

# A Study of the Financial Behavior Based on the Theory of Planned Behavior

Hsien-Ming Shih<sup>1</sup>, Bryan H. Chen<sup>1</sup>, Mei-Hua Chen<sup>1</sup>, Ching-Hsin Wang<sup>2</sup> & Li-Fen Wang<sup>3</sup>

<sup>1</sup> Department of Finance, National Changhua University of Education, Changhua City, Taiwan

<sup>2</sup> Department of Leisure Industry Management, National Chin-Yi University of Technology, Taiwan.

<sup>3</sup> Department of Eldercare, Central Taiwan University of Science and Technology, Taichung City, Taiwan

Correspondence: Ching-Hsin Wang, Professor of Department of Leisure Industry Management, National Chin-Yi University of Technology, No.57, Sec. 2, Zhongshan Rd., Taiping Dist., Taichung City, Taiwan, R.O.C.

Received: April 2, 2022

Accepted: May 14, 2022

Online Published: June 6, 2022

doi:10.5539/ijms.v14n2p1

URL: <https://doi.org/10.5539/ijms.v14n2p1>

## Abstract

Personal finance and investments are closely related to people's lives. Most investors focus on return rates than on risks. However, when the market changes considerably or unexpectedly, investors may incur losses. Employees in the electronics industry are a middle- to high-income group. However, their work may prevent them from acquiring financial knowledge and factors affecting investments. This group should also understand methods of reducing risks in investments and avoiding losses. This study examines employees in the electronics industry in Taiwan and uses the theory of planned behavior to investigate the effects of demographic variables and intention to manage personal finances and invest on investment behavior. A total of 600 questionnaires were distributed, and 469 were returned. Among the 469 questionnaires, 41 were incomplete and invalid and thus disregarded, posting a response rate and valid response rate of 78.16% and 71.33%, respectively. SPSS 20 and structural equation modeling were used for analysis. The results demonstrate that financial attitude has a significant and positive effect on financial knowledge and subjective norms, that subjective norms have a significant and positive effect on perceived financial control, and that financial knowledge has a significant and positive effect on financial behavioral intention. However, subjective norms and perceived financial control do not significantly affect financial knowledge. The results suggest that individuals should reduce risks in their personal finances and investments. Potential directions for further research are also provided.

**Keywords:** financial behavioral intention, financial knowledge, financial attitude, subjective norm, perceived financial control

## 1. Introduction

The era of the knowledge economy and information explosion necessitates sufficient knowledge, particularly financial knowledge, to act in the globalized economy. Such knowledge can facilitate the accumulation of personal wealth and financial freedom and strengthen nations' economic power (Hayhoe, Leach, & Turner, 1999). After the 2006 financial crisis, numerous countries, such as the United States, the United Kingdom, and those in the European Union (EU), began to strengthen their financial education. In January 2008, former U.S. President George W. Bush established the President's Advisory Council on Financial Literacy (PACFL) to promote activities related to financial knowledge. In addition, former U.S. Secretary of the Treasury Paulson visited 112 cities across 48 states to help students, teachers, parents, soldiers, and workers formulate financial retirement plans (Hsu, 2008). Former U.S. President Barack Obama supported the initiative and indicated that understanding how to balance accounts and budgets wisely to avoid debts is increasingly crucial. In 2006, the European Parliament Committee on Culture and Education published an education announcement and suggested that EU member states promote practical social and business education to deepen students' understanding of corporate culture (Chiao, 2006). With numerous countries focusing on financial education, the Financial Supervisory Commission suggested that Ministry of Education improve finance and management education in primary and secondary schools. With a strong understanding of financial skills and concepts, students can avoid costly financing resulting from misjudgment or a lack of knowledge when they enter the workforce (Liu, 2009).

Financial literacy and skills are the foundation for economic development and civilized society. Financial

literacy can help the public develop useful skills and habits to make informed financial decisions, thereby laying a crucial foundation for individuals and families (Grable & Joo, 1998; Martin & Oliva, 2001). Scholars have discovered that financial training can help consumers gain knowledge, make informed financial decisions (Braunstein & Welch, 2002), improve investment behavior (Campbell, 2006), increase savings, and reduce debts (Lyons & Neelakantan, 2008) and that financial knowledge is directly correlated with financial behavior (Hilgert, Hogarth, & Beverly, 2003). Studies have indicated that families with financial difficulties often lack aspects of financial knowledge, which results in improper loan and investment behavior (Lusardi & Mitchell, 2007) and can affect health (Norvilitis, Szablicki, & Wilson, 2003). In addition, individuals' unpreparedness for retirement can burden the government and society (Klemme, 2002).

However, Braunstein and Welch (2002) argued that financial knowledge may not improve financial behavior. Mandell (2008) discovered that students from families with numerous financial resources have stronger financial knowledge and that studying finance in high school is not correlated with financial behavior; the validity of these conflicting hypotheses must be verified using additional data. This study offers a new perspective on financial behavior by investigating factors that affect financial behavior. Studies on finance must analyze relationships between variables and identify their effects. This requires quantitative data and the appropriate statistical methods. Because domestic financial data alone are insufficient, studies have often used questionnaires to collect and analyze data for different occupations (e.g., teachers, medical personnel, and retired people). In addition, because most studies have investigated the relationships between individual variables, the generalizability of their results has been limited.

This study investigates employees in the electronics industry, who are considered a high-income group, and uses structural equation modeling (SEM) for statistical analysis. This study also uses theoretical and practical methods to develop a model and questionnaires to investigate the path relationship between personal financial knowledge and financial behavior. In addition, this study uses a latent variable, which is difficult to observe, derived from several other variables and creates constructs such as financial knowledge. This method is employed to resolve insufficiencies of the univariate processes, which is the first study objective. The second objective is developing two main constructs, investigating the paths between the independent variables and financial behavioral intention, observing the linear relationship between the constructs and their effects, and comparing the results with those of other studies. The model and path analysis are also used to explore the factors that affect financial behavioral intention and to avoid using a single variable to explain financial behavior. The statistical inferences can fill gaps in research on finance and reveal factors that affect financial knowledge and financial behavior, thereby providing reference studies on financial knowledge and behavior.

## **2. Literature Review**

### *2.1 Theory of Planned Behavior*

The theory of planned behavior (TPB) derives from the theory of reasoned action (TRA). The TRA was proposed by Fishbein and Ajzen (1980), and its theoretical basis is social psychology. The TRA is used to predict behavior and investigate the relationships among attitude, intention, and behavior. The TRA indicates that behavioral intention is affected by attitudes and subjective norms and that behavioral intention affects behavior. The TRA also hypothesizes that individuals have free will to control their behavior after reflection.

Scholars prefer the TPB to the TRA and consider it a more comprehensive model of behavioral intention. Empirical studies have demonstrated that the TPB is superior to TRA in terms of prediction. The TPB comprises the following elements:

- 1) Attitude: Attitudes are individuals' evaluations of objects and ideas and can predict behavior. Individuals with positive attitudes toward a behavior have a stronger intention to engage in that behavior.
- 2) Subjective norms: Subjective norms are a form of social pressure from parents, friends, spouses, or colleagues that determines behavior. Strong positive subjective norms increase behavioral intention.
- 3) Perceived behavioral control: Perceived behavioral control is individuals' control over the resources and opportunities required to perform a specific behavior. It relates to desires, intentions, and nonmotivational factors that cannot be controlled, such as time, money, skills, opportunities, resources, and policies. A lack of control over resources can prevent individuals from performing certain behavior. Self-efficacy and external resources can limit perceived behavioral control. Self-efficacy is related to individuals' ability to perform a specific behavior, whereas low accessibility to external resources can create obstacles. Both factors affect individuals' decision to perform certain behavior.
- 4) Behavioral intention: Behavioral intention refers to how strongly individuals desire to perform a certain

behavior. It can be measured in terms of willingness of effort. Behavioral intention can be used to predict behavior. However, behavior is often affected by external environmental factors and are not completely under individuals' control; the TRA is less suited to explaining such behavior than the TPB. To resolve this problem, Ajzen incorporated perceived behavioral control into the TRA and developed the TPB to increase explanatory and predictive power (Figure 1; Ajzen, 1991).

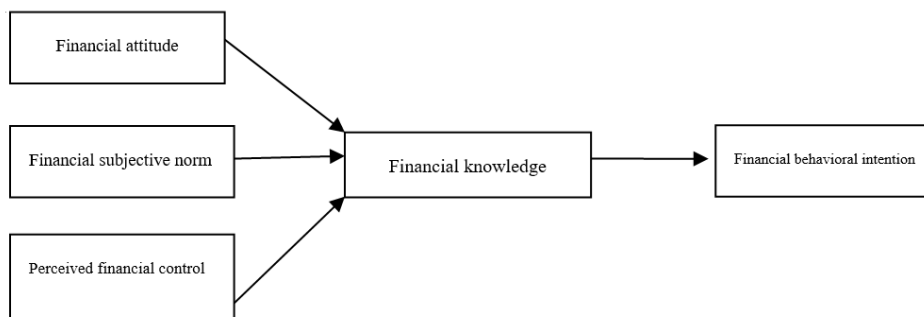


Figure 1. Financial behavior in the TPB

## 2.2 Financial Knowledge

### 2.2.1 Financial Literacy

The Financial Literacy and Education Commission defines financial literacy as the ability to make wise decisions and to use and manage money effectively (Basu, 2005). The U.S. Department of the Treasury defines financial literacy as the ability to understand and manage money to make wise financial decisions (Office of the Comptroller of the Currency, 2012). The Jumpstart Coalition for Personal Financial Literacy defines financial literacy as the use of knowledge and skills to manage financial resources and achieve lifetime financial security; PACFL also adopted this definition (PACFL, 2008). The UK Financial Services Authority defines financial capabilities as individuals' capacity to manage money and their financial status, develop financial plans, select financial commodities, and obtain information regarding financial events (Orton, 2007). In a UK education research report, Schagen and Lines indicated that financial literacy is the ability to use and manage money wisely (Worthington, 2006). Financial knowledge requires an understanding of various concepts, theories, commodities, services, and investment strategies, which enables the effective management of personal wealth and responsible, beneficial financial decision-making (Worthington, 2006; Orton, 2007).

### 2.2.2 Financial Knowledge

Financial knowledge encompasses several aspects that vary by profession. Hogarth (2002) noted that financial literacy should entail an understanding of money and asset management, financial transactions, investments, credit, insurance, taxes, and financial planning to make financial decisions. Hogarth and Hilgert (2002) used created a questionnaire on concepts such as credit cards, savings, and mortgage loans. Some scholars have indicated that money management, consumption, savings, the usage and costs of loans, and investments are essential components of financial knowledge (Boyce & Danes, 1998). Other scholars have noted that modern financial services, bank deposits, retirement products, and loan and credit products are crucial components (Braunstein & Welch, 2002). In addition, the correct usage of credit cards is a basic component of financial knowledge (Lyons, Rachlis, & Scherpf, 2007). The Jumpstart Coalition for Personal Financial Literacy indicates that K–12 students should learn financial responsibility and decision-making, income and occupation, money management and planning, credit and loans, risk management and insurance, and savings and investments (Jump\$tart, 2007). Scholars and institutions differ considerably in terms of their definition of financial literacy.

The same applies to financial behavior as well. The Financial Supervisory Commission (2008) defines financial behavior as behavior that relates to money management. Braunstein and Welch (2002) evaluated financial behavior in terms of cash flow management, savings and investments, credit, taxes, and money management. Hilgert, Hogarth, and Beverly (2003) used four aspects to explain financial behavior: cash flow management, credit management, savings, and investments. O'Neill and Xiao (2003) developed a financial fitness quiz to examine financial behavior. The quiz comprised 20 statements related to money management behavior, such as

“I have a checking account and I use it to pay my bills” and “I shop around to see if I can get a bargain.” Robb and Woodyard (2011) used contingency fund, personal credit reports, overdraft loans, credit card payment, retirement accounts, and risk management as evaluation standards. Various methods have been employed to evaluate financial knowledge and behavior. This study used the evaluation standards developed by the Study on the Methodology, Framework and Field Investigation of the National Financial Literacy Survey.

### 2.2.3 Relationship Between Financial Knowledge and Behavior

Scholars have explored the relationship between financial knowledge (literacy) and financial behavior. In a professional report, the Organization for Economic Cooperation and Development indicated that financial illiteracy is not the only factor that creates risks; however, financial illiteracy increases risks (Organization for Economic Cooperation and Development, 2009). A UK study on financial literacy noted that financial illiteracy prevents individuals from identifying financial services and products that satisfy their needs and desires. Inappropriate financial operations such as loans can result in financial loss (Lord, 2001). Most studies have indicated that financial knowledge and behavior are positively correlated (Hilgert, Hogarth, & Beverly, 2003; Mandell & Klein, 2009; Robb & Woodyard, 2011). Financial literacy helps individuals manage their money, savings, and investments effectively, utilize loans, prepare for retirement, and invest in stocks. Hira and Zorn (2001) discovered that providing consultation courses for families before they purchase houses helps them avoid delinquency on loans. Hilgert, Hogarth, and Beverly (2003) demonstrated the positive correlation between financial knowledge and behavior. They discovered that those with strong financial knowledge tend to have higher indices of financial behavior, credit management, savings, and investments. Hira and Loibl (2005) indicated that when employees received financial education, their financial literacy in topics such as retirement, investments, planning, and credit management improved. By anticipating their future financial status, they developed confidence and become more satisfied with their work. Mandell (2006) discovered that checks written by those with strong financial knowledge are unlikely to be declined and that such individuals often clear their debts successfully. Lusardi and Mitchell (2007) revealed that financial literacy affects financial behavior, that those without savings and retirement plans have low financial literacy, and that those with strong financial knowledge are prepared for retirement, particularly those who understand compound interest and develop various savings plan. They also analyzed factors that affect retirement plans, such as educational attainment, marital status, number of children, retirement status, race, and sex, and concluded that the most crucial factor is financial literacy.

Van Rooij, Lusardi and Alessie (2011) investigated financial literacy and decision-making behavior. Financial literacy can be basic or advanced. Basic financial literacy consists of knowledge of deposit income, compound interest, inflation, time value, and money illusion. Advanced financial literacy consists of knowledge of topics such as stocks, bonds, and mutual funds. The study considered investment behavior a financial decision-making behavior and discovered that education level, income, and wealth are correlated with stocks. Because of the complexity of the stock exchange, those without financial literacy invest less; those with stronger financial literacy often hold more stocks. Cole, Paulson and Shastry (2012) discovered that education strengthens financial knowledge, facilitates participation in financial markets, and increases assets and savings. One study discovered that the financial literacy of university students significantly and directly affected their financial activity and that attitude changes indirectly affected their financial activity (Tseng, 2013). Brown, Van der Klauw, Wen and Zafar (2013) investigated the relationship between financial literacy and consumer debts and revealed that financial knowledge can help young people increase their credit ratings and asset returns rates and avoid delinquency and dependency on debts. Shih and Ke (2014) discovered that financial literacy predicts financial decision-making and that those with financial knowledge engage in financial behavior with high risks.

Hogarth and Hilgert (2002) discovered that those with financial knowledge often have higher education levels. Cole, Paulson and Shastry (2012) demonstrated that education can strengthen financial knowledge. Robb and Woodyard (2011) discovered that education level is a crucial factor affecting financial behavior. Hogarth and Hilgert (2002), Hilgert, Hogarth and Beverly (2003), and Atkinson, McKay, Collard and Kempson (2007) indicated that those with low income often have less financial knowledge. However, Buckland (2010) discovered that those with low income often have sufficient knowledge of market price, governmental plans, and financial services and that they have limited savings and abilities to take out loans. Robb and Woodyard (2011) indicated that income is a crucial factor affecting financial behavior. Most studies have demonstrated that financial knowledge positively, significantly, and directly affects financial behavior, even if education and income levels are considered. This study investigates whether the external latent variable, namely financial knowledge, would positively affect the internal latent variable, namely financial behavior regardless of the effect of education and income on financial knowledge.

This study explores the observed variables that constitute financial knowledge and behavior. Next, this study examines how financial knowledge affects financial behavior. Because of data limitations, most studies have used a univariate process for financial knowledge and behavior (Robb & Woodyard, 2011; Shih & Ke, 2014). Consequently, the components are unknown, and how each observed variable explains financial knowledge or behavior cannot be determined. Supporting data are required to identify observable variables affecting financial knowledge and behavior. This study focuses on understanding the strengths and weaknesses of financial knowledge and behavior in Taiwan.

### 2.3 The TPB in Studies on Investment Behavior

The TPB is often applied in psychology to analyze decision-making processes. Studies on investment behavior have increasingly used the TPB. Fishbein and Ajzen used the TRA to investigate behavior and adoption intention in various fields. Ajzen (1991) incorporated perceived behavioral control into the TPB. Studies applying the TPB to investment behavior include Yang (2010), who examined the costs for investors switching to online stock trading. Wang (2010) researched students' entrepreneurial behavior. Wu (2013) applied the TBP to entrepreneurial intention and used entrepreneurial skills as moderator. Chen (2014) investigated young entrepreneurs' behavior in Japan by using the TPB. Tseng (2015) performed a path analysis of the effects of education level and annual family income on financial knowledge and behavior in Taiwan. Warsame and Ileri (2016) determined whether the TPB matters in sukuk investment. Because these studies used the TPB to investigate investment behavior and to demonstrate that attitudes, subjective norms, and perceived behavioral control are positively correlated, this study uses the as a basis to investigate behavioral intention to invest.

## 3. Methods

### 3.1 Sample and Procedure

This study conducts a survey by using the convenience sampling method. Before the survey, the author calls the participants' company to explain the purpose of this study and the questionnaire process and determines whether the employees are willing to participate. The author then obtains permission to distribute the questionnaire and sends it to the participants. The author asks the company's management to distribute the questionnaire to the employees and to seal them when completed. A designated worker then collects the questionnaires. To ensure the validity of the questionnaire, only full-time workers are permitted to respond. A total of 600 questionnaires is distributed, and 469 are returned. After preliminary processing, 41 incomplete and invalid questionnaires are removed, and 428 valid responses remain; the response rate and valid response rate were 78.16% and 71.33%, respectively.

### 3.2 Research Tool

The questionnaire is used to collect data. This study also uses scales developed by various scholars. Academic and industry experts use the scales to create the questionnaire and a pretest and to adjust their wording. Content validity is determined through interviews with the experts, and the pretest is revised to eliminate ambiguous wording and irrelevant questions. A total of 30 pretests are collected for analysis and validity testing. After the pretest, no items are added or deleted. The overall Cronbach's  $\alpha$  of the questionnaire is 0.944. The Cronbach's  $\alpha$  values of the five dimensions, namely financial behavioral intention, financial knowledge, financial attitude, subjective norms, and perceived financial control, are 0.945, 0.847, 0.913, 0.889, 0.938, which are higher than 0.7, indicating high validity. Therefore, the questionnaire has high consistency.

The questionnaire consists of two parts. The first is the operational definition of the dimensions. The questionnaire is developed with reference to the literature and the following operational definitions of the TPB and theory of perceived risks:

- (1) Financial attitude: individuals' evaluation of personal finances.
- (2) Subjective norms: the effects of others' approval on personal finances.
- (3) Perceived financial control: individuals' perception of their ability to manage their personal finances.
- (4) Financial knowledge: the ability to evaluate risks to personal finances.
- (5) Financial behavioral intention: the willingness to manage personal finances.

The questionnaire consists of four sections: financial behavioral intention, financial attitude, subjective norms, and perceived financial control. The financial behavioral intention section, which consists of two dimensions, namely financial behavioral intention and financial knowledge, is developed with reference to Xiao and Dew (2011) and Perry and Morris (2005). The financial attitude section was adapted from the questionnaires used by Rajna et al. (2011) and Rotter (1966) and comprises eight items. The subjective norms section is developed with

reference to the questionnaire used by Rajna et al. (2011) and comprises five items. The perceived financial control section is adapted from the questionnaire used by Rotter (1996) and comprises five items. The personal information section comprises 10 items, namely sex, education level, age, marital status, job tenure, occupation, preferred investment method, investments in financial commodities, monthly income, and monthly disposable household income.

The fifth section of the questionnaire is categorical, and the first through fourth sections use the 5-point Likert scale, which requires participants to indicate whether they agree with each statement (*strongly disagree, disagree, neutral, agree, or strongly agree*). Higher scores indicate stronger identification. The scores are used in the empirical data analysis.

### 3.3 Research Framework and Hypotheses

This study adds a financial knowledge dimension to improve the explanatory power of the TPB model; Figure 2 presents the research framework.

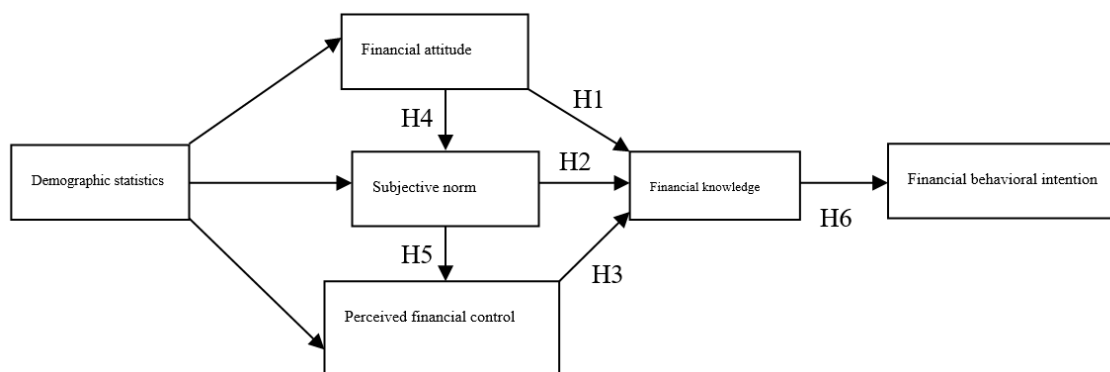


Figure 2. Research framework

The hypothesized path relationships among the six latent variables are as follows:

1) Financial attitude, subjective norms, perceived financial control, and financial knowledge: Ajzen (1991) noted that behavioral intention affects behavior and is affected by behavioral attitude, subjective norms, and perceived behavioral control. The TPB hypothesizes that individuals that have positive attitudes toward a behavior, feel a strong sense of social pressure, and perceive that they have control over their behavior exhibit a strong intention to perform the behavior (Liang, 2013). Therefore, this study proposes the following hypotheses:

H1: Financial attitude positively affects the financial knowledge of employees in the electronics industry.

H2: Subjective norms positively affect the financial knowledge of employees in the electronics industry.

H3: Perceived financial control positively affects the financial knowledge of employees in the electronics industry.

2) Financial attitude and subjective norms: Because financial attitude affects personal subjective norms (Liang, 2013), this study proposes the following hypothesis:

H4: Financial attitude positively affects the subjective norms of employees in the electronics industry.

3) Perceived financial control and financial knowledge: Because perceived financial control affects personal financial knowledge (Liang, 2013), this study proposes the following hypothesis:

H5: Perceived financial control positively affects the financial knowledge of employees in the electronics industry.

4) Financial knowledge and financial behavioral intention: Because financial knowledge affects financial behavioral intention (Liang, 2013), this study proposes the following hypothesis:

H6: Perceived risks positively affect the behavioral attitude of employees in the electronics industry.

## 4. Results

This study uses AMOS to analyze the linear structural relations and the causal relationships and correlations

among the variables. According to Forza and Filippini (1998), model fit indices, namely the goodness-of-fit index (GFI), relative fit index (RFI), adjusted GFI (AGFI), and normed fit index (NFI), should be higher than 0.8, the comparative fit index (CFI) should be higher than 0.9 (Hair et al., 2006), root mean square error of approximation (RMSEA) should be lower than 0.06 (Brown & Cudeck, 1993), and  $\chi^2$ /degrees of freedom (df) should be equal to or less than 3 (Chau & Hu, 2001).

The analysis indicates that the  $\chi^2$  value is 686.454, df is 323,  $\chi^2$ /df is 2.125, GFI is 0.909, AGFI is 0.869, NFI is 0.851, RFI is 0.800, CFI is 0.913, and RMSEA is 0.051. These results meet the standards proposed by scholars. Therefore, the structural model has excellent fit (Table 1).

Table 1. Model fit indices

Association to variable		Estimated parameter	p value							
Financial knowledge	<--- H1: financial attitude	.915	***							
Financial knowledge	<--- H2: subjective norms	.991	.173							
Financial knowledge	<--- H3: perceived financial control	.989	.147							
Subjective norms	<--- H4: financial attitude	.879	***							
Perceived financial control	<--- H5: subjective norms	.992	***							
Financial behavioral intention	<--- H6: financial knowledge	.971	***							
I believe that making financial plans is essential	<--- Financial attitude	.537	***							
I believe that making notes of financial matters is a waste of time	<--- Financial attitude	.597	***							
I believe that savings are essential	<--- Financial attitude	.555	***							
My past financial experiences help me plan my investments and personal finances	<--- Financial attitude	.36	***							
I believe that I should only focus on my current financial situation	<--- Financial attitude	.453	***							
I believe that successfully managing personal finances requires consideration for risks	<--- Financial attitude	.519	***							
I research financial commodities available in the market	<--- Financial attitude	.546	***							
I collect information regarding investments and personal finances	<--- Financial attitude	.468	***							
My family and friends think I should manages my personal finances	<--- Subjective norms	.561	***							
I reference the opinions of expert investors to plan my financial behavior	<--- Subjective norms	.586	***							
I reference from the opinions of my friends to determine my financial behavior	<--- Subjective norms	.55	***							
My friends practice financial behavior, so I should too	<--- Subjective norms	.659	***							
My family and friends approve of my investments and financial behavior	<--- Subjective norms	.394	***							
I can change my ideas about investments into action	<--- Perceived financial control	.424	***							
I can control essential matters in life	<--- Perceived financial control	.48	***							
I can achieve what I want to if I am determined	<--- Perceived financial control	.566	***							
My future is in my hands	<--- Perceived financial control	.522	***							
I can decide on my own how to invest	<--- Perceived financial control	.311	***							
I know how to diversify my investments to reduce risks	<--- Financial knowledge	.652	***							
I know how the economy affects my investments	<--- Financial knowledge	.449	***							
I know how to invest in the right financial commodities	<--- Financial knowledge	.338	***							
I shop around before I make a decision about buying a product or service	<--- Financial behavioral intention	.555	***							
I strive to pay all my bills on time	<--- Financial behavioral intention	.666	***							
The perceived value of consumer (sense of ease)	<--- Financial behavioral intention	.612	***							
I strive to keep records of my monthly expenses	<--- Financial behavioral intention	.589	***							
I strive to manage my budget	<--- Financial behavioral intention	.634	***							
I can control my credit card spending	<--- Financial behavioral intention	.521	***							
I pay attention to due dates for credit card payments and my balance	<--- Financial behavioral intention	.597	***							
I strive to set aside a fixed amount of money from my salary	<--- Financial behavioral intention	.487	***							
I am willing to save for long-term goals like cars, education, or family expenses	<--- Financial behavioral intention	.488	***							
<b>Model fit indices</b>										
$\chi^2$	d.f.	p value	$\chi^2$ /d.f.	RMR	GFI	AGFI	NFI	RFI	CFI	RMSEA
686.454	323	0.000	2.125	0.022	0.909	0.869	0.851	0.800	0.913	0.051

Note. \*: P<0.05, \*\*: P<0.01, \*\*\*: P<0.001.

1) Financial attitude has a significant and positive effect on financial knowledge. The standardized coefficient is 0.915 ( $p = .001$ ). Therefore, those with positive financial attitudes can gain financial knowledge. Financial attitude positively affects personal financial knowledge; this supports H1.

2) Subjective norms do not significantly affect financial knowledge. The standardized coefficient is 0.991 ( $p = .173$ ). Therefore, individuals may rely on their financial knowledge even if they do not know if it is correct; the results do not support H2.

3) Perceived financial control does not significantly affect financial knowledge. The standardized coefficient is 0.989 ( $p = .147$ ). Although external perceived financial control may change individuals' perspectives, it does not affect financial knowledge; the results do not support H3.

4) Financial attitude has a significant and positive effect on subjective norms. The standardized coefficient is 0.879 ( $p = .000$ ). Emotions and behavior related to finance can result in positive evaluations. If they are affected by others, such as parents or friends, then their financial attitude has a more positive effect on subjective norms. The results support H4.

5) Subjective norms have a significant and positive effect on perceived financial control. The standardized coefficient is 0.992 ( $p = .000$ ). Subjective norms have similar effects to those of society on behavioral intention. Strong subjective norms often lead to positive perceptions of financial control; this supports H5.

6) Financial knowledge has a significant and positive effect on financial behavioral intention. The standardized coefficient is 0.971 ( $p = .000$ ). Financial knowledge facilitates participation in financial markets and increases intention to practice financial behavior; this supports H6.

All hypotheses except that relating subjective norms to financial knowledge and that relating perceived financial control to financial knowledge all supported. Figure 3 presents the results of the path analysis.

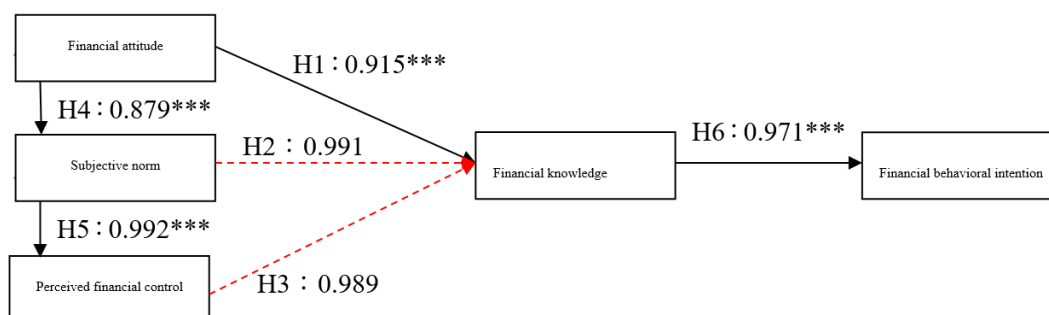


Figure 3. Results of structural model analysis

## 5. Conclusion and Suggestions

This study examines employees in the electronics industry in Taiwan and uses the theory of planned behavior to investigate the effects of demographic variables and intention to manage personal finances and invest on investment behavior. According to the analysis of this study, the results of the study are detailed as follows:

1) Financial attitude has a significant and positive effect on financial knowledge. This result supports those of Joo and Grable (2004), Bryant, Stone and Wier (2006), and Shim, Xiao, Barber and Lyons (2009). Financial education determines financial knowledge and attitude. Positive financial attitudes create hierarchical relationships between financial knowledge and behavioral intention, which can increase individuals' satisfaction with their financial situations.

2) Subjective norms do not significantly affect financial knowledge. This result does not support one of the hypotheses. Individuals use their own knowledge to explore financial matters and do not consider whether others' opinions are correct. This is crucial to decision-making. Therefore, the relationship between subjective norms and financial behavior should be investigated.

3) Perceived financial control does not significantly affect financial knowledge. This result does not support one of the hypotheses. Although perceived financial control can change individuals' perspectives, it does not affect financial knowledge. Higher social perception can control behavioral intention more easily, and greatly increases



financial knowledge.

4) Financial attitude has a significant and positive effect on subjective norms. This result supports those of Shim (2010) and Bubolz and Sontag (1993). Financial attitude can predict emotions; positive financial attitudes indicate strong subjective norms.

5) Subjective norms have a significant and positive effect on perceived financial control. This result supports those of Fishbein and Ajzen (1975) and Ajzen (1989). The possibility of individuals perceiving financial control when purchasing financial products and services is high when subjective norms are strong. Therefore, subjective norms positively affect perceived financial control.

6) Financial knowledge has a significant and positive effect on financial behavioral intention. This result supports those of Ajzen (1991), Lyons and Scherpf (2006), and Perry and Morris (2005). Financial knowledge can facilitate participation in financial markets and positively affect financial behavioral intention. In addition, positive evaluations of financial knowledge strengthen financial behavioral intention.

Due to the long working hours of employees in the electronics industry, they have less opportunity to obtain investment and financial information in their lives. However, investment and financial knowledge should be an important life knowledge in most people's lives. This study will be provided to the education and training department of the electronics company. When they conduct employee education and training, they can incorporate financial expertise into the curriculum to help employees avoid serious financial losses due to insufficient financial knowledge. The results suggest that middle- and high-income investors should reference not only their subjective attitudes and perceived financial control but also their financial knowledge. In addition, investors should use positive financial attitudes and financial intention to reduce risks in personal finances and investments. One limitation of this study is that the results are derived from employees of the electronics industry in central Taiwan and thus cannot be generalized to other industries. Studies should employ a wide research scope to increase the value of their contributions.

## Reference

- Ajzen, I. (1989). Attitude structure and behavior. *Attitude Structure and Function*, 241, 274.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Atkinson, A., McKay, S., Collard, S., & Kempson, E. (2007). Levels of financial capability in the UK. *Public Money and Management*, 27(1), 29–36. <https://doi.org/10.1111/j.1467-9302.2007.00552.x>
- Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structure equation models. *Journal of the Academy of Marketing Science*, 16(1), 74–94. <https://doi.org/10.1007/BF02723327>
- Basu, S. (2005). *Financial literacy and the life cycle*. White House Conference on Aging. Retrieved from [http://216.87.66.5/member/govt\\_relation/new/loader.cfm?url=/commonspot/security/getfile.cfm&PageID=33231.pdf](http://216.87.66.5/member/govt_relation/new/loader.cfm?url=/commonspot/security/getfile.cfm&PageID=33231.pdf)
- Boyce, L., & Danes, S. (1998). *Evaluation of the NEFE high school financial planning program 1997–1998*. Retrieved from <http://www.hsfpp.org/Portals/0/Documents/NEFE%20HSFPP%20Impact%20Study%201997-1998.pdf>
- Braunstein, S., & Welch, C. (2002). Financial literacy: An overview of practice, research and policy. *Federal Reserve Bulletin*, 88(11), 445–457. <https://doi.org/10.17016/bulletin.2002.88-11>
- Brown, M., van der Klaauw, W., Wen, J., & Zafar, B. (2013). *Financial education and the debt behavior of the Young*. Federal Reserve Bank of New York. staff report no. 634. Retrieved from <http://www.philadelphiafed.org/research-and-data/events/2013/consumer-credit-and-payments/papers/Brown.pdf>
- Bryant, S. M., Stone, D. N., & Wier, B. (2006). *Financial Attitudes: Implications for personal financial planning services (PFPSs) and financial literacy*. Retrieved from <http://ssrn.com.ezproxy.library.wisc.edu/abstract=896101>
- Bubolz, M. M., & Sontag, M. S. (1993). Human ecology theory. In P. G. Boss, W. J. Doherty, R. LaRossa, W. R. Schumm & S. K. Steinmetz (Eds.), *Sourcebook of family theories and methods: A contextual approach* (pp. 419–448). [https://doi.org/10.1007/978-0-387-85764-0\\_17](https://doi.org/10.1007/978-0-387-85764-0_17)
- Buckland, J. (2010). Are low-income Canadians financially literate? Placing financial literacy in the context of personal and structural constraints. *Adult Education Quarterly*, 60(4), 357–376.

- <https://doi.org/10.1177/0741713609358449>
- Campbell, J. Y. (2006). Household Finance. *Journal of Finance*, 61(4), 1553–1604. <https://doi.org/10.1111/j.1540-6261.2006.00883.x>
- Chen, Y. P. (2014). *An investigation of entrepreneurial behavior of early entrepreneurs in Japan through the theory of planned behavior (TPB)*. Ling Tung University, Taichung City, Taiwan.
- Chu, P. Y., Yeh, H. J., & Huang, J. Y. (2002). *An integrated volunteer behavior model and its application on recruiting volunteers for foundations for the elderly* (pp. 475–505).
- Cole, S., Paulson, A., & Shastry, G. (2012). Smart money: The effect of education on financial behavior. In *Harvard Business School* (pp. 09–071). <https://doi.org/10.2139/ssrn.1317298>
- Fan, L. W. (2002). *The behavioral intention of university students participating in ecotourism: A case study of Tunghai University students*. National Taichung University of Education, Taichung City, Taiwan.
- Fishbein, M. L. A. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research* (pp. 181–202).
- Grable, J. E., & Joo, S. (1998). Does financial education affect knowledge, attitudes, and behavior? An empirical analysis. *Personal Finances and Worker Productivity*, 2(2), 213–220.
- Hair, J. F. Jr., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis* (5th ed.). Englewood Cliff, NJ: Prentice Hall.
- Hayhoe, C. R., Leach, L. J., & Turner, P. R. (1999). Discriminating the number of credit cards held by college students using credit and money attitudes. *Journal of Economic Psychology*, 20, 643–656. [https://doi.org/10.1016/S0167-4870\(99\)00028-8](https://doi.org/10.1016/S0167-4870(99)00028-8)
- Hilgert, M., Hogarth, J., & Beverly, S. (2003). Household financial management: The connection between knowledge and behavior. *Federal Reserve Bulletin*, 89(7), 309–322.
- Hira, T. K., & Loibl, C. (2005). Understanding the impact of employer-provided financial education on employee commitment. *Journal of Consumer Affairs*, 39(1), 173–194. <https://doi.org/10.1111/j.1745-6606.2005.00008.x>
- Hirad, A., & Zorn, P. M. (2001). *A little knowledge is a good thing: Empirical evidence of prepurchase homeownership counseling*. McLean, VA: Freddie Mac.
- Ho, L. C. (2012). *Intentions in teaching hospitality English and conversation: An application of the theory of planned behavior and self-efficacy*. National Kaohsiung University of Hospitality and Tourism, Kaohsiung City, Taiwan.
- Hogarth, J. (2002). Financial literacy and family and consumer sciences. *Journal of Family and Consumer Science*, 94, 14–28.
- Hogarth, J. M., & Hilgert, M. A. (2002). Financial knowledge, experience and learning preferences: preliminary results from a new survey on financial literacy. *Consumer Interest Annual*, 48, 1–7.
- Hsu, P. Y. (2014). *A study of the consumption behavior of low-cost carrier transportation*. National Taiwan Ocean University, Taipei City, Taiwan.
- Hyoyoun, P., & Wook, S. (2013). Behavioral Finance: A Survey of the Literature and Recent Development Seoul. *Journal of Business*, 19(1). <https://doi.org/10.35152/snusjb.2013.19.1.001>
- Joo, S. H., & Grable, J. E. (2004). An exploratory framework of the determinants of financial satisfaction. *Journal of Family and Economic Issues*, 25(1), 25–50. <https://doi.org/10.1023/B:JEEI.0000016722.37994.9f>
- JumpStart Coalition for Personal Financial Literacy. (2007). *National Standards in K–12 Personal Finance Education with Benchmarks, Knowledge Statements, and Glossary*. Retrieved from <http://www.jumpstartcoalition.org>
- Klemme, D. (2002). National jumpstart coalition for financial literacy benchmarks: Curriculum inclusion and pedagogical practice in Wisconsin. *Journal of Family and Consumer Sciences Education*, 20(2), 13–19.
- Lee, W. I., & Chao, P. J. (2004). The research of information technology acceptance model of electronic patient record system in health care industry's employees—An example of central and southern Taiwan. *Journal of Healthcare Management*, 5(2), 243–269.

- Lord, N. (2001). *Summing up: Bridging the financial literacy divide*. A CAB evidence report. London: National Association of Citizens Advice Bureaux.
- Lusardi, A., & Mitchell, O. S. (2007). Baby boomer retirement security: The role of planning, financial literacy, and housing wealth. *Journal of Monetary Economics*, 54(1), 205–224. <https://doi.org/10.1093/acprof:oso/9780199230778.003.0013>
- Lyons, A., & Neelakantan, U. (2008). Potential and pitfalls of applying theory to the practice of financial education. *Journal of Consumer Affairs*, 42(1), 106–112. <https://doi.org/10.1111/j.1745-6606.2007.00097.x>
- Lyons, A. C., Chang, Y., & Scherpf, E. (2006). Translating financial education into behavior change for low-income populations. *Journal of Financial Counseling and Planning*, 17(2).
- Lyons, A. C., Rachlis, M., & Scherpf, E. (2007). What's in a score? Differences in consumers' credit knowledge using OLS and quantile regressions. *Journal of Consumer Affairs*, 41(2), 223–249. <https://doi.org/10.1111/j.1745-6606.2007.00079.x>
- Mandell, L. (2006). *Financial literacy: Improving education results of the 2006 national Jump\$tart survey*. Washington, DC: Jumpstart Coalition.
- Mandell, L. (2008). Financial literacy of high school students. In J. J. Xiao (Ed.), *Handbook of Consumer Finance Research* (pp. 163–183). New York, NY: Springer. [https://doi.org/10.1007/978-0-387-75734-6\\_10](https://doi.org/10.1007/978-0-387-75734-6_10)
- Mandell, L., & Klein, L. (2009). The Impact of Financial Literacy Education on Subsequent Financial Behavior. *Journal of Financial Counseling and Planning*, 20(1), 16–24.
- Martin, A., & Oliva, J. C. (2001). Teaching children about money: Applications of social learning and cognitive learning developmental theories. *Journal of Family and Consumer Sciences*, 93(2), 26–29.
- Min-Hua, K., Nai-Fong, K., Yao-Chu, C., & Ping-Hang, F. (2005). *Gender and Investment Behavior: on Taiwanese Individual Investors*.
- Norvilitis, J. M., Szablicki, P. B., & Wilson, S. D. (2003). Factors influencing levels of credit-card debt in college students. *Journal of Applied Social Psychology*, 33(5), 935–947.
- O'Neill, B., & Xiao, J. J. (2003). Financial fitness quiz: A tool for analyzing financial behavior. *Consumer Interests Annual*, 49, 1–3.
- OCC. (2012). *Financial Literacy Resource Directory*. Retrieved from <http://www.occ.treas.gov/cdd/finlitresdir.htm>
- OECD. (2009). *Financial Education and the Crisis*. Retrieved from <http://www.oecd.org/finance/financial-education/50264221.pdf>
- Orton, L. (2007). *Financial literacy: Lessons from international experience*. CPRN Research Report.
- Perry, V. G., & Morris, M. D. (2005). Who is in control? The role of self-perception, knowledge, and income in explaining consumer financial behavior. *Journal of Consumer Affairs*, 39(2), 299–313. <https://doi.org/10.1111/j.1745-6606.2005.00016.x>
- President's Advisory Council on Financial Literacy (PACFL). (2008). *2008 Annual Report to the President*. Retrieved from [http://www.treas.gov/offices/domestic-finance/financial-institution/fin-education/council/exec\\_sum.pdf](http://www.treas.gov/offices/domestic-finance/financial-institution/fin-education/council/exec_sum.pdf)
- Robb, C., & Woodyard, A. (2011). Financial Knowledge and Best Practice Behavior. *Journal of Financial Counseling and Planning*, 22(1), 60–70. <https://doi.org/10.4148/jft.v3i1.1453>
- Shih, T., & Ke, S. (2014). Determinates of financial behavior: Insights into consumer money attitudes and financial literacy. *Service Business*, 8(2), 217–238. <https://doi.org/10.1007/s11628-013-0194-x>
- Shim, S., Barber, B. L., Card, N. A., Xiao, J. J., & Serido, J. (2010). Financial socialization of first-year college students: The roles of parents, work, and education. *Journal of Youth and Adolescence*, 39(12), 1457–1470. <https://doi.org/10.1007/s10964-009-9432-x>
- Shim, S., Xiao, J. J., Barber, B. L., & Lyons, A. C. (2009). Pathways to life success: A conceptual model of financial well-being for young adults. *Journal of Applied Developmental Psychology*, 30(6), 708–723. <https://doi.org/10.1016/j.appdev.2009.02.003>

- Tseng, Y. C. (2015). The path analysis of education, family's annual income on financial knowledge and financial behavior of the Taiwanese. *Kaohsiung Normal University Journal*, 38, 49–68.
- van Rooij, M., Lusardi, A., & Alessie, R. (2011). Financial literacy and stock market participation. *Journal of Financial Economics*, 101(2), 449–472. <https://doi.org/10.1016/j.jfineco.2011.03.006>
- Wang, S. H. (2010). *Research on entrepreneurial behavior of student entrepreneur—Based on the theory of planned behavior*. National Taipei University, Taipei City, Taiwan.
- Wang, W. H., & Lin, H. T. (2008). *A research of internet bank consumer behavior—Technology acceptance model*.
- Warsame, M. H. (2016). EM Ileri. *Journal of Behavioral and Experimental Finance*.
- Worthington, A. C. (2006). Predicting financial literacy in Australia. *Financial Services Review*, 15(1).
- Wu, P. W. (2013). *Application the theory of planned behavior to entrepreneurial intention: Entrepreneurial skills as moderator*. National Taipei University. Taipei City, Taiwan.
- Wu, S., & Lin, T. C. (2007). Exploring knowledge sharing behavior of IS personnel with theory of planned behavior. *Journal of Information Management*, 14(2), 75–110.
- Yang, P. Y. (2010). *A study of theory of planned behavior and switching costs of investors on the intention of using online stock trading*. National Taipei University. Taipei City, Taiwan.

### Copyrights

Copyright for this article is retained by the author, with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).