Using the Four-Quadrant Model of Think/Feel/Fast/ Slow to Understand the Decision-Making of Self-Managed Superannuation Fund Trustees

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Abstract

This research focuses on decision-making by trustees of self-managed superannuation funds (SMSFs) in Australia. Behavioral attributes are examined using the four-quadrant model (FQM) developed by Lovric et al. (2010), comprising the cognitive, affective, controlled, and automatic quadrants. The FQM integrates two closely related dual-process theories (DPT). Both the DPT framework and the FQM draw on foundational principles from the cognitive and behavioral sciences. The result of the mixed methods study uses the FQM to explain investment decision-making. The dataset was examined using cluster analysis to identify underlying group structures, followed by regression modelling to assess the relationships between key variables. The model can also predict trustees who seek investment advice and those who act independently. The FQM was also associated with different styles of investment decision-making by the SMSF trustees and investors. Under the model, trustees and investors are classified as active or passive investors. A key finding of the research is that investment decision-making often includes emotions and feelings as overriding influences and nonrational behavior can, and does determine investment decisions.

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Introduction

Recent research in behavioral finance suggests that nonrational investment decisions caused by heuristics and biases are an important foundation for understanding the potential effect of these decisions on financial markets (Chaudhary, 2013; Ferri et al., 2021; Tekçe & Yılmaz, 2015). While the investment decisions of professionals and traders have often been studied in behavioral finance, there has been less research on individuals' investment decisions (Hwang et al., 2024). Individuals may need to make important decisions for others who are not necessarily professionals or professionally trained (Posavac et al., 2019; Yao & Rabbani, 2021). Examples are the trustees of family trusts, private companies and self-directed superannuation funds members (Earl et al., 2015; Lehane, 1995).

A conceptual model of an individual investor developed by Lovric et al. (2010) incorporating the FQM was applied to analyze and describe

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behavioral phenomena. This study used the DPT model to examine the influence of behavioral attributes in a real-world setting, shaping the investment decision-making behavior of Self-Managed Superannuation Funds (SMSF) trustees in Australia. The research also studied the interplay between the components of the FQM and independent behavioral attributes, which may have significant effects on an individual investor's behavior and cognition. The investment decision-making processes of SMSF trustees were analyzed to determine any negative impacts that may result in trustees facing retirement with an income well short of their expectations. (For the purposes of this research the term SMSF member and SMSF trustee are interchangeable. All members must be trustees and vice versa.) It was found that the FQM may be superior to DPT, as it provides a deeper and more nuanced understanding of decision-making behavior. In addition, it was found that the interplay between the FQM and independent behavioral attributes influences various aspects of SMSF trustee investment behavior. For example, SMSF trustees may initially lack financial knowledge and information to make educated or informed investment decisions (Thorp et al., 2020).

A contribution of this article is the finding that the behavior of investors, whether rational or nonrational, is a small part of the complexity of investor behavior and the FQM shows that seemingly nonrational investor decision-making behavior is occurring. The conceptual model of individual investor purpose provides a structured representation for implementation into a real-world financial market. The results provide a greater understanding of the influence of the FQM on the investment decision processes undertaken by SMSF trustees and these behavioral factors may provide insights into the investment decisions of individual investors.

This article seeks to address the following research questions:

1. How does the FQM explain the advice seeking behavior of SMSF trustees?
2. How does the FQM explain different investment decision-making styles adopted by SMSF trustees?

The article works towards a conceptual framework to identify behavioral attributes, to explain what is known about them, and suggest research questions to encourage future empirical research.

We find that investment decision-making can often include emotion overriding rational decision-making, and that financial decision-making can sometimes occur based on quick thoughts and feelings. The well thought out deliberations of investors in their decision-making may not apply to many of the 'at risk' population charged with making their own financial decisions including SMSF trustees, family trust trustees and those who may qualify as professional investors (Australian Taxation Office [ATO] 2008; *Corporations Act 2001 (Cth) Reg 6D.2.0*). This suggests a significant role for education guided by regulatory policymakers (Kingsford Smith, 2009), and for the financial services sector (Chater et al., 2010).

The remainder of the article is set out as follows. Section 2 provides a background to SMSFs and the Australian retirement system, Section 3 reviews the relevant literature and proposes the hypotheses along with the research model. Section 4 describes the research method followed by Section 5, which reports the empirical results. Section 6 sets out our conclusions.

Background

Australia's retirement income system had A$4.5 trillion in total superannuation assets as of 30 September 2025, falling within three groups: defined benefit; defined contribution schemes: consisting of employer, industry-based or commercial funds and individuals who actively manage their own fund called SMSF (Australian Prudential Regulation Authority, 2025; Drury, 2025; The Association of Superannuation Funds of Australia Limited, 2023). The SMSF sector is an integral part of Australia's superannuation system achieved extraordinary prominence since inception, comprising over one quarter of Australian superannuation assets (Self Managed Superannuation Funds Association, 2020).

The SMSF component of the superannuation industry began in 1999 and is regulated by the Australian Taxation Office (ATO). It has grown from a niche product where the members who are also the trustee are responsible for the investment decisions taken for the fund (ATO,

2025). SMSFs are unique to Australia, with no other overseas jurisdiction providing the same level of choice and control for individuals (Castillo, 2013; Self Managed Superannuation Funds Association, 2020). Trustees of SMSFs are not required to have any training or professional qualifications in finance, yet 1.2 million members manage some 653,000 SMSFs in Australia, accounting for an estimated A$1.1 trillion in funds (ATO, 2025). As such, the context provides a rich background to examine how the FQM can be applied to a broader section of the population, still responsible for important financial decisions. SMSF members are expected to have a grasp of basic investment concepts like diversification, risk management, and asset allocation although this is not tested (ATO, 2025).

Literature Review

To understand how SMSF trustees think and feel as individual investors, it is necessary to know the evolution of the theoretical basis of their actions. The conceptual development of this article proceeds with a discussion of neo-classical utility theory, and the impact of psychology in behavioral finance, which leads into the dual processing theory of financial behavior. We arrive at the FQM of investors acting emotionally, rationally, fast, or slow by understanding the related schools of thought in behavioral finance. This discussion starts first with classical utility theory.

Individual Decision-Making

The first significant theories of decision-making, expected utility and subjective expected utility, developed within economics. They were normative in orientation, describing how decision-makers should behave (Lau, 2003). The process assumes that individuals are rational agents maximizing the utility function and that decision-making is a reasoning process that is rational (Gabbi & Zanotti, 2019). The field of behavioral finance emerged, leading to recent theories, including bounded rationality and prospect theory, in turn leading to the concept of nonrational and irrational decision-making (Kahneman & Tversky, 1974, 1979; Simon, 1982, 1993).

Kahneman et al. (1982) found that individuals use a few mental shortcuts, or heuristics, to help make decisions; these provide general rules of thumb for decision-making. Heuristics use fewer cognitive resources and simplify the process, which may lead to incorrect decisions about issues that are more complicated. There are many heuristics and biases listed in behavioral finance literature, namely, representativeness, causality and attribution, availability, covariation and control, overconfidence, conservatism, and judgmental biases in risk perception (Barber & Odean, 2013; Kahneman et al., 1982; Richardson et al., 2012; Xu et al., 2024) and probabilistic reasoning (Gigerenzer, 1991). Further, Tversky and Kahneman (1992) listed five major phenomena: framing effects, nonlinear preferences, source dependence, risk seeking, and loss aversion.

Behavioral heuristics and biases in investing encompass many types including both cognitive and emotional biases. Individual investor behavior is often impacted by emotional processes, mental mistakes, and personality traits that complicate investment decisions (Bajo et al., 2023; Howard, 2014). The field of investor behavior seeks to understand and explain decisions by merging the topics of psychology and individual investing on a micro level. Individual investors may make nonrational decisions by establishing heuristics that can save time but lead them away from rational thinking.

In making decisions, individuals constantly make judgments or draw conclusions (Schirrmeister et al., 2020). Some of these judgments seem intuitive, fast, and reflexive; for example, which road to choose (De Neys & Goel, 2011). Others appear to be more reasoned, deliberate and consciously derived, like deciding on a career. The distinction between intuition and reasoning in an individual is known as dual process theory (DPT).

Dual Processing and Individual Decision-Making

Fast and undemanding heuristics provide valuable responses in many situations; however, there may also be bias reasoning in tasks that require slower and more analytical processing. The operation of two different human reasoning systems has received substantial support, pointing to dual neural pathways during individual decision-making (Alós-Ferrer & Strack, 2014; Brocas & Carrillo, 2014; Evans, 2006). Kahneman (2011) used two processes, System 1 (intuition) and System 2 (reasoning),

to explain how the two systems interact with each other when making judgments.

DPT (Grayot, 2020) is a recent development and encompasses a group of theories in social, personality, and cognitive psychology that describe how people think about information when they make judgments or solve problems (Evans, 2008; Evans & Stanovich, 2013; Kahneman, 2003). Unless otherwise specified, the term dual process is used in the article to refer to dual process theory. The two processing types recognized in the literature are referred to as Type 1 and Type 2 (Evans & Stanovich, 2013). For this research and to maintain consistency, the terms Type 1 (fast thinking) and Type 2 (slow thinking) will be used for dual processes. While DPT considers thinking fast and slow, it does not consider the role of emotions in influencing investment decisions (Forbes, 2024).

A common notion of the two system DPT models is that one of the two processes operates only to the extent that the other fails (Payne, 2008). Criticisms of DPT include that Type 1 and Type 2 processes are not of higher cognition and that other models may be more appropriate (Chaiken & Trope, 1999; Frank et al., 2009; Sherman et al., 2014). Conrey et al. (2005) argued that these assumptions make the two system DPT models less suitable to capture circumstances in which automatic and controlled processes operate simultaneously. Conrey et al. (2005) proposed a quadruple process model that includes parameters for four distinct processes instead of two.

Quad Models

The purpose of the quadruple process model (quad model) was to estimate the simultaneous contributions of automatic and controlled processes, as processing type properties can easily be overlapped in two-process accounts (Evans & Frankish, 2009). Conrey et al. (2005) stated that no decision process is pure and that many responses are influenced simultaneously by automatic and controlled processes. It is proposed that decision-making may be influenced by automatic activation of an association or bias, such as stereotyping (Macrae et al., 1994). This leads to being able to determine a correct response and overcome any automatically activated association or response bias.

A comparable quad model with association activation was proposed by Sherman (2006a) to determine how individuals regulate their automatic associations and behavioral instincts. The quad model enhances many DPT models by regulating psychological processing through understanding activation versus overcoming activation (Sherman, 2006b; Sherman et al., 2008). Gawronski and Creighton (2013) described the quad model as a multiple process model rather than a DPT model while retaining the emphasis on automatic and controlled processes.

Early research commencing with Camerer et al. (2004) focused on reverse inference, linking activity in different brain regions to competing behavioral models. However, this research did not achieve wide acceptance (Konovalov & Krajbich, 2019).

Neuroeconomics is developing more complex models to study decision-making processes (Grayot, 2020; Stoyanov, 2017). Neuroeconomics, with the use of technology, is well placed to assess the convergence of economics and psychology and determine their role in the decision-making process.

Conceptual Model of Individual Investor Components

Lovric et al. (2010) proposed a conceptual model of individual investor decision-making consisting of three components. First, a three-stage decision-making process of perception, interaction, and action. Second, the FQM proposed by Camerer et al. (2005) as the foundation cognitive model. The FQM decision-making behavior quadrants are controlled-cognitive (Quadrant I), controlled-affective (Quadrant II), automatic-cognitive (Quadrant III), and automatic-affective (Quadrant IV). Third, the influence of individual behavioral attributes on styles of decision-making. The first three important attributes for the investment decision-making purpose are risk, portfolio allocation, and portfolio management. The remaining six are decision-making attributes mainly concerning information sources or heuristics and biases. Although Lovric et al. (2010) suggested using computational techniques, such as agent-based models, they proposed that shifting a FQM to field experiments in a real-world financial market would increase validity (Buturovic & Tasic, 2015). Lovric et al. (2010) show the

FQM can explain investor behavioral heuristics and psychological biases.

Financial Advice Seeking

Individuals can obtain financial advice from several sources (including accountants, financial planners, lawyers, sharebrokers, and financial institutions) and the type of adviser chosen varies based on their needs and demographic factors. Studies have shown that wealthier individuals tended to use professional financial advice, where less wealthy individuals were more likely to rely on informal social networks such as family and friends (Alyousif & Kalenkoski, 2023; Robb et al., 2012). Wealthier individuals typically use financial advice due to both the number and complexity of investment decisions they are required to undertake and have the resources to fund the advice (Peterson, 2007).

Pursuing financial advice for a financial planning issue, problem or objective is a form of help-seeking behavior (Grable & Joo, 1999, 2001). Marsden et al. (2011) found that seeking advice on the retirement planning process results in positive financial outcomes. Olsen and Whitman (2007) suggested that a lack of financial knowledge results in poor retirement outcomes. While seeking advice is one possible way to over-come a lack of knowledge there is minimal research examining the role of financial advice and its effectiveness in investment decision- making (Lusardi & Mitchell, 2014; Westermann et al., 2020).

Psychological research has examined the relationship between making investment decisions and investors being over-confident (Hsu, 2022). This overconfidence may lead investors to make decisions autonomously leading to unprofitable trading behavior and lower investment competence (Barber & Odean, 2001). Lambert et al. (2012) defined overconfidence as the tendency for individuals to overestimate their own knowledge and abilities.

Over-estimating one's own knowledge and financial abilities may lead to a reduction in the willingness to seek external advice. Mihaylov et al. (2015) found that self-directed investors are at risk of managing underperforming SMSFs if they are overconfident and financially illiterate. Further, the impacts that might occur from this may be mitigated by seeking technical and financial advice (Burke & Hung, 2021).

Hypotheses Development

In this conceptual model, investment decisions are seen as an iterative process of interactions between the investor, as represented by the FQM, and the chosen investment environment. This investment process is influenced by several interdependent variables and driven by dual mental processes. Hypotheses are developed showing how the FQM can be used to understand the use of financial advisers and the general investment behavior of SMSF trustees.

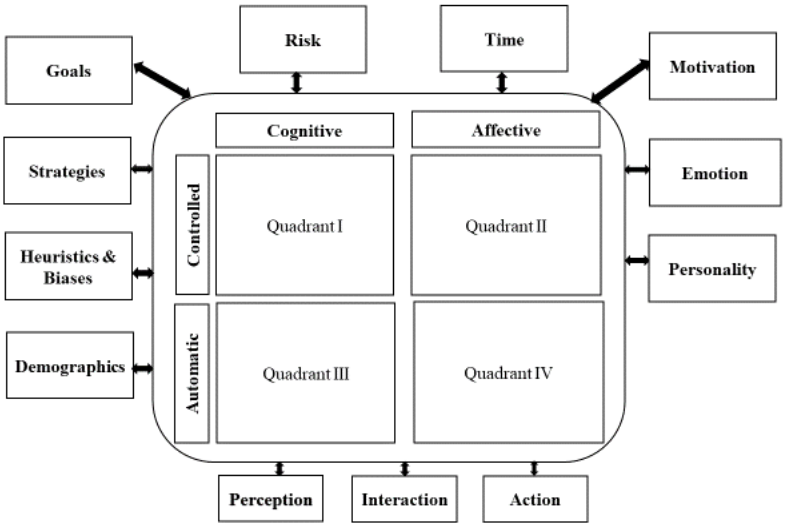

Figure 1. Conceptual model of individual investor components used for study (Lovric et al., 2010).

Figure 1 shows the conceptual framework depicting the relationship between the FQM and styles of decision-making. Quadrant I (controlled/cognitive) has similar characteristics to Type 2 (slow decision-making), including serial, controlled, intentional, conscious, and effortful. Quadrant II (controlled/affective) characteristics are both serial and effortful and include displaying feelings and fast decision-making. Quadrant III (automatic/controlled) characteristics are both parallel and effortless and display slow and analytical decision-making. Quadrant IV (automatic/affective) has similar characteristics to Type 1, which shows decision-making as fast, effortless, emotional, and lacking introspection.

Four hypotheses were developed to address the first research question. Each of the following hypotheses seeks to explore whether there was a statistically significant relationship between the FQM and the dependent variable of seeking advice.

H1: Quadrant I (controlled-cognitive) – slow thinking is positively associated with SMSF trustees seeking advice.

H2: Quadrant II (controlled-affective) – slow feeling is positively associated with SMSF trustees seeking advice.

H3: Quadrant III (automatic-cognitive) – fast thinking is positively associated with trustees independent investment decision-making.

H4: Quadrant IV (automatic-affective) – fast feeling is a predictor of SMSF trustees independent investment decision-making.

SMSF trustees rely on advice providers, such as financial advisers and accountants (Thorp et al., 2020). Bird et al. (2018) found that 59% of trustees used professional help from advisers to establish their SMSF. In contrast, individual investors may not feel the need to seek advice (Hsu, 2022). Inderst and Ottaviani (2009) highlighted that seeking financial advice is dependent on an investor personality characteristic, which in turn affects the likelihood of following advice. This approach may be linked to seeking better-than-average returns by working against trends in the market using independent thinking (Kaniel et al., 2008). Further barriers to advice are that individuals believe they cannot afford it and do not believe their circumstances justify the need (Fidelity International, 2019).

Individual investors are commonly portrayed in behavioral finance literature as unsophisticated or naïve and being unduly influenced by trends and psychological biases in their investing activity (Kaniel et al., 2012). Investment decision-making is a complex process consisting of significant judgments required by an individual, including asset allocation and risk/reward trade-off (Chalmers et al., 2013).

The role of active versus passive investment management in relation to all tradeable investments is of interest to researchers (Baiocchi, 2014). An active investing style is where an investor selects their own strategies, undertakes investment trades, measures portfolio performance, and rebalances portfolios (Ellis, 2015). A passive investing style involves less buying and selling whereby an investor would adopt a 'set and forget' approach, investing in such financial products as index funds or other managed funds (Blitz, 2014; Camilleri et al., 2019; Evanson Asset Management, 2011).

Four hypotheses were developed to address the second research question. Each of the following hypotheses seeks to explore whether there was a statistically significant relationship between the FQM and the dependent variable of decision-making styles.

H5: Quadrant I (controlled-cognitive) – slow thinking is a positive predictor of SMSF trustees using an *active* investment style.

H6: Quadrant II (controlled-affective) – slow feeling is a positive predictor of SMSF trustees using a *passive* investment style.

H7: Quadrant III (automatic-cognitive) – fast thinking is a positive predictor of SMSF trustees using an *active* investment style.

H8: Quadrant IV (automatic-affective) – fast feeling is a positive predictor of SMSF trustees using an *active* investment style.

Method

Research Design

To refine and test the FQM, three different types of measures were adopted for the purposes of this study. The qualitative study presents results from 18 semi-structured interviews with SMSF trustees and SMSF advisers, a pilot test of 33 SMSF trustee participants who were excluded from the main

survey, as well as a survey result of 221 SMSF trustees. The results of the qualitative study provide support for the quantitative study, which uses an FQM to explain investment decision-making. A triangulation method was used with SMSF trustees, financial advisers and an academic/expert panel supporting content validity by cross-checking data sources of information and collection procedures (Patton, 1999). Based on the interview responses and previous literature, the FQM measures were developed for the third stage, an online survey of 221 trustees. The in-depth interviews explored a wide range of issues related to financial advice and its role—or not—in the decision-making of trustees. The interviews examined, for example, how trustees established their self-managed funds, how they evaluated performance, the risk–return characteristics they considered, and the factors that influenced their decision-making, whether they took an active role or not in managing their SMSF. All these factors were used to develop the FQM measures for the online survey.

NVivo was chosen for its simplicity using a small data set (Bazeley & Jackson, 2013). An initial coding framework was generated inductively from the data. Two researchers independently coded a subset of transcripts to establish consistency. Coding discrepancies were discussed and resolved through agreement, and the codebook was refined accordingly. The remaining data were then coded using the agreed coding framework. Regular meetings were held to review emerging themes and ensure consistency across the dataset. This process enhanced the rigour and transparency of the qualitative component of the mixed-methods design.

A full set of discussion questions is show in Appendix A. Ethics approval was granted in accordance with the requirements of the National Statement on Ethical Conduct in Human Research.

Measurement

An analysis of the in-depth interviews informed question development and found support for the FQM, as shown in Table 1. These comments were identified by analysis of comments using the FQM as a guide to coding responses. While qualitative research cannot be used to generalize findings, the indicative comments provided initial face validity for the development of measures.

Table 1. Indicative comments relating to the FQM.

Sample of Interview Responses	Quadrant
According to the trustee interviewees, SMSF trustees were seeking a solution to a wealth or retirement issue – a framework that would facilitate their taking control of their wealth and retirement outcomes.	I
Six trustees who relied on advice believed that when establishing their SMSF they would decide on and control investment decisions; however, they came to realize they were too busy to undertake all trustee roles.	II
An accounting partner expressed a view shared by all practitioners: “That trustees have no clear strategy at commencement of the SMSF for investment decision-making or monitoring ongoing investment performance.”	III
One trustee indicated: “My wife and I are still unfamiliar with all aspects of the SMSF and rely on a financial planner and an accountant.” This was confirmed by another trustee: “We use a professional adviser, tried the other, doing it by ourselves, and it didn’t work.”	IV

The in-depth interviews also revealed three decision-making styles of trustees; these were later confirmed in a cluster analysis of the survey responses.

Table 2. Sample interview responses related to trustee decision-making and financial behavior.

Sample of Interview Responses	Related
An accounting partner stated that: "We prepare or assist with annual return or audit; however, clients usually outsource rest due to complexity-investment and compliance."	Passive investment style
According to one trustee, the purpose of running an SMSF is to do her own share trading, picking the stocks like her father used to do.	Active investment style
What is key driver for establishing and running an SMSF from your viewpoint? Another trustee said: "Control of investment decisions."	Control/active investment style
Another accounting partner noted when asked about their client's purpose for running an SMSF: "…they have a significant amount of confidence in some investment strategy of their own, real-estate or share trading in particular would be the two that I'd be looking at."	Active investment style

The survey questions were informed from research undertaken by Nguyen et al. (2019) and Chandra and Sharma (2010) together with work on behavioral finance by Russell (2019). The questionnaire developed as the result of stage one, was piloted with 33 respondents and consisted of the following. Questions 1–3 examined the demographic background of respondents. The relevance of the demographic information is that age and gender may influence participants (Davar & Gill, 2007; Eberhardt et al., 2019). For example, younger investors might hold a higher level of tolerance for risk because they have more time (Bolster et al., 1995). Questions 3–6 measured the experience of SMSF trustees and the size of their fund in terms of the number of people it supported. SMSF trustees who participated in the pilot test of the main research instrument were not eligible to participate in Stage three of the research.

The next section of the questionnaire measured the FQM. Sample items for Quadrant I (Controlled/Cognitive) included "I check financial conditions before I invest," "Use technical analysis to make decisions" and "Consider a variety of alternatives before investing" (note the full measures used in the analysis are shown in the factor analysis results). This quadrant is consistent with risk attitude (Corter & Chen, 2006), including comfort with risk and investment advice. This is also consistent with personalities associated with risk taking and decision-making (Pak & Mahmood, 2015). Where the degree of consciousness and attention to detail is associated with this type of decision-making. Quadrant II (Controlled/Affective) included items such as "I consult with financial advisers before I invest," "Confident in my financial adviser's forecasts", and "Rather have someone else manage my investments." This is consistent with previous research showing feelings rather than thoughts driving decision-making (Lucey & Dowling, 2005). Quadrant III (Automatic/Controlled) included items such as "Willing to take risks and earn returns," "Enjoy making investment decisions" and responding negatively to the statement "Long time to make up my mind." Investors in this quadrant may not spend a significant amount of time and energy focusing on their financial situation but may have significant investment goals (Nevins, 2004).

Quadrant IV (Automatic/Affective) consisted of items such as "Rely on instinct to make decisions," "Make investment decisions without having all the information available" and "Often invest in alternative products that are not properly researched." This is consistent with what is called decision-making in psychology with almost unconscious emotion (Winkielman & Berridge, 2004) and has also been found to a style of decision-making in investments (Clark et al., 2018; Rubaltelli et al., 2010).

The final section of the questionnaire covered the different tools and sources of information the participants used to make investment decisions. The alternatives available were examples of internal and external influences. The purpose was to provide information on the factors underlying the investment decision. How influential the media and advisers are considered among the external influences can describe several tendencies that investors may have, such as following the herd, having low confidence in their judging ability, or being

overconfident. Sample items included "I consult with financial advisers before I make investment decisions", "Sources of investment information are professional advice (stockbroker, financial adviser, accountant)", to more independent decision-making, as shown by questions such as "I have made an investment decision contrary to advice from my financial planner" and "Make investment decisions without having all the information available". A full description of the items in the questionnaire is shown in Appendix B.

Sample

The sample was obtained from the SMSF Connect trustee member database of the Self-Managed Superannuation Fund Association (SMSFA), allowing access to draw a representative sample group of SMSF trustees to participate in the main survey questionnaire. Four-hundred trustees were contacted by email and asked to complete an online questionnaire. The questionnaire was distributed on November 25, 2019.

Results

Sample Respondents

There were 201 valid responses to the survey. The response rate to the main research questionnaire was 55%, which is higher than the average response rate for online surveys of 45% (See meta-analysis by Wu et al., 2022). The largest representative age group was 60–69 years (69 participants or 34.3%), followed by 70 years and over (62 participants, 30.8%) and 35–49 years (31 participants, 15.4%). The sample included 50 females (24.9%) and 151 males (74.9%). The sample showed that 75.6% of SMSFs were managed by two members. The next most represented was one member at 12.4%. This was in line with the proportion of members as of June 2021 (ATO, 2022), when 69.2% of funds were for two members and 23.7% were for one member.

The sample showed a significant cross-section in investment experience and decision-making; 78.1% of respondents indicated they had at least some experience in investing in a wide range of investments; 64.2% undertook the investment decision process for themselves and other members. A further 20.9% made investment decisions jointly with other members; 35.3% made investment decisions with the help of other members or advisers; 28.9% made decisions by themselves, while 18.4% made decisions with other members. The remainder relied on advisers or had little input into the investment decisions.

It is recognized that this is a relatively small sample, but the sample size is consistent with other research in the literature and the results from the 221 respondents are of an appropriate size to conduct the detailed analysis that was undertaken in this stage of the research (Bujang et al., 2012; Cattell, 2012; Saunders et al., 2015).

Development of Measures and Cluster Analysis

Principal components factor analysis with a rotated component matrix was undertaken analyzing the four quadrants, providing some usable results. Factor scores were saved and used as independent variables in later analyses. Variables that were not strong enough with low factor loadings were eliminated, although additional criteria were considered before taking out a variable. The standardized factor loading of all the items' ranges was set above the threshold limit of 0.4, as suggested by Hair et al. (2006). Further, to ensure a simple structure, each identified factor has at least three variables with high factor loadings, and each variable should load highly on only one factor. On the rerun, the KMO value was .815. Bartlett's test of sphericity determines if a correlation matrix is an identity matrix, testing if variables are sufficiently correlated to justify dimension reduction techniques like factor analysis or PCA. A significant result ($p<0.05$) indicates that variables are not orthogonal, allowing for further analysis. The results of the rotated factor solution are shown in Table 3. Collectively the analysis accounted for 41% of the extracted variance. The FQM measures were used as independent variables in subsequent analyses.

Table 3. Rotated factor matrix of four-quadrant model.

Factor Analysis – Quadrants				
	Controlled/ Cognitive	**Controlled/ Affective**	**Automatic/ Controlled**	**Automatic/ Affective**
I check financial conditions before I invest	0.69			
Use technical analysis to make decisions	0.65			
Review investment goals before decisions	0.61			
I assess risk tolerance before I invest	0.61			
I use ROI before I invest	0.61			
Consider a variety of alternatives before investing	0.60			
Assess liquidity/ marketability of investments	0.59			
Review investment performance with market benchmarks	0.59			
Assess the convenience with which an investment can be traded	0.57			
Manage investments on a weekly basis	0.47	-0.44		
I am calm when I have to make investment decisions quickly	0.47		0.47	
Committed to achieving investment goals	0.41			
Investments will return good returns in the medium-long term	0.40			
I consult with financial advisers before I make investment decisions		0.84		
Confident in my financial advisers' forecasts		0.79		
Consult financial advisers to improve performance		0.79		
Sources of investment information are professional advice (stockbroker, financial adviser, accountant)		0.75		
Rather have someone else manage my investments		0.67		
I avoid selling investments that have fallen in value and sell those that have increased in value		0.56		
Sources of investment decisions are family, friends, and peers		0.54		
Wait to anticipate future improvements		0.44		
Sources of investment information are media (television, internet, print media)		-0.43		
I stick with my investment decisions regardless of outcomes		0.42		
I generate my own ideas/research		-0.42		
Use judgment to improve performance		-0.42	0.41	
Look for safe investments			-0.75	
A cautious person			-0.72	
Long time to make up my mind			-0.65	
Willing to take risks to earn returns			0.65	
I enjoy making investment decisions			0.61	

Factor Analysis – Quadrants				
	Controlled/ Cognitive	**Controlled/ Affective**	**Automatic/ Controlled**	**Automatic/ Affective**
Confident of a quick decision if an opportunity presents			0.58	
Risk is opportunity			0.56	
My skills and knowledge outperform the market			0.51	
Investments are easy to understand			0.50	
Confidence in the performance of my investments	0.43		0.46	
Rely on experience for investment decisions	0.44		0.46	
Rely on instinct to make investment decisions				0.58
Make investment decisions without having all the information available				0.57
Often invest in alternative products that are not properly researched				0.54
After a gain on investments, I become more risk seeking				0.53
I favor one option of investing but then change to another option				0.50
I have made an investment decision contrary to advice from my financial adviser(s)				0.47
Extraction Method: Principal Component Analysis				
Rotation Method: Varimax with Kaiser Normalization. 41% of variance explained				
Rotation converged in six iterations				

Table 4 shows the results of the same analysis for measures of financial behavior. Factors were also saved and used as independent variables in later analyses. The cumulative percentage of variance was 50.76%. On the rerun, the KMO value was .677. The Bartlett's Test of Sphericity should be significant (less than .05) and met the criterion as the test is significant (p=.001).

Table 4. Rotated factor matrix of financial behavior.

Factor Analysis: Financial behavior		
	Financial Advice	**Independent Thinking**
I consult with financial advisers before I make investment decisions	0.83	
Sources of investment information are professional advice (stockbroker, financial adviser, accountant)	0.75	
I generate my own ideas/research	-0.64	
Sources of investment decisions are family, friends and peers	0.63	
Sources of investment information are media (television, internet, print media)	-0.60	
I check with fellow trustee before I make investment decisions	0.46	
Make investment decisions without having all the information available		0.78
I have made an investment decision contrary to advice from my financial adviser(s)		0.72

Factor Analysis: Financial behavior		
	Financial Advice	**Independent Thinking**
Extraction Method: Principal Component Analysis *Rotation Method: Varimax with Kaiser, 51% of the variance explained, Normalization*[a]		

To identify different types of segments of SMSF behavior, a two-stage cluster analysis was conducted on measures of different trustee experiences and the nature and size of each SMSF they managed. A hierarchical cluster analysis suggested there were two clusters. Following this, a k-means cluster analysis was conducted for two clusters (shown in Appendix B). A study of the characteristics of each cluster indicated the following:

Cluster 1 (label: Active style, N=168) consists of SMSF trustees who score high on financial investment product experience. This would be beneficial with trustees having the discretion to decide which products their SMSF invests in. It may ensure that all investments are consistent with the SMSF investment strategy and trust deed. This cluster also shows a high score for trustees displaying skill, care and diligence to self-initiate investment decisions, which may indicate sound investment decisions. The trustees are inclined to actively manage their investments to try to achieve their goals.

Cluster 2 (label: Passive style, N=33) consists of SMSF trustees who score low on investment experience. They have limited investment decision-making experience and prefer to take a passive role by delegating the initiation and making of investment decisions to someone else. They have little knowledge of the investment process and are willing to have a positive relationship with their financial advisers.

The next step in the analysis was the examination of hypotheses one to four, using regression analysis. The results of the cluster analysis were used as the dependent variable in the tests of hypotheses five to eight with discriminant analysis.

Evaluation of Hypotheses

Regression analysis

The regression results in Table 5 relate to financial behavior for two dependent variables: seeking financial advice and independent thinking. The model predicts seeking financial advice using the FQM well, with an Adjusted R Square = 0.85. All four independent variables of the FQM or predictors were significant. Seeking and taking financial advice is associated with slow feeling or being Controlled-Affective (QII, $\beta = 0.85$, $p<0.01$), but surprisingly not associated with being Controlled-Cognitive (QI), or slow thinking (QI, $\beta = -0.19$, $p<0.01$), thus support was found for H2 but not for H1. Thinking fast or Automatic-Cognitive reasoning (QIII) was also found to be negatively associated with financial advice ($\beta = -0.29$, $p<0.01$). This meant that H3 was not supported. Lastly, feeling quickly or Automatic-Affective (QIV) was also not associated with financial advice ($\beta = -0.12$, $p<0.01$). It seems that the greatest predictor of seeking financial advice is not judgment but the reassurance (feeling or affect) that develops over time.

The results for independent thinking showed a lower level of prediction with an Adjusted R Square = 0.41 The greatest influence upon independent thinking in financial terms was Automatic-Affective (QIV, $\beta = 0.62$, $p<0.01$) and QIII, fast thinking (Automatic-Cognitive, $\beta=-0.16$, $p<0.01$). These results show that independent thinking by trustees in SMSFs seems to occur quickly and without too much introspection or perhaps by intuition.

Table 5. Multiple regression results.

Model		Financial Advice			Independent Thinking		
		Standardized Coefficients Beta	t	Sig.	Standardized Coefficients Beta	t	Sig.
	(Constant)		0	1		0	1
	Controlled/Cognitive	-0.19	-6.97	0.00	-0.06	-1.15	0.25
	Controlled/Affective	0.85	30.71	0.00	-0.03	-0.55	0.58
	Automatic/Cognitive	-0.29	-10.53	0.00	-0.16	-2.99	0.00
	Automatic/Affective	-0.12	-4.29	0.00	0.62	11.45	0.00
Adjusted R^2 =0.85					Adjusted R^2 =0.41		

Discriminant Analysis

Discriminant analysis was used to predict group membership of the two clusters (active and passive style investing). The dependent variables were the FQM measures and measures of financial behavior (seeking financial advice and independent thinking).

The Eigenvalue was 1.042 for the discriminant function, which explained 100% of the variance in group membership. The consistent discriminant function explained a significant variation in group membership (Wilks Lamba=0.48, Chi-Square=142.18, $p<0.01$). The group centroid or discriminant scores for the two clusters were active (0.46) and passive (-2.32). The standardized canonical correlation coefficients (similar to beta loading on a regression) indicate each variable's contribution to the practical value of the discriminant function. In other words, how each variable predicts membership of the two clusters (active-passive). The Eigenvalue was 0.50 for Cluster 1, providing 100% of the variance showing a lessor function. The canonical correlation was 0.577, which is a moderate level. The Wilks' lambda was 0.668 with a p value = .000.

As shown in Table 6, being an active investor in a SMSF is associated with being Controlled-Cognitive (QI, Discriminant coefficient = 0.72), or thinking slowly and thinking fast or being Automatic-Cognitive (QIII, Discriminant coefficient = 0.72). To a lesser extent, active investors (trustees) were associated with Automatic-Affective thinking, or quick feeling when making decisions (QIV, Discriminant coefficient = 0.27). Thus, support was found for H5, H7, and H8, respectively.

Table 6. Discriminant coefficients.

Standardized Canonical Discriminant Function Coefficients		Cluster association
	Function 1	
Controlled/Cognitive (QI)	0.72	Active investor
Controlled/Affective (QII)	-0.81	Passive investor
Automatic/Cognitive (QIII)	0.72	Active investor
Automatic/Affective (QV)	0.27	Active investor
Financial Advice	0.03	Active/passive investor
Independent Thinking	-0.22	Passive investor
Cluster centroids. Active investor 0.46 and passive investor. -2.32. The analysis predicts 94.5% cluster membership		

Passive SMSF trustees or investors are guided by an interplay of controlled-affective thinking (QII, Discriminant coefficient = -0.81, which provides support for H6), and to a lesser extent displaying independent thinking characteristics with respect to financial advice (Discriminant coefficient = -0.22). Following financial advice seems to have only a small impact on being associated with either investment decision-making style of active or passive (Discriminant coefficient =0.03).

In terms of prediction, the results showed that the analysis correctly classified 94.5% of individuals. This result is mirrored closely in cross-validation of 94% when the scores of all other cases are used to derive the discriminant function. The validation of the discriminant model provides strong support that the FQM predicts actual investment behavior.

Conclusion

Discussion

This study aimed to authenticate the FQM's components of financial thinking and feeling, slow and fast, in the context of SMSF trustee investment decision-making. In particular the research focused how the FQM would explain advice seeking behavior of SMSF trustees and its ability to explain different decision-making styles of trustees.

The results provide empirical evidence that SMSF trustees use multiple processes in decision-making within the framework of the FQM. In addition, evidence is also provided that two distinct independent behavioral variables and two investment styles influence SMSF trustee decision-making.

The results showed that the use of financial advice was influenced by Quadrant II (slow thinking, or controlled-affective thinking, H2), and independent thinking by automatic-affective (Quadrant IV, or fast feeling, H4). The analysis also suggests two types of broad investment decision-making occur with SMSF trustees – an active and passive approach. An active approach to investment decision-making was found to be used by 83.59% of SMSF trustees who are older (60 years and above) and predominantly male.

Theoretical Implications

The findings of the study in this article imply that there are four distinct types of decision-making, which are more holistic than the simplified model of DPT and offer a more precise explanation of financial behavior. Preceding studies have proposed that individual decision-making relies on two systems or processes, which one can simply label Type 1 (automatic) and Type 2 (controlled) (Chaiken & Trope, 1999; Sherman et al., 2014). Type 1 (also referred to as the affective system) is proposed to operate fast and effortlessly. Type 2 (also referred to as the cognitive system) is proposed to be slower and more effortful.

While the dual process framework is on the exterior compelling, this research contributes to the dual process literature by bringing a divergent decision-making approach in the FQM versus single or dual processes that may be incomplete (Frank et al., 2009; Grayot, 2020). The findings suggest that the FQM may be superior to DPT, as it provides a richer and more nuanced understanding of behavior and a more precise explanation of financial behavior.

The second impact is that the research contributes to FQM by testing in a real-world investment environment. There is criticism of dual processes models in that the operating conditions of the processes cannot be tested empirically (Grayot, 2020). Due to testing in controlled laboratory settings, resulting evidence for dual systems only predicts behaviors and does not provide clarity of decision-making processes in a real-world financial setting (Buturovic & Tasic, 2015). The findings provide some insight into the use of financial advice and the investment strategies adopted by SMSF trustees.

The findings identify that independent behavioral attributes play a role in influencing individual investor decision-making. Active and passive styles are linked to particular investment heuristics and biases: overconfidence and self-control for active; endowment and loss aversion for passive (Barber & Odean, 2013; Pompian, 2011). In contrast, minimal input into investment decision-making was evidence of a passive style. Implementing investment strategies is also a feature of the active style and is a key attribute of the model. This may lead to the conclusion that individual investors display bounded rationality and therefore recognize shortcomings in individual cognition that lead to judgment biases.

Further, there may be an interplay between the FQM and independent behavioral attributes influencing various aspects of SMSF trustee investment behavior. The cluster analysis led to the formation of two separate clusters, with distinctive investment behaviors. Heuristics and biases, along with demographic factors such as gender, appear to significantly influence investment behavior. The assumption that the investor behaves rationally is not entirely evident from the research results; as the study shows, investors behave non-rationally.

Practical Implications

The results may provide some insights into the use of financial advice and the investment strategies SMSF trustees adopt. The research demonstrates that an FQM may be suitable for testing in a real-world setting to see how the processes respond to features of such an environment. Establishing an investment style is potentially the most important decision SMSF trustees can make.

SMSF Trustee

Establishing an investment style is potentially the most important decision an SMSF trustee can make. Deciding on an active or passive style or a mix of both, is critical leading to strategies to achieve retirement goals. The research shows that SMSF trustees are using a style but there little understanding of the efficacy. The development of a decision-making framework is required to guide SMSF trustees on the portfolio construction process, investment strategies and understanding risk/reward trade-off for their investment decision-making.

The research makes an identifiable contribution to individual investor decision-making by the interaction of the investment environment factors and the cognitive model of individual investor. An SMSF trustee is expected to have a high level of financial literacy to make informed financial decisions (ATO, 2022). Behavioral finance assumes that individuals are boundedly rational actors having limited ability to process information. Prior research explored how available information affects the quality and outcomes of decisions (Kahneman, 2003; Simon, 1982). In seeking financial advice and adopting an independent thinking approach to investing, SMSF trustees may be displaying a lack of financial knowledge and information to make educated or informed investment decisions. This may lead to poor investment decisions and persistent underperformance with reduced long-term retirement balances.

Advisers

SMSF trustees have complex investment decision-making needs which are far beyond routine investment advice. Significant implications for financial advisers arise from this research including an opportunity for advisers to grow their practices by assisting under-prepared trustees with this complexity.

This research suggests that financial advice can be enhanced by studying SMSF trustee decision processes and behaviors, thereby creating targeted communication strategies. It may provide insights into individual investor decision-making behavior that could be highly relevant for advisers assisting with the design of client services. Understanding how SMSF trustees think and behave would give financial advisers some fresh insights into how to achieve improved investment outcomes for trustees in the future. When advisers can identify these factors within their client base, they may be able to address them directly and consequently mitigate any negative effects improving risk management.

Policymakers

For policymakers, the extent to which these behavioral factors indicate suboptimal investment decision-making behavior is not well understood. The results of the research present a number of implications for policy relating to the SMSF sector. First, a greater understanding of the influence of FQM on the investment decision processes undertaken by SMSF trustees, may improve their decision utility to maximize retirement incomes. To aid a potential loss of utility, the findings suggest that many SMSF trustees may not fully develop or implement appropriate investment strategies beyond treating them as a regulated compliance action.

Second, the research brings out the potential existence of a number of investor heuristics and biases within the SMSF trustee investment behavior. These behavioral factors may impact the investment decisions of individual investors which may lead to increased compliance risk. For policymakers, the extent to which these behavioral factors are indicative of sub-optimal

investment decision-making behavior is not well understood.

Finally, regulators do not assess the ability of SMSF trustees to make informed investment decisions and undertake all the roles of implementing a fund investment strategy, including analysis and asset allocation. Thus, a promising avenue for future research is to use FQM to develop and test effective interventions such as decision aids, instructions beyond seeking financial advice.

Limitations and Directions for Future Research

The limitations of this research are highlighted here, and it is anticipated that these can provide directions for future research. The study of the behavior of SMSF trustees, and its measurement, is a relatively new area of research in behavioral finance. The decision-making process is iterative, as the SMSF trustee is seen to be learning, adapting, and evolving, reacting with their environment, processing information, then acting upon it (e.g., changes in a portfolio) and adjusting their internal states. Further research on utility-maximization and behavioral variables on other groups of individual investors may provide a more comprehensive understanding of the investment decision process.

While independent attributes including heuristics and biases were a focus of this research, an alternative approach could have been to place more emphasis on the results of SMSF trustees' ongoing investment decision-making through the lens of bounded rational behavior. Future research could be undertaken on a larger sample size to test the conceptual model of investor behavior.

Future research can use real-world settings to develop important implications for dual process theorizing including evaluating the influence of financial advisers on investment decisions made by SMSF trustees. The objective would be to establish the degree to which financial advisers impact these decisions. Another focus for research on investment decision-making is a study on how SMSF trustees overcome behavioral biases. Further research on these biases may suggest that improved knowledge and experience should reduce an individual's susceptibility to bias.

Concluding Comments

This study makes two identifiable contributions to behavioral finance theories. First, the evidence suggests that investment experience and involvement in the investment process impact the decision-making judgment of individual investors. Second, the findings identify that independent behavioral attributes play a role in influencing individual investor decision-making.

This study presents a conceptual model of an individual investor bringing together various behavioral and cognitive elements that play a role in the behavior of individual investors, namely SMSF trustees. The research extends on the extant literature on the investment decision-making process using a multiple processing system of the FQM and independent behavioral attributes. This research has examined whether the FQM can be used to interpret the decision-making behavior of SMSF trustees. The findings are consistent with the decision-making literature.

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Appendix A: Interview questions for in-depth interviews.

Interview Questions: Semi-structured **Source: The researcher**
Accountant/Financial Planner Practitioner

1. How many years' experience have you had with SMSFs?
2. What range of SMSF services do you provide?
3. Do you do more than just the SMSF annual return and compliance?

4. How many funds does your practice have? Pension versus accumulation phase?
5. Do you work with other professionals in this sector?
6. Personal demographic/socio economic details of SMSF members/trustee?
7. What circumstances lead clients to set up a self-managed superfund?
8. What factors were considered in their decision-making?
9. How do trustees/members receive their education/responsibilities on SMSF?
10. What do you believe is a minimum balance/costs?
11. How do trustees measure performance?
12. Risk/Return characteristics of clients?
13. A choice of licensing options now faces accountants who want to handle SMSF business, what is your view and approach?
14. Will SMSF work grow organically or actively?

Appendix B. Description summary of clusters.

Measures		**Self-Managed Cluster Membership**					
		Active (n=168)			**Passive (n=33)**		
		Count	**%**	**Mean**	**Count**	**%**	**Mean**
What age range do you fall into?	Under 34	4	2.40		5	15.20	
	35–49	18	10.70		13	39.40	
	50–59	23	13.70		7	21.20	
	60–69	61	36.30		8	24.20	
	70 and over	62	36.90		0	0.00	
What is your gender?	Male	139	82.70		12	36.40	
	Female	29	17.30		21	63.60	
How many members are there in your SMSF?				2			2
How familiar are you with investing in a Wide range of investment types such as shares, managed funds, property, inside or outside superannuation?	Experienced as an investor	72	42.90		0.00	0.00	
	Some experience as an investor	83	49.40		2	6.10	
	Minimal experience as an investor	13	7.70		14	42.40	
	Have experience with superannuation and personal debt only	0	0.00		4	12.10	
	Not very familiar	0	0.00		13	39.40	
What best describes you with regards to	I do most of the research and analysis of investment decisions	129	76.80		0	0.00	

Measures		Self-Managed Cluster Membership					
		Active (n=168)			Passive (n=33)		
		Count	%	Mean	Count	%	Mean
decision-making?	Decisions are made jointly with members sharing equally	36	21.40		6	18.20	
	While our decisions are made jointly, I have minimal input	3	1.80		10	30.30	
	I have minimal involvement in investment decisions	0	0.00		13	39.40	
	I am not involved in research and analysis	0	0.00		3	9.10	
	I am not involved in investment decisions	0	0.00		1	3.00	
In terms of investment decisions made, how would you describe your SMSF?	Self-initiated investment decisions by member	58	0.35		0	0.00	
	Primarily self-initiated investment decisions in discussion with other decision makers	37	22.00		0	0.00	
	Self-initiated investment decisions with occasional help of other decision-makers and advisers	65	38.70		6	18.20	
	Investment decisions dependent on the advice of experts	8	4.80		12	36.40	
	I have minimal involvement in investment decisions	0	0.00		15	45.50	
	I am not involved in investment decisions	0	0.00		0	0.00	

Appendix C. Demographics.

Appendix 5.0: Descriptive analysis – demographic variables.

Appendix 5a: Demographic statistics.

		What age range do you fall into?	What is your gender?	How many members are there in your SMSF?	How familiar are you with investing in a wide range of investment types such as shares, managed funds, property, inside or outside superannuation?	What best describes you with regards to decision-making?	In terms of investment decisions made, how would you describe your SMSF?
N	Valid	201	201	201	201	201	201
	Missing	0	0	0	0	0	0
Mean		3.72	1.25	2.09	2.01	1.62	2.49
Std. Deviation		1.18	0.43	0.72	1.08	1.02	1.22
Variance		1.40	0.19	0.52	1.16	1.04	1.48

Appendix 5b: What age range do you fall into?

Age range	Frequency	Percent (%)	Cumulative Percent (%)
Under 34	9	4.5	4.5
35 to 49	31	15.4	19.9
50 to 59	30	14.9	34.8
60 to 69	69	34.3	69.2
70 and over	62	30.8	100
Total	201	100	

Appendix 5c: What is your gender?

Gender	Frequency	Percent %	Cumulative Percent %
Male	151	75.1	75.1
Female	50	24.9	100
Total	201	100	

Appendix 5d. How many members are there in your SMSF?

Fund members	Frequency	Percent	Cumulative Percent
1	25	12.4	12.4
2	152	75.6	88.1
3	5	2.5	90.5
4	19	9.5	100
Total	201	100	

Appendix 5e: How familiar are you with investing in a wide range of investment types such as shares, managed funds, property, inside or outside superannuation?

Trustee experience	Frequency	Percent	Cumulative Percent
Experienced as an investor in a wide range of investment types	72	35.8	35.8
Some experience as an investor in a wide range of investment types	85	42.3	78.1
Minimal experience as an investor in a wide range of investment types	27	13.4	91.5
Have experience with superannuation and personal debt only	4	2.0	93.5
Not very familiar	13	6.5	100
Total	201	100	

Appendix 5f: What best describes you with regards to decision-making?

Decision input	Frequency	Percent	Cumulative Percent
I do most of the research and analysis of investment decisions for myself and /or for other members	129	64.2	64.2
Decisions are made jointly with members sharing equally in research and analysis of investment decisions	42	20.9	85.1
While our decisions are made jointly I have minimal input to research and analysis of investment decisions	13	6.5	91.5
I have minimal involvement in investment decisions	13	6.5	98.0
I am not involved in research and analysis of investment decisions	3	1.5	99.5
I am not involved in investment decisions	1	0.5	100
Total 201 100			

Appendix 5g: In terms of investment decisions made, how would you describe your SMSF?

Decision process	Frequency	Percent	Cumulative Percent
Self initiated investment decisions by member	58	28.9	28.9
Primarily investment decisions in discussion with other decision makers (other members)	37	18.4	47.3
Self-initiated investment decisions with occasional help of other decision makers and advisers	71	35.3	82.6
Investment decisions dependent on the advice of experts	20	10.0	92.5
I have minimal involvement in investment decisions	15	7.5	100
Total	201	100	