ORIGINAL ARTICLE

Acceptance of robo-advisors: Effects of financial experience, affective reactions, and self-enhancement motives

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Abstract

Robo-advisors have recently been gaining interest as a technology-enabled means to make financial management easier. The aim of this study is to examine how people's self-assessed financial experience, affective reactions, and the interplay with individual values influence their willingness to use a robo-advisor. We argue that one's self-assessed financial experience influences the willingness to use robo-advisors as a result of different affective reactions (i.e., anxiety and joy) associated with its usage. We further posit that the mediating effect of anxiety varies with individual levels of a motivational factor—self-enhancement—which has been found to regulate anxiety-related feelings. Based on a large-scale nationwide survey with an online sample of American adults, it was found that affective responses (i.e., anxiety and joy) explain (i.e., mediate) the effect of self-assessed financial experience on the willingness to use robo-advisor. Moreover, the mediating effect of anxiety was found to vary with levels of self-enhancement motives. The findings suggest that willingness to use robo-advisors may be increased with positive emotions (e.g., joy) expected from use, while decreased by anticipated negative emotions (e.g., anxiety), and that the relationship may be altered by inducing individuals' self-enhancement motives (e.g., possibility of accumulating wealth).

KEYWORDS
affect, financial technology, robo-advisor, self-enhancement, technology acceptance

1 | INTRODUCTION

Saving for the future and managing finances are difficult issues for many people (Tam & Dholakia, 2014; Thaler & Benartzi, 2004). As a means to ensure better access to financial services and advice, robo-advisors are increasingly becoming available and gaining interest among consumers (Epperson, Hedges, Singh, & Gabel, 2015; EY, 2015). Robo-advisors constitute a new form of financial investment assistance by applying advanced analytics capabilities, which are enabled by improvements in data science techniques and artificial intelligence, in the financial market.

The technology assists people to make decisions regarding savings, asset management and investment, and decisions by asking questions about their goals and preferences as well as their financial situation. Users can determine how much they want to save, as well as the time frame, and the robo-advisor will automatically allocate the money to different financial products—mostly exchange-traded funds (ETFs) but also mutual funds, individual stocks, bonds, futures, or commodities—in the background to create personalized portfolios (c.f., Fidelity, 2018; Schwab, 2018; Vanguard, 2017).

While robo-advisors are continuously gaining market presence among the public, not much is known about the

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drivers of consumers' adoption and use of robo services. One factor that has been found to influence people's financial behaviors is prior level of financial experience. For example, it has been suggested that people who are sophisticated investors may be more open to using robo-advisors (Epperson et al., 2015). This is especially interesting, given that robo-advisors are often positioned to benefit people who are less experienced with financial products and investments, with capabilities to automatically make investment decisions without requiring consumers to know about the technical details regarding how their portfolios are designed.

It can be further hypothesized that varied levels of self-assessed financial experience lead to different affective reactions towards robo-advisors, which subsequently influence adoption and use. A possible explanation is that people's beliefs in their own competencies, which can be shaped through their experience with technology, can lead to different affective reactions towards robo-advisors (Verkasalo, López-Nicolás, Molina-Castillo, & Bouwman, 2010). As previous research has demonstrated, the belief in one's own abilities determines the level of arousal associated with an event (Bandura, Reese, & Adams, 1982). Higher levels of belief in one's own competency can lead to lower negative (i.e., anxiety) and higher positive (i.e., joy) affective reactions towards a task (Bandura et al., 1982; Venkatesh & Bala, 2008). Thus, it can be assumed that people who feel more experienced (due to higher competency beliefs) with financial investments may have higher positive and lower negative affective reactions towards robo-advisors. Considering the influence of affective reactions in the adoption process of technologies (Hackbarth, Grover, & Mun, 2003; Raue et al., 2019; Venkatesh, Thong, & Xu, 2012), it can be further argued that higher levels of positive affective reactions could increase the willingness to adopt robo-advisors, while the opposite effect may hold for negative emotions. Investigation of affective factors is thus key to understanding the links between people's experience with financial products and their willingness to adopt robo-advisors.

This study also considers an external variable—self-enhancement values—which has been found to influence the strength of negative affective reactions on the willingness to use new technology (Hohenberger, Spörrle, & Welpe, 2017). It has been suggested that self-enhancement values "emphasize the pursuit of self-interest by seeking to control people and resources (power) or by exhibiting ambition and socially recognized success (achievement)" (Sagiv, Roccas, Cieciuch, & Schwartz, 2017, p. 631). It was found that the effect of anxiety on the willingness to use a technology was less relevant for people with a higher (vs. lower) need to self-enhance (Hohenberger et al., 2017). Given that robo-advisors aim to help to cumulate resources, it can be inferred that the effect of anxiety on the willingness to use robo-advisors may likely be less pronounced for

people with a higher (vs. lower) need to self-enhance. By taking into account an anxiety-regulating variable, which can be considered as relatively stable, this study looks at characteristics associated with affective reactions in the adoption process of robo-advisors that go beyond the object (i.e., robo-advisor).

In summary, previous research has indicated that one's own experience can determine the willingness to use technology-enabled financial services such as robo-advisors. However, previous research has not provided sufficient explanation for *why* this happens. One possible explanation is experience in a field can elicit different levels of affective reactions (i.e., anxiety and joy) (Bandura et al., 1982; Venkatesh & Bala, 2008). Elicited emotions can act as an indicator to approach or avoid a technology respective to the valence of the emotions. Concretely, when people feel more anxious they reduce their intention to use a technology, whereas the opposite is true for joy (Moon & Kim, 2001; Shen, Huang, Chu, & Hsu, 2010). Thus, a research objective associated with this study is to examine whether affective reactions can explain *why* different levels of financial experience influence the willingness to use robo-advisors. This study aims to determine whether the negative effect of anxiety on the willingness to use robo-advisors differs in dependence of individual personal values. We argue that people with a higher need (vs. lower need) to self-enhance put less importance on the effect of anxiety on the willingness to use robo-advisors, providing insights for *whom* negative affective reactions are especially relevant. Based on empirical data, we seek to not only identify the underlying causes in dependence of one's own financial experience (i.e., affective reactions) that should be addressed, but also add insights about whom to target in particular (i.e., those with less financial experience) in which manner (i.e., appealing to self-enhancement motives).

2 | THEORETICAL BACKGROUND

As discussed in Jung, Dorner, Glaser, and Morana (2018), previous research regarding consumer interactions with robo-advisors has focused primarily on identifying design principles and requirements. Understanding consumer acceptance or adoption remains a topic to be investigated. This section presents related discussions in understanding consumer acceptance of various technology-enabled systems and services. This section also discusses how different factors and constructs may apply to describing consumer acceptance of robo-advisors.

2.1 | The influence of experience on technology adoption

A person's past experience with technology can determine the willingness to use a more innovative technology in a related field. For example, Lee, Ward, Raue, D'Ambrosio,

and Coughlin (2017) found that people with higher self-reports of technology experience, confidence, and trust were more likely to be interested in using autonomous vehicles. With increasing experience, the effect of a technology's perceived ease of use on willingness to use becomes weaker, as those who have experience and more familiarity have a clearer understanding of its functions (Venkatesh & Bala, 2008). Robo-advisors operate at the intersection of mobile or computer technology and financial services, both of which have existed for a relatively long period of time. In fact, the adoption rate of the internet has steadily increased over the last 10 years (Perrin & Duggan, 2015). Hence, people's experience with the underlying technologies that enable robo-advisors (i.e., internet or mobile apps) might already be appropriately defined as sophisticated.

In contrast, while financial experience is known to influence investment decisions (Lyons, Chang, & Scherpf, 2006), investment decision making still remains a complex issue (Hastings, Madrian, & Skimmyhorn, 2013). While consumer experience with the underlying technology underlying the use of robo-advisors seems to already have been established, experience in the respective field of the application (i.e., financial management and investments) varies greatly. The effects of experience need to be further understood. Experience with financial investments is an antecedent for online (Tan & Teo, 2000) and offline (Lyons et al., 2006) investment decisions. In Woodyard and Grable (2018), individuals' objective and subjective financial knowledge are discussed to determine under- or over-confidence, which are thought to significantly affect robo-advisor acceptance. This is especially relevant due to the fact that the simplification of financial investments through new technologies, such as robo-advisors, might help people to overcome their shortage of knowledge and experience in the financial domain.

In summary, past research has demonstrated that people's experience with traditional technologies (e.g., internet, car) strongly influence new but related technologies. While it has already been discussed that domain knowledge and experience (e.g., knowledge of financial markets, investment experience) can influence the adoption of related technological innovations, additional evidence is necessary to further investigate the possible effects. Thus, we hypothesize that:

H1 Higher levels of financial experience lead to a higher willingness to use robo-advisors.

2.2 | The influence of experience on affective reactions towards technology

People's belief in their own competencies can determine the level of arousal associated with an event (Bandura, 1988). It has been observed that people with a higher belief in their competencies tend to anticipate lower levels of negative affect when faced with a task (Bandura et al., 1982). Conversely, the higher the belief in one's own competencies, the higher the positive emotions associated with a task (Venkatesh & Bala, 2008). However, the effect of competency beliefs has been found to be less influential on acceptance when people have more time to try out a technology (Venkatesh & Bala, 2008). This might indicate that people's competency beliefs are strengthened through experience, which in turn might also influence their affective reaction towards a technology. For example, Verkasalo et al. (2010) showed that people who have experienced internet services (vs. no experience) exhibit higher levels of enjoyment related to the services. Other research by Lu, Zhou, and Wang (2009) found a positive relationship between actual experience and the perceived enjoyment of instant-messaging systems.

Conversely, research by Hackbarth et al. (2003) has demonstrated that people who have more (vs. less) experience with Microsoft Excel report lower (vs. higher) levels of negative emotions (i.e., anxiety). Further research by Bozionelos (2001) has found a similar effect with regard to computers.

To sum up, research has shown that the level of experience with a technology can determine a person's affective reaction towards it. Less (vs. more) experience tends to elicit higher (vs. lower) levels of negative and lower (vs. higher) levels of positive emotional reactions. Given that people have had time to try out mobile or internet-based technologies over the last decade, their level of experience might already be relatively high, but they may lack experience with financial products. In this study, we focus on the field of application of the technology (i.e., financial investments). Thus, we posit that:

H2a Higher levels of financial experience lead to lower levels of anxiety towards the use of robo-advisors.

H2b Higher levels of financial experience lead to higher levels of joy towards the use of robo-advisors.

2.3 | The influence of affective reactions in the technology adoption process

Emotions play a pivotal role for people when facing an object by providing internal feedback regarding decisions to approach or avoid the object (Clore & Huntsinger, 2009; Frijda, Kuipers, & Ter Schure, 1989; Loewenstein, Weber, Hsee, & Welch, 2001). Anxiety, in contrast to other negative emotions (e.g., anger), can be classified as a behavioral-avoidance indicator towards an object (Carver, 2004; Frijda

et al., 1989). Anxiety's negative behavioral influence in consumer adoption processes has been shown across a variety of technologies. For example, higher perceptions of anxiety towards autonomous cars (Hohenberger et al., 2017), computers (Compeau & Higgins, 1995), and self-serving technologies (e.g., automated teller machines) reduce the willingness to use these services (Blut, Wang, & Schoefer, 2016). When focusing on financial technologies, such as mobile banking, anxiety, has been found to be a negative antecedent of a person's willingness to adopt the technology (Shen et al., 2010).

Due to the fact that robo-advisors are a digital financial technology, which is used in an online or mobile environment, it can be assumed that higher levels of anxiety will reduce the willingness to adopt robo-advisory services. Further support for this possibility stems from research on risk perception and financial behavior, which suggests that feelings of anxiety can convey information about risks associated with an event (So et al., 2015), such that investing money entails a risk of loss, which in turn shapes a preference for low risk and reward options (Raghunathan & Pham, 1999). As such, we hypothesize the following:

H3a Higher levels of anxiety lead to lower willingness to use robo-advisors.

In contrast to negative emotions, positive emotions can act as a behavioral-approach indicator for a decision maker (Carver, 2003) and may increase willingness to adopt a technology. Joy is an emotion that can indicate to an individual if it is worth pursuing a certain goal (e.g., usage of a new technology) in order to experience positive feelings (Carver, 2003). The hedonic feedback expected with the use of a technology has been found to positively influence the adoption willingness of the internet (Moon & Kim, 2001), mobile internet (Venkatesh et al., 2012), autonomous cars (Hohenberger, Spörrle, & Welpe, 2016), online games (Li, Liu, Xu, Heikkilä, & Van Der Heijden, 2015), and smartwatches (Hong, Lin, & Hsieh, 2017). Hence, we hypothesize that positive associations, especially joy, will positively influence the willingness to adopt with robo-advisors, such that:

H3b Higher levels of joy lead to higher willingness to use robo-advisors.

Considering that self-assessed experience might elicit affective reactions towards robo-advisors, which in turn may influence the willingness to use robo-advisory services, it can be hypothesized that:

H4 The effect of self-assessed experiences on the willingness to use robo-advisors is mediated through affective reactions.

2.4 | The interplay between negative affective reactions and self-enhancement in the technology adoption process

According to So et al. (2015), emotions can prime self-regulation goals (e.g., showing status), which in turn can influence people's choices (e.g., buy vs. decline to buy). Given this study's focus on anxiety, which can be seen as a self-focused emotion that is a response to a threatening stimuli (Gross & Hen, 2004), it is likely that anxiety activates self-regulation goals, which often leads a person to avoid the respective object.

However, it has been shown that the relevance of affective experiences, and thus the subsequent behavior towards an object, might differ in dependence on one's own self-regulation mechanism (Tsai, Chiang, & Lau, 2015). More precisely, it has been found that personal values can act as a self-regulation mechanism used to cope with negative emotions in order to maintain the process of goal achievement (Tsai & Lau, 2013). Among personal values, self-enhancement has been found to serve as an anxiety regulator mechanism (Schwartz et al., 2012; Tsai et al., 2015). Self-enhancement is a personal value that helps someone focus on "the pursuit of self-interest by seeking to control people and resources (power) or by exhibiting ambition and socially recognized success (achievement)" (Sagiv et al., 2017, p. 631).

Recent research on technology adoption has demonstrated that feelings of anxiety elicited by a new technology, which is linked to status perceptions and the subsequent willingness to use technology, are less relevant for people who have a high (vs. low) self-enhancement motivation (Hohenberger et al., 2017). This indicates that self-enhancement values can act as a regulator mechanism to control anxiety-related feelings as a way to achieve one's goal (i.e., using the technology). Thus, in a technology context, anxiety as an avoidance indicator towards an object does not necessarily have the same strength of indication for every person but may vary with different levels of self-enhancement.

Robo-advisors were developed as a means to increase people's resources (e.g., time and money). Robo-advisors might, therefore, be perceived as an object to fulfill self-enhancement goals. Robo-advisors also are likely to be associated with anxiety-related feelings when a person thinks about using such a service. However, people with high self-enhancement (vs. low) motivation (i.e., the need to possess material resources such as money) should be more likely to suppress negative feelings associated with anxiety resulting from the usage of robo-advisors. Therefore, we hypothesize that:

H5 The negative effect of self-assessed financial experience on the willingness to use robo-advisors through anxiety

decreases with increasing levels of self-enhancement motivation.

3 | METHOD

3.1 | Study design

A conceptual research model was developed based on findings and suggestions from the literature and related research. The model, which is illustrated in Figure 1, describes relationships hypothesized in the previous section. Measures for different items described in the model were selected and defined based on past studies that used similar measures for understanding adoption and use of technologies in a variety of domains.

3.2 | Procedure

A questionnaire was designed to gather people's perceptions of, attitudes towards, and willingness to adopt and use robo-advisors. Questions were written to reflect the measures selected for testing the hypotheses. Questions were developed in order to capture various aspects of perceptions and attitudes that predict adoption and use. In order to learn about other characteristics that may affect acceptance of a robo-advisor, questions were also asked around financial experiences in general, personal values, and participant demographics. Key questions asked in the study are presented in Table 1. The operational definitions for the personal values, as stated in Table 1, followed descriptions previously presented by Schwartz et al. (2012) and Hohenberger et al. (2017). To measure participants' answers, 5-point Likert-scales, ranging from 1 to 5 (e.g., 1 = strongly disagree, 5 = strongly agree), were used. The exact labels varied across questions as summarized in Table 1.
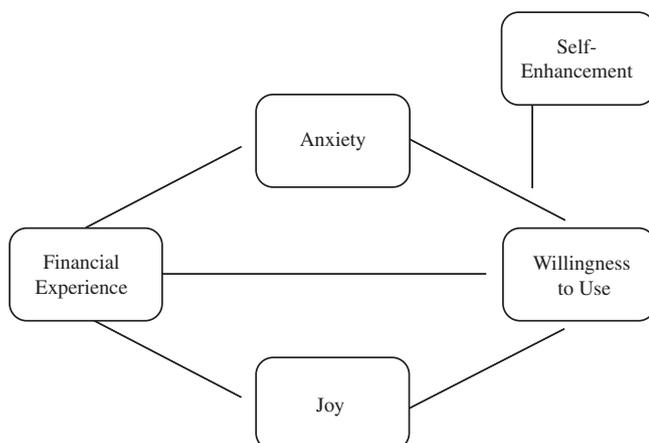

FIGURE 1 Research model

The questionnaire also included the following short description of a robo-advisor:

> "A robo-advisor is an online service that provides automated financial advice or portfolio management without the use of human financial planners. Robo-advisors can also help you to save money for certain situations in life (e.g., retirement or education savings) by calculating your individual savings rate according to your goals and preferences. A robo-advisor uses mathematical rules or algorithms and technological capabilities to simulate the judgment and behavior of an experienced human with specialized knowledge. Based on information about a user's financial situation and investment preferences, the software can provide advice and/or choose stocks and other investments for the user."

Participants were shown the description before the questions displayed in Table 1 were asked, in order to establish a baseline level of knowledge.

3.3 | Data collection and measures

The survey was conducted in the United States, and responses were collected from a sample of 630 adults. In order to gather responses among the main target segment of those who may potentially use a robo-advisor, participation was limited to people born between 1946 and 1997. Data collection was administered online with a panel service provided by Qualtrics (http://qualtrics.com) to gain access to a broad and diverse sample within the age inclusion criteria, as well as to ensure a balanced split in terms of key demographic variables including age, gender, and household income. No restriction was applied for employment, ethnicity, or geography. As summarized in Table 2, the sample represented a broad range of demographic traits and socio-economic characteristics. The sample was evenly split across three generations—Baby Boomers (born 1946–1964), Generation X (born 1965–1980), and Millennials (born 1981–1997). Likewise, participants were representatively split between males and females. The majority (56.2%) of the sample reported an annual household income of less than $50,000. The majority of the sample were employed (full-time: 38.1%, part-time: 10%, self-employed: 8.1%). About half were married or living with a partner (50.6%), whereas the majority of the sample was White (78.7%).

The majority of participants had never used a robo-advisor for financial planning and financial management help ($N = 594$, 94.3%). It was also noted that the majority of

TABLE 1 Operationalization of variables used in the survey

Focus		Measure	Question statement	Response scale (5-point Likert-scale)
Object-related	Trait	Financial experience	How would you rate your degree of experience regarding financial investments?	1: Little or no experience ~5: a great deal of experience
	State	Joy	Please indicate how much you think the following characteristic describe robo-advisors: enjoyable to use	1: Strongly disagree ~ 5: strongly agree
	State	Anxiety	Please indicate how much you agree with each statement below. – I would be afraid to use a robo-advisor for fear of making mistakes in the process (e.g., investment plan, registration) that cannot be corrected. – I would be afraid that I could cause a technical error when using a robo-advisor. – I would be afraid that I could make errors in my investment when using a robo-advisor	1: Strongly disagree ~ 5: strongly agree
	Behavior	Willingness to use	Please indicate how much you agree with each statement below. – I could imagine using a robo-advisor as a means of financial management. – I am willing to invest with a robo-advisor. – I could imagine using a robo-advisor instead of a human financial advisor.	1: Strongly disagree ~ 5: strongly agree
Non-object-related	Trait	Personal values	Introduction: Please rate how important the following values are to you in your daily life.	1: Not important at all ~ 5: very important
		Higher-order	Self-enhancement	
		Lower-order	Achievement	
			Personal success through demonstrating competence according to social standards.	
			Power	
			Social status and prestige—having power over people and resources	
		Higher-order	Self-transcendence	
		Lower-order	Benevolence	
			Understanding, appreciation and tolerance for the welfare of all people and the nature	
			Universalism	
			Supporting the welfare of my family and other people close to me	
		Higher-order	Openness to change	
		Lower-order	Stimulation	
			Excitement, novelty and change in life	
			Hedonism	
			Pleasure and enjoyment for myself	
			Self-direction	
			Independent thought and action—choosing, creating and exploring my own goals	
		Higher-order	Conservation	
		Lower-order	Tradition	
			Respect and acceptance of other customs, religions or cultures	
			Security	
			Safety, harmony and stability of society, family and myself	
			Conformity	
			Obeying social expectations and norms to prevent from harming others	

the sample had never used a human financial advisor ($N = 426$, 67.6%). When asked to self-assess their financial experience, 33.7% of participants said they have average experience, while about half of the sample reported being inexperienced (24.1% little or no experience, 24.3% less than average experience). A smaller number of participants reported having more than average experience (12.1%) or a great deal of experience (5.9%). Additionally, a question on the self-assessed complexity of their overall financial situation showed that about half of the sample evaluated their financial situation to be of average complexity (48.4%). Participants were more likely to report having a simple financial situation (8.6% extremely simple, 25.4% quite simple) compared to a complicated situation (12.1% quite complicated and 5.6% extremely complicated).

3.4 | Statistics

The PROCESS macro for SPSS by Hayes (2012) was used to analyze the data. The PROCESS macro is a tool for path analysis and uses a regression-based approach, which is able to handle multiple mediating variables by simultaneously calculating a moderation when predicting one dependent variable. The PROCESS macro is able to automatically standardize the moderating variables, include the formed interaction term of them, and directly calculate conditional effects in moderation models. Moreover, the PROCESS macro delivers identical coefficients and *SE*s similar to structural equation modeling (SEM) approaches (Hayes, 2013; Hayes, Montoya, & Rockwood, 2017). For continuous variables, PROCESS estimates outcomes by ordinary least square estimations.

4 | RESULTS

4.1 | Main effects

Correlational effects can be found in Table 3. In order to test hypotheses H1 through H2b, a regression-based analysis was first applied. Variables including self-assessed financial experience and emotions (i.e., anxiety and joy) were entered as predictors, whereas willingness to use a robo-advisor served as the criterion. Age, gender, ethnicity, marital status, education, employment, and income dummies, as well as prior usage of a robo-advisor were included as covariates. Demographic covariates were included as these have been found to influence technology adoption in different domains (c.f., Lee & Coughlin, 2015, Lee et al., 2017; Ward, Raue, Lee, D'Ambrosio, & Coughlin, 2017).

As expected, participants who assessed themselves as financially experienced were more likely to be willing to use robo-advisors ($\beta = .13$, $p < .01$, 95% CI [.05, .22]),

TABLE 2 Sample profile ($N = 630$)

Characteristics	Descriptive statistics
Age (year of birth)	Baby Boomers (born 1946–1964): 210 (33.3%) Generation X (born 1965–1980): 210 (33.3%) Millennials (born 1981–1997): 210 (33.3%)
Gender	Male: 313 (49.7%) Female: 315 (50.0%) Other or prefer not to answer: 2 (0.3%)
Marital status	Single, never married: 208 (33.0%) Married or living with a partner: 319 (50.6%), divorced or separated: 75 (11.9%) Widowed: 28 (4.4%)
Ethnicity	White: 496 (78.7%) Black or African-American: 59 (9.4%) Hispanic or Latino: 36 (5.7%) Asian or Asian-American: 23 (3.7%) Other or multiracial: 16 (2.6%)
Education (highest level completed)	Some high school or less: 23 (3.7%) high school diploma: 143 (22.7%) Some college: 131 (20.8%) Trade/technical/vocational school or associate's degree: 91 (14.4%), college degree: 157 (24.9%) Some postgraduate work: 20 (3.2%) Postgraduate degree: 65 (10.3%)
Employment	Employed full-time: 240 (38.1%) Employed part-time: 63 (10.0%) Self-employed: 51 (8.1%) Not employed: 65 (10.3%) Retired: 94 (14.9%) Student: 27 (4.3%) Homemaker: 80 (12.7%) Other: 24 (3.8%)
Annual household income (U.S. Dollar)[a]	Less than $25,000: 149 (23.7%) $25,000 or more but less than $50,000: 205 (32.5%) $50,000 or more but less than $75,000: 126 (20.0%) $75,000 or more but less than $100,000: 69 (11.0%) $100,000 or more but less than $150,000: 55 (8.7%) $150,000 or more but less than $250,000: 17 (2.7%) $250,000 or more: 8 (1.3%)

[a]One missing income data.

confirming H1 (higher levels of financial experience lead to a higher willingness to use robo-advisors). Besides the main hypothesis, we found that willingness to use a robo-advisor declined with increasing chronological age ($\beta = -.28$,

TABLE 3 Means, standard deviations, skewness, kurtosis, and correlations among variables

	M	SD	SK	KU	Range	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Age	44.86	14.45	0.08	−1.19	20–71	(—)	.14**	−.11**	−.27**	.03	−.23**	−.35**
(2) Sex (2 = female)[a]	1.50	0.50	0.09	−2.01	1–2	.13**	(—)	−.26**	−.09*	.09*	−.16**	−.19**
(3) Financial experience	2.51	1.15	0.31	−0.64	1–5	−.11**	−.26**	(—)	.19**	−.25**	.31**	.27**
(4) Joy	3.20	1.16	−0.34	−0.45	1–5	−.27**	−.09*	.17**	(—)	−.25**	.28**	.59**
(5) Anxiety	3.46	1.04	−0.46	−0.39	1–5	.01	.08*	−.23**	−.21**	(.90)	−.05	−.45**
(6) Self-enhancement[b]	2.80	1.04	0.25	−0.61	1–5	−.22**	−.15**	.28**	.26**	−.05	(.63)	.29**
(7) Willingness to use	2.81	1.18	−0.16	−1.02	1–5	−.34**	−.19**	.27**	.56**	−.45**	.27**	(.94)

Note: M = mean, SD = standard deviation; SK = skewness, KU = kurtosis, code for sex 1 = male, 2 = female, N = 630. Because most skewness and kurtosis values are within the range of −1.00 and +1.00 suggested by Muthén and Kaplan (1985) parametric analyses seem justified. Pearson correlation above main diagonal and Spearman correlation below main diagonal. All measures show a good discriminant validity because correlations among constructs are lower than their Cronbach's coefficient alpha (c.f., Andaleeb, 1995).

[a]Two people did not indicate their gender.

[b]Values prior to the centering procedure suggested by Schwartz (1992); afterwards: M = −0.94, SD = 0.77, SK = −0.04, KU = −0.39, Range = [−3.20; 1.20].

*p < .05; **p < .01.

p < .001, 95% CI [−.03, −.01]). Those who were married or living with a partner (vs. single or never married) showed a higher willingness to use a robo-advisor (β = .10, p < .05, 95% CI [.02, .39]). Moreover, White participants were more likely to be willing to use a robo-advisor (β = −.07, p < .05, 95% CI [−.90, −.01]), and participants with some postgraduate work (vs. some high school degree or less), exhibited a higher willingness to use a robo-advisor (β = .12, p < .05, 95% CI [.12, 1.22]).

Decreasing levels of self-assessed financial experience were associated with higher levels of perceived anxiety (β = −.19, p < .001, 95% CI [−.29, −.11]) and lower levels of perceived joy (β = .10, p < .05, 95% CI [.01, .19]), confirming H2a (higher levels of financial experience lead to lower levels of anxiety towards robo-advisors) and H2b (higher levels of financial experience lead to higher levels of joy towards robo-advisors). Focusing on emotional influence as a factor describing the willingness to use robo-advisors, it was observed that higher levels of anxiety were associated with a lower (β = −.32, p < .001, 95% CI [−.38, −.26]) willingness to use, and that higher levels of joy were associated with a higher (β = .41, p < .001, 95% CI [.35, .47]) willingness to use robo-advisors, confirming H3a (higher levels of anxiety lead to lower willingness to use robo-advisors) and H3b (higher levels of joy lead to higher willingness to adopt use robo-advisors).

4.2 | Mediated effect of affective reactions on the willingness to use a robo-advisor

To test whether affective reactions mediate (i.e., explain *why*) the effect of financial experience on the willingness to use a robo-advisor, we performed a regression-based multiple mediation analysis by using the PROCESS macro for SPSS (model 4; 5,000 bootstrap samples) from Hayes (2012). The macro is able to perform automatically a multiple mediation analysis with one dependent, as well as an independent variable, several covariates, and multiple mediators in one process. The total, direct, and indirect effects, as well as confidence intervals, were calculated using the tool (c.f., Hayes, 2013).

Financial experience was entered as the predictor, the affective measures (i.e., anxiety and joy) served as the mediating variables, and willingness to use a robo-advisor was used as the criterion. Age, gender, ethnicity, marital status, education, employment, and income dummies, as well as prior usage of robo-advisor were entered as covariates. The original effect of financial experience on the willingness to use a robo-advisors (c path: β = .13, p < .001, 95% CI [.05, .22]) was eliminated when entering anxiety and joy as mediating variables (c' path: β = .02, ns, 95% CI [−.05, .08]) indicating a fully mediating effect.

This confirmed hypothesis H4 (effect of self-assessed experiences on the willingness to use robo-advisors is mediated through affective reactions) by demonstrating that anxiety (indirect effect of anxiety: .06, 95% CI [.03, .09]) and joy (indirect effect of joy: .04, 95% CI [.01, .08]) were able to explain the effect of one's own financial experience on the willingness to use robo-advisors (i.e., due to different affective reactions). The mediating effect still held when controlling for the potential influence of confounding covariables.

4.3 | Moderated effect of self-enhancement on the effect of anxiety and willingness to use a robo-advisor

To examine whether self-enhancement is associated with the effect of anxiety on the willingness to use a robo-advisor, a moderation analysis was performed using implementations in the PROCESS macro (model 1; 5,000 bootstrap samples) (Hayes, 2012). Anxiety was the predictor, whereas self-enhancement was entered as the moderating variable, and willingness to use a robo-advisor was used as the criterion. Age, gender, ethnicity, marital status, education, employment, income dummies, prior usage, and personal values were included as covariates.

However, due to multicollinearity indicated by the high correlation between self-transcendence and conservation ($r = .67$, $p < .01$), self-transcendence was dropped from the analyses.[1] Removing one variable is a common recommended procedure for correcting multicollinearity (Allison, 1999; Tabachnick, Fidell, & Osterlind, 2001).

Results showed that the negative effect of anxiety on the willingness to use a robo-advisor decreased with increasing levels of self-enhancement (interaction effect: $\beta = .09$, $p < .001$, 95% CI [.04, .20]). As recommended by Aiken and West (1991), follow-up analyses were employed to examine the strength of anxiety on the willingness to use a robo-advisor for different levels of self-enhancement (Figure 2). The effect of anxiety on the willingness to use robo-advisors was especially pronounced for participants with low (-1 SD below the mean: $\beta = -.51$, $p < .001$, 95% CI [$-.61$, $-.42$]) levels of self-enhancement. The effect significantly decreased with medium (mean: $\beta = -.42$, $p < .05$, 95% CI [$-.49$, $-.36$]) and high levels ($+1$ SD below the mean: $\beta = -.33$, $p < .05$, 95% CI [$-.42$, $-.24$]) of self-enhancement. This confirms hypothesis H5 (negative effect self-assessed financial experience on the willingness to adopt use robo-advisors through anxiety decreases with increasing levels of self-enhancement) by showing that self-enhancement orientation determines the relevance of anxiety in the robo-advisor adoption process.
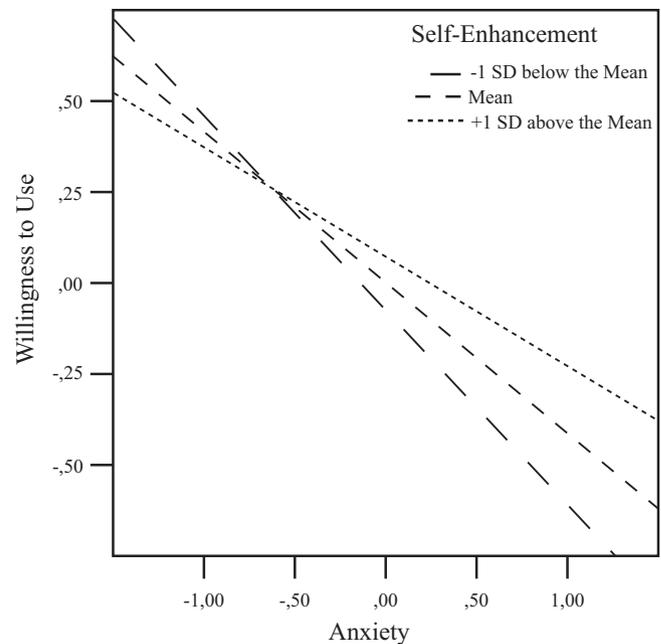
FIGURE 2 The moderating effect of anxiety on willingness to use with different levels of self-enhancement. *Note:* Standardized values were used for analysis

4.4 | Moderated mediation effect of self-enhancement on the effect of financial experience and willingness to use through affective reactions

Given (a) the buffering effect (i.e., moderation) of self-enhancement on the negative effect of anxiety on the willingness to use a robo-advisor as well as (b) the mediating effect of anxiety and joy on the association between financial experience and the willingness to use a robo-advisor, one might assume that the indirect effect of financial experience on the willingness to use a robo-advisor through anxiety depends on levels of self-enhancement. To test for a moderated mediation, we performed a moderated mediation analysis implemented in the PROCESS macro (model 14; 5,000 bootstrap samples) (Hayes, 2012). This model performed a combined moderation and mediation analysis in one model, where the analysis was "based on an interval estimate of the parameter of a function linking the indirect effect to values of a moderator" (Hayes, 2015, p. 1). The analysis is defined as the index of moderated mediation, which indicates a moderated mediation, when the result is different from zero by, for instance, a confidence interval (Hayes, 2015).

For the moderated mediation analysis, financial experience was entered as a predictor, anxiety. and joy were used as mediator variables, and self-enhancement was entered as a moderator variable. Age, gender, ethnicity, marital status, education, employment, income dummies, prior usage, and
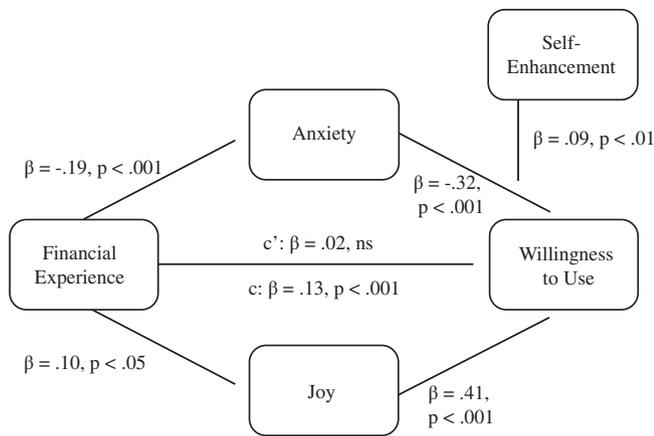
FIGURE 3 Final model depicting the results

personal values served as covariates. The results showed that the index of moderated mediation for anxiety did not include zero in the confidence interval (point estimate: $-.02$, 95% CI $[-.04, -.01]$) indicating a moderated mediation effect. The index was not significant for joy (point estimate: .003, 95% CI $[-.002, .013]$). A follow-up analysis showed that the indirect effect of anxiety was especially pronounced for people with low levels of self-enhancement (point estimate: .08, 95% CI $[.04, .13]$) but the effect decreased with medium (point estimate: .06, 95% CI $[.03, .09]$), and high levels (point estimate: .04, 95% CI $[.02, .07]$) of anxiety. Thus, the effect of financial experience on the willingness to a use robo-advisor through anxiety depended on individual levels of self-enhancement. This effect was not observed for joy (Figure 3).

5 | CONCLUSION AND DISCUSSION

5.1 | Summary of findings

Current trends in technology within the personal and household financial management domain call for a better understanding of potential users' perceptions and acceptance. This study examined two underlying effects related to explaining *why* and *how* people with varied degrees of self-assessed financial experiences differ in their willingness to use a robo-advisor. Based on a mediation analysis, this study was able to explain *why* differences in self-assessed financial experience occur. More concretely, results showed that people with higher (vs. lower) self-assessed financial experience exhibit lower (vs. higher) levels of anxiety and higher (vs. lower) levels of joy towards the thought of using a robo-advisor. Higher levels of anxiety were associated with a decreased willingness to use a robo-advisor, whereas higher levels of joy were related to a higher willingness to use robo-advisor. The differences with regard to affective reactions were able to explain *why* people differ in their

willingness to use a robo-advisor. People with higher (vs. lower) self-assessed experience do not feel more (vs. less) joy but they do feel less (vs. more) anxious, which in turn is associated with their willingness to use a robo-advisor.

Furthermore, a moderated mediation analysis explained *how* people with varying levels of self-assessed financial experience differ in their willingness to use a robo-advisor. Results showed that the indirect effect of self-assessed financial experience on the willingness to use a robo-advisor through anxiety varies with individual levels of self-enhancement orientation. Stronger self-enhancement motivation was associated with smaller effects of self-assessed financial experiences on the willingness to use a robo-advisor through anxiety. This finding explains *how* differences in the self-assessed financial experience on the willingness to use robo-advisors through anxiety occur by diminishing the negative indirect effect of self-assessed financial experience on the willingness to use robo-advisors through anxiety.

In summary, this study adds to existing discussions around the role of individuals' assessment of financial experience related to using new financial technologies. This study finds that subjective assessment of financial experience can explain people's willingness to use robo-advisors, thus demonstrating that people take into account their prior behavioral experience with financial investments when they think about using a new financial technology. Such reflections of past experiences are also found to affect people's emotions (i.e., joy and anxiety) towards robo-advisors. Subsequently, these emotions can explain the effect of one's self-assessed financial experience on the willingness to use robo-advisors. Thus, differences in the subjective assessments of financial experience on the willingness to use a robo-advisor can be eliminated by altering people's affective reactions towards these service providers. Furthermore, findings show that one's motivation to self-enhance can diminish the negative effect of anxiety on the willingness to use robo-advisors.

5.2 | Research contribution

This study extends current research on robo-advisors by providing answers to questions around why and how people might differ in their willingness to use a robo-advisory service. Empirical evidence thus far has lacked descriptions about the predictive validity of variables in the adoption process of robo-advisors. This study introduced an object-related trait (i.e., self-assessed financial experience), which was able to predict people's willingness to use a robo-advisor. The addition of object-related affect measures (i.e., anxiety and joy) provided evidence for the relevance of

affective reactions in the adoption process of robo-advisors. In addition, an external, non-object-related trait (i.e., self-enhancement) was also found to influence the effect of the object-related trait on the willingness to use a robo-advisor through the object-related affect.

Results showed that a participant's self-assessed financial experience can predict differences in the willingness to use a robo-advisor. However, this effect can be fully explained by the different affective reactions of anxiety and joy towards robo-advisors, which in turn negatively (i.e., anxiety) or positively (i.e., joy) influence the willingness to use a robo-advisor. Moreover, the effect of self-assessed financial experience on the willingness to use a robo-advisor through anxiety depends on individual levels of self-enhancement. With increasing levels of self-enhancement, the effect of self-assessed financial experience on the willingness to use a robo-advisor through anxiety diminishes.

5.3 | Theoretical contributions

This research sheds additional light on the process of technology adoption. First, in prior research, experience was mainly considered to be a moderating variable (e.g., Sun & Zhang, 2006), mostly operationalized with actual usage (e.g., Venkatesh & Bala, 2008). By introducing self-assessed experience, and thus a person's subjective estimation, this study was able to show this variable's relevance in the technology adoption process.

Second, given that existing research has already focused on the direct effect of one's own experience with technology and the willingness to use new adoptions in the field (c.f., Lyons et al., 2006; Yu, Lin, & Liao, 2017), this study was able to explain one underlying mechanism for this tendency (i.e., different affective reactions). Thus, the findings provide an explanation as to why people with varying experience differ in their willingness to use new technology innovations. This study demonstrates that affective reactions do not only operate as independent variables in the technology adoption process (c.f., Li et al., 2015; Venkatesh & Bala, 2008; Venkatesh et al., 2012) but also as mediators to explain behavioral differences in the willingness to use technology. This study extends existing research that has investigated indirect effects of demographics on the willingness to use technology through affective reactions (e.g., Hohenberger et al., 2016), by showing a mediating effect also for behavioral characteristics such as experience.

Third, this study adds to the understanding of the roles that the personal characteristics of an adopter play on the effect of object-related traits and states on the willingness to use a technology. It was found that an individual's need to self-enhance can act as a buffer to alleviate the effect of competency beliefs on the willingness to use a technology

through anxiety. With increasing levels of self-enhancement, the negative indirect effect of self-assessed financial experience on the willingness to use a robo-advisor is diminished. This demonstrates that while joy, as a positive emotion, generally acts as an object approach indicator and anxiety as the opposite (Carver, 2003), self-enhancement motivation is able to reduce the strength of an avoidance indicator, thus overriding its initial function (i.e., behavior avoider). Existing research has already found the buffering effect of self-enhancement on stress related events (Tsai et al., 2015) and for technology products in the public context, such as autonomous cars (Hohenberger et al., 2017). Given that people's consumption behavior can differ in a public or private context (Griskevicius, Tybur, & Van den Bergh, 2010), this study provides additional evidence that the buffering effect of self-enhancement on the relationship of anxiety and the willingness to use a technology also holds in private contexts, where other people cannot observe one's own behavior. Furthermore, adding to discussions around self-enhancement motivations manifest in a multidimensional way (e.g., impressing others or control resources) (Sagiv et al., 2017; Schwartz et al., 2012), this study demonstrates the buffering phenomenon in other situations, which allow people to control resources (vs. impressing others) (c.f., Hohenberger et al., 2017). The results from this study indicate a universal buffering effect of self-enhancement on the relationship between anxiety and willingness to use in technological contexts. Future research could examine the relevance of self-enhancement in the adoption process of technologies that offer the opportunity to fulfill one's achievement motivation (e.g., education technology).

5.4 | Practical contribution

The findings from this study can help inform policy makers when developing programs that foster awareness and adoption of robo-advisors among those with limited access to financial services. Given that people who feel less experienced with financial products are more reluctant to use them, the user experience design should evoke less negative and as much positive emotions as possible. This can be done by, for example, by creating a fluent user flow when using robo-advisors (Graf & Landwehr, 2015) or by reducing unnecessary elements while focusing on simplicity (Schwarz, 2018). The needs of people with low levels of experience can be addressed with customized and targeted messages based on specific financial experience and knowledge categories. For instance, for those that indicate very low levels of financial experience when filling out the form, service providers may be more successful by inducing self-enhancement motivations to improve acceptance. This can be done by showing potential users that they have control over their own

financial assets (e.g., inducing power motives) or that they can accumulate money over time (e.g., inducing achievement motives). Moreover, companies can attempt to segment potential customers along self-enhancement motivation levels and target them as lead users. This can be done by asking (potential) customers short statements about the importance of personal values in daily life. After calculating a score, companies can create new persona types (e.g., self-enhancer, etc.), which will allows companies to segment and target potential users accordingly.

Another implication for financial service providers and financial regulation authorities is to consider ways to standardize some of the questions and items that are used to gather information about individual consumers, including their financial goals, risk profile, and investment experience. Consistent and regulated practice standards regarding these questions exist for in-person financial advisory and planning currently. However, as stated by Faloon and Scherer (2017), questions that robo-advisors ask to consumers to assess risk-taking behavior, for example, are not always validated and often ad-hoc. And as discussed in Kaya (2017), such questions are usually not sufficient to gather a complete overview of a consumer's financial situation and investment horizon. Standardization of the initial assessment process for robo-advisors may provide benefits to potential users by making the language and procedures consistent and more transparent, thereby reducing anxiety and mistrust. This can help financial services companies by providing a manageable platform across practices, including in-person and online.

5.5 | Limitations and outlook

As robo-advisors become increasingly commonplace, more research needs to be done to gain a better understanding of how people across different segments feel about technology and related services. This study focused on an online sample of participants that self-selected to take part in the study. Since robo-advisors operate on internet-enabled platforms and target consumers who have access to the internet, and because the majority of the general public, even older adults, uses the internet on a regular basis, this sample limitation does not pose significant threats to the generalizability of the study. However, expanding the sample to include those with limited access to or less experience with online financial transactions may be helpful to better understand how robo-advisors or other technology-enabled financial services may be able to provide benefits to consumers who are technologically underserved. In order to strengthen the generalizability of the findings, future research needs to consider obtaining a sample that is more diverse in terms of their engagement with online services and activities.

In the online survey, a brief description of robo-advisors was provided to establish a baseline knowledge of the concept. However, participants may have varied in terms of the completeness and accuracy in their understanding. Also, even though the overall interest in using a robo-advisor was generally low among the sample ($M = 2.19$ on a scale from 1: not at all interested to 5: very much interested; 40.5% not at all interested and 23.2 a little interested), this may still be a reflection of the description that was presented in the survey, which did not give details of possible shortcomings and risks involved with using a robo-advisory service. A possible direction for future research is to provide a visual aid or an interactive example to describe of how robo-advisors operate. Another possible way to ensure participants' understanding would be to build a series of questions that test how much and/or how correctly participants understand the descriptions presented to them. This would also enable an analysis on possible effects of knowledge on acceptance.

This study explored financial experience as a key factor using participants' global self-assessment. In order to better understand detailed factors that contribute to such self-assessment, future research needs to include behavioral measures (e.g., current and past usage of financial products, financial literacy and knowledge, involvement in household finances) to gain a deeper understanding into the association between experience and acceptance.

Finally, it is important to note that the sample was limited to people who were currently living in the United States. The majority of the sample was White (78.7%). While the questionnaire did not ask for any identification of cultural background(s), this racial limitation may correspond to limited diversity in cultural backgrounds. Because individual personal values differ in their strengths across societies (Schwartz & Bardi, 2001), findings from this study around self-enhancement may not readily apply to different cultures or societies.

ENDNOTE

[1] Following the approach to correct multicollinearity when performing analyses with personal values suggested by Ahola (2015) and Feather (1995), we created two value orientation variables. The self-enhancement (vs. self-transcendence) value orientation was computed by subtracting the mean of self-transcendence from the mean of self-enhancement. Thus, positive values indicate a higher self-enhancement value orientation. The same procedure was performed by subtracting the mean of conservation from the mean of openness to change. Here, higher positive values indicate a higher openness to change value orientation. When performing the moderation analysis, with anxiety as the predictor, self-enhancement value orientation as the moderator, willingness to use as criterion, and the same aforementioned covariates, the interaction effect of anxiety and self-enhancement value orientation on the willingness to use was significant ($\beta = .05$, $p < .05$; 95% CI [.01, .09]). Specifically, the

negative effect of anxiety on the willingness to use decreased for low (-1 SD below the mean: $\beta = -.51$, $p < .001$, 95% CI [$-.61$, $-.42$]), medium (mean: $\beta = -.43$, $p < .001$, 95% CI: [$-.48$, $-.36$]), and high levels of self-enhancement value orientation ($+1$ SD above the mean: $\beta = -.32$, $p < .001$, 95% CI: [$-.42$, $-.22$]). Thus, the alleviating effect of self-enhancement on the effect of anxiety and willingness to use a robo-advisor also holds when using a different computational method.

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