate bonds. Consequently, over time, the financial risk-taking stance of individuals influences their choice of assets and asset classes for investment and, in doing so, the extent of portfolio diversification, and ultimately, the level of wealth. It is important, therefore, that there is a greater understanding within the finance industry of attitudes to financial risk and how these preferences affect financial decision-making, given their substantial impact on current and future financial outcomes and well-being.

This particularly is relevant in Australia where the superannuation system (comprising compulsory employer and optional employee-funded retirement income) allows for considerable flexibility by individuals in their chosen risk profile through fund mobility and choice of investment strategy, and the degree of self-management. It is also important to understand the traditional heavy weighting that Australians have given to equity and residential property (both owner-occupied and investor) in household portfolios. Financial planners and other advisors need to be aware of such information in tailoring an investment strategy to meet best their clients' goals. Attitudes to risk-taking are also pertinent to policy makers seeking to meet the information needs of Australian consumers of financial products (and services) and to address any

limitations in financial literacy and financial capacity identified in particular subgroups of the population.

Unfortunately, an individual's attitude to financial risk-taking is inherently unobservable. Consequently, some studies infer risk-taking attitudes from the holding of risky assets, such as equities (Paas et al. 2007; Wang and Hanna 2007), from the risk profile of superannuation (retirement) accounts (Olivares et al. 2008; Watson and McNaughton 2007) or from business ownership, as entrepreneurial activity also typically involves making risky decisions (Polkovnichenko 2005; Yao et al. 2004). Yet, others utilise household survey panel data that include questions on self-reported individual attitudes to financial risk, including the US Survey of Consumer Finances, the German Socioeconomic Panel, and the Australian Household Income and Labour Dynamics in Australia (HILDA) Survey (Yao and Zhang 2005; West and Worthington 2014).

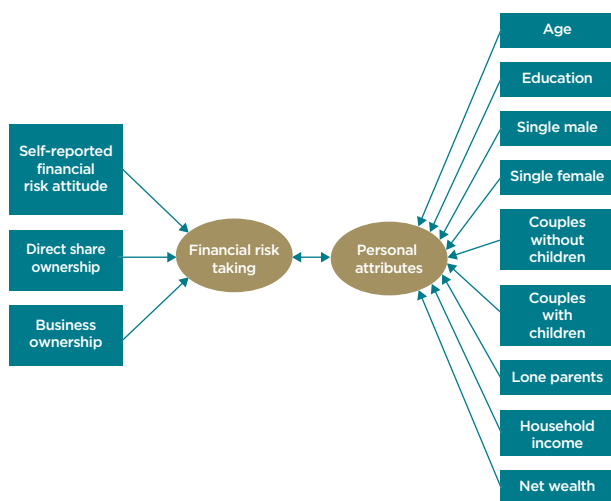
For the most part, personal attributes such as age, income, education, and wealth feature prominently in the literature as determinants of individual financial risk-taking (or equivalently, the level of risk aversion or tolerance). Nearly all extant studies find that with high (low) wealth, individuals tolerate higher (lower) levels of risk. Many also find that financial risk taking tends to increase with age up until about 65 years and decreases thereafter, possibly because of income uncertainty surrounding retirement and increased health expenses later in life (Yao et al. 2004). Income and education are also generally positively associated with financial risk-taking, and there is evidence that women take fewer financial risks than men.

This study aims to contribute to the growing international body of work on financial risk-taking by employing canonical correlation analysis to identify

latent relationships between individual financial risk-taking, either observed or surveyed, and personal attributes. This is important because in relation to Australian studies of financial risk-taking, existing 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 were significantly positively associated with financial risk tolerance, with a negative relationship between risk tolerance and age and marital status.

Elsewhere, 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, thereby implying higher risk preferences, though this approach did not necessarily consider the liquidity constraints single women also faced. Watson and McNaughton (2007) also observed that women generally chose more conservative investment strategies than their male counterparts. However, unlike this body of work, we employ canonical correlation analysis which we believe, among other things, better allows for the complexity of human behaviour, avoids the restrictive assumptions associated with conventional regression analysis, and recognises the difficulties in identifying a single measure of financial risk-taking.

FIGURE 1: Model of financial risk-taking and personal attributes



Method and hypotheses

Most studies concerning the financial risk-taking attitudes of individuals have used regression analysis where some proxy for financial risk attitudes (self-reported scale response, share of risky assets held, business ownership, etc.) serves as the sole dependent variable. Instead, we use canonical correlation analysis to identify the latent linear relationships between individual financial risk-taking (as variously defined) and personal attributes. In essence, this identifies and measures the associations between two sets of variables. This is typically appropriate in the same situations as multiple regression analysis, but with multivariate relationships on both sides of the equation.

In our case, we wish to identify the relationships between a set of variables used to measure financial risk-taking attitudes and a set of variables identifying personal attributes, as depicted in Figure 1. Canonical correlation analysis then determines a set of canonical variates, orthogonal linear combinations of the variables within each set that best explain the variability both within and between sets. Clearly, as shown in Figure 1, while there is a likely causal relationship between financial risk-taking and personal attributes (for example, an individual's risk-taking attitudes will determine employment and investment decisions, and this will potentially influence income and wealth), the main direction of causality is from personal attributes to financial risk-taking. To recognise this, we refer to the measures of financial risk-taking as the dependent variables (variates) and the set of personal attributes as the independent variables (variates).

The first set of variables we specify comprises measures typically used to assess financial risk-taking attitudes in the literature. First, we use an attitudinal question on financial risk-taking obtained by survey; second, an indicator of direct equity investment; and finally, business ownership. Both investment in shares and businesses indicate an aptitude for financial risk-taking, and the inclusion of both variables is important because the literature often finds that business owners are also often necessarily shareholders (Heaton and Lucas 1997, 2000). We believe these three measures yield quite a broad and detailed perspective on individual preferences for financial risk-taking.

Based on the literature, we then identify a set of personal attributes that we hypothesise contribute to financial risk-taking attitudes including gender, age, education, income and net wealth, and household structure. First, as discussed earlier, most studies find that financial risk-taking tends to increase with age initially and declines thereafter, most likely due

to income uncertainty surrounding retirement and lifespan (Halek and Eisenhauer 2001; Olivares et al. 2008; Yao and Curl 2011). Second, we include education given the strong positive association with higher levels of financial literacy (and therefore calculated risk-taking) (Lusardi and Mitchell 2007). Third, we include a set of variables identifying single and coupled males and females, with and without children, and lone parents. Based on the literature where females are consistently highly financial risk avoiding, we expect single females and lone parents (many of whom are females) to load negatively on the canonical variates for the set of independent variables. In related work, Riley and Chow (1992) found that widowed and separated women were less like to take financial risks than married women, while Yilmazer and Lyons (2010) found that married women with more control over financial resources or married to older men were less likely to invest in risky assets. Couples are more likely to be less financial risk-taking than individuals, as are couples with children given their demands on household resources (Euwals et al. 2004).

Finally, we include household income and wealth. The consensus on household wealth is that wealthier individuals are generally prepared to tolerate higher levels of risk (Yao et al. 2004). Income, like education, is typically associated with higher levels of financial literacy (and therefore calculated risk-taking); and improved learning makes individuals feel competent to make long-term financial decisions, also enabled by employment and earnings (Lusardi and Mitchell 2007).

Data

We draw all of our data from the 2010 HILDA Survey, the most recent wave of this longitudinal survey available, which includes a 'Wealth Module' encompassing a self-reported financial risk-taking measure. To avoid overfitting the data, a common problem in extremely large datasets given the 11,698 respondents in our selected survey wave, we construct a bootstrapped sample of 100 randomly sampled respondents from 1,000 repeated draws. Table 1 includes the response frequencies for each variable for this bootstrapped sample per 100 respondents.

TABLE 1: Response frequencies per 100 surveyed

Dependent variables freq	Freq
Self-reported financial risk-taking	
[1] Never has any spare cash	18
[2] Not willing to take financial risks	37
[3] Takes average financial risks expecting average returns	37
[4] Takes above-average financial risks expecting above-average returns	7
[5] Takes substantial financial risks expecting substantial returns	1
Direct share ownership	
[0] No	62
[1] Yes	38
Business ownership	
[0] No	87
[1] Yes	13
Independent variables	
Age group	
[1] Under 25 years	16
[2] 25-34 years	13
[3] 35-44 years	19
[4] 45-54 years	13
[5] 55-64 years	20
[6] Over 65 years	19
Education	
[1] Year 11 and below	27
[2] Year 12	18
[3] Vocational education	31
[4] Bachelor degree or higher	24
Single male	
No	93
Yes	7
Single female	
No	89
Yes	11
Couple without children	
No	68
Yes	32
Couple with children	
No	68
Yes	32

Independent variables <i>cont.</i>	Freq
Lone parent	
No	97
Yes	3
Household income	
Less than \$0	1
\$1-\$19,999	8
\$20,000-\$49,999	21
\$50,000-\$99,999	43
Above \$100,000	27
Household net wealth	
Less than \$0	2
\$1-\$499,999	46
\$500,000-\$999,999	22
\$1,000,000-\$1,499,999	12
Above \$1,500,000	18

All of the variables correspond to the discussion of the hypotheses in the preceding section. They also match the response to the original HILDA questions with the following exceptions. First, the first dependent variable used to measure financial risk-taking is a response to an attitudinal question on financial risk-taking that appears in the HILDA self-completion questionnaire, administered to every member of the household aged 15 years or over. We re-ordered this variable so that [5] 'I never have any spare cash' becomes [1] and so on, to indicate financial risk-taking is increasing as the responses increase from [1] through to [5]. The second and third dependent variables used to measure financial risk-taking include a dummy variable to signify positive values for direct equity ownership and business ownership, and these objective measures thus correspond with the subjective response variable (higher value signifies increasing financial risk-taking).

For the independent variables, where there was a categorical response (such as age, education, household income and household net wealth) we combined some options for ease of analysis — i.e. ages 15–17, 18–19, 20–21 and 22–24 years were combined into an under-25-years category. We also renumbered educational attainment so that the level of education increases as the numbered response rises. We specified dummy variables for the sex/household structure factor variables: namely, single males, single females, couples without and with children, and lone parents. We retained the categories for household income and wealth specified in the original survey data.

Empirical results

Table 2 provides the correlation coefficients, canonical R2 and multivariate tests of significance for the three canonical functions (as there are three dependent variables). The first canonical correlation coefficient provides the highest correlation (0.722) and indicates that there is a large degree of association between the two sets of variates (dependent and independent), followed by the second correlation coefficient (0.326) and the third (0.270), as each correlation is maximised with different loadings. The test statistics (Wilks' lambda, Pillai's trace, Lawley-Hotelling's trace and Roy's largest root) indicate that the canonical functions together are statistically significant at the 0.01 level. The canonical R2 for the first canonical function is 0.521, which is the most important, represents the amount of shared variance between the dependent and independent canonical variates.

TABLE 2: Model fit and significance

Model fit			
Canonical function	Canonical correlation coefficient	Canonical R2	
1	0.722	0.521	
2	0.326	0.106	
3	0.270	0.073	
Tests of significance			
Statistic	Value	Approximate F-statistic	Probability
Wilks' lambda	0.397	3.549	0.000
Pillai's trace	0.700	3.044	0.000
Lawley-Hotelling's trace	1.284	4.121	0.000
Roy's largest root	1.086	10.861	0.000

The Stewart-Love redundancy index overcomes the limitations of the canonical R2 by considering the canonical loadings, and its interpretation is similar to the R2 calculation used in multiple regression. We summarise the redundancy index calculations in Table 3. For brevity we only discuss the first canonical function, (as corresponding to the self-reported financial risk-taking measure) since only the first canonical function as a canonical correlation is greater than 0.5 (the conventional used for significance). As shown, the redundancy index for the dependent variate of 0.345 for the first function indicates that the independent variates (personal attributes) explain 34.5 per cent of the variance in the dependent variates (financial risk-taking). The redundancy index for independent variates, however, is lower (0.174) for the first function, resulting from the relatively low shared variance in the independent variates (0.335). This means that the dependent variates (financial risk-taking) explain only 17.4 per cent of the variance in the independent variates (personal attributes). This supports our argument that the predominant direction of causality is from personal attributes to financial

TABLE 3: Redundancy analysis

Canonical function	Own canonical variate (shared variance)		Canonical R ²	Other canonical variate (redundancy)	
	Percentage	Cumulative percentage		Percentage	Cumulative percentage
Standardised variance of the dependent variables explained by:					
1	0.663	0.663	0.521	0.345	0.345
Standardised variance of the independent variables explained by:					
1	0.335	0.335	0.521	0.174	0.174

risk-taking. However, there is also a significant number of personal attributes explained by financial risk-taking attitudes, and while not problematic for our analysis, this suggests that the strong causal relationship relied upon in multiple regression analysis may not be as clear as hoped.

Table 4 contains the canonical loadings and cross-loadings for the dependent and independent variates for the first canonical function. The canonical loadings show that the three dependent variables load strongly on the canonical variate, with the largest being direct share ownership (1.089), followed by self-reported financial risk-taking (0.637) and business ownership (0.629), suggesting that all three measures are representative of financial risk-taking, though direct share ownership is the best. The loading of independent variables on the canonical variates is somewhat consistent with expectations. First, it is consistent with the literature that two of the variables with the highest loading are being a single male (1.205) and net wealth (0.648), but it was a surprise to find that couples with children (0.791) also loaded strongly, as did lone parents (-0.548).

TABLE 4: Canonical loadings and cross-loadings

Variates and variables	Canonical loadings	Cross-loadings	Cross-loadings squared
Dependent variables			
Self-reported Financial Risk-taking	0.637	0.863	0.744
Direct Share Ownership	1.089	0.774	0.598
Business Ownership	0.629	0.463	0.214
Independent variables			
Age	0.043	0.142	0.020
Education	0.073	0.378	0.143
Single Male	1.205	0.263	0.069
Single Female	0.166	-0.141	0.020
Couples without Children	0.401	0.039	0.002
Couples with Children	0.791	0.261	0.068
Lone Parents	-0.548	-0.334	0.111
Household Income	0.150	0.421	0.177
Net Wealth	0.648	0.902	0.813

The cross-loadings are determined by correlating each of the dependent variables directly with the independent canonical variate, and vice versa. The three dependent variables exhibit a high correlation with the independent canonical variate (all are greater than 0.5). By squaring these terms, we find the percentage of the variance for each of the variables explained by the independent canonical variate. The results show that independent variate explains 74.4 per cent of the variance in self-reported financial risk-taking, 59.8 per cent of direct share ownership, and 21.4 per cent of business ownership. We take this as meaning that the personal attributes commonly examined best explain the variation in self-reported risk-taking, but to a lesser extent the observed behaviour we associate with increased risk-taking, here direct share and business ownership.

Looking at the cross-loadings of the independent variables, we see that net wealth has a very high correlation of 0.902 with the dependent canonical variate, followed by household income (0.421) and education (0.378). From the squared cross-loadings, we can see that the dependent variate explains approximately 17.7 per cent and 81.3 per cent of the variance in income and net wealth, respectively. That is, increased financial risk-taking is strongly positively associated with the level of income and especially wealth. The level of education also appears to be closely associated with the level of financial risk-taking, with the later explaining about 14.3% of the variation in the later. Interestingly, the independent variables that explain little variation in financial risk-taking are age and single females (2.0 per cent), couples without children (0.2 per cent), couples with children (6.8%) and lone parents (11.1 per cent).

Concluding remarks

While there are some limitations to this study, mainly the absence of directly comparable results in the financial risk-taking literature, this study has some interesting findings.

First, the first canonical function showed a high correlation (0.722) between the set of dependent variables representing financial risk-taking and the set of independent variables representing personal attributes. One implication is that personal attributes do a good job of explaining financial risk-taking,

primarily self-reported financial risk-taking stance. Put differently, personal attributes have more to do with individual subjective responses on financial risk-taking and less to do with actual behaviour. And, by implication, factors other than those specified here must strongly influence apparent financially risky behaviour such as direct share and business ownership.

This suggests that, in practice, because the types of questions currently used to ascertain financial risk-taking do not do a very good job of explaining actual risk-taking behaviour, we should be giving greater attention to the development of more meaningful questions to include in surveys, and in questions used by financial planners and other advisors to evaluate a client's risk-taking profile. In addition to this, it may be easier and just as accurate to observe merely what clients do and have done in the past as a means of evaluating their financial risk-taking, i.e. 'do they hold direct shares?', 'are they a business owner, etc.?'

Second, the cross-loadings showed that the important correlations between personal attributes and financial risk-taking as a whole were wealth, followed at some distance by income and then education. This clearly shows that financial risk-taking exerts a powerful positive influence on wellbeing. Age, family structure and gender appeared to play little role once these variables were considered.

The implication here is that there has been some misdirection in the existing focus in the literature, especially concerning the role of gender. Our research suggests women are only slightly less risk-averse than men, with differences in wealth and income explaining most of the variation found. Finally, the results indicated that wealth explained more than 80 per cent of variation in financial risk-taking, with the next two most important personal attributes, income, and education, each accounting for less than 20 per cent of any variation.

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