

An Intimate Portrait of the Individual Investor

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We examine a range of investment decisions, and ensuing portfolio performance, and established that they have statistically significant associations with personality traits captured by Costa and McCrae's [1992] operationalization of Norman's [1963] 'Big Five' (Negative Emotion, Extraversion, Openness to Experience, Agreeableness and Conscientiousness), Bem's [1977] psychological gender traits (Masculinity and Femininity) and Jackson's [1976] personality traits of Preference for Innovation and Risk Taking Propensity.

Keywords: Personality, Gender role, Investment decisions

INTRODUCTION

Are investors' decisions driven by their personalities? Since the turn of the century, personality theorists have argued that personality is a motivator of human behavior.¹ Norman's [1963] 'Big Five' personality inventory (emotional stability, extraversion, culture, agreeableness and conscientiousness), the psychological gender constructs of masculinity and femininity [Constantinople [1973] and the personality traits of preference for innovation and risk taking propensity have emerged to capture elements of personality. Applying measurement tools developed by Costa and McCrae [1985], Bem [1977] and Jackson [1976], these personality attributes have been used to predict job performance, occupational status and academic achievement.

We analysed a sample of 21 investors from across Australia who completed a personality quiz (embodying the work of Costa and McCrae [1992], Bem [1994], Jackson [1976]) and disclosed their trading details for the financial year ending June 30, 2005. Our results provide the first evidence that personality is associated with both trading behavior and investment performance.

Individuals who were more extraverted, had a greater preference for innovation and were less masculine achieved superior portfolio performance. Individuals who had higher negative emotion, higher risk-taking propensity and more openness to experience opted for higher portfolio risk. Higher

negative emotion and higher risk taking propensity were also associated with increased trading behavior, with investors who were more extraverted having a lower propensity to trade. Personality was also related to the extent to which an individual sought information about the market through differing media. We did not find evidence that personality traits were associated with investors' opinions on investing.

Our study is very different from previous works that have examined 'individual' investors. Studies such as Barber and Odean [2000], Grinblatt and Keloharju [2000, 2001a, 2001b], Ersoy-Bozcuk and Lasfer [2001], and Toshino and Suto [2004] simply document how individuals trade. They use the investment behavior of the masses to make inferences about individuals. Furthermore, from these inferences about how individuals behave they generalize how such behavior is reflected in the market. Such arguments are somewhat circular. In contrast to these studies, our analysis presents a more complete understanding of why investors trade and what determines their portfolio performance. In searching for this answer we looked further and deeper into the individual, going where no finance study has gone before; to the very things that define an individual's psychology. In contrast to many behavioral finance studies, we also seek to understand a wide range of metrics relating to investor decision making and performance rather than focussing on a limited range of behaviors.

In looking at the psychological make-up of individuals, we built on prior primary data studies which sought to learn about investors. For example, De Bondt [1998] surveyed 45 individual investors and found evidence that they exhibited biases such as overconfidence. He also found that they did not recognize phenomena such as the risk-return tradeoff and

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the benefits of diversification, concepts that are fundamental assumptions to theories that have been central to modern finance.²

Our view is that investors should be categorised by their individual psychology, as personality theorists believe that the motivators of our behavior lie within the individual (e.g., McDougall [1932], Davidson and Griffin [2003]). In the second section of this paper, therefore, we review the constructs used to capture individuals' personalities. We discuss our data in the third section of this paper and report our analysis in the fourth section. The fifth section concludes the paper.

PORTRAYING THE INDIVIDUAL INVESTOR

To analyse the personalities of our set of investors, we needed some way of capturing and measuring information about them. First we introduce Costa and McCrae's [1992] operationalization of Norman's [1963] 'Big Five'; then discuss Bem's [1977] measures of psychological gender (masculinity and femininity); and finally review Jackson's [1976] personality traits of preference for innovation and risk-taking propensity. Our primary focus was whether personality determined investment decisions and performance and, therefore, we did not formally hypothesize the relationships we might find. Our later discussions of significant findings, however, suggest reasons for how these personality variables might relate to individual decisions and performance, but detailed considerations of these reasons have been left to future research.

Five-Factor Personality Inventory

To measure personality, we studied the psychology literature to find if common themes were present. The five-factor model is a product of several decades of psychological research focussing on trait personality and has been proven to capture a vast amount of the variability in personality (Goldberg [1993]). While the five factor model has its sceptics (Block [2001], McAdams [1992]), it now appears to hold pre-eminence in personality research, with widespread agreement about the five personality dimensions and their content (Barrick et al. [2003]). The dimensions are commonly attributed to the work of Norman [1963] and hence, are often labeled as Norman's 'Big Five,' but their conceptual roots were suggested much earlier by McDougall [1932] and given initial empirical support by Fiske [1949] and Tupes and Christal [1961]. Costa and McCrae [1992] describe these five dimensions as negative emotion, extraversion, openness to experience, agreeableness and conscientiousness.

Negative emotion is the direct opposite to emotional stability. People who rank highly on this scale tend to experience negative feelings such as embarrassment, guilt, low self-esteem, emotional instability and pessimism. People who score highly on the extraversion scale tend to be more sociable and prefer to work with other people. Increased openness

to experience tends to be characterized by people who are imaginative, cultured, open-minded and curious (often such people also tend to be less traditional and less conservative). Individuals high on the agreeableness scale tend to be sympathetic, value and respect the beliefs of others are readily helpful and fundamentally altruistic. Finally, highly conscientious people are characterized as being purposeful, strong-willed, responsible and trustworthy.

The five-factor model has attracted the attention of many psychologists, with Costa and McCrae's (1985) NEO inventory the most acclaimed tool for measuring the 'Big Five.' Taylor and MacDonald [1999] state that the NEO has demonstrated exceptional psychometric properties, while a shorter version of the NEO (the NEO-FFI, Costa and McCrae [1992]) has also been proven to reliably assess the five personality dimensions (Couneya and Hellsten [1998]). The 'Big Five' classification has also proven to be robust across different countries, to remain fairly stable throughout adulthood and to predict a range of outcomes, such as job performance, occupational status and academic achievement (see Roberts and Robins [2000]). Besides its popularity, the 'Big Five' appears to be free of any gender-role (Lippa [1991]), instrument or self-reporting bias (Costa and McCrae [1992]), and the results are readily understood (Sneed et al. [1998]).

Notably, the theoretical links between personality and investment behavior are not unfounded as there is a constantly growing literature relating personality and cognitive thinking. Zhang [2003], for example, found that the 'Big Five' measured using the NEO was predictive of learning approaches. Pompian and Longo [2004] showed personality was directly related to an investor's susceptibility to cognitive biases. Using the Myers-Briggs Type Indicator (MBTI, see Briggs [1988]) to measure the personality of a sample of 100 investors, Pompian and Longo [2004] found that susceptibility to overconfidence and optimism biases were distinguishable by personality type.³

Hunter and Kemp [2004] attempted to make the link between personality and investment decisions more specific, in that their paper investigated the personality differences between people who chose to invest in risky companies and investors who chose to invest in 'normal' companies. Defining risky companies to be new e-commerce companies, Hunter and Kemp [2004] found that e-commerce investors were significantly more open to experience,⁴ concluding this aspect of personality impacted upon risk preferences and, thus, investment decisions.⁵

In a recent (unpublished) study, Lo et al. [2005] attempted to test whether trading performance was associated with personality, using the 'Big Five' and a sample of day traders, but none of the correlations was statistically significant. Such results are inconsistent with the results of Fenton-O'Creevy et al. [2004], who found people working in the finance industry were more neurotic but more introverted and conservative than a control group of non-finance professionals; however, for the subset of finance professionals who were traders, those

enjoying greater success (as measured by total remuneration) tended to be emotionally stable introverts who were open to new experiences.

Psychological Gender

Our paper tests whether psychological gender better identifies differences between investors and, thus, explains why investors trade in different ways. This approach is a clear departure from Barber and Odean [2001], who split their sample into men and women on the assumption that men are more overconfident. They found that, as a consequence of excessive trading, male investors underperformed relative to female investors. Our contention that psychological gender may better explain trading, however, is supported by the results of Dorn and Huberman [2002], who found that sex failed to account for differences in actual portfolio choices for German investors. Dorn and Huberman [2002] noted the tendency to tilt one's portfolio towards local and domestic stocks, portfolio diversification and portfolio turnover was better correlated with self-reported risk tolerance than with biological sex. It may be, therefore, that biological differences between male and females are unlikely to be the cause of different trading behaviors.

Historically, psychological gender has mostly been measured on the basis of an individual's biological sex. Both management and society at large long considered masculinity and femininity to be opposite ends of a uni-dimensional continuum; thus a person had to be either masculine or feminine, but could not be both (Maupin [1989]). Masculinity was traditionally associated with the male role of provider, while females were viewed primarily as caregivers, hence the concept of femininity embodied these characteristics. This historical preconception was challenged in the 1960s by the spread of the feminist movement (Helson et al. [1995]), as well as by increasing female participation in the workforce and higher education. Similarly, men also started to become more active in traditionally female-dominated occupations, such as daily domestic tasks (Bianchi et al. [2000]). This movement in labor and domestic roles led researchers to challenge the equivalence of psychological gender and biological sex.

Arguments were made that masculinity and femininity were not opposite ends of a uni-dimensional scale but two independent dimensions (Constantinople [1973]). Masculinity was associated with a task focus or 'getting the job done,' whereas femininity was associated with a relationship focus, that is, a 'care and concern for others' (O'Neill and Blake-Beard [2002], p. 55).⁶ The development of the Bem Sex Role Inventory (BSRI, Bem [1977]) was based on this very notion that gender is a multi-dimensional construct, with Bem [1974] providing empirical evidence that psychological gender did not necessarily correlate with biological sex. Frequent use of the BSRI in gender research led us to incorporate it in this research.

Psychologically androgenous individuals were argued to be more effective given their task and relationship focus, which led to calls for managers in modern organizations to be more collaborative, more feminine, in their leadership style (Kanter [1989]). If psychological gender might be predictive of how effective an individual is as a manager, surely it's not too bold a step to suggest it could also influence the effectiveness of an individual investor.

Personality Traits

Even after considering Norman's [1963] 'Big Five' and psychological gender, we had a residual concern that further subtraits would be required to adequately address our research question. While Dorn and Huberman [2002] argued that self-reported risk tolerance is positively related to portfolio risk and performance, they used a 'back of the envelope' risk tolerance measure in their survey. Reference to the psychological literature suggested a more robust means to measure an individual's tolerance for risk. Referred to as risk taking propensity, this measurement is conceptualized as one's orientation toward taking chances in a decision-making situation (Sexton and Bowman [1985]).

The Jackson Personality Inventory (JPI, Jackson [1976]) was developed to provide, in one convenient form, a set of personality measures that reflected a variety of cognitive, interpersonal and value orientations important to an individual's functioning. One scale, risk taking, was designed to elicit the willingness of an individual to commit to a decision that could either lead to success or failure. While it measures aspects of ethical, physical and social risk, its main focus is financial risk (Stewart et al. [2003]) and, hence, seemed ideal for assessing investor attitude. The scale has been reported to display high reliability and validity and to exhibit high correlations with self and peer-ratings (Jackson [1976]).⁷

A second personality trait of interest was preference for innovation. The literature defines a person with a high preference for innovation as being one able to monitor and be open to adopting the innovations necessary to adapt to changes in their environment (Welsch and Young [1982]). Innovators communicate more and seek out all types of information to keep up with new opportunities. Given this behavioral definition, preference for innovation may also determine the behaviour of investors. For example, people who have a greater preference for innovation may invest more in risky stocks or trade more excessively. Similarly they may also have a greater exposure to equities or preference for smaller (often more innovative) stocks.

Preference for innovation was also measured using the Jackson Personality Inventory (Jackson [1976]). It has specific applicability to financial environments, having been used extensively in SME and entrepreneurial research (Roberts and Robins [2000]). Consistent with the risk taking scale above, preference for innovation has also been reported to display high reliability and validity and to exhibit high correlations with self- and peer-ratings (Jackson [1976]).⁸

DATA AND METHOD

The sample for this study comprises individual investors who held a portfolio of Australian equities (including managed funds and unit trusts) for the financial year ending June 30, 2005. This time period was chosen because the data collection period coincided with the time investors would have portfolio information on hand for filing tax returns.⁹ The sample includes participants from all regions of Australia. Investors who left the management of their portfolios to fund managers or agents were excluded from the sample.¹⁰ In total, 81 questionnaires were mailed with 21 returns (a response rate of 26%). Of these, three investors failed to disclose their individual share holdings as of July 1, 2004, leaving a final sample of 18 for some parts of the study.

A mail survey instrument was chosen as the method of collecting the self-reported data. Despite potential problems with non-response, mail questionnaires are commonly held as the most efficient means of collecting empirical data (Wu and Vosika [1983]).¹¹ Questionnaires based on Dillman's [1978] Total Design Methodology were mailed with a one-page covering letter and a preprinted postage-paid envelope, all of which were placed in an envelope of sufficient size to avoid folding the letter and questionnaire. The covering letter outlined the intent of the research, assured participants that the information they provided would be confidential, and provided contact details of project members. The letter also gave an estimation of the time needed to complete the questionnaire and was signed by the most senior researcher; both of these factors have been found to significantly increase response rates (Hornik [1981], Brown and Coverly [1999]).

After some instruction on item completion, the questionnaire sought answers to numerous questions on the individual's opinions on investing, psychographic information, socio-demographics, educational status, and trading behavior. The last items in the questionnaire were the ones considered (by the researchers) to be most onerous to answer and the earlier items the easiest and most interesting to answer.¹² In total, the questionnaire consisted of 140 items split into the following sections:

- a "Your Opinions on Investing" where we asked the same questions as De Bondt [1998];
- b "Your Attitudes" where we asked 104 questions about the personality of the subjects:
 - i. We used the short form of the NEO-PIR instrument, the NEO-FFI developed by Costa and McCrae [1992]. This is based on Norman's [1963] 'Big Five' personality constructs of negative emotion, extraversion, openness to experience, agreeableness and conscientiousness. There were 60 items in the questionnaire (12 for every construct) with each 'measured' using a five-point agreement scale;¹³
 - ii. We asked 30 question developed by Bem [1994] to determine psychological gender;

- iii. The remaining questions assessed subjects' preference for innovation and risk taking propensity using instruments developed by Jackson [1976];¹⁴
- c "Your Knowledge of the Market" which asked questions about the investors' propensity to seek information about the market;
- d "Your Details" in which we asked for details such as age, education, biological gender, wealth and income and reasons for investing; and
- e "Your Trading Information for the Year" in which we invited respondents to complete a matrix about their share investments. Each matrix asked for identification of the stock (either by name or ASX code); the number of shares owned as July 1, 2004; how many shares were bought and sold during the financial year; and the date of each transaction (the matrix also asked for dividend reinvestment information). This section commenced with instructions on how to fill out the matrix, using situational examples to demonstrate.

We used the data provided by the respondents to reconstruct their portfolio returns for the 12 months ending in June 2005 (the Australian financial year). From this information we could construct the portfolio metrics we analyze. We calculated the returns of their portfolios, the risk of their portfolios and Sharpe ratios (both monthly and daily) to examine the risk-adjusted performance of the investors' portfolios.

RESULTS

Investment performance is a function of the choices investors make but it is not only the shares investors choose that determine the returns they enjoy. The proportion of assets that they invest in shares (as opposed to leaving in the bank), the allocation of assets to "large" stocks, the frequency of their trading (and whether they are active or passive investors) and the extent that they track the market may all affect the returns investors experience. We now consider the effect of the psychological variables on the choices investors make. We find a link between the investment choices we study and psychological variables.

In this section, we analyze the data obtained from our survey. First we present information about the sample and then we report their opinions on investing using De Bondt [1998] as a point of comparison. Third we demonstrate that the personality metrics studied have statistically significant relationships to a range of investment choices, such as the propensity to trade. Finally, we prove that there are statistically significant relationships between the personality metrics we study and risk-adjusted returns and risk experienced by the investors in our sample.

TABLE 1
Demographic and Investor Sophistication: Descriptive Statistics.

Sample (n)		Mean	Median	St. Dev
Age (years)	(21)	34.38	32.00	11.23
Sex	(21)	Male 90% (19)	Female 10% (2)	
Marital status	(21)	Married/ Living with Partner 52% (11)	No longer married/No longer living with partner 5% (1)	Single/ never lived with a partner 43% (9)
Trading (years)	(20)	Mean 10.50	Median 8.50	St. Dev 7.98
Derivative trader	(21)	Yes 14% (3)	No 86% (18)	
General education	(21)	With undergraduate qualification or higher 86% (18)		
Finance/business	(21)	67% (14)		

Notes: This table reports the characteristics of the full sample of survey respondents. Detailed are the social demographics of age, biological gender and marital status. Included also are statistics documenting the trading experience, derivative experience and educational achievements of the respondents. The numbers of individuals are indicated in parentheses.

Sample Demographics and Summary Statistics

Table 1 reports the demographics for all 21 survey respondents. The average respondent's age was 34 (with a median

of 32) and a standard deviation of 11.23. The sample was mainly male; only 2 women returned completed questionnaires. Marital status of the sample was roughly equal for those who were married/currently living with a partner and those who were single/never lived with a partner. The table shows that the sample had on average 10.5 years investing experience with a median of 8 years. Of the sample, 85% had an undergraduate university degree or higher; more than 66% of the sample had a similar level of finance/business education.

Table 2 illustrates the psychographic characteristics of our sample. Comparing the personality inventory scores with population estimates provided by Costa and McCrae [1992] we find that our sample was significantly less agreeable than the overall population at a p-value of 0.000.¹⁵ Testing the distribution of the scores we found that none of the 'Big Five' inventories of our sample had a statistically different distribution to their population equivalents, as the Kolmogorov-Smirnov one-sample test was insignificant at the 5% level (we do not report the detailed statistics).¹⁶ For Agreeableness alone, however, our sample and the population had significantly different variances (with the sample in this study being larger).¹⁷

Comparing the characteristics of psychological gender and personality traits with a sample of Australian SME owners provided by Watson and Newby [2005],¹⁸ we found our sample was significantly less masculine and feminine.¹⁹ The distribution of the scores, however, was not statistically different (per the Kolmogorov-Smirnov test), with both samples having statistically indistinguishable variances. For the personality traits, the samples were found to have similar means and distribution of values, although there was a statistically significantly larger variance in risk taking propensity for the data collected for this paper.²⁰

TABLE 2
Summary Statistics – Investor Personality.

Variable		Sample (n)	Mean	Median	Highest observation	Lowest observation	St. Dev
Personality inventory	Negative emotion	(21)	27.38	26	41	15	5.95
	Extroversion	(21)	41.14	42	53	30	6.07
	Openness to experience	(21)	38.67	39	51	27	5.13
	Agreeableness	(21)	39.86	41	51	24	7.40
	Conscientiousness	(21)	46.90	46	57	41	3.96
Personality traits	Preference for innovation	(21)	29.57	28	47	17	7.48
	Risk-taking propensity	(21)	28.67	29	41	11	7.88
Psychological gender	Masculinity	(21)	45.95	46	62	36	6.47
	Femininity	(21)	48.48	48	62	34	7.88

Notes: This table displays summary statistics for the personality attributes. Included are Norman's 'Big Five' personality traits measured using the short form of Costa and McCrae's NEO-PIR scale (Costa and McCrae [1992]). The scale incorporates 12 items for each trait and each item is measured using a five point Likert-type scale ranging from 1 (strongly disagree) to five (strongly agree). This means that an individual can rank from 12 (suggesting that you carry little of that personality trait) to a maximum of 60. Personality traits of preference for innovation and risk taking propensity are measured using a scale developed by Jackson [1976]. It includes 7 items measured with a seven point Likert-Type scale; therefore an individual can rank from a low of 7 to a high of 49 for each trait. Psychological gender is measured using a reduced form of the Bem's Sex Role Inventory (Bem [1994]). Both masculinity and femininity are measured using 10 items, each being measured using a seven point Likert-scale. Therefore an individual can rank from 10 to 70 on each gender trait.

TABLE 3
Summary Statistics—Portfolios.

Variable		Sample (n)	Mean	Median	Highest observation	Lowest observation	St. dev
Panel A							
Transactions	Number of trades per annum	(18)	3	3	16	0	3.85
	Number of shares traded	(18)	88,305	1,391	1,532,000	0	360,334
	Trades per annum in \$s	(18)	\$66,409	\$7,242	\$983,450	\$0	\$229,780
	Proportion of portfolio traded	(18)	93%	22%	750%	0%	2.07
Purchases and sales	Number of purchases per annum	(18)	2	0	7	0	2.18
	Number of shares purchased	(18)	56,174	0	997,000	0	234,802
	Purchases per annum in \$s	(18)	\$36,792	\$0	\$543,550	\$0	\$127,435
	Number of sales per annum	(18)	1	1	9	0	2.31
	Number of shares sold	(18)	32,131	50	535,000	0	125,599
	Sales per annum in \$s	(18)	\$29,617	\$50	\$439,900	\$0	\$102,816
Panel B							
Characteristics	Number of stocks held as at 30 June 2005	(18)	3.83	4	8	1	2.23
	Value of the portfolio as at 30 June 2005 in \$s	(20)	\$81,810	\$45,000	\$330,000	\$1,000	\$95,917
	Value relative to non-cash assets as at the 30 June 2005	(18)	26%	18%	96%	0%	24%
Panel C							
Risk	Standard deviation of returns	(18)	0.0124	0.0125	0.3459	0.0042	0.0074
	Beta estimate	(18)	0.96	0.91	1.57	0.35	0.29
Panel D							
Performance	Total annual return	(18)	20.96%	17.96%	83.73%	−5.87%	22.45%
	Abnormal return	(18)	−0.32%	3.67%	62.92%	−33.96%	23.34%
	Daily Sharpe ratio	(18)	13.34	14.67	36.71	−7.06	13.86
	Monthly Sharpe ratio	(18)	3.26	2.73	10.05	−1.63	3.63
Panel E							
Benchmarks	ASX All Ordinaries Accumulation Index	Annual return 23.30%					
	Three month Australian Government Treasury Bill rate	5.01%					

Notes: Panel A reports the descriptive statistics for the individuals' trading for the financial year. The proportion of portfolio traded is the dollar value of trades divided by the total estimated value of the portfolio as at 30th June 2005. Panel B reports the individuals' portfolio characteristics. Value of the portfolio is the dollar value estimate as at 30 June 2005. Weighted value is the dollar value divided by net non-cash assets as at 30 June 2005. Panel C reports risk estimates for the portfolios. Beta captures the way an individual's portfolio returns covary with the Australian equity risk premium and standard deviation of returns measures the standard deviation of daily portfolio returns. Panel D reports individuals' annual portfolio performance for the financial year, which includes total returns and three measures of risk adjusted return. Panel E, reports the return on the All Ordinaries (as a market benchmark), and the 3 month Australian Government Treasury Bill rate for the year.

Panel A of Table 3 reports the trading decisions of the 18 respondents who provided us with a description of their trading behavior. The average investor in our sample traded a total of 3 times a year, traded a total of 88,305 shares which were worth around \$66,409. However, shares traded and value traded had highly positively skewed distributions (i.e., a skewness statistic greater than 4) with medians of 1,391 and \$7,242, respectively. On average, the sample traded 97% of the value of their portfolio (estimated as of June 30, 2005). Again, however, the distribution was highly positively skewed with a median of 22.5%.

The break up of trading information into buys and sells (see Panel A of Table 3) revealed a number of interesting features. Analysis of the averages showed that for every sell trade, there were around two buys. The average investor

purchased 56,174 shares compared to 32,131 shares sold (these represented dollar values of \$36,792 for purchases and \$29,617 for sells) but, as with other data in this table, the distribution was highly skewed.²¹ Panel B of Table 3 reports portfolio characteristics. The investors had an average (median) of 3.83 (4) stocks in their portfolio, worth approximately \$81,810 (\$45,000) that represented 25% (18%) of their net non-cash assets.

Panel C of Table 3 reports two risk estimates for the portfolios. The sample has an average portfolio beta of 0.96 and a standard deviation of daily returns of 0.0124 (the medians were similar in magnitude).

Panel D of the table reports portfolio performance statistics. The average portfolio achieved a total annual return of 20.96%, which is slightly less than the annual market return

TABLE 4
Investors' Beliefs about Investing.

Question	Sample (n)	Agree	Disagree	% Agree
1. I would rather have in my stock portfolio just a few companies that I know well than many companies that I know little about.	21	14	7	67% (89%)
2. If you do not do your homework I doubt that you will achieve investment success.	21	14	7	67% (70%)
3. Investing in stocks is like buying lottery tickets. Luck is everything and investment skill plays no meaningful role.	21	2	19	10% (0%)
4. Because most investors do not like risk, risky stocks sell at lower market prices.	21	9	12	43% (7%)
5. The risk of a stock depends on whether its price typically moves with or against the market.	21	9	12	43% (18%)

Notes: This table documents the respondents' opinions of investing. Given a particular statement, taken from DeBondt [1998] the investors were asked whether they agree or disagree with the opinion. Tabulated is the number who agreed and disagreed as well as the proportion that agreed. Reported in parentheses are the DeBondt [1998] proportions for comparison.

for the same period of 22.30% (reported in Panel E). The abnormal return for the portfolios suggested the portfolios had a median abnormal return of 3.67%;²² the average, however, revealed negative abnormal returns of -0.32%. The sample had an average daily Sharpe ratio of 13.34 and monthly Sharpe ratio of 3.26.²³

Opinions on Investing

Table 4 reports results for the sample from questions also included in De Bondt [1998]. We report the number of those who agreed, the number of those who disagreed and, consequently, the proportion of "agrees" for each particular opinion.

It appears from Opinion 1 that a large majority in our sample thought that a solid understanding of just a small number of firms was a more effective risk management tool than diversification. A similar majority considered analysis of the market and stocks not to be a precondition to investment success. However, the sample distinctly rejected the idea that investing is like 'throwing darts,' that is, that the market is an unbiased fair game. For Opinion 4, the majority rejected the risk-return tradeoff, with a similar proportion for Opinion 5 rejecting the idea that the risk of a stock depends upon the co-variability of returns with the market index.

Comparing the results of De Bondt (1998), we found that our sample had significantly more individuals agreeing with the risk/return tradeoff and that beta was a priced factor (as

TABLE 5
Sources of Information.

Information source	Sample (n)	% Often/Very often
T.V	(21)	76.2% (16)
Investment forums	(21)	9.5% (2)
Advice	(21)	14.3% (3)
Publications	(21)	16.3% (4)

Notes: This table identifies the percentage of survey respondents who use these sources of market information often or very often. Number of individuals are reported in parentheses.

revealed by Opinion 4 and 5, respectively).²⁴ The sample seemed to agree more with the Efficient Market Hypothesis, believing that the investment skill played little role in investing success (as revealed by Opinion 3). Our sample also includes more individuals who believed in the benefits of diversification as indicated by their responses to Opinions 1 and 2.^{25,26}

Table 5 details the main sources of market information used by the investors in the sample. While the questions allowed for five categories depicting frequency of use,²⁷ the table reports the number of individuals who indicated use of the information source often or very often. The majority of the investors in our sample watched the financial news on the television, consistent with the findings of De Bondt [1998].²⁸ Only 16% of the sample read publications on a regular basis, with a similar proportion reliant on investment advice often or very often. Investment forums proved the least popular source of information as only 9.5% of the respondents stated that they visited forums on a regular basis.

We model the use of sources of information by investor personality variables in Table 6. The findings present a mixed picture of the determinants of information usage. While Model 1 reveals that the propensity to use television as a source of information had a statistically significant positive relationship to preference for innovation and a statistically significant negative relationship to risk-taking propensity, no psychological trait was found to significantly relate to the use of investment forums (Model 2).²⁹ Reliance on investment advice was found to have significant positive relationships with negative emotion and openness to experience (Model 3), with this result consistent with arguments that both more neurotic and more open-minded investors are drawn to investment advisers. The positive and statistically significant coefficient for femininity in Model 4 indicates that relationship-focus is associated with increased propensity to obtain information from publications. This can perhaps be explained by the use of the print media as a substitute for direct personal contact.

Effect of Personality on Investment Choices

In Tables 7 to 12, we regress the portfolio metrics identified earlier against the psychometric variables obtained from our

TABLE 6
The Extent to which an Individual Seeks Information about the Market.

Dependent variables Independent variables	Model							
	Television		Investment forums		Investment advice		Financial publications	
	(1)	<i>p-value</i>	(2)	<i>p-value</i>	(3)	<i>p-value</i>	(4)	<i>p-value</i>
Negative emotion	0.113	0.350	0.191	0.144	0.444	0.011	−0.002	0.704
Extraversion	0.272	0.081	0.229	0.154	−0.121	0.437	−0.005	0.325
Openness to experience	−0.364	0.119	−0.123	0.504	0.508	0.029	−0.013	0.141
Agreeableness	0.302	0.091	−0.143	0.472	0.152	0.332	0.000	0.966
Conscientiousness	−0.043	0.821	0.299	0.144	−0.131	0.493	0.016	0.035
Masculinity	0.031	0.901	−0.481	0.099	−0.244	0.331	0.003	0.671
Femininity	−0.126	0.328	0.304	0.085	0.203	0.196	0.011	0.015
Preference for innovation	0.515	0.036	0.072	0.704	−0.204	0.340	0.000	0.970
Risk-taking propensity	−0.357	0.044	0.269	0.061	0.239	0.148	0.003	0.627

Notes: This table reports the regression results of the extent to which an individual tracks the market via differing media outlet and personality variables. These personality variables include Norman's 'Big Five' personality attributes of Negative Emotion, Extraversion, Openness to Experience, Agreeableness and Conscientiousness, as well as the variables Masculinity and Femininity to capture psychological gender. The personality traits of Preference for Innovation and Risk Taking propensity have also been included. The dependent variables are the extent to which an individual uses differing media outlets. The regressions are modeled using 21 observations. Model (1) reports the full variable model results where the media outlet is the television financial news. Model (2) reports the full variable model results where the media outlet is investment forums. Model (3) reports the full variable model results where the media outlet is investment advice. For Models (1) to (3) the dependent variable is categorical taking on a value of 1 if the investor never uses that source; 2 if they rarely use it; 3 if they sometimes use it; 4 if they often use it and 5 if they very often use it. The models are run using plim ordinal regression methodology. Model (4) reports the full variable regression results where the media outlet is financial publications. For Model (4), the dependent variable is equal to the proportion of publications read often or very often, the models are run via Tobit methodology, with p-values calculated using quasi-maximum likelihood standard errors that are robust to heteroskedasticity. All models included a constant term that has been omitted to save space. Significance at the 5% level is italicized and in bold.

TABLE 7
The Relationship between the Level of Stock Exposure and Personality Variables.

Dependent variable Independent variables	Model			
	Size of the portfolio weighted by net non-cash assets			
	(1)	<i>p-value</i>	(2)	<i>p-value</i>
Constant	0.2520	0.739	1.2645	0.003
Negative emotion	0.0103	0.086		
Extraversion	0.0310	0.000	0.0333	0.000
Openness to experience	0.0056	0.643		
Agreeableness	−0.0151	0.007	−0.2513	0.001
Conscientiousness	0.0079	0.311		
Masculinity	−0.0259	0.002	−0.0175	0.014
Femininity	−0.0047	0.489		
Preference for innovation	0.0133	0.224		
Risk-taking propensity	−0.0176	0.025	−0.0197	0.038
<i>Summary stats</i>				
R^2	0.6840		0.5462	
R^2 -adjusted	0.3996		0.4252	

Notes: This table shows Tobit regressions of the level of individual exposure to stocks on various personality variables. The dependent variable is measured as the dollar size of the portfolio, weighted by net non-cash net assets as at 30 June 2005. The regressions are modeled using 20 observations. The independent variables include Norman's 'Big Five' personality attributes of Negative Emotion, Extraversion, Openness to Experience, Agreeableness and Conscientiousness, as well as the variables Masculinity and Femininity to capture psychological gender. The personality traits of Preference for Innovation and Risk Taking Propensity have also been included. Model (1) show the results with all variables included. Model (2) reports what we consider to be the best model using a stepwise methodology, of deleting the least significant variable each time, from Model (1). All regressions include a constant term. P-values are calculated using quasi-maximum likelihood standard errors and are robust to heteroskedasticity. Significance at the 5% level is italicized and in bold.

TABLE 8
The Relationship between Trading Frequency and Personality Variables.

Dependent variables	Model							
	Number of times an investor trades				Proportion of shares traded during the year			
	(1)	<i>p</i> -value	(2)	<i>p</i> -value	(3)	<i>p</i> -value	(4)	<i>p</i> -value
Constant	-43.3476	0.195	.338068	0.937	-3.7646	0.860	-2.1718	0.395
Negative emotion	0.7465	0.000	0.4623	0.003	0.1767	0.225	0.1607	0.026
Extraversion	-0.7424	0.002	-0.4747	0.000	-0.0832	0.696	-0.1444	0.028
Openness to experience	0.2074	0.380			-0.0409	0.844		
Agreeableness	0.2283	0.261			-0.0656	0.724		
Conscientiousness	0.3486	0.362			0.1167	0.533		
Masculinity	0.6756	0.054			-0.1427	0.713		
Femininity	-0.1023	0.680			0.0469	0.754		
Preference for innovation	-0.5880	0.055			-0.0442	0.838		
Risk-taking propensity	0.4895	0.034	0.3129	0.007	0.2416	0.115	0.1432	0.064
Summary stats								
R^2	0.7091		0.6136		0.1543		0.1708	
R^2 -adjusted	0.2935		0.4947		-1.0539		-0.0843	

Notes: This table shows Tobit regressions of the frequency that the investor trades, on various personality variables. The regressions are modeled using 18 observations. The independent variables include Norman's 'Big Five' personality attribute, Negative Emotion, Extraversion, Openness to Experience, Agreeableness and Conscientiousness, as well as the variables Masculinity and Femininity to capture psychological gender. The personality traits of Preference for Innovation and Risk Taking Propensity have also been included. Model (1) shows the regression results for the full variable model where the dependent variable is the number of trades during the year, calculated as the number of times an investor trades. Model (2) reports what we consider to be the best model using a stepwise methodology, of deleting the least significant variable each time from Model (1). Model (3) shows the regression results for the full variable model where the dependent variable is the proportion of shares traded during the year, calculated as the dollar value of trades weighted by the estimated portfolio value as at the 30th June 2005. Model (4) reports what we consider the best model using a stepwise methodology, of deleting the least significant variable each time from Model (3). All regressions include a constant term. P-values are calculated using quasi-maximum likelihood standard errors and are robust to heteroskedasticity. Significance at the 5% level is italicised and in bold.

TABLE 9
The Relationship between Choice of Large Stocks and Personality Variables.

Dependent variables	Model							
	Stocks from the top decile				Stocks from the top two deciles			
	(1)	<i>p</i> -value	(2)	<i>p</i> -value	(3)	<i>p</i> -value	(4)	<i>p</i> -value
Constant	1.6946	0.041	1.0145	0.003	1.3278	0.071	2.0928	0.000
Negative emotion	-0.0124	0.016	-0.0256	0.013	-0.0269	0.009	-0.0305	0.000
Extraversion	-0.0180	0.030	-0.0450	0.000	-0.0415	0.025	-0.0354	0.002
Openness to experience	-0.0118	0.716			0.0074	0.615		
Agreeableness	-0.0131	0.474			0.0035	0.795		
Conscientiousness	-0.0096	0.920			-0.0081	0.418	-0.0112	0.049
Masculinity	0.0316	0.108	0.0625	0.000	0.0678	0.025	0.0549	0.001
Femininity	0.0126	0.190	0.0086	0.049	0.0009	0.923		
Preference for innovation	0.0047	0.758			-0.0118	0.361		
Risk-taking propensity	-0.0336	0.012	-0.0330	0.004	-0.0306	0.004	-0.0329	0.002
Summary stats								
R^2	0.6269		0.6208		0.6513		0.6381	
R^2 -adjusted	0.0963		0.4140		0.1531		0.4407	

Notes: This table shows Tobit regressions of the exposure to large capitalization stocks in the investor's portfolio and personality variables. The regressions are modeled using 18 observations. The independent variables include Norman's 'Big Five' personality attribute - Negative Emotion, Extraversion, Openness to Experience, Agreeableness and Conscientiousness - as well as the variables Masculinity and Femininity to capture psychological gender. The personality traits of Preference for Innovation and Risk Taking Propensity have also been included. Model (1) shows the regression results against all variables, where the dependent variable is measured by the proportions of stocks an individual holds that are from the top capitalization decile of ASX listed stocks as at 1 July 2004. Model (2) reports the best model obtained using a stepwise methodology, of deleting the least significant variable each time from Model (1). Model (3) shows the regression results against all variables, where the dependent variable is measured by the proportions of stocks an individual holds that are from the top two capitalization deciles of ASX listed stocks as at 1 July 2004. Model (4) reports the best model obtained using a stepwise methodology, of deleting the least significant variable each time from Model (3). All regressions include a constant term. P-values are calculated using quasi-maximum likelihood standard errors and are robust to heteroskedasticity. Significance at the 5% level is italicized and in bold.

TABLE 10
The Relationship between Total Return and
Personality Variables.

Dependent variable	Model			
	Portfolio return			
Independent variables	(1)	<i>p-value</i>	(2)	<i>p-value</i>
Constant	1.6405	0.213	1.3711	0.014
Negative emotion	0.0032	0.742		
Extraversion	0.0315	0.034	0.0272	0.029
Openness to experience	-0.0007	0.955		
Agreeableness	-0.0091	0.418		
Conscientiousness	-0.0182	0.345	-0.0198	0.065
Masculinity	-0.0610	0.021	-0.0508	0.006
Femininity	0.0038	0.745		
Preference for innovation	0.0322	0.062	0.0321	0.015
Risk-taking propensity	0.0009	0.935		
<i>Summary stats</i>				
R^2	0.6492		0.6101	
R^2 -adjusted	0.2546		0.4902	
F-Stat	1.6453	0.247	5.0859	0.011

Notes: This table shows OLS regression results of an individual's total portfolio return against the various personality variables. The dependent variable is the total annual return of an individual's portfolio for the financial year ended 30 June 2005. The regressions are modeled using 18 observations. The independent variables include Norman's 'Big Five' personality attributes of Negative Emotion, Extraversion, Openness to Experience, Agreeableness and Conscientiousness, as well as the variables Masculinity and Femininity to capture psychological gender. The personality traits of Preference for Innovation and Risk Taking Propensity have also been included. Model (1) shows the regression results for total returns against all variables. Model (2) reports what we consider to be the best model obtained using a stepwise methodology of deleting the least significant variable each time from Model (1). All regressions include a constant term. Reported are the coefficients with White's heteroskedasticity adjusted *p*-values adjacent (White [1980]). Significance at the 5% level is italicized and in bold.

survey. For each dependent variable, we report two analyses. The first analysis will include all psychological measures as independents. The second analysis will report the optimal parsimonious solution using a backward stepwise deletion procedure.³⁰ Statistical significance is reported using heteroskedasticity consistent estimates (White [1980]) and, if the dependent variable has a lower bound of zero, Tobit analysis is used.³¹ Unless we note otherwise, the following discussion relates to the second analysis, that is, the most parsimonious model.

In Table 7 (Model 2) we found risk-taking propensity had a negative and statistically significant relationship to the level of investor exposure to stocks, with such a result perhaps unsurprising if stocks are, generally, considered a "riskier" asset class. However, we also found masculinity had a negative and statistically significant relationship to exposure to equities. If the interpretation of stocks as being "riskier" is correct, these findings for masculinity provide

evidence against Barber and Odean's [2001] interpretation of biological gender (where males are seen as relatively less averse to risk).

Examination of Model 2 in Table 7 also reveals stock exposure had a positive and statistically significant relationship to extraversion; perhaps exposure to equities gives more to socialize about. However, we also found a negative and statistically significant relationship to agreeableness; unfortunately, our review of this personality measure gave us no indication of why we should find such a relationship. We hope, therefore, that future research may assist us in the interpretation of these findings.

Table 8 examines the number of trades (Models 1 and 2) and proportion of shares traded (Models 3 and 4), respectively. Both Model 2 and 4 reveal statistically significant roles for extraversion but, unlike the case for the exposure to shares (examined in Table 7), the relationship was negative (i.e., extraverts traded less). This result is at odds with the literature which seems to imply that trading should have a positive relationship to sociability.³² In addition, neither Models 2 and 4 in Table 8 reveals a role for masculinity in explaining trading behaviour; this provided further evidence that Barber and Odean's [2001] analysis of the effect of biological gender is not robust to considerations of psychological gender.

Tables 8 also reveals that negative emotion and risk-taking propensity had positive and statistically significant relationships to trading activity. It is probably unsurprising that investors with a greater propensity for risk trade more often, for such a result is consistent with Dorn and Huberman [2002]. That investors who are more anxious should trade more is, however, more difficult to interpret. We suspect that the positive association of negative emotion to trading may be associated with an increased propensity to respond to stimuli in a way that results in trading, for if these stimuli increase the nervousness of neurotic investors, trading might be perceived as a means to reduce these unpleasant feelings.

In Table 9 we model the concentration of investors' portfolios in the top 10% (Models 1 and 2) and 20% of stocks (Models 3 and 4), respectively (as measured by market capitalization at the beginning of our study period). Gaunt, Gray and McIvor [2000], Durack, Durand and Maller [2004] and Durand, Juricev and Smith [2007] found that the size-premium in Australia was large, with Durand, Juricev and Smith [2007] arguing that the small firm premium is driven by behavioral factors (emotional arousal and mis-reaction).³³ We found that investors increased their holdings in larger stocks as their risk-taking propensity fell.³⁴ such a result is consistent with the belief that small stocks are perceived to be riskier.

Our analyses in Tables 9 also reveal that the coefficients for negative emotion were negative and statistically significant in all models. Conceivably, the lower returns and lower risk-adjusted returns (Durand, Juricev and Smith [2006]) for large firms could drive neurotic investors to (smaller) firms that have better returns. Alternatively, possibly additionally,

TABLE 11
The Relationship between Sharpe Ratios and Personality Variables.

Dependent variables Independent variables	Model							
	Monthly Sharpe ratios				Daily Sharpe ratios			
	(1)	<i>p-value</i>	(2)	<i>p-value</i>	(3)	<i>p-value</i>	(4)	<i>p-value</i>
Constant	38.0858	0.170	22.2969	0.047	188.602	0.068	92.873	0.016
Negative emotion	-0.2465	0.069			-0.9859	0.030		
Extraversion	0.4519	0.060	0.3230	0.010	2.0375	0.016	1.1717	0.025
Openness to experience	-0.0844	0.691			-0.6580	0.361		
Agreeableness	-0.1951	0.462			-1.2509	0.184		
Conscientiousness	-0.4311	0.139	-0.3999	0.032	-1.6330	0.111	-1.5493	0.012
Masculinity	-0.6662	0.154	-0.4998	0.051	-3.2642	0.055	-1.9358	0.035
Femininity	0.1121	0.565			0.5420	0.449		
Preference for innovation	0.6103	0.057	0.5420	0.014	2.6964	0.018	2.2157	0.004
Risk-taking propensity	-0.3111	0.106	-0.2472	0.039	-1.3652	0.048	-1.1701	0.023
<i>Summary stats</i>								
R ²	0.6102		0.5180		0.6759		0.5746	
R ² -adjusted	0.1716		0.3172		0.3112		0.3973	
F-stat	1.3912	0.326	2.5791	0.083	1.8534	0.199	3.2412	0.044

Notes: This table shows OLS regressions of an individual's portfolio Sharpe ratio on various personality variables. The dependent variable is the Sharpe ratio of an individual's portfolio for the financial year ended 30 June 2005. The regressions are modeled using 18 observations. The independent variables include Norman's 'Big Five' personality attributes of Negative Emotion, Extraversion, Openness to Experience, Agreeableness and Conscientiousness, as well as the variables Masculinity and Femininity to capture psychological gender. The personality traits of Preference for innovation and Risk Taking Propensity have also been included. Model (1) shows the regression results for all personality variables, where the dependent variable is the monthly Sharpe ratio. Model (2) reports what we consider to be the best model obtained using a stepwise methodology of deleting the least significant variable each time. Model (3) reports the full variable results where the dependent variable is the daily Sharpe ratio, Model (4) reporting what we consider to be the best model obtained using a stepwise methodology of deleting the least significant variable each time. All regressions include a constant term. Reported are the coefficients with White's heteroscedasticity adjusted p-values adjacent (White [1980]). Significance at the 5% level is italicized and in bold.

the positive association between negative emotion and the propensity to seek investment advice (found in Model 4 of Table 6) might also generate this result.³⁵ The significant negative relationship between large stocks and extraversion is, however, much more difficult to interpret, especially given the previously noted significant positive relationship to stock exposure (Table 8). We again trust that future research may assist us in determining the persistency and interpretation of these findings.

While both masculinity and femininity had positive and statistically significant associations with proportion of stocks in the top decile (Model 2 of Table 9), only masculinity had a positive and statistically significant association with stocks in the top two deciles (Model 4 of Table 9). Assuming that small stocks are indeed riskier this is, once again, at odds with the interpretation of biological gender proffered by Barber and Odean [2001]. In terms of femininity, choice of stocks in the top decile (stocks others appear to choose) is certainly compatible with a relationship-focus.

Effect of Personality on Investment Performance and Risk

Having assessed the determinants of our respondents investment choices earlier, we now turn to analysis of the performance of their portfolios.

Table 10 reports the analysis where the dependent variable was the return earned by each investor's portfolio in the 12 months to June 30, 2005. Focusing on Model 2, we found that extraversion was positive and statistically significant, suggesting that the more sociable the individual, the higher their portfolio return. If trading is thought to reduce returns, this finding is consistent with the negative relationship of trading with extraversion (Table 8) and it is also consistent with increased extroversion resulting in greater exposure to the size-premium.

The positive and statistically significant coefficient for preference for innovation indicated that, as we suggested earlier, higher preference for innovation was associated with better performance as investors with this trait have better monitoring skills and the openness to modify their decisions in response to new information. The negative coefficient for masculinity indicated that the more psychologically masculine an investor was his/her returns were lower. It may be the case that as investors become more task-focused, they are less able to process the diverse range of data required to achieve investment success. This finding is in keeping with Barber and Odean's [2001] finding for biological gender but, as we have found in the analyses reported earlier and will find in the subsequent analyses we report in this subsection, such consistencies mask deeper differences.

TABLE 12
The Relationship between Standard Deviation of
Returns and Personality Variables.

Dependent variable Independent variables	Model			
	Standard deviation of daily returns			
	(1)	<i>p-value</i>	(2)	<i>p-value</i>
Constant	-0.0094	0.631	.012542	0.130
Negative emotion	0.0009	0.000	0.0009	0.000
Extraversion	0.0000	0.790		
Openness to experience	0.0004	0.075	0.0003	0.032
Agreeableness	0.0004	0.077	0.0003	0.025
Conscientiousness	-0.0002	0.531		
Masculinity	-0.0010	0.002	-0.0011	0.000
Femininity	-0.0002	0.391		
Preference for innovation	0.0000	0.793		
Risk-taking propensity	0.0009	0.000	0.0010	0.000
<i>Summary stats</i>				
R^2	0.8372		0.8292	
R^2 -adjusted	0.6046		0.7360	

Notes: This table shows Tobit regressions of the standard deviation of an individual's portfolio daily returns on various personality variables. The dependent variable is the standard deviation of daily returns for the financial year ended 30 June 2005. The regressions are modeled using 18 observations. The independent variables include Norman's 'Big Five' personality attributes of Negative Emotion, Extraversion, Openness to Experience, Agreeableness and Conscientiousness, as well as the variables Masculinity and Femininity to capture psychological gender. The personality traits of Preference for Innovation and Risk-taking Propensity have also been included. Model (1) shows the regression results for all variables included. Model (2) reports what we consider to be the best model obtained using a stepwise methodology, of deleting the least significant variable each time from Model (1). All regressions include a constant term P-values are calculated using quasi-maximum likelihood standard errors and are robust to heteroskedasticity. Significance at the 5% level is italicized and in bold.

The returns discussed in Table 10 do not consider if higher returns are simply compensation for bearing higher risk. In Table 11 we adjust returns for risk; the dependent variables are the monthly Sharpe (Models 1 and 2) and daily Sharpe ratios (Models 3 and 4) of the investors' portfolios. Concentrating on Model 2 (the parsimonious regression where monthly Sharpe ratios are the dependent variable), we found that, as was the case in our analysis of returns (in Table 10), extraversion and preference for innovation were positive and statistically significant,³⁶ but that masculinity became marginally insignificant.³⁷ We also found that the coefficient for risk-taking propensity was negative and statistically significant, that is, increased risk-taking propensity was associated with lower risk-adjusted returns. Conscientiousness was also negative and statistically significant but, once again, our understanding of the 'Big Five' (Norman [1963]) did not provide any suggestions about why this might be the case.

Reference to the daily Sharpe ratio regressions in Table 11 shows that the coefficient of masculinity again became negative and statistically significant in Model 4; therefore,

higher masculinity was associated with lower risk-adjusted returns as well as lower returns (Table 10). Such a result is consistent with Barber and Odean [2001], who argue that biological gender is associated with increased propensity to take risks, but unlike their result, we found no association between risk-adjusted returns and femininity. However, while our finding here for masculinity is superficially consistent with Barber and Odean [2001], we could not support their reasoning over increased trading or exposure to risk, nor how biological gender shapes an individual's exposure to risk (per Table 12 below).

Results of our analysis on the standard deviations of individuals' portfolios are shown in Table 12. Focusing again on Model 2, we find that higher risk taking propensity was, as might be expected, associated with a higher portfolio standard deviation. Masculinity was again associated with exposure to risk, with the model revealing that the higher an individual's scores on masculinity the lower the risk of an individual's portfolio (femininity was not found to have any association with risk). This finding again contradicts Barber and Odean's [2001] inferences on the role of biology and investment performance.

Inspection of Model 2 in Table 12 also shows that negative emotion, openness to experience and agreeableness were found to have positive and statistically significant relationships with portfolios' standard deviations. While the finding for openness to experience appears consistent with 'a priori' expectations, it appears that people who rank highly on negative emotion are, contra-intuitively, drawn to portfolios that may, through their volatility, heighten bad experiences from investing. This likely accounts for the increased trading associated with negative emotion, as more neurotic investors will be stimulated to trade to reduce negative emotions induced by their increased risk (this actual increased exposure to risk appears to be explained by a propensity to choose smaller, and riskier, equities, see Table 9). With higher agreeableness found to be associated with an investor having less of his or her wealth in securities (which may suggest that investors are risk averse, see Table 7); it is perplexing to us why such investors have portfolios with greater risk. Our examination of the 'Big Five' leaves us with no indication of why such a relationship might exist; hence, once again, we leave this to future research to consider.

CONCLUSION

Our aim in undertaking the research reported in this paper was to determine whether personality is associated with individuals' investment decisions and the resulting performance of their portfolios. Our research has established that there is indeed a relationship of personality with investment decisions and performance. We are the first to establish such a relationship.

TABLE 13
The Significant Associations between the Personality Variables and Investment Choices.

	Portfolio exposure	Number of trades	Proportion of portfolio traded	Proportion of shares in largest 10% of ASX stocks	Proportion of shares in largest 20% of ASX stocks
Negative emotion	n/s	+	+	—	—
Extraversion	+	—	—	—	—
Openness to experience	n/s	n/s	n/s	n/s	n/s
Agreeableness	—	n/s	n/s	n/s	n/s
Conscientiousness	n/s	n/s	n/s	n/s	—
Masculinity	—	n/s	n/s	+	+
Femininity	n/s	n/s	n/s	+	n/s
Preference for innovation	n/s	n/s	n/s	n/s	n/s
Risk-taking propensity	—	+	+	—	—

Notes: This table reports the associations between the personality variables and the investment choices metrics. (+) denotes a positive and significant association, (—) denotes a negative and significant association. (n/s) denotes insignificance.

Using a sample of 21 investors from across Australia, we derived their psychological profiles using the constructs of Norman's [1963] 'Big Five' personality inventory (operationalized by Costa and McCrae [1992] as negative emotion, extraversion, openness to experience, agreeableness and conscientiousness), the psychological gender constructs of masculinity and femininity (Constantinople [1973]) and the personality traits of preference for innovation and risk taking propensity (Jackson [1976]). We obtained data on how they obtained information about the market, their opinions on investing, their exposure to stocks, their exposure to stocks with larger market capitalizations and the extent of their trading. We calculated the returns of their portfolios, the risk of their portfolios and monthly and daily Sharpe ratios. We found that every metric analyzed was related to one or more of the psychological constructs.

Our findings for the relationships between personality traits and investment choices are shown in Table 13. Our findings of the relationships between personality traits and investment performance are shown in Table 14. Individuals who were more extraverted, had a greater preference for innovation and were less masculine achieved superior portfolio performance. Individuals who had higher negative emotion, higher risk taking propensity and more openness to experience opted for higher portfolio risk. Higher negative emotion and higher risk taking propensity were also associated with increased trading behavior, while investors who were more extraverted were found to have a lower propensity to trade. Although we made no formal hypotheses about how the personality traits might relate to investment, it was not difficult to provide a cogent explanation for many of the relationships we found. Some relationships, however, were not readily interpretable. Therefore, we look forward to future studies which may help us better understand such findings.

Notably, while return and risk are seen to be inextricably linked in the finance literature, our results, summarized in Table 14, suggest the facets of personality that influence our exposure to risk are different from those found to have

a significant association with total return. It is only when we combine risk and return to calculate risk-adjusted return measures that the regressions show some influences in common. If the facets of personality associated with return are not those associated with exposure to risk, then it may not be surprising that we find individuals hold too few stocks or inefficient portfolios.

In addition, we utilized Bem's Sex Role Inventory (BSRI, Bem [1977]) to examine if psychological gender better identified differences than the simpler approach of biological gender adopted by Barber and Odean [2001]. Our findings suggest that focussing on sex has been distracting. We argue that sex-roles are better than sex (at least in analyzing investors) and we look forward to future research exploring this area.

To date, Behavioral Finance has focussed on heuristics, the mechanics of decision-making, having predominately observed the results of decisions taken and sometimes the decisions themselves. Behavioral Finance has led us to a deeper

TABLE 14
The Significant Associations between the Personality Variables and Investment Performance and Risk.

	Total return	Monthly Sharpe ratio	Daily Sharpe ratio	Standard deviation
Negative emotion	n/s	n/s	n/s	+
Extraversion	+	+	+	n/s
Openness to experience	n/s	n/s	n/s	+
Agreeableness	n/s	n/s	n/s	+
Conscientiousness	n/s	—	—	n/s
Masculinity	—	n/s	—	—
Femininity	n/s	n/s	n/s	n/s
Preference for innovation	+	+	+	n/s
Risk-taking propensity	n/s	—	—	+

Notes: This table reports the associations between the personality variables and the investment performance and risk metrics. (+) denotes a positive and significant association, (—) denotes a negative and significant association. (n/s) denotes insignificance.

understanding of financial markets. Its focus on heuristics may be short-sighted. The analysis presented in this paper may point the way to a future research agenda. Such research may help us gain a deeper understanding of financial markets through a deeper understanding of the individuals whose behavior creates and sustains them.

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NOTES

1. The *Oxford English Dictionary* (2006 <http://dictionary.oed.com>) has, as one of its definitions of personality, that it is "...the quality or collection of qualities which makes a person a distinctive individual; the distinctive personal or individual character of a person, especially of a marked or unusual kind."
2. For example, the Capital Asset Pricing Model (Sharpe [1964], Lintner [1965], Mossin [1966]).
3. Pompian and Longo's [2004] questionnaire was largely based on Kahneman and Riepe [1998], which also used the MBTI. It should be noted, however, that this typology puts people into 16 "boxes," a significantly different approach to our use of the continuous measures in the NEO (Costa and McCrae [1992]).
4. As measured by the NEO.
5. In contrast to Hunter and Kemp [2004] the current study incorporates all the "Big Five" factors (not just openness to experience).
6. The uni-dimensional sex dichotomy would, therefore, obscure the possibility that an individual could exhibit qualities that were both masculine as well as feminine (Maupin [1989]).
7. In terms of the "Big Five," Jackson's [1976] risk taking scale seemed firmly embedded as a negative dimension of agreeableness (Paunonen and Jackson [1996]).
8. Jackson's [1976] innovation scale is, unsurprisingly, positively related to the "Big Five" factor of openness to experience (Paunonen and Jackson [1996]).
9. It was also based on the assumption that more recent information would increase the likelihood of more accurate disclosure.
10. It was believed this was likely to confound the relationship between the individual's personality and their investment behaviour.
11. Problems of non-response can be mitigated to a large extent by specifically tailoring the questionnaire design. For example the questionnaire was anonymous, which, based on the work of Futrell and Hise [1982], seems to increase the response rate. The questionnaire and all correspondence was also headed prominently with *The University of Western Australia* emblem as Greer and Lohtia [1994] found University sponsorship increased questionnaire response rates when compared to a non-sponsored control.
12. This being consistent with Dillman [1978], who views this approach as effective in encouraging questionnaire completion.
13. While a seven-point scale is used in the other questions, five points are used here to allow direct comparison with the population statistics provided by Costa and McCrae [1992].
14. The reliability of the psychological items was tested using Cronbach's [1951] Alpha. The Alpha measures the internal consistency of the scales, with values in excess of 0.60 being considered reliable (Nunnally [1967]). All psychometric scales employed in the study are considered statistically reliable as tested using Cronbach's [1951] Alpha.
15. Significance was tested using a one sample t-test as all psychometric variables are normally distributed.
16. The Kolmogorov-Smirnov one-sample test is a test for goodness-of-fit. It is concerned with the degree of agreement between the distribution of the sample and some specified distribution, which in this case is the distribution of the population. Significance suggests you can reject the null that the distributions are the similar (Seigel and Castellan [1988]).
17. The Chi-square p-value reported as 0.001.
18. Our reasoning for this comparison was motivated by Watson and Newby's [2005] sample mainly comprising SME owners who held one or two firms only. As such, we considered they were similar to the investors in our sample that held relatively under diversified portfolios.
19. As population psychological gender levels have been documented as changing through time (Twenge [1997]), published population estimates from early use of Bem's [1977] scale was considered suspect. Watson and Newby's [2005] sample, therefore, also represented the most current data set available for comparison.
20. No population estimates were available for either of Jackson's [1976] scales, hence the Watson and Newby [2005] estimates were used as a proxy.
21. While the average indicates that investors purchased more than they sold during the year, the median suggests otherwise.
22. *Abnormal return* represents the return on the portfolio, in excess of expected return given its beta risk,

- as modeled by the CAPM. We do not explore metrics based on asset pricing models such as the CAPM in this study. Considerable debate exists about the correct model of the cross-section of returns for all Australian securities (Durand, Limkriangkrai and Smith [2006]). Furthermore, we are reluctant to use a dependent variable measured with such noise in our analysis.
23. We examined the relationships of the return metrics to trading activity. We found some indications that daily and monthly Sharpe ratios had a negative relationship to trading activity but, as the evidence was marginal, we chose not to pursue this line of investigation in our analysis.
 24. Significance is determined using a Chi-squared test. However, in undertaking such a test we breached the usual practice that cells have at least five items.
 25. Agreeing to these statements would indicate that you *didn't* believe in the benefits of diversification.
 26. We analyzed the response to each question using the personality variables but did not find any significant relationships.
 27. These categories are Very Often, Often, Sometimes, Rarely and Never.
 28. Only 11% (5) of his sample of 45 had 'never' watched *Wall Street Week* (with Louis Rukeyser).
 29. Perhaps this is consistent with the low usage of investment among investors in our sample.
 30. The backward stepwise approach deletes the least significant variable until we get the model with the greatest number of significant coefficients (p -values < 0.05). We made an exception to this rule Table VIII (Model 4), Table X (Model 2) and Table XI (Model 2) where we report variables where the p -value is greater than, but close to, 0.05. The inferences that we make on the basis of the statistically significant variables are unaffected by the inclusion of these insignificant variables; we include these variables for the reader's information.
 31. See Greene (2003), Chapter 22 for further information.
 32. This is because, first, Barber and Odean [2001] argued that excessive trading is a manifestation of overconfidence and, second, Pompian and Longo [2004] found that extraverts suffered more from overconfidence. Therefore, we might hypothesize a positive relationship between extraversion and trading.
 33. There may also be a liquidity premium for holding small firms (James and Edmister [1983], Beedles, Dodd and Officer [1988]) or investors may require higher returns from small firms as compensation for information asymmetry (Berk [1995]).
 34. The coefficient is negative and statistically significant for both models in both tables.

35. This would be the case if we make the assumption that investment advisors promote smaller stocks.
36. The positive association with *extraversion* is at odds with the conclusions of Fenton-O'Creevy et al. [2004], who found that successful traders tended to be introverts who were characterized by being open to new experiences.
37. The sign of the coefficient for masculinity was still negative, but the p -value became 0.051.

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