

Effect of IT Trading Platform on Financial Risk-Taking and Portfolio Performance

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Abstract

As a fast growing area in Finance, Information technology (IT) plays an important role in how traders trade online. Investigating whether online trading has a significant effect on financial returns and risks is central to this inquiry. This study, using perceived usefulness and satisfaction categories, addresses how the IT trading platform affects the trader's trading risk-taking behavior and stock portfolio performance. We examined two unique data sets: 2,726 proprietary online trading accounts and 178 professional investors' field survey. The results revealed that while the perceived usefulness category presented significant differences between the risk-taking groups and significant impact on stock portfolio performance, the satisfaction category showed no significant results.

1. Introduction

The current mobile and more rapid data sharing environment certainly has stirred many interests and possibilities in the Finance community. Online trading activity—buying and selling securities and stocks via the internet—has been increasing steadily in last few years [28], [59]. There have been reports of the effects of using IT in trading.

For example, in Finance, many stocks can now be purchased online by a trader; this group of stocks is called a portfolio. The goal of holding a portfolio is to maximize returns and minimize risk (losses). There are costs associated with buying and selling stocks that are called transaction's costs (commissions paid to trade). The more a trader buys and sells stocks (called "turnover"), the higher the transactions costs involved. Consequently, traders who trade more or have a higher turnover most likely realize lower financial returns due to the transaction's costs.

However, online trading has certainly reduced transaction's costs because online brokers charge less commission than that of full service brokers or even

discount brokers [5], [68]. Consequently, this online movement is causing a gradual diminishing process of the traditional trading practice: face-to-face with a financial advisor or broker, a practice that typically consumes more time and resources than online trading. Given the convenience and efficiency of online trading, now a trader can buy and sell as many stocks and as often as he wants in any given day.

Online trading has also changed the way a trader communicates financial information to other traders. Many online traders now openly share and post their trading transactions and activities online for other traders to see and follow [24]. For example, a trader may purchase 1,000 shares of a company stock and post it online for other traders to follow and monitor the changes over time. Similar to the concept of social media, this "socially trading" behavior drastically benefits those who are positioned to purchase that particular stock in the near future.

As IT's infusion into the financial markets accelerates, it calls for more interdisciplinary research studies that combine IT with Finance, because one discipline alone cannot grapple the complexity of emerging issues and phenomena in today's IT-embodied financial ecosystem. User experience in IT utilization is one of the major research areas, and there are a number of classic studies to reference. Among the models arising from these studies, the well-known Technology Acceptance Model (TAM) presents a number of precedent constructs such as perceived usefulness, perceived ease of use, user satisfaction, in addition to many other constructs [72], [73], [74].

In Finance, however, there is no IT related model that explains finance technology consumption. In the traditional portfolio theory in Finance, portfolio performance is based on rational trader utility maximization [48], [50], [64]; as well, the traditional portfolio theory did not investigate the reasons for traders' portfolio performance results under the context of IT. Other financial principles, like Behavioral Portfolio Theory (BPT) [63], [38], attribute portfolio performance to behavioral biases that traders may

have, and yet again, did not examine the biases under the context of IT.

Given these deficiencies, this study is to examine the relationship between IT perceived usefulness and satisfaction with traders' risk tolerance levels and their portfolio performance.

This study contributes to both Finance and IT with its cross-field synergistic effects. Most importantly, it is justified, because as discussed above, Finance is entirely reliant on IT to execute transactions and millions of traders execute their trades online. Previous studies that have examined online traders have not used an IT theoretical approach and have only focused on behavioral financial theories [61]; therefore, this is the first study that examines how IT affects traders' risk tolerance and their portfolio performance.

2. Theoretical Framework

2.1. Relevant theories

With the need to better understand how a trader perceives, adopts, and manages financial information with technology, and leverages it during a financial risk-taking decision process and in financial portfolio management, we turn to a few corroborating theories: technology acceptance model, theory of planned behavior, and theory of technological affordances.

The technology acceptance model (TAM) is a classic IT theory: it takes a human subjective perspective in interpreting a technology's perceived usefulness and ease of use [11]. Introduced during the mid-1980's, the TAM has been episodically evolving by integrating salient variables to the current form. Venkatesh and Davis [69] listed the following variables: computer self-efficacy, perceptions of external control, computer anxiety, computer playfulness, perceived enjoyment, and objective usability. In other words, a person's decision to adopt and use technology is based on a number of intrinsic and extrinsic variables.

Similarly, the theory of planned behavior [1] states that attitude toward behavior, subjective norms with respect to the behavior, and perceived control over the behavior come together in predicting, with a high accuracy, a person's behavioral intentions. Correspondingly, the theory of technological affordances [47], which originates from ecological psychology [46], [26], posits that the technology and surroundings enable or afford a person to achieve a person's goal and possibly more.

In explaining the risk-taking behavior in Finance, the gambling theory must be discussed. Finance theory

of gambling, based on psychology, posits that individuals assume risk based on psychological factors [42]. Some individuals invest more in high risk stocks, for instance, stocks with higher idiosyncratic volatility (standard deviations) and lower prices, even though the stocks have lower returns. In sum, traders' attitudes toward gambling are predicted by the choice of the stocks they trade [41].

Further, from the discipline of Communications, we find the gratification theory [71], [50], [53], which shares conceptual resemblance with enactive and social-cognitive theories [18]. The gratification theory evaluates a trader actively seeks out a particular medium to obtain gratification and then evaluates the gratification sought after and obtained.

2.2. Literature review

In IS, there is a scarcity of financial trading related IT studies. Only a few studies are found in the Finance-IS domain; they are mostly about finance applications and systems implementations and management [13], [30], [31].

In Finance, a number of studies have focused on trading behaviors. Barber and Odean [5] discuss how the spread of the Internet could affect financial markets and traders' behavior. Behavioral biases affect traders; an example of such behavioral bias, for instance, is excessive optimism that can lead traders to overestimate their future performance [13].

Another example of behavioral bias is overconfidence, which leads traders to underestimate the risk of their investment [5], [53]. In conjunction, such behaviors can lead to financial forecasts that are too bold leading traders to overestimate the amount of profit they will earn [36]. In relation to trading online, subsequently traders who trade frequently are more likely to adopt online trading [68]. Other studies similarly show traders' trading frequency increases when they trade online [5].

Online trading also affects the flow of information in Finance and traders' trading behavior. Investors receive news from multiple sources, and they trade based on such reports. Epstein and Schneider [20] showed that the source of the news matters. When the news comes from sources that the traders perceived as reliable, then that lead them to trade more frequently (portfolio rebalancing). The quality of information that traders receive can lead them to make rational investment decisions with clear positive impact on performance [23]. Other studies showed that the word-of-mouth also affects how traders make trading decisions [33]. However, Feng and Sesholes [22] do not find evidence of word-of-mouth effects among Chinese traders.

Information also plays a great role on how many stocks that traders are willing to hold and how frequently they are willing to trade them. Huberman [33] showed that traders who acquire less information tend to trade less and hold a smaller number of stocks. Goetzmann and Kumar [27] and Kahneman et al. [36] point out that traders who don't rely on information hold a less diversified portfolio (stocks that move in the same directions with each other) and a fewer number of stocks in their portfolio. Portfolio theory assumes that traders form expectations about return and risk of securities and select portfolios according to their expectations and risk preferences [48]. As a consequence, they should hold broadly diversified portfolios and trade very little. But instead, private traders have been shown to hold under-diversified portfolios [27], to trade frequently [53] [5], to encounter high levels of risk [8], [9], and to gamble in the stock market [41], [42].

Addressing customer satisfaction, Dhar and Zhu [17], Graham et al. [29], Fan et al. [21], and Fournier [24] showed that unobservable factors can explain the behavioral biases that traders may have, and one of those factors is customer satisfaction. Reichheld & Sasser [58] and Bolton [7] have also confirmed that customer satisfaction affects business profitability. In addition Zeithaml et al. [70], and Ruyter et al. [60] and Cronin and Taylor [12] found that the service quality is the primary factor that affects customer satisfaction.

3. Hypothesis Development

Merton [50] and Viceira [64] explained that rational traders should trade on the premise of maximizing their utility (satisfaction). While Shefrin and Statman [63] showed that Behavioral Portfolio Theory (BPT) emphasizes behavioral preferences that incite responses such as hope and fear, and thus explain traders trading choices.

Obtaining information in the financial markets is directly related to performance and risk. Verrecchia [67] noted that traders who acquire less information assume less risk. He has also showed that if acquiring information is less costly, then that will increase risk tolerance (assume more risk) for individual traders. Dorn and Huberman [18] showed that traders who are well informed tend to hold riskier stocks, trade more, and achieve high return on a risk adjusted basis.

The conveniences and efficiencies of an IT trading platform in trading activities positively influence the traders' perception of the platform's usefulness and allow them to tolerate risk, which also contribute to their satisfaction. The ubiquity, efficiency, and availability of online trading with a supporting online

ecosystem technologically affords [47] a higher level of technology acceptance [11], according to Venkatesh and Davis [69] – a perceived usefulness and satisfaction. Based on the above arguments, we hypothesize the following

H1.1: There is a significant difference in the *satisfaction* of the IT trading platform between the different levels of *risk-taking*.

H1.2: There is a significant difference in the *perceived usefulness* of the IT trading platform between the different levels of *risk-taking*.

Wilcox [65] noted that studies trying to understand traders' decision-making processes remain limited and research in this field depends on socio-demographic factors, such as age and gender, to explain investors' decisions. Graham, Harvey, and Huang [29] echoed the same argument. The theory of planned behavior [2] and other finance studies [33], [54] relate to the behavioral factors that may explain traders' decision-making processes. In order to explain traders' decision-making processes, research studies ought to focus more on the unobservable behavioral factors [17], [29], and [44].

Peress [57] shows that the portfolio performance of rational traders increases with the amount of information traders optimally collect. Being able to access more information and execute more positive trading behaviors are technologically afforded by an IT trading platform and consequently, significantly high levels of perceived usefulness would be exhibited from the traders.

H2: There is a significant association between the *perceived usefulness* of IT trading platform and *portfolio performance*.

The satisfaction construct was not included in this portfolio performance hypothesis as the analysis approach of H2 is different than H1.1 and H2.2. The full data analysis information is provided in Section 5, the data analysis and discussions, below.

4. Data description

For this study, two different professional sources of data sets were identified. One data set was from a stock trading website, www.collective2.com, where the traders link their personal trading accounts to the website and post all of their trades on the website.

Collective2 has given their consent for the purpose of this study. In all, we obtained 2,726 proprietary accounts and information from 256,674 round-trip (buy & sell) transactions. These transactions were generated from November 2004 to January 2012.

Table 1 presents a summary of 2,726 proprietary account holders. Describing the table 1 columns, 'Trade Size' is defined as the dollar amount of the stocks traded in one trade in US Dollars (USD). 'Trades per day' is defined as the total number of trades executed by an account holder each day. 'Number of trades' is defined as the total number of trades executed during the lifetime of the account.

Table 1. Descriptive statistics of proprietary accounts

	Trade Size (\$USD)	Trades Per day	Number of trades
Mean	27,085.17	0.66	94.18
25th %	3,693.60	0.08	2.00
Median	9,184.00	0.23	13.00
75th %	20,580.00	0.67	54.00
Obs.	256,674	2,726	2,726

Another data set is obtained through a field survey of a group of 178 professional online stock traders. The survey was designed originally for this study and measures the traders' satisfaction and their perceived usefulness of the IT trading platform. Initially, a total of 20 Likert scale items were created.

The items were subjected to principal component analysis using a SPSS statistical package. Any items that fell below 0.700 were carefully evaluated on a theoretical perspective before they were removed. After two runs of factor analysis, we had 8 items for the satisfaction constructs and 5 items for the perceived usefulness constructs.

For the reliability, the correlation matrix yielded coefficients of 0.3 and above, the Kaiser-Meyer-Olkin value 0.960, and Bartlett's Test of Sphericity's statistical significance, $p < 0.05$. Besides the final 13 items, other items were also included in the survey. One item was the risk tolerance item that identifies participants in three different risk tolerance levels: risk seeker, risk averse, and neutral.

5. Data analysis and Discussion

5.1. Analysis of different risk-taking level groups

We examined the relationship between the IT trading platform and financial risk tolerance through the traders' perceived usefulness and satisfaction levels of the IT trading platform. This analysis is based on the survey results of the 178 participants who responded. A data normality check was performed as a routine, and it issued a failed result. Consequently, a non-parametric test, a Kruskal-Wallis test was performed to determine if there were any significant differences in the categories of perceived usefulness and satisfaction between the three risk-taking groups: risk seeking, risk averse, and neutral.

For the satisfaction category, the sample sizes were: risk seeker $N=47$, risk adverse $N=45$, neutral group $N=86$, total $N=178$. The risk adverse group recorded the highest median score of 41, while risk seeker recorded 26 and neutral recorded 37.5.

It was reported that the satisfaction level was not significantly different across the three different risk-taking groups: Chi-Square (2, $n=178$) = 5.429, $p=0.066$. Therefore, $H_{1.1}$ was not supported.

Based on this result, the link between trader's risk taking behavior and trader's satisfaction on IT trading platform is not established. The benefits of technological affordances and advantages of gratification seeking behavior have not influenced the two factors. In other words, risk-taking and satisfaction may have no effect on each other in a financial trading environment.

For the perceived usefulness category, the sample sizes were: risk seeker $N=47$, risk adverse $N=45$, neutral $N=86$, and total $N=178$. The risk adverse group recorded the highest median score 27 while the risk seeker recorded 16 and neutral group recorded 25.

It was reported that the perceived usefulness was significantly different across the three different risk-taking groups: Chi-square (2, $n=178$) = 11.817, $p=0.003$.

With this significant result, we further assessed the results to determine which group is considerably different from which group. Mann-Whitney U test was used. For simplicity, we used the following notations for the groups: group 1 = risk seeker, group 2 = risk averse, and group 3 = neutral. The Mann-Whitney U test was conducted on: 1 vs. 2, 1 vs. 3, and 2 vs. 3.

The result (table 2) revealed that there are significant differences in: 1 vs. 2 and 1 vs. 3, but no significant difference in 2 vs. 3. Therefore, $H_{1.2}$ was supported.

Table 2. Mann-Whitney u test on perceived usefulness

	1 vs. 2	1 vs. 3	2 vs. 3
Mann-Whitney U	627.500	1477.500	1693.500
Wilcoxon W	1755.500	2605.500	5434.500
Z	-3.366	-2.566	-1.173
Asymp. Sig. (2-tailed)	.001	.010	.241

Significant differences were found between the risk seeker and risk averse, and between the risk seeker and neutral groups, but no significant differences were found between risk averse and neutral.

In explaining this result, the gambling theory [8] is applied. A risk-taking trader often fits the profile of a gambler whereby he or she would maximize an expectation of their capital rather than the expected profit from each bet. The gamblers chase the profits by placing bets to increase their overall capital regardless of the risk that they take on their individual trade (bet).

The significantly higher perceived usefulness of the IT trading platform would add to this aggressive risk-taking behavior where the technology affords and supports their intention of behavior. Contrarily, the absence of this aggressive risk-taking behavior may have contributed to the little difference between risk-averse and neutral, despite the available technology.

5.2. Analysis of portfolio performance

This analysis is performed by analyzing the trading record data set from the stock trading website, www.collective2.com. We estimated the following linear regression model. We regressed the following variables, which are discussed below, on the profit/loss per trade (performance): where P/L is the profit/loss for an account holder; “Turnover” is defined as how many trades are completed per day by each trader; “Account age” is how long the account has been opened by the trader; “Hold-time-in-hours” is the mean length of time a position (stocks bought and sold) is held open for trader account; and the “position size” is the mean position size of a trade calculated by the number of contracts (stocks) purchased times the purchase price. The position is the number of stocks purchased or sold. The position size is the total US dollars of the position calculated as numbers of stocks purchased or sold times the price. For example, if a trader buys 100 stocks at \$30 each, then the position is 100 and the position size is \$3,000.

$$P/L = \alpha + \beta_{1i} \text{Turnover} + \beta_{2i} \text{Accountage}_{it} + \beta_{3i} \text{Hold time in hours}_{it} + \beta_{3i} \text{Position size}_{it}$$

We used control variables in our regression because they have been analyzed in previous financial empirical studies [2] [5] [54]. We first control for “Turnover” because Barber and Odean [5] discovered that the more active traders (traders who trade frequently) underperform than less active traders. Second, we control for “Account age” of the traders because Nicolosi, Peng and Zhu [52] analyzed retail individual traders and found individual traders learn from their trading experiences. The authors found that the longer retail individuals trade, the more they learn and the better they perform.

The authors noted they would control for the biological age of the traders but that information is not in the database. Third, we control for “position size” because Abbey and Doukas [1] revealed that account holders who trade larger position sizes outperform those who trade smaller position sizes. The reason we use control variables is to enable us to determine whether risk tolerance (Hold-time-in-hours) is significant.

“Hold-time-in-hours” is defined as the mean length of time a position is held open. “Hold-time-in-hours” is a proxy for risk tolerance, because if a trader holds his securities for a short time before trading them, the higher the risk tolerance level that the trader has. The reason we came to this conclusion is because of the work of Kelly [39] and Kumar et al. [41], and Calvet [8] on the gambling theory that was discussed in the above section. The gambling theory supports that traders will hold their stocks for less time and regularly trade to chase profits. Also “Hold-time-in-hours” is used because the more useful the trade platform is perceived to be, the higher the risk tolerance levels for the traders, for example, the more they use it the more comfortable traders become with risk.

The results in table 3 show that “Turnover” and “Account Age” are negative but insignificant, which implies that there is no significant relationship between the IT trading platform’s perceived usefulness with trading activity or with how long traders had their accounts. Table 3 also shows two explanatory variables with statistical significance: “Hold-time-in-hours” and “Position size”. The coefficient of “Position size” is negative and significant, but as we mentioned earlier this is a control variable to enable us to determine the effect of the main analytical variable and that is “Hold-time-in-hours”.

The significant values of “Hold-time-in-hours,” -1.31 and t-statistic = -6.64, reveals that there is a

negative relationship between the length positions that are held open with performance. This implies that the more time traders hold their positions (traders take more time to trade), the more negative their performance will be and vice versa.

The traders who take risks trade quickly or take less time than other traders when they make a trade, comparable to gamblers who assume a great deal of risk. Since the coefficient of “Hold-time-in-hours” is negative and significant, this means that the less time traders hold their positions the better their portfolio performance will be. We established earlier that traders who perceive the IT trading platform as useful associate themselves as risk takers (H1.2). Therefore, we can conclude that there is a noteworthy positive impact of the IT trading platform’s perceived usefulness and portfolio performance through the positive association between risk taking and portfolio performance. Therefore, H2 is supported.

The result reveals statistically significant dependent variables, albeit a low coefficient of determination. Regardless of the coefficient of determination, the significant coefficients for “Hold-time-in-hours” and “Position size” represent the mean change in the response for one unit of change in the dependent variable.

Table 3. The Association between Perceived Usefulness and Portfolio Performance

	Coefficient	t-statistic
Intercept	1,176.21	-1.7
Turnover	-240.88	(-0.68)
Account age	0.65	-0.35
Hold-time-in-hours	-1.31	(-6.64)*
Position size	-0.004	(-2.11)*
R2	0.021	
Obs.	256,674	

6. Implications and Contributions

As for the theoretical implications, an inclusion of IT factors and other user experience constructs can make finance information systems studies more productive and valued. The support of IT theories such as TAM and Technology affordances may shed some light on how a trader utilizes certain IT in planned behavior or trading. The speed of digitization, ubiquity, spontaneity, immediacy, portability, synchronicity, and

other salient IT-Finance technologies’ characteristics are expected to accelerate the transformations.

This study, and other similar future studies, would need to converge both disciplines’ theories and developments in order to unveil core emerging IT in finance. As to its practical implication, many traders would apply the results of this study in selecting a trading platform and developing their portfolio. The subjective forms of perceived usefulness and satisfaction will vary among traders and this subjectivity will determine the adoption and consumption of IT in financial markets.

7. Conclusion and Future Studies

This study’s results introduce some significant findings that underpin a much closer relationship between IT and Finance than many think. This study analyzed the underlying relationship between the IT trading platform’s user experience – perceived usefulness and satisfaction – and financial trading activities – trading risk-taking behavior and stock portfolio performance.

The results have revealed that traders who have perceived their trading platform as being useful outperformed those traders who have perceived their trading platform as not being useful. This study’s result posits a significant underlying relationship between the user experience of IT and the user’s stock portfolio performance.

Given the rapid IT transformation in finance trading and other areas, a number of finance-IT hybrid studies are duly expected to better understand the new IT-induced financial trading ecosystem.

On the finance side, we are eyeing a number of variables that need to be analyzed, such as income and education levels or trading experience, and where these may influence a trader’s trading perspective and decision processes. On the IT side, we are pointing to the emergent mobile platform and social media for their synergistic effects on the speed of information transmittal and their sharing capability and how these may influence a trader’s market awareness and quick decision-making.

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