

Intention To Adopt Online Trading: Identifying The Future Online Traders

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Based on investment behavior and innovation diffusion theories, intention to adopt online trading was investigated using 2000-01 MacroMonitor data. The impacts of the following determinants were examined: investment-related factors (type of brokerage accounts and trading frequency and volume); psychological factors (confidence, investment risk preference, price sensitivity, attitudes toward human interaction, and investment decision making style); technology-related issues (familiarity with online shopping and banking); and demographics. Investors who are younger and more willing to take investment risk intend to adopt online trading, whereas investors who value human interaction and those with full brokerage accounts do not have an intention to adopt.

Key words: Online Trading, Online Investment, Adoption, Diffusion, E-commerce, Innovation

Introduction

Since the introduction in 1995, online trading has increased dramatically. In 2000, there were 7.8 million individuals trading online, making 807,000 trades per day, and the number of online trading accounts represented 12.5% of all security investment accounts (U.S. Securities and Exchange Commission, 2001). Although the stock market decline of the past two years has slowed the growth of online investing (*Wall Street Journal*, 2001), online trading has fundamentally changed the securities market and is expected to continue to be a valued choice for investors (*American Banker*, 2002).

Online trading as an alternative to the traditional phone-based trading has unique characteristics. Brokerage firms can use online trading to reduce costs by eliminating human interaction as well as by unbundling trading from other services such as providing investment advice (Bakos et al., 2000). For consumers, online trading lowers trading costs, because the commission charged by online brokers is less than the commission charged by offline full-service brokers and even discount brokers (Barber & Odean, 2000). Online trading also improves execution speed; with online trading, buying or selling stocks is only one click away. Current users of online trading exhibit some

characteristics that are different from those of traditional investors. Several researchers (Barber & Odean, 2000; Balasubramanian, Konana & Menon, 1999) described online investors as more confident and more likely to be young males than offline investors. However, other than demographic descriptions, investors' adoption of online trading has not been well understood. Which factors hinder or encourage investors' adoption remain unknown.

Previous studies made inferences about the reasons for adopting online trading from cross-sectional data in which investors' investment characteristics and psychology were examined after adopting online trading. This method is problematic, since it is plausible that investors change their investment behavior and psychology in response to the new environment of online trading. For example, going online may cause investors to trade more frequently, and if investors' profits decline because of online trading, their confidence and investment risk propensity may change accordingly. Thus, it is hard to tell which variables cause investors to adopt online trading, or whether online trading results in changes in investors' behavior and psychology.

This study focused on the intentions of investors who have been investing in traditional ways, but have not

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adopted online trading. By examining their investment behavior and psychology before going online instead of after, this study provides further insights into the factors associated with investors' adoption of online trading. It also brings together the literatures on household investment behavior, adoption of innovation, and communications. In addition, the findings of this study will provide useful information for consumer educators and financial counselors and planners.

Review Of Literature

Households' Investment Behavior

Stock ownership in the U. S. has grown tremendously in the last two decades. The total value of households' stockholdings rose from 15% of households' total assets in 1983 to 35% in 1998. The median equity holding has also moved up -- from \$15,400 in 1995 to \$25,000 in 1998, a 62.3% increase (Kennickell, Starr-McCluer & Surette, 2000). However, securities investment is not for everyone. The probability of owning stocks is higher for certain groups, including more educated, married Whites with higher levels of income and assets (Bertaut, 1998; Bertaut & Starr-McCluer, 2000). Chiteji and Stafford (1999) also found that young families whose parents owned stock were more likely to hold equities. Bertaut (1998) found that households with lower levels of risk aversion had a higher conditional probability of entering the stock market than households with greater risk aversion.

Individual investors can purchase and trade stocks, bonds, and other financial instruments through retail brokers. Traditionally, retail brokerage firms can be grouped into two categories: "full-service" (or "full commission") and "discount-commission" (Gerlach, 1998). Full-service brokers, such as Merrill Lynch, charge steep commissions whenever customers buy stocks, bonds, or mutual funds. However, they provide expert advice and other services. On the other hand, discount brokers charge a fraction of what the full-service firms charge but do not provide investment advice to customers.

Investors choose their discount or full-service brokers based on their interest in research on securities, the cost of commissions, other services available, or a combination of all of these (Gerlach, 1998). Some investors use more than one broker and/or switch brokers once they obtain expert advice (Bakos et al., 2000; Chen & Hitt, 2000). For example, some investors first choose a full-service firm that offers great research

Financial Counseling and Planning, Volume 13(2), 2002 and services and then open another brokerage account at a discount broker where they can make more frequent trades with lower commissions.

Theory of Innovation and Diffusion and the Adoption of E-Commerce

Bass's model (1969) conceptualized the adoption of innovation as a probability of adopting or not adopting that innovation. Following Bass's model, Mahajan, Muller and Rayendra (1990) suggested that the source of influence can be used to distinguish between an innovator and an imitator. Bass's classification can be contrasted with Rogers' (1995) multistate-flow model where Rogers classified consumers into five groups across the timing of the adoption: innovators, early adopters, early majority, late majority, and laggards.

Bass's original diffusion model (1969) was developed to describe market-level behavior without a direct microeconomic derivation of the individual's adoption decision (Roberts & Lattin, 2000). More recently, to explain individual-level behavior several researchers introduced individual-level diffusion models (Chatterjee & Eliashberg, 1990; Lattin & Roberts, 1988; Roberts & Urban, 1988). This approach assumes that each member of the population has an idiosyncratic probability of adoption.

The advantages of individual-level diffusion models are obvious. With an understanding of the behavior of individuals during the diffusion process, models can be grounded in consumer behavior theory. What is more, they may address the managerial questions of how many people will adopt, who those adopters will be and why they will adopt (Roberts & Lattin, 2000). They can also easily be used for segmentation and targeting with the application of market-research data about preference and behavioral intentions. The purchase probabilities and expected sales levels can be predicted.

Consumers' adoption of online trading has been rapid, especially among those investors who do not need much investment advice (Clemons & Hitt, 2000). Investors who decide to go online also exhibit some characteristics that are different from those of traditional investors. Barber and Odean (2000) examined the characteristics of 1,607 investors who not only adopted online trading but also switched from phone-based to online trading during the period from 1992 to 1995. They documented that young men who are active traders with high incomes and a preference for investing in small growth stocks with high market

risk before going online are more likely to switch to online trading.

Balasubramanian et al. (1999) found seven basic reasons for adopting online trading: feeling of empowerment, cost, speed and availability, convenience, easy access to reliable information, lack of trust in and unsatisfactory experiences with traditional brokers, and investors' discomfort when communicating directly with traditional brokers. Chen and Hitt (2000) found that customers with high overall transaction volume have high incentives to switch to an online broker. However, these studies used a cross-sectional data set to investigate investors' investment characteristics and psychology after adopting online trading. It is plausible that investors might change their investment behavior and psychology in response to the new environment of online trading. For example, going online may cause investors to trade more frequently, and if investors' profits decline because of online trading, their confidence and investment risk propensity may change accordingly. Therefore, the causality has not been established.

Internet Usage in Communications Literature

Recognizing the Internet as a new medium, the communications literature brings additional insights to explaining Internet usage behavior. The most prevalent paradigm in the communications literature is the uses and gratification theory, which shares much conceptual resemblance with enactive and social-cognitive theories (LaRose, Mastro & Eastin, 2001). According to the uses and gratification theory (Eighmey & McCord 1998; Morris & Ogan, 1996; Parker & Plank, 2000), consumers actively seek out a particular medium to obtain gratification and evaluate the gratification sought after and obtained. The uses and gratification theory views such usage and evaluation of gratification as an iterative process, whereas enactive learning theory conceptualizes such a process as learning (LaRose et al., 2001). Similarly, social-cognitive theory posits that media behavior has a reciprocal relation with individuals and their environment, emphasizing bi-directional instead of uni-directional impacts and recognizing people as "self-organizing, proactive, self-reflecting, and self-regulating" entities (Bandura, 2001, p. 266). Applying the communications theories to Internet usage, LaRose et al. (2001) and Eastin and LaRose (2000) explained Internet usage is encouraged or discouraged by positive or negative experience, while a self-regulatory process moderates the relation.

Intention to Adopt Online Trading

Whereas the inclusion of self-efficacy in explaining Internet behavior, particularly day traders' addiction to engage in excessive trading, presents promising hypotheses to be examined, such hypotheses cannot be tested in this study, due to the use of a secondary data set.

A Proposed Model Of Adoption Of Online Trading

Based on the literature review, an individual-level model of adoption of online trading is proposed. This model proposes that investors' intention to adopt online trading in the future is influenced by investment, psychology, technology and demographic factors. The model attempts to determine the drivers of consumers' adoption and addresses who will adopt and why they will adopt on an individual basis.

The following characteristics have been suggested to be associated with investors' adoption of online trading: trading frequency, trading volume, and the type of brokerage accounts. Barber and Odean (2000) have shown that trading frequency is positively associated with investors' adoption of online trading. The higher the trading volume, the more likely investors are to adopt online trading. After going online, investors tend to increase their trading frequency (Deloitte & Touche, 1999; Konana, Menon & Balasubramanian, 2000). The type of brokerage account is also associated with investors' adoption of online trading (Bakos et al., 2000; Gerlach, 1998). Investors with only full-service brokerage accounts, investors with only discount brokerage accounts, and investors with both types of accounts may have different likelihoods of adopting online trading.

The following psychological factors were identified as potential determinants of investors' decisions to adopt online trading: price sensitivity, need for human interaction, confidence, and attitude toward investment risk. Price or cost sensitivity was found to influence investors' decisions to adopt online trading (Balasubramanian et al., 1999; Deloitte & Touche, 1999; Gerlach, 1998). Balasubramanian et al. (1999) suggested that investors' discomfort when communicating directly with traditional brokers is a factor that influences investors' decisions, while another issue is whether customers would be concerned about de-humanizing the service situation (Breakwell, Fife-Schaw, Lee & Spencer, 1986; Zeithaml & Gilly, 1987). Barber and Odean (2000) found that investors who are more confident before going online tend to choose to switch to online trading, and this finding is also supported by Balasubramanian et al. (1999) and

Gerlach (1998). Also, investors who are risk lovers before going online tend to choose online trading (Balasubramanian et al., 1999; Barber & Odean, 2000).

Technology-related issues and prior knowledge and experience of an innovation have been proposed to be related to investors' adoption of online trading (Konana, et al., 2000; Zeithaml & Gilly, 1987). More specifically, some researchers found consumers who are more familiar with the computer and the Internet are more likely to use online services (Deloitte & Touche, 1999; Huang, 1998; Konana et al., 2000), since prior experience with technology may influence consumers' future adoption of similar technologies (Dabholkar, 1992; Dickerson & Gentry, 1983; Hirschman, 1980).

Researchers have examined the socioeconomic and demographic characteristics of adopters of different investment channels as well as adopters of innovations, such as online shopping, including online trading. Online shoppers are portrayed as young (Amel, 1986; Barber & Odean, 2000; El-Haddan & Almahmeed, 1992; Kennickell & Kwast, 1997; Marshall & Heslop, 1988; Pavitt, 1997; Swinyard & Ghee, 1987; Taube, 1988), male (Huang, 1998; Kunz, 1997; Mathwick, 1997), without children (Barber & Odean, 2000), high-income (Amel, 1986; Barber & Odean, 2000; El-Haddan & Almahmeed, 1992; Huang, 1998; Kennickell & Kwast, 1997; Marshall & Heslop, 1988; Pavitt, 1997; Swinyard & Ghee, 1987; Taube, 1988), and educated (Amel, 1986; El-Haddan & Almahmeed, 1992; Kennickell & Kwast, 1997; Marshall & Heslop, 1988; Swinyard & Ghee, 1987; Taube, 1988). Researchers also found that investors who are male and have graduate degrees are more knowledgeable about investments, and those who traded online are more knowledgeable than those who did not (Volpe, Kotel & Chen, 2002).

Methods

Data

Data from the 2000-01 MacroMonitor database are employed in this study. MacroMonitor is a biennial survey conducted by the Consumer Finance Decision section of SRI Consulting Corporation. It focuses on retail financial services and covers consumers' attitudes, behaviors, and motivations related to financial services. The survey started in 1978 and has been conducted every other year since. The sample in MacroMonitor consists of households nationwide, so the sample represents the total population of households in the U.S. In 2000, 3,759 households

The sampling method of the survey is two-stage random sampling. The first step is a stratified disproportionate random sampling. The stratification variables are whether the households' annual income exceeds \$100,000 a year or whether the households' total assets exceed \$500,000 excluding their primary residence. The purpose of disproportionate sampling is to provide a large sample of affluent households. Weights are then used to obtain representativeness of the population. The second step is a simple random sampling, specifically random-digit-dialing (RDD). Of the households who agreed to participate via telephone calls, 49% returned questionnaires.^b

The sample used in this study was investors who have been investing in the security market through traditional offline brokerages, but have not adopted online investing. Among the respondents, 1,455 households owned at least one full-service or discount brokerage account, and they were named direct securities "investors." Households without stock brokerage accounts were considered "non-investors." The definition of "investors" omits those who own stocks or mutual funds only indirectly through employer-sponsored stock purchase plans and other means. However, these investors are not likely to use online trading unless they have stock brokerage accounts with either stock brokerage firms or other types of financial service institutions. Thus, their exclusion does not pose a threat to this study. Among the 1,455 investors, 389 were currently investing online and 1,066 were still investing in traditional ways.^c The profile of the sample, including both current online and offline investors, is presented in Table 1.

Measurement and Analysis

Based on the proposed model of individual-level adoption of online trading, it was assumed that an individual's probability of adopting online trading was a function of a set of proposed variables. Because the dependent variable is a binary variable, probit or logistic regression is a proper analysis to use. Due to its ease of interpretation, logistic regression was employed, using SAS PROC TLOGISTIC procedure. The dependent variable was the dichotomous variable, the probability of belonging to category 1 (future adopters) versus category 2 (future non-adopters). The independent variables included investment-related characteristics, investor psychological factors, technology-related issues, and demographic variables. The variables are described in Table 2.

Since confidence, investment risk preference, price sensitivity, attitude toward human interaction, and attitude toward using investment advice were measured with multiple items, factor analysis was used. Principle component factor analysis was conducted, and using varimax rotation, an orthogonal factor structure was obtained to avoid multicollinearity. The resulting factor scores were then included as independent variables in multivariate analysis.

The primary assumption underlying logistic regression is that the independent variables are not multicollinear. Correlation coefficients among independent variables were used to examine potential multicollinearity problem. Then, the estimated model was validated, using the 1998-99 MacroMonitor data set to test the performance of the model and its stability.

Results

Descriptive Statistics

Table 1 presents the demographic profiles of future adopters and future non-adopters, and the demographics

of current online adopters are also presented for comparison. In this and subsequent sections, statistical results reported are t-statistics for continuous variables and Chi-square statistics for categorical variables.

Current Online Investors vs. Offline Investors Among the investors, there were 389 current online investors and 1,066 current offline investors. On average, online investors were younger than offline investors (44.5 years old vs. 53.0 years old). A greater proportion of online investors were less than 50 years old (67.6%), while more offline investors were older than 50 (56.2%). Online investors also had more education than offline investors.

Table 1.

Profile of the Sample: Current Offline Investors and Current Online Traders

Demographic characteristics	All households (n=3759)	All households		Investors		Offline Investors	
		Investors (n=1455)	Non- investors (n=2304)	Online investors (n=389)	Offline investors (n=1066)	Future adopters (n=292)	Future non- adopters (n=774)
Age	18-34	22.3%	17.1%	22.6%	15.6%	32.9%	8.2%
	35-49	33.3%	31.8%	45.0%	28.2%	34.1%	25.7%
	50-64	23.3%	29.0%	24.5%	30.3%	26.7%	31.8%
	65 or older	21.1%	22.1%	7.9%	25.9%	6.5%	34.3%
	median	47.0	50.0	43.0	52.8	42.0	57.0
	mean	49.1	51.0	44.5	53.0	47.6	56.8
Education	less than high school	18.5%	4.9%	0.1%	6.2%	3.5%	7.3%
	high school graduates	28.4%	20.6%	8.2%	23.9%	16.3%	27.2%
	some college	26.9%	23.7%	20.8%	24.5%	22.1%	25.6%
	BS or more	26.2%	50.8%	70.9%	45.4%	58.2%	39.9%
Gender of household head	male	63.7%	73.7%	84.4%	70.8%	74.2%	69.3%
	female	36.3%	26.3%	15.6%	29.2%	25.8%	30.7%
Marital status	never married	19.2%	15.9%	19.0%	15.0%	28.0%	9.4%
	divorced/separated	16.6%	9.4%	5.3%	10.6%	11.9%	10.0%

	widowed	9.8%	8.6%	10.1%	2.3%	10.3%	2.7%	13.6%
	married	54.4%	66.1%	51.2%	73.4%	64.1%	57.4%	67.0%
Income								
	less than \$20,000	24.4%	4.7%	29.8%	0.0%	6.0%	5.0%	6.5%
	\$20,000-\$39,999	27.4%	16.8%	30.3%	2.6%	20.6%	14.2%	23.3%
	\$40,000-\$59,999	18.4%	21.3%	17.5%	17.8%	22.2%	20.8%	22.8%
	\$60,000-\$99,999	18.5%	27.9%	16.0%	30.7%	27.1%	31.1%	25.4%
	\$100,000 or more	11.3%	29.3%	6.4%	48.9%	24.1%	29.0%	22.0%
	Median	\$37,000	\$67,500	\$31,600	\$98,000	\$60,050	\$70,000	\$55,000
	Mean	\$52,184	\$90,220	\$41,708	\$114,215	\$83,810	\$86,038	\$82,841
Presence of dependent children								
	Without children	65.6%	67.0%	65.2%	57.1%	69.7%	60.9%	72.7%
	With children	34.4%	33.0%	34.7%	42.9%	30.3%	39.1%	23.3%

Table 2.
A Summary Description of Variables

Variable	Description
Investment characteristics	
Prior trading frequency	A continuous variable, the number of separate purchase and sale transactions the household made through full-service and discount accounts in the last 12 months
Prior trading volume	A continuous variable, the total dollar amount of securities the household purchased plus the total amount of securities the household sold in the last 12 months
Type of brokerage accounts	A categorical variable; full-service stock brokerage account, discount stock brokerage account, and both
Psychological factors	
Confidence	The following questions were asked to measure psychological factors. The responses were coded on a 4-point Likert scale ranging from "mostly agree (1)" to "mostly disagree (4)."
Investment risk preference	"I do a very good job of keeping my financial affairs in order" (reverse coded); "Often I'm not sure whether the financial decisions I've made are the right ones"; "I feel uncomfortable making judgments about the riskiness of investments."
Price sensitivity	"It is very important to me to have both a guaranteed interest rate and federal insurance on my savings"; "I am willing to accept some risk of losing money if an investment is likely to come out ahead of inflation in the long run" (reverse coded); "It is wise to put some portion of savings in uninsured investments to get a high yield" (reverse coded); "I am willing to take substantial risks to realize substantial financial gains from investments" (reverse coded); "The stock market is too risky for me."
Attitude toward human interaction	"I am always looking for the lowest cost financial service."
Attitude toward using investment advice	"Chatting with the people I know at financial institutions is an important part of doing financial business for me" (reverse coded); "The less I talk to financial institution personnel the better"; "I prefer to do most of my financial business in person."
	"I don't need advice on investment options"; "I feel qualified to make my own investment decisions"; "It is important that a financial services representative makes recommendations I should consider"; "I prefer to consult a specialist when making financial decisions"; "I like to discuss my financial options before making a decision about them"; "I need help selecting savings and investment products that are best suited to meet my financial goals"; "I would be willing to pay for professional financial advice"; "Using my financial institution as a sounding board for ideas about my finances is important to me"; "It is important that a financial services representative provides good investment advice."
Technology-related issues	
Familiarity with online shopping	A binary variable: whether a respondent had made a purchase over the Internet during the last two years (1=purchase online; 0=did not purchase)
Familiarity with online banking	A binary variable: whether a respondent made more than zero financial transactions or spent more than zero hours to conduct computerized home banking, which was defined as the usage of a personal computer at home with an online computer service to find out account balances, to transfer money between accounts, to pay bills, etc. (1=used home banking; 0=did not use)
Demographic variables	
Age	A continuous variable
Household composition	A categorical variable: single female head of household, single male head of household, and married couple.
Presence of dependent children	A binary variable (1=with dependent children, 0=without dependent children)
Education	A categorical variable: less than high school, high school, some college, and bachelor's degree or more

More than 70% had a bachelor's or more advanced degree, compared to only 45.4% of offline investors. A majority of both online investors (84.4%) and offline investors (70.8%) were male. More than one-half of both online investors and offline investors were married (73.4% and 64.1%, respectively). Online investors earned much more than offline investors. The average household income for online investors was \$114,215, while the average household income for offline investors was only \$83,810. Also, nearly 48.9% of online investors earned more than \$100,000 a year, while only 24.1% of offline investors earned that

much. Online investors were more likely to have dependent children than offline investors (42.9% vs. 30.3%).

There were several interesting aspects of the respondents' investment behavior. On average, current online investors traded much more often than offline investors. Online investors traded 29.2 times a year, while offline investors traded only 7.1 times a year. In terms of trading volume, online investors also traded a larger sum of money than

Table 3.
Descriptive Statistics of Future Adopters and Non-Adopters

Independent variables		Future adopters (n=292)	Future non-adopters (n=774)	Test statistics (p value)
Investment related factors	Trading frequency			0.15 (0.6970)
	mean (std dev)	7.3 (32.3)	6.5 (24.3)	
	Trading volume			6.42 (0.1696)
	less than \$20,000	80.0%	81.5%	
	\$20,000-\$39,999	9.1%	6.4%	
	\$40,000-\$59,999	3.3%	3.6%	
	\$60,000-\$99,999	1.9%	1.8%	
	\$100,000 or more	5.7%	6.7%	
	mean (std dev)	\$27,221 (\$101,336)	\$37,839 (\$272,130)	1.92 (0.1658)
	Type of brokerage accounts			19.27 (<0.0001)
	full-service	67.4%	81.5%	
	discount	20.0%	11.3%	
	both full-service & discount	12.6%	7.2%	

Psychological factors	Factor 1 Decision making style			3.00 (0.0834)	
	mean (std dev)	-0.0473 (1.0159)	0.0491 (0.9847)		
	Factor 2 Investment risk preference			63.91 (<0.0001)	
	mean (std dev)	0.1873 (0.9566)	-0.3431 (0.9313)		
	Factor 3 Confidence			3.75 (0.0530)	
	mean (std dev)	-0.1715 (0.9755)	-0.0175 (0.9910)		
	Factor 4 Attitude toward human interaction			40.77 (<0.0001)	
	mean (std dev)	-0.3144 (0.9700)	0.1918 (1.0024)		
	Factor 5 Price sensitivity			0.07 (0.7868)	
	mean (std dev)	-0.1264 (0.8795)	-0.2420 (1.0087)		
Technology	Online banking experience			26.18 (<0.0001)	
	yes	51.0%	29.7%		
	no	49.0%	70.3%		
	Online shopping experience			9.67 (0.0019)	
	yes	69.6%	53.6%		
	no	30.4%	46.4%		
Demographic characteristics	Age	18-34	32.9%	8.2%	77.39 (<0.0001)
		35-49	34.1%	25.7%	
		50-64	26.7%	31.8%	
		65 or older	6.5%	34.3%	
		mean (std dev)	47.6 (61.2)	56.8 (64.0)	78.34 (<0.0001)
	Education	less than high school	3.5%	7.3%	8.52 (0.0365)

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	high school graduates	16.3%	27.2%
	some college	22.1%	25.6%
	BS or more	58.2%	39.9%
Household status	single female	17.0%	22.5%
	single male	25.6%	11.5%
	married	57.4%	66.0%
Income	less than \$20,000	5.0%	6.5%
	\$20,000-\$39,999	14.2%	23.3%
	\$40,000-\$59,999	20.8%	22.8%
	\$60,000-\$99,999	31.1%	25.4%
	\$100,000 or more	29.0%	22.0%
	mean (std dev)	\$86,038 (\$367,117)	\$82,841 (\$996,661)
Presence of dependent children			18.58 (0.0001)
	without children	60.9%	72.7%
	with children	39.1%	23.3%

offline investors. The average trading volumes for online investors and offline investors were \$152,798 and \$35,018, respectively. However, the majority of both online investors (64.6%) and offline investors (81.2%) traded less than \$20,000 a year. The trading volume distribution for online investors was also skewed toward the high end with 16.1% of online investors trading more than \$100,000 a year. The majority of online investors had only discount brokerage accounts (56.5%), while the majority of offline investors had only full-service brokerage accounts (74.9%). A significant proportion of online investors had both full-service brokerage and discount brokerage accounts (26.1%).

A greater proportion of online investors had banked online than had offline investors (83.8% vs. 42.5%). A majority of both online investors and offline investors had online shopping experience, while online investors were more likely to have this experience than offline investors (92.2% vs. 61.3%).

Future Adopters vs. Future Non-Adopters Among the 1,066 offline investors, there were 292 investors who indicated that they might adopt online trading (future adopters) and 774 investors who indicated they were not interested in adopting online trading (future non-adopters). Table 3 presents the descriptive statistics.

On average, future adopters were much younger than future non-adopters (47.6 years old vs. 56.8 years old). Like online investors, a greater proportion of future adopters were less than 50 years old (67%), while more

future non-adopters were older than 50. Future adopters were better educated than non-adopters. More than 58% of future adopters had a bachelor's or more advanced degree compared to 40% of future non-adopters. A majority of both future adopters and non-adopters were male and married. The average household income for future adopters was \$86,038, while the average household income for future non-adopters was \$82,841. Future adopters were more likely to have dependent children than future non-adopters (39.1% vs. 23.3%).

Regarding investment-related factors, there were fewer significant differences between future adopters and non-adopters. The trading frequencies of future adopters and non-adopters were not significantly different. On average, future adopters traded 7.3 times a year, while future non-adopters traded 6.5 times a year. In terms of trading volume, future adopters and non-adopters also were not significantly different. The average trading volume for future adopters was \$27,221 and \$37,839 for future non-adopters. The majority of both future adopters and non-adopters traded less than \$20,000 a year. The two groups were significantly different at the .05 significance level in the type of brokerage accounts owned. About two-thirds of future adopters had only full-service brokerage accounts compared to 81.5% of future non-adopters.

When it comes to psychological factors, there was not a significant difference between future adopters' and future non-adopters' dependence on expert advice. The factor score of confidence for future adopters was

marginally lower than for future non-adopters ($p=0.0530$). On the other hand, a very significant difference was seen in the factor scores of attitude toward human interaction. Future adopters do not want human interaction, while future non-adopters do. Price sensitivities of future adopters and future non-adopters were not statistically different.

Future adopters were more likely to have online banking experience than future non-adopters (51.0% vs. 29.7%), although this difference was smaller than the difference between online investors and offline investors. Also, although a majority of both future adopters and future non-adopters had online shopping experience, future adopters were more likely to have this experience (69.6% vs. 53.6%).

Factor Analysis

The results of the factor analysis are presented in Table 4. Five factors emerged, using principal factor analysis

Financial Counseling and Planning, Volume 13(2), 2002 with varimax rotation. Factor 1 measured investors' use of investment advice. A positive score indicated that investors need professional advice when making investment decisions; those with a negative score tended to make their own investment decisions. Factor 2 showed investors' risk preference toward savings and investments.

A positive score meant investors prefer investment risk, while a negative score meant they tend to avoid investment risk. Factor 3 represented investors' confidence in making sound investment decisions. A positive score was related to higher confidence, while a negative score indicated lower confidence. Factor 4 indicated investors' attitude toward human interaction. The score was positive for investors who want human interaction and negative for those who do not. Factor 5 reflected investors' price sensitivity. Investors with a positive score were price sensitive, while those with a negative score were price insensitive.

Table 4.
Results of Factor Analysis

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Final Comm- unality
It is important that a financial services representative makes recommendations I should consider.	0.7832	0.0478	-0.0155	-0.0449	-0.0131	0.6181
I prefer to consult a specialist when making financial decisions.	0.7349	-0.0471	-0.0187	0.0336	0.0140	0.5439
I like to discuss my financial options before making a decision about them.	0.6830	-0.0304	0.0737	-0.0566	-0.1645	0.5032
I don't need advice on investment options.	0.5872	-0.0970	-0.2326	-0.0686	0.1819	0.4462
I need help selecting savings and investment products that are best suited to meet my financial goals.	0.5736	-0.1207	-0.4297	0.0028	-0.0041	0.5284
I would be willing to pay for professional financial advice.	0.5720	0.2337	-0.1567	-0.0245	0.1594	0.4303
It is important that a service representative provides good investment advice.	0.5282	-0.0087	-0.0755	0.2080	0.0224	0.3286
Using my financial institution as a sounding board for ideas about my finances is important to me.	0.5211	0.0662	-0.0272	0.2808	0.0594	0.3591
I feel qualified to make my own investment decisions.	0.4935	-0.2717	-0.4304	-0.1815	0.0758	0.5414
I am willing to take substantial risks to realize substantial financial gains from investments.	-0.0930	0.7215	-0.0064	-0.0555	-0.0620	0.5361
I am willing to accept some risk of losing money if an investment is likely to come out ahead of inflation in the long run.	0.0919	0.6802	-0.0137	0.0460	0.0191	0.4738
It is wise to put some portion of savings in uninsured investments to get a high yield.	0.0471	0.6794	-0.0077	-0.0783	-0.0358	0.4713
It is very important to me to have both a guaranteed interest rate and federal insurance on my savings.	-0.0873	0.5196	0.0366	-0.0917	0.3914	0.4406
The stock market is too risky for me.	0.0083	0.4776	0.3311	-0.1178	0.3490	0.4736
Often I'm not sure whether the financial decisions I've made are the right ones.	-0.0514	-0.1070	0.7307	-0.1336	0.1309	0.5830
I do a very good job of keeping my financial affairs in order.	0.0061	-0.0167	0.7100	0.1747	-0.2302	0.5880
I feel uncomfortable making judgments about the riskiness of investments.	-0.1511	0.2414	0.4351	-0.0265	0.3476	0.3920
Chatting with the people I know at financial institutions is an	0.1763	-0.0960	-0.0548	0.7356	-0.0298	0.5854

Intention to Adopt Online Trading						
important part of doing financial business for me.						
The less I talk to financial institution personnel the better.	0.0996	-0.0012	0.0968	0.6164	0.5047	0.6540
I prefer to do most of my financial business in person.	0.0729	0.1161	-0.0442	-0.5831	0.3561	0.4876
I always look for the lowest cost financial service.	0.1215	-0.0232	-0.0510	-0.0459	0.6916	0.4983
Eigen value	3.8947	2.4766	1.7385	1.2454	1.1285	10.4838
Variance explained	3.5272	2.1988	1.8167	1.5128	1.4282	
Variance explained (%)	18.6%	11.8%	8.3%	5.9%	5.4%	49.9%

The five factors reflect each construct adequately, with eigenvalues ranging from 3.89 to 1.13. Factor 1 explained the greatest percentage of total variance (18.6%), followed by Factor 2 (11.8%), Factor 3 (8.3%), Factor 4 (5.9%) and Factor 5 (5.4%). The five factors together explained nearly 50% of total variance.

Logistic Regression Analysis

Table 5 shows the results of the logit analysis. The model produced a log likelihood ratio of 1083.49 and a model chi-square (χ^2) of 168.25. The likelihood ratio is highly significant, indicating a good fit of the model.

It shows that the whole model has a statistically significant predictive efficacy for the log odds of investors' adoption of online trading. In other words, the independent variables as a whole significantly improve the predictive efficacy of the model over the null model. The R-square is 0.15. The model, including all of the independent variables, explained about 15% of the variance in the log odds ratio.

Among the independent variables, five variables were significantly related to investors' intention to adopt online trading: type of brokerage accounts, Factor 2 (investment risk preference), Factor 3 (confidence), Factor 4 (attitude toward human interaction), and age.

The potential two-way interaction effects were examined but were not significant.

Specifically, investors with only full-service brokerage accounts are less likely to adopt online trading in the future than investors with both full-service and discount brokerage accounts. The odds of adopting online trading in the future for investors with only full-service brokerage accounts were about one-half as large as they were for investors with both full-service and discount brokerage accounts. However, there was no statistical difference in the intention to adopt online trading between investors with only discount brokerage accounts and investors with both full-service and discount brokerage accounts.

Three of the five psychological factors had a significant impact on investors' intention to adopt

online trading. Factor 2 (investment risk preference) had a positive relationship with investors' intention to adopt online trading. Investors who are risk-loving are more likely to adopt online trading in the future than investors who are risk-adverse. This finding is consistent with the results of previous research (Balasubramanian et al., 1999; Barber & Odean, 2000). The odds ratio for Factor 2, attitude toward investment risk, was 1.708, indicating that the odds of adopting online trading for investors who are risk-loving were about one and three fourths as large as they were for people who are risk neutral (the factor score ranges from -1 to 1).

Surprisingly, Factor 3 (confidence) was negatively related to investors' intention to adopt online training.

This is contrary to the belief of some researchers (Balasubramanian et al., 1999). Confidence had an odds ratio of 0.852. The odds of adopting online trading in the future for people who are most confident were nearly 85% as large as they were for people who have average confidence. Further study is needed to explain this result more precisely.

Factor 4 (attitude toward human interaction) was negatively related to investors' intention to adopt online trading. Investors who do not want to interact with financial personnel are more likely to adopt online trading in the future than investors who like to speak to financial advisors.

Age was the only demographic variable that had a significant impact on investors' intention to adopt online trading. Younger investors are more likely to adopt online trading in the future than older investors. The odds ratio for age was 0.964. A year increase in a person's age decreased the odds of adopting online trading in the future by nearly 4%. For example, the odds for people who are 39 years old were 96% as large as they were for those who are 40 years old.

Logistic regression is most appropriate when there is a lack of multicollinearity among the independent variables. High interdependencies can cause a

multicollinearity problem and make the logit model unsustainable. Thus, the interdependencies among the independent variables were examined using correlation analysis. Although some of the independent variables were significantly correlated, the correlation coefficients between the continuous variables were all less than 0.35 and few exceeded 0.30. The weak correlation among the variables indicated that a model incorporating all of the independent variables is appropriate and the results from this model are robust.

Model Validation

The results of the validation model are presented in Table 5. The coefficients of the original model with only five significant variables (investment risk preference, confidence, attitude toward human interaction, age and the type of brokerage account) were calculated from the original data set and then applied to the validation data set. All of the variables that were significant in the original model were highly significant in the validation model. The effects of the coefficients were also very similar with the same directions and magnitude. Several statistics were also computed for the new logistic regression model. The likelihood ratio was highly significant, and the R-square and adjusted R-square were adequate. The new model also had a high chi-square value (0.741) and information value (0.8779). These results show that the original model held very strongly when the new data set was used and had very good predictive power.

Performance was also evaluated, using a decile plot

Two of the investment-related characteristics, trading frequency and trading volume, were found to have no impact on investors' intention to adopt online trading. On the other hand, significant differences were found between online and offline investors in their trading frequency and volume. Online investors traded more frequently than offline investors; online investors traded 29.2 times a year, while offline investors traded only 7.1 times a year. In terms of trading volume, online investors also traded a larger sum of money than

Financial Counseling and Planning, Volume 13(2), 2002 (Figure 1). By scoring the validation data set with the old coefficients, the predicted probability was computed from the logit response using the model obtained from the validation data set. The deciles were calculated by rank-ordering the predicted probabilities. The group with the lowest predicted probability of intending to adopt online trading was assigned a decile of 1. The group with the highest predicted probability of intending to adopt online trading was assigned a decile of 10. The average actual adoption rate by deciles and the average of predicted probabilities by deciles were calculated for the validation data set. They were then plotted against the deciles. In the validation plot, the predicted followed the actual relatively well. The results indicated that the original model performed well when used with data from the previous time periods.

Discussion

A large proportion of households in the U.S. includes investors who trade securities through brokerage firms. Among the 3,759 households in the database, 38.7% (1,455) were investors. However, adoption of online trading is far from widespread in the U.S. Among the 1,455 investors in the sample who traded securities, only 26.7% had adopted online trading. Among those 1,066 investors who used traditional offline trading, less than 30% indicated that they were interested in online trading and planned to adopt online trading in the future. Compared with online shopping and banking, the diffusion of online trading is still at an early stage.

offline investors. The average trading volumes for online investors and offline investors were \$152,798 and \$35,018, respectively. These results suggest supporting evidence for the conclusion of Barber and Odean (2000) and Konana et al. (2000) that adoption of online trading changes one's investment behavior, encouraging more frequent trading and greater trading volume. They also suggest that trading frequency and volume are not

Table 5.
Results of Logistic Regression Analysis and Validation of the Estimated Model

Independent Variable	Estimated Model			Validation Model		
	Parameter estimates	Odds ratio	p-value	Parameter estimates	Odds ratio	p-value
Investment related factors						

				Intention to Adopt Online Trading		
Trading volume	-3.39E-7	1.000	0.2878			
Trading frequency	0.0008	1.001	0.5670			
Type of brokerage accounts (reference category: both)			0.0114			
Full-service brokerage account	-0.2935	0.531	0.0089	-0.3299	0.504	0.0007
Discount brokerage account	-0.0460	0.680	0.7545	-0.0257	0.683	0.8267
Psychological factors						
Factor 1: Decision making style	-0.0469	0.954	0.5563			
Factor 2: Attitude toward risk	0.5351	1.708	<0.0001	0.5298	1.699	<.0001
Factor 3: Confidence	-0.1604	0.852	0.0372	-0.1647	0.848	0.0194
Factor 4: Attitude toward human interaction	-0.3740	0.688	<0.0001	-0.3714	0.690	<.0001
Factor 5: Price sensitivity	0.0126	1.013	0.8728			
Technology related issues						
Online banking usage	0.0024	1.005	0.9750			
Online shopping usage	0.0520	1.110	0.5395			
Demographic characteristics						
Age	-0.0367	0.964	<0.0001	-0.0355	0.965	<.0001
Income	-7.92E-8	1.000	0.8090			
Education (reference category: Bachelor's degree or more)			0.6016			
less than high school	-0.1427	0.736	0.7793			
high school	0.0784	0.918	0.7750			
some college	-0.0996	0.768	0.6542			
Household status (reference category: Married)			0.2882			
Single female	-0.2255	0.861	0.2195			
Single male	0.3019	1.460	0.1152			
Presence of dependent children	-0.0243	0.953	0.7812			
Chi-square of Likelihood Ratio	168.25		< .001	137.92		<.001
R-square	0.1460			0.1130		
Max-rescaled R-square	0.2113			0.1526		
C Value				0.741		
Information Value				0.8779		

Figure 1.
Decile Plot

associated with the intention to adopt. These findings suggest that online trading changes investment behavior rather than that investment behavior influences adoption of online trading.

The type of brokerage account was significantly related to investors' intention to adopt online trading. Investors with both full-service brokerage and discount brokerage accounts were more likely to adopt online trading in the future than investors with only full-service brokerage accounts. However, no significant result was found when comparing investors with both full-service and discount brokerage accounts with investors who had only discount brokerage accounts. This result suggests that online trading is probably most appealing to customers of discount brokerages regardless of whether they have an account with full-service brokers. The patrons of discount brokers typically care about trading costs (Gerlach, 1998; Schmalensee & Willig, 1986). The findings of this study provide empirical support for Bakos' and his associates' (2000) proposition that online trading is a natural fit for discount brokers and that customers of discount brokers will probably also like online trading.

Among the psychological factors, investors' dependence on expert advice did not have a significant

impact on intention to adopt online trading. Perhaps investors realize that the rich information and advice available through the Internet may be an acceptable substitute for the expert advice typically associated with full-service brokerages. Attitude toward investment risk was, on the other hand, positively associated with intention to adopt online trading. Investors who were risk-loving are more likely to adopt online trading in the future than those who were risk-averse. This finding is consistent with the diffusion of innovations theory's hypothesis that adopters are more venturesome financially. Online trading gives risk-loving investors the ability to trade more frequently and more speculatively without the interference of their brokers.

Confidence was found to have a significant effect on investors' intention to adopt online trading, although the effect was contrary to the findings from previous research (Balasubramanian et al., 1999; Barber & Odean, 2000). Earlier researchers found that confidence is an important reason for people to adopt online trading, but in the current study less confident investors showed more interest in adopting online trading. Attitude toward human interaction was negatively associated with investors' intention to adopt online trading. Investors who do not like to interact

with financial personnel were more likely to adopt online trading in the future than those who like human interactions. This result is consistent with the findings of Balasubramanian et al. (1999) that investors' discomfort in communicating directly with traditional brokers is a key factor that influences investors' decisions to go online.

Finally, price sensitivity had no impact on investors' intention to adopt online trading. Neither future adopters nor non-adopters were very price sensitive, contrary to common belief (Balasubramanian et al., 1999; Deloitte & Touche, 1999; Gerlach, 1998). This result suggests that investors value other advantages of online trading, such as eliminating the investor need to contact traditional human brokers, more than the cost advantage. Also, there is a possibility that the type of brokerage variable captured the variance attributable to price sensitivity.

Technology-related issues were found to have no significant effect on investors' intention to adopt online trading. Neither shopping online nor banking online was significant. The diffusion of online shopping is quite widespread among both future adopters and non-adopters of online trading. These results suggest that as the diffusion of Internet transactions becomes widespread, familiarity with the Internet and relevant technology skills will no longer be obstacles to online trading.

Only one of the demographic variables had a significant impact on investors' intention to adopt online trading; age was negatively related to intention to adopt online trading. Younger investors were more likely to adopt online trading in the future than older investors. Not surprisingly, this result is consistent with the diffusion of innovations theory as well as the results of most of the previous studies (Amel, 1986; Barber & Odean, 2000; El-Haddan & Almahmeed, 1992; Kennickell & Kwast, 1997; Marshall & Heslop, 1988; Pavitt, 1997; Swinyard & Ghee, 1987; Taube, 1988). Interestingly, the descriptive statistics showed that future adopters were not absolutely young. In fact, they were middle-aged. The average age of future adopters was 47.6 and the average age of future non-adopters was 56.8. Future adopters are just younger than future non-adopters.

Income was not significantly related to investors' intention to adopt online trading. Both future adopters and non-adopters had relatively high incomes. The average household income for future adopters was

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\$86,038, while the average household income for future non-adopters was \$82,841. Previous studies (El-Haddan & Almahmeed, 1992; Kennickell & Kwast, 1997; Marshall & Heslop, 1988; Pavitt, 1997; Swinyard & Ghee, 1987; Taube, 1988) found that high-income people are more likely to adopt new Internet technologies. However, since investors as a group tend to have higher incomes, less variance in income exists within this group than among all households. Likewise, the lack of significance in the relationship between education and the intention to adopt online trading is likely attributable to the higher education of investors relative to the general population. While previous studies found that males are more likely to use online services, especially online shopping, than females (Huang, 1998; Kunz, 1997; Mathwick, 1997), gender differences were not found in intention to adopt online trading. In addition, no significant relationship between the presence of dependent children and the intention to adopt online trading was found, contrary to Barber and Odean (2000) who noted that investors without children are more likely to decide to use online trading.

Implications

The results from this study are useful for financial advisors and consumer educators. First, the results suggest that future adopters of online trading are financial risk-lovers. While consumer educators can point out the financial risks associated with online trading, especially day trading, risk-loving consumers may ignore them or even find such warning to be incentive to trade online. Instead, professionals assisting consumers might focus on improving their understanding of investment risk, realistically assessing their risk tolerance, and tracking the degree of risk in their investment portfolios.

Second, research has shown that switching to online trading lowers investment performance (Barber & Odean, 2000). One reason is that consumers often underestimate the real costs of online trading (Konana et al., 2000). In addition to the posted, per-trade costs of online investing, there are often a variety of unobservable costs, including execution speed, system availability, and transaction-making methods. Both this study and Konana et al. (2000) found that investors increase their trading volume and accelerate their trading frequency after moving their transactions online. Professionals assisting consumers can help them to create a system to monitor their online investment activity and recognize such dramatic behavior changes.

Finally, future adoptors of online trading are more likely to be current customers of discount brokerages. One would expect that, compared to customers of full-service brokerages, discount brokers' customers are comfortable making decisions without paying for the advice of professionals. They may be likely to see the information and advice available through the Internet as an acceptable substitute for the expert advice typically associated with full-brokerage firms. However, total dependence on the Internet can be dangerous. Low (2001) cited many examples of fraudulent and inaccurate investment information on the Internet. Consumer educators and financial advisors could develop and share with consumers objective criteria to use when evaluating online investment information and advice. Cost-conscious consumers might also seek advice when they need it by continuing to use a traditional discount-brokerage firm on occasion.

Limitations and Suggestions for Future Research

Undoubtedly, this study has several limitations and further studies are necessary. Selection bias exists in the selection of the sample of this study. First, the definition of an investor leaves out those who own stocks or mutual funds only indirectly through employer-sponsored stock purchase plans and other means. People who are not currently investors may want to become online investors without first being offline investors. If so, a future study investigating potential online trading adoptors among consumers who do not first have an offline brokerage account would be valuable.

Another area for research is the complete process of adoption of online trading. The theory of diffusion of innovations suggests that consumers go through a multistage decision process when making a purchase (Bettman, 1979; Boyd & Mason, 1999). In Stage 1, the consumer evaluates the innovation and forms attitudes and purchase intentions. In Stage 2, the consumer chooses the brand. These stages are also similar to the decision and implementation stages of the innovation decision process described by Rogers (1995). In the adoption of online trading, investors probably go through a similar process; investors form attitudes and intentions in the first stage and choose a specific broker in the second stage. This study examined the first part of the adoption process, and it is worthwhile to examine investors' choice of online brokers. Another important area for future research is the factors that influence investors' decisions to continue to trade

Financial Counseling and Planning, Volume 13(2), 2002 online. This question is probably more relevant to the long-term profitability of brokerage firms because the retention of core customers is of critical importance to the profitability of financial institutions. Finally, the role of self-efficacy proposed to influence Internet usage in communications literature could not be examined in this study. The previous study on self-regulatory process on Internet addiction presents a promising prospect in explaining the increase in trading volume after adopting online trading, which is worthy of further investigation.

Endnote

- a. More details about the sampling methodology can be found at <http://www.sric-bi.com/CFD/2000MM.shtml>.
- b. More details about the data set and how to get the data can be found at <http://www.sric-bi.com/CFD/2000MM.shtml>.
- c. The respondents were asked to select the online financial services they now use at home. If the respondents selected "buying or selling mutual funds or buying or selling stocks or bonds", they were identified as current adoptors of online trading. Those who did not use these online financial services were identified as current non-adoptors of online trading.

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