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Investor Risk Tolerance and General Economic Mood

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Abstract

This paper examines whether there is a relationship between investor risk tolerance and general economic mood in the Australian context. Utilising suitable measures for the two constructs and controlling for the effects of demographic variables on investor risk tolerance, OLS regression analysis of a large dataset of investor risk tolerance scores over a time period indicates the absence of a relationship with general economic mood. T-tests comparing risk tolerance scores during optimistic and pessimistic months and during months preceded by positive and negative sharemarket returns validate the above conclusion. Implications on investment and personal financial planning advice as well as future areas for research are discussed.

JEL Classifications: D14; D81; D91; G11

Keywords: risk tolerance, economic mood, personal investor, risk assessment, financial planning

Introduction

The present paper aims to answer the following research question: is the risk tolerance of Australian investors affected by the general economic mood?

Any investor is considered exposed to risk given that there is uncertainty about the financial outcome of the investment. In this light, investor risk tolerance can be taken as "the extent to which an individual chooses to risk experiencing a less favourable financial outcome in the pursuit of a more favourable financial outcome" (Davey, 2002) or the level of uncertainty that an investor is comfortable with in regard to investments. Given its intangible nature, an investor's attitude towards taking on risk can only be measured indirectly and relatively by assessing actual investing behaviour, by assessing responses to hypothetical investment scenarios or through subjective questionnaires, with the last one being used most commonly (Hallahan, Faff & McKenzie, 2004). Grable and Lytton (1999) confirm that psychometric questionnaires that measure subjective attitudes is the most widely used method of assessing a person's financial risk tolerance. They suggest a 13-item risk tolerance assessment instrument. Likewise, the present paper utilises risk tolerance assessments of investors derived from their responses to a set of psychometrically constructed questions, over a nine-year study period.

The present paper also utilises assessments of general economic mood derived from a population sample's responses to a set of questions, covering the same time period. The research question is answered by determining if a relationship exists between the values obtained for the two variables over the period of study.

The present paper, aside from contributing to the existing body of knowledge on behavioural finance, has significant implications in the area of personal financial planning. An assessment of a client's risk tolerance, typically through a questionnaire, is the major basis for a financial planner's recommendation on portfolio asset allocation (Taylor, 2007). An understanding of the possible effects of general economic mood would guide the financial planner in administering risk tolerance assessment questionnaires and in interpreting the results. There are also

implications for investment advice provided by financial planners. A positive relationship between risk tolerance and general economic mood might result in herding behaviour by clients buying risky securities (e.g. shares) during uptrends and selling them during downtrends. Investors exhibiting such behaviour are not likely to achieve optimal returns on their investments and need to be educated through proper advice.

Review of Literature

An observation that led to this research is the phenomenon of herding behaviour among investors mentioned earlier. Herding investors join others in taking advantage of a positive market run or in cutting losses during a negative market run. This behaviour has been generally attributed to the tendency of individuals to project current trends into the future (Plous, 1993) and this is generally referred to as projection bias (Grable, Lytton & O'Neill, 2004). It is accepted that investors will buy into a bull market with the common belief that the uptrend will continue and that they will therefore profit from the investment.

Changing risk tolerance could also offer an explanation for herding, noting that general willingness to invest in a risky asset such as shares is an indication of increased risk tolerance. For instance, institutional investors have been observed to be most risk tolerant during market highs and least tolerant during market lows (Shefrin, 2002).

There are prior investigations into the relationship between investor risk tolerance and investment market performance, both current and expected. Grable, Lytton and O'Neill (2004) report a significant positive relationship between risk tolerance and market performance as measured by three different US stock market indices. However, it needs to be pointed out that the study period was only four months, from September to December 2002. The method used of regressing risk tolerance values against market index values is also open to question, given that the latter variable has a long term general upward trend which could not be similarly expected of risk tolerance values. Rui, Hanna and Lindamood (2004) report that financial risk tolerance in the US tends to increase during periods of stock return increases and tends to decrease during periods of stock return decreases. However, one shortcoming of the study is that its measure of risk tolerance is based on a single question in the Survey of Consumer Finances conducted regularly by the US government. Several studies find a similar positive relationship between investor risk tolerance and optimistic economic expectations (Grable, 2000; Schooley & Worden, 1999).

The present paper aims to contribute to the body of literature by using a measure that is broader than sharemarket returns, a general economic mood scale that captures the general population's perception of recent and future economic outlook. This scale directly measures general sentiment, while sharemarket return is just one of the factors that affect market sentiment. The present paper also utilises a large dataset of validated risk tolerance assessments over a period of time that is more extensive than in previous studies.

In analysing the risk tolerance assessments, demographic variables relating to the investor need to be taken into consideration and controlled for. Prior research in

various country contexts find significant relationships between risk tolerance and demographic variables such as gender, age, educational attainment, net assets, income, marital status and number of dependants. Males are reported to be more risk tolerant than females (Bajtelsmit, Bernasek & Jianakoplos, 1999; Bernasek & Shwiff, 2001; Grable et al., 2004; Grable, 2000; Hawley & Fujii, 1993; Jianakoplos & Bernasek, 1998; Morse, 1998; Palsson, 1996; Powell & Ansic, 1997; Rui et al., 2004; Sundén & Surette, 1998). Younger investors have higher risk tolerances (Grable et al., 2004; Palsson, 1996; Riley Jr. & Chow, 1992; Rui et al., 2004; Xiao, Alhabeeb, Hong & Haynes, 2001). People with higher education are more risk tolerant (Grable et al., 2004; Grable, 2000; Hawley & Fujii, 1993; Rui et al., 2004; Shaw, 1996; Xiao et al., 2001). Wealthy and high earning individuals have higher risk tolerances (Grable et al., 2004; Grable, 2000; Hawley & Fujii, 1993; Riley Jr. & Chow, 1992; Rui et al., 2004; Schooley & Worden, 1996; Shaw, 1996). Married individuals are less risk tolerant (Grable et al., 2004; Hawley & Fujii, 1993; Rui et al., 2004) and so are those with more dependants (Chaulk, Johnson & Bulcroft, 2003).

Hallahan, Faff and McKenzie (2004) also find that, consistent with prior research, males, younger and educated people, wealthy and high earning individuals, singles and those with fewer dependants are more risk tolerant. The finding of the last study is doubly significant as it utilises the same Australian dataset, albeit over a different time period, as the present paper. This body of literature serves as justification for using all the demographic variables above as control variables in the regression analysis, which will be discussed in the next section.

Data and Method of Analysis

The present paper utilises as measure of investor risk tolerance the risk tolerance scores (RTS) of clients compiled over the years by FinaMetrica. The latter is an Australian based risk profiling company that have kindly provided the dataset analysed in this study. General economic mood is measured through the Westpac Melbourne Institute monthly consumer sentiment index (CSI) over the same period. Multiple regression analysis is carried out on the two variables, after controlling RTS for investor demographic variables.

The FinaMetrica RTS[i] is on a 0-100 scale based on client responses to 25 attitudinal questions relating to investments. A higher score indicates a higher risk tolerance. The proprietary questionnaire is commercially available to clients on the company website or through financial planners who subscribe to it. It was developed by FinaMetrica (known as ProQuest then) with the assistance of the University of New South Wales School of Psychology, who have conducted usability, reliability and norming trials that found it to be a valid and reliable instrument for assessing investor risk tolerance (UNSW, 1999). In addition to the 25 attitude questions, the survey also collects data on the respondents' gender, age, educational attainment, net assets, income, marital status and number of dependants.

The Westpac Melbourne Institute CSI[ii] is based on the views (whether optimistic or pessimistic) of 1,200 telephone respondents across Australia stratified by gender, age and location on the following:

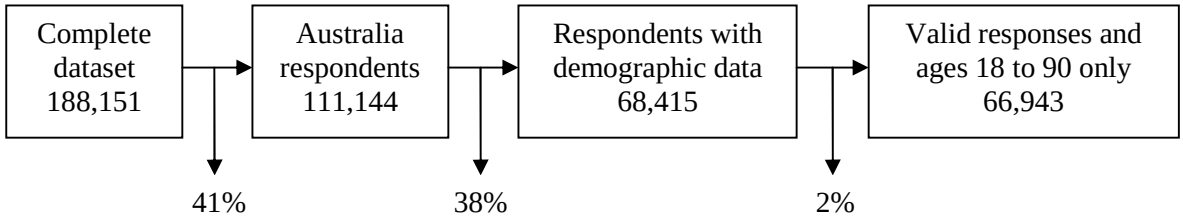
- current family finances compared to those a year ago
- expectations of family finances for the next 12 months

- expectations of economic conditions for the next 12 months
- expectations of economic conditions for the next 5 years
- ability to purchase major household items

The CSI for a particular month is calculated as 100 plus the average of differences between percent optimistic and percent pessimistic for each item. Therefore, the CSI for a generally optimistic month will be greater than 100. For the period of this study, the Westpac Melbourne Institute CSI is found to be highly correlated with a similar measure, the Roy Morgan Consumer Confidence Rating, with a 0.937 Pearson correlation significant at 0.01 level. The Westpac Melbourne Institute CSI has also been found to significantly track the primary economic variable, quarterly GDP growth (Low, 2006). A US study used a similar measure, the University of Michigan CSI, for economic mood (Anoruo, Bajtelsmit, Ramchander & Simpson, 2003). There have been several studies showing that such measures of consumer sentiment are useful predictors of other economic variables. For instance, Otoo (1999) shows that the University of Michigan CSI moves together with stock returns.

The RTS dataset utilised in this study consists of responses to the FinaMetrica risk tolerance questionnaire by 188,151 clients for the period 14 May 1998 to 22 May 2007 narrowed down to 66,943 cases as follows:

Figure 1: FinaMetrica dataset utilised in the study



The RTSs are assigned to a particular month based on the date when the questionnaire was completed. Corresponding monthly data for CSI is obtained for the same time period (i.e. from May 1998 to May 2007). As the CSI is a direct measure of the general economic mood construct and is obtained during the second week of each month, the CSI value could be related to all RTSs obtained for a particular month. RTS and CSI therefore are taken as concurrent variables without a need to lag the former.

One potential shortcoming in the research methodology is the fact that the present paper utilises data gathered from two different surveys. The CSI respondents are randomly selected but the RTS respondents may be self-selecting in that systematic factors might favour inclusion of certain demographic segments. However, the fact that the RTSs are controlled for demographic variables and the CSI respondents belong to a representative sample arguably makes both surveys representative of the same underlying population and therefore mitigates this shortcoming.

Before proceeding to the regression analysis, a final validation of the RTS instrument is carried out. It should be pointed out that the last question in the FinaMetrica instrument asks respondents to estimate what they perceive their RTS to be. For the dataset utilised in this study, perceived RTS is found to be highly correlated with actual RTS, with a 0.772 Pearson correlation significant at 0.01 level, indicating that RTS generally accords with the individual's self assessment.

As mentioned earlier, another study (Hallahan et al., 2004) that utilised the same dataset but over a different time period (i.e. May 1999 to February 2002) finds that all demographic variables affect risk tolerance. This is supported by relevant literature. For the dataset utilised in this study, the demographic distribution of the respondents are summarised in the following table.

Table 1: Demographic distribution of respondents in the FinaMetrica dataset

	Number of observations	% of sample
Gender		
Male	41843	62.5
Female	25100	37.5
Total responses	66943	
Age (scalar variable, not categorical)		
18 to 29 years	4159	6.2
30 to 39 years	12565	18.8
40 to 49 years	15411	23.0
50 to 59 years	19285	28.8
60 to 69 years	12673	18.9
70 to 79 years	2504	3.7
80 to 90 years	346	0.5
Total responses	66943	
Educational attainment		
Did not complete high school	6544	9.8
Completed high school	12697	19.0
Completed trade or diploma	18424	27.5
Completed university or higher	29278	43.7
Total responses	66943	
Net assets		
Under $10,000	740	1.1
$10,000 to $24,999	1054	1.6
$25,000 to $49,999	1635	2.4
$50,000 to $99,999	2959	4.4
$100,000 to $149,999	3120	4.7
$150,000 to $249,999	6093	9.1
$250,000 to $499,999	16821	25.1
$500,000 to $999,999	17993	26.9
$1,000,000 to $2,499,999	11659	17.4
$2,500,000 and above	4869	7.3
Total responses	66943	
Income		
Under $30,000	13146	19.6
$30,000 to $49,999	15655	23.4
$50,000 to $99,999	22308	33.3
$100,000 to $199,999	10862	16.2
$200,000 and above	4972	7.4
Total responses	66943	
Marital status		
Married	62311	93.1
Not married	4632	6.9
Total responses	66943	
Number of dependants (scalar variable, not categorical)		
0 to 1	40575	60.6
2 to 3	20236	30.2
4 to 5	5693	8.5
6 to 7	365	0.6
8 to 9	74	0.1
Total responses	66943	

To control for demographic variables, the present paper initially carries out multiple regression analysis of the RTS values against all the demographic variables. The residual values of RTS are obtained and finally regressed against CSI to ascertain whether investor risk tolerance is affected by general economic mood. Regression analysis is utilised instead of other techniques because of the continuous nature of the dependent variable RTS (Hair, Black, Babin, Anderson & Tatham, 2006). All regression analysis is carried out after ascertaining that the dependent variable is normally distributed (Hair et al., 2006).

The conclusion from the regression analysis is validated by conducting a t-test on the means of residual RTS from optimistic and from pessimistic months. In this case, an optimistic month is when the CSI is above 100 and a pessimistic month is when the CSI is below 100. The t-test is carried out after ascertaining that the residual RTS is normally distributed (Hair et al., 2006).

As a further validation, another t-test is conducted on the means of residual RTS from months preceded by a month when the sharemarket return is positive and preceded by a month when the sharemarket return is negative. The sharemarket return is calculated from the change in the ASX All Ordinaries Accumulation Index during a particular month.

Results of Analysis

The model utilised in the OLS regression of RTS against the set of demographic variables is as follows:

$$\begin{aligned} RTS_i = {} & \beta_0 + \beta_1 Gender_i + \beta_2 Age_i + \beta_3 Age_i^2 + \beta_4 Educ_{1,i} + \beta_5 Educ_{2,i} + \beta_6 Educ_{3,i} \\ & + \beta_7 Assets_{1,i} + \beta_8 Assets_{2,i} + \ldots + \beta_{15} Assets_{9,i} \\ & + \beta_{16} Inc_{1,i} + \beta_{17} Inc_{2,i} + \beta_{18} Inc_{3,i} + \beta_{19} Inc_{4,i} \\ & + \beta_{20} Status_i + \beta_{21} Dependant_i + \varepsilon_i \end{aligned} \qquad \textbf{(Equation 1)}$$

where:

RTS is the risk tolerance score between 0 and 100 for respondent *i* from the FinaMetrica dataset;

Gender is a dummy variable that takes the value of 1 if the respondent is male, female being the reference category;

Age is the age of the respondent in years;

$Educ_{1\text{-}3}$ are dummy variables that respectively take the value of 1 if the respondent did not complete high school, completed high school, completed trade or diploma with the reference category being completed university or higher;

$Assets_{1\text{-}9}$ are dummy variables that respectively take the value of 1 if the respondent's net assets in $000 fall within 0-10, 10-25, 25-50, 50-100, 100-150, 150-250, 250-500, 500-1,000, 1,000-2,500 with the reference category being above 2,500;

Inc$_{1\text{-}4}$ are dummy variables that respectively take the value of 1 if the respondent's income in $000 fall within 0-30, 30-50, 50-100, 100-200 with the reference category being above 200;

Status is a dummy variable that takes the value of 1 if the respondent is married, with the reference category being not married; and

Dependant is the number of dependants of the respondent.

The above model utilises a quadratic representation for the variable *Age,* following on from previous studies (Grable et al., 2004; Hallahan et al., 2004). In the case of the monetary variables above, it is acknowledged that inflation over the years will cause shifts in the categories. As the responses were gathered categorically, there is no way to adjust the dataset to account for these shifts. However, given an average inflation rate of just around 3% during the study period, this limitation is not expected to affect the analysis materially. The results of the OLS regression analysis are summarised in the following table, with the adjusted R^2 for the model being 0.228.

Table 2: Results of regression of RTS against demographic variables

Dependent variable: RTS		Adjusted R^2 = 0.228		
Variable	Category of dummy variable	Coefficient	T statistic	P value
Intercept	-	72.439	106.884	0.000
Gender	Male	5.205	53.200	0.000
	Female	0*	-	-
Age	-	-0.211	-8.141	0.000
Age^2	-	-0.001	-4.094	0.000
$Educ_1$	Did not complete high school	-3.515	-21.896	0.000
$Educ_2$	Completed high school	-2.227	-17.994	0.000
$Educ_3$	Completed trade or diploma	-0.799	-7.352	0.000
	Completed university or higher	0*	-	-
$Assets_1$	Under $10,000	-5.783	-12.308	0.000
$Assets_2$	$10,000 to $24,999	-4.308	-10.529	0.000
$Assets_3$	$25,000 to $49,999	-4.059	-11.686	0.000
$Assets_4$	$50,000 to $99,999	-3.028	-10.596	0.000
$Assets_5$	$100,000 to $149,999	-3.310	-12.047	0.000
$Assets_6$	$150,000 to $249,999	-3.459	-14.824	0.000
$Assets_7$	$250,000 to $499,999	-2.744	-13.828	0.000
$Assets_8$	$500,000 to $999,999	-1.412	-7.369	0.000
$Assets_9$	$1,000,000 to $2,499,999	-0.296	-1.523	0.128
	$2,500,000 and above	0*	-	-
Inc_1	Under $30,000	-5.367	-24.119	0.000
Inc_2	$30,000 to $49,999	-3.603	-17.312	0.000
Inc_3	$50,000 to $99,999	-1.803	-9.420	0.000
Inc_4	$100,000 to $199,999	0.502	2.550	0.011
	$200,000 and above	0*	-	-
Status	Married	-0.790	-4.481	0.000
	Not married	0*	-	-
Dependant	-	-0.110	-3.227	0.001

* set to zero because this is the reference category

All the coefficients, except for one, are significant at the 0.01 level, expectedly reflecting similar results as in Hallahan, Faff and McKenzie (2004). In fact, the quick comparison summarised in the following table shows that the regression model derived in this study is able to predict RTS values that are reasonably close to that from the earlier study.

Table 3: Comparison of two regression models

Most typical case		Least typical case	
Male		Female	
Age 56		Age 90	
Completed university degree or higher		Did not complete high school	
$500,000 to $999,999 net assets		Under $10,000 net assets	
$50,000 to $99,999 income		$200,000 and above income	
Married		Not married	
No dependants		9 dependants	
Predicted RTS		Predicted RTS	
Hallahan et al 2004:	RTS = 61.5	Hallahan et al 2004:	RTS = 33.4
This study:	RTS = 58.7	This study:	RTS = 35.1

The model utilised in the OLS regression of residual RTS against the measure of general economic mood which is CSI is as follows:

$$residual\ RTS_i = \beta_0 + \beta_1 CSI_i + \beta_2 CSI_i^2 + \varepsilon_i \qquad \textbf{(Equation 2)}$$

where:

residual RTS is the remaining risk tolerance score after controlling for demographic variables for respondent *i* from the FinaMetrica dataset; and

CSI is the corresponding consumer sentiment index for the month when the test was taken.

The results of the OLS regression analysis are summarised in the following table.

Table 4: Results of regression of residual RTS against CSI

Dependent variable: residual RTS	Adjusted R^2 = 0.000		
Variable	Coefficient	T statistic	P value
Intercept	20.788	3.384	0.001
CSI	-0.395	-3.483	0.000
CSI^2	0.002	3.570	0.000

Although the coefficients are significant, there appears to be no relationship between investor risk tolerance and general economic mood given the zero adjusted R^2 value. A model hypothesising a linear relationship between *residual RTS* and *CSI* was also tried but yielded the same adjusted R^2 value and the coefficient of the explanatory variable was not significant.

The conclusion from the regression analysis summarised in Table 4 is validated by conducting a t-test on the means of residual RTS from optimistic months and from pessimistic months. The results of the t-test summarised below indicate that the means of the two groups are not significantly different, indicating the absence of any relationship between RTS and CSI.

Table 5: Results of t-test of optimistic and pessimistic months

Descriptive statistics

	N	Mean	Standard deviation
Residual RTS during optimistic months	59013	-0.0027	10.9816
Residual RTS during pessimistic months	7930	0.0198	11.1039

Independent samples test (equal variances assumed)

P value for Levene's test	T-test statistic	P value
0.417 Greater than 0.05 therefore variances are equal	0.171	0.865 Greater than 0.05 therefore no significant difference

As a further validation, another t-test is conducted on the means of residual RTS from months preceded by a month when the sharemarket return is positive and preceded by a month when the sharemarket return is negative. The results of the t-test summarised below indicate that the means of the two groups are not significantly different, indicating the absence of any relationship between RTS and sharemarket performance.

Table 6: Results of t-test of positive and negative sharemarket return months

Descriptive statistics

	N	Mean	Standard deviation
Residual RTS after positive returns	47505	0.0237	10.9809
Residual RTS after negative returns	19438	-0.0579	11.0332

Independent samples test (equal variances assumed)

P value for Levene's test	T-test statistic	P value
0.684 Greater than 0.05 therefore variances are equal	-0.872	0.383 Greater than 0.05 therefore no significant difference

Summary and Conclusion

The aim of this paper is to investigate whether investor risk tolerance is affected by general economic mood. This issue is important because of its implications on investment and personal financial planning advice. According to the results obtained using the FinaMetrica dataset, the risk tolerance of Australian investors (as measured by RTS) does not appear to be affected by the general economic mood (as measured by CSI). After confirming the significance of demographic variables and therefore having to control for them, regression of residual RTS against CSI does not indicate any significant fit with an RTS-CSI model. This is confirmed by a t-test which indicates no significant difference between the means of residual RTS during optimistic and pessimistic months.

Going back to the phenomenon of herding behaviour by investors, this study shows that changing risk tolerance is not a likely reason for it. The established theory of projection bias, or the tendency of individuals to believe that a current positive or negative run will continue into the future, appears to be a suitable explanation. There are other theories that seek to explain investor herding, but aside from acknowledging projection bias, the present paper does not consider these within its scope to investigate.

The present paper seeks to focus on the implications in personal financial planning. Prior literature has established the importance of a scientific risk tolerance assessment instrument that is able to measure the inherent risk tolerance of an investor as what the FinaMetrica questionnaire has been certified to be measuring. Financial planning advice should also emphasise client education, particularly on the pitfalls of herding behaviour resulting from overweighting recent events, where the investor might end up buying when prices are high and selling when prices are low. The long term characteristics of the asset classes in an investor's portfolio constructed based on his/her risk tolerance should be emphasised, rather than just recent performance. The adage, past performance is not indicative of future performance, still applies.

A limitation of this study is the fact that the controlling variables are limited to those included in the FinaMetrica questionnaire. Other possible contributing variables could be included in future studies.

An area for further research is that using possible measures for general economic mood other than CSI, ideally a composite of several socio-economic indicators. As mentioned earlier, several studies used recent sharemarket performance (Grable et al., 2004; Rui et al., 2004). The present paper confirms the earlier regression results through a t-test on the means of residual RTS from months preceded by a month when the sharemarket return is positive and preceded by a month when the sharemarket return is negative. Carrying this further, future research could also examine the effect of actual recent performance of the client's investment portfolio on RTS.

Another further area for research is the use of actual investing behaviour (e.g. portfolio asset allocation) as a measure of risk tolerance. It is established practice in

personal financial planning that portfolio asset allocation, or specifically the split between growth and defensive assets, is reflective of the investor's risk tolerance (Taylor, 2007).

It would also be interesting to see the results in the context of other countries (e.g. USA, UK) using the same methodology as in this study. It is noted that the FinaMetrica dataset utilised in this study, having been mainly collected online, actually includes a substantial number of respondents from these two countries. It would only require a time series of a suitable measure for general economic mood for these countries.

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[i] More information about the FinaMetrica risk profiling system is available at www.myrisktolerance.com
[ii] More information about CSI is available at http://melbourneinstitute.com/research/macro/csi.html