Research Paper: Partial Least Squares Structural Equation Modeling to Establish Reliability and Validity of Teacher's Investment Awareness, Attitudes and Investment Intentions

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ABSTRACT

Investment behaviour involves individual actions such as researching, selecting, purchasing, managing, and eventually disposing of financial products. Understanding this behaviour reveals insights into how individuals use their surplus funds among available investment avenues. Financial security and good investment behaviour among educators directly influence educational outcomes and broader societal well-being. Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to capture a respondent teacher's perception of investment awareness, attitudes towards investment and investment intentions.

KEYWORDS

Partial Least Squares Structural Equation Modeling (PLS-SEM), Awareness, Attitude and Intentions

1. INTRODUCTION

Investments are generally perceived as actions taken today with the intention of securing future financial gains. In essence, investing involves allocating resources, typically money, into financial or real assets in anticipation of generating profits, interest, or capital appreciation in the future (Pandey, 2021).

Our School Teachers constitute a unique segment of investors. Indian School teachers are responsible for shaping the intellectual and moral fabric of our Indian society. The financial well-being of teachers greatly impacts their professional efficiency, personal quality of life (Commerce Factory, 2021) and directly influence educational outcomes and broader societal well-being.

PLS-SEM was utilised for establishing validity and reliability of the measures used to capture a respondent teacher's perception of investment awareness, attitudes towards investment and investment intentions.

2. SAMPLE SIZE AND SURVEY

Out of the 500 participants in the survey, 10 respondents (2.0 %) were drawn from government schools, whereas the overwhelming majority of 490 respondents (98.0 %) attended private or public (non-government) schools. 413 participants (82.7 %) were female, while 87 participants (17.3 %) were male. As per the age distribution of the respondents, largest single cohort falls in the 31–40 years bracket (212 participants; 42.4 %), followed by the 41–50 years group (125 participants; 25.0 %), 24–30 years account for 87 respondents (17.4 %), while 50 years and above comprise the remaining 76 respondents (15.2 %). This age profile suggests that most participants are in the middle of their careers, which may have implications for interpreting awareness, attitudes, and intentions across life stages.

As per the income distribution, largest group falls in the ₹5–10 lakhs bracket, with 207 participants (41.4 %), closely followed by ₹2–5 lakhs at 198 participants (39.6 %). A smaller segment earns upto ₹2 lakhs (68; 13.6 %), and the smallest group reports ₹10 lakhs and above (27; 5.4 %) as their annual income. This concentration in the middle-income ranges suggests a relatively homogenous economic profile for the majority of respondents.

As per teaching experience, largest group of 258 teachers (51.6 %) has 10 years or more of experience. Over one fifth of the sample (113 teachers; 22.6 %) fall into the 5–10 years category. Those with 3–5 years of experience account for 77 respondents (15.4 %), and the smallest group comprises teachers with up to 3 years on the job (52 respondents; 10.4 %). This concentration toward higher experience levels indicates that a majority of participants are veteran educators. A large majority of 433 participants (86.6 %) reported as being married, while 40 participants (13.4 %) are unmarried.

3. VALIDITY AND RELIABILITY OF THE SCALES USED

In the study, teacher's investment awareness, attitudes and investment intentions are the main working constructs. Therefore, it is imperative to establish their validity and reliability first. The present study employs PLS-SEM, which starts with evaluating the measurement model (outer model) before assessing the structural relationships. This step is critical to establish the psychometric soundness of the constructs.

3.1 ANALYSIS OF MEASUREMENT MODEL

To start off with establishing the validity and reliability of the measures used, firstly, the outer model is estimated. The PLS-SEM estimations are done via the seminR package ver. 2.3.1 in the R statistical programming language ver. 4.5.0. Table 1 indicates the item codes for each item and construct and Table 2 shows the factor loadings obtained from the analysis of the outer model.

Construct	Code	Statement	Item Source
Awareness about Investment Avenues	A1	I am aware of equity shares as an investment avenue, including how to buy and sell them.	Bhattacharjee & Singh (2017); Deene & Pathi (2013)

Construct	Code	Statement	Item Source
	A2	I am familiar with the features, interest rates, and tenure options of bank fixed deposit schemes.	Lokhande (2015); Ramyashree (2024)
	A3	I understand the different modes of investing in gold (e.g., physical gold, gold ETFs, sovereign gold bonds) and their benefits.	Lokhande (2015); Ramyashree (2024)
	A4	I have knowledge of various mutual fund categories (equity, debt, hybrid) and their risk–return profiles.	Akash & Muthumani (2024); Chaudhary (2016)
	A5	I know about post-office investment schemes (e.g., PPF, NSC, Kisan Vikas Patra) and their tax and maturity benefits.	Lokhande (2015); Ramyashree (2024)
	A6	I understand the relationship between risk and expected return for different investment avenues.	Bhattacharjee & Singh (2017); Ramyashree (2024)
	A7	I know where to obtain reliable information about these investment avenues (e.g., websites, financial advisors, seminars).	Karmacharya (2023); Guria, Patankar & Tyagi (2017)
	A8	I have attended or would attend financial literacy/investor-awareness programs conducted by schools, colleges, or government agencies.	Guria, Patankar & Tyagi (2017); Ramyashree (2024)
	A9	I feel confident comparing different investment options (shares vs. FDs vs. gold vs. mutual funds vs. post-office schemes) before making a decision.	Deene & Pathi (2013); Karmacharya (2023)
	A10	I am aware of how my circumstances such as age, income, and years of teaching experience influence one's awareness of investment avenues.	Karmacharya (2023); Lokhande (2015)
Attitudes Towards Investment	AT1	I believe investing in equity shares is a worthwhile way to grow my wealth.	Ramyashree (2024); Bhattacharjee & Singh (2017)
	AT2	I feel bank fixed deposits are a safe and reliable investment option for teachers.	Ramyashree (2024); Lokhande (2015)
	AT3	I consider gold investment to be an effective hedge against inflation and market volatility.	Ramyashree (2024); Lokhande (2015)
	AT4	I trust mutual funds to deliver satisfactory returns relative to the risk involved.	Ramyashree (2024); Chaudhary (2016)
	AT5	I view post-office savings schemes (e.g., PPF, NSC, Kisan Vikas Patra) as reliable long-term investments.	Ramyashree (2024); Lokhande (2015)

Construct	Code	Statement	Item Source
	AT6	I find the risk–return trade-off of different investment avenues acceptable for achieving my financial goals.	Bhattacharjee & Singh (2017); Ramyashree (2024)
	AT7	I am confident making investment decisions without relying heavily on external financial advisors.	Guria, Patankar & Tyagi (2017); Karmacharya (2023)
	AT8	I believe systematic investing (e.g., SIPs) is the most disciplined way to accumulate wealth over time.	Ramyashree (2024)
	AT9	I think participation in financial-literacy programs positively influences my investment attitude and confidence.	Guria, Patankar & Tyagi (2017); Ramyashree (2024)
	AT10	I feel my age, income level, and years of teaching experience shape my attitude toward investment risk.	Karmacharya (2023); Lokhande (2015)
Investment Intentions	IT1	I intend to invest in equity shares within the next six months.	Sashikala & Chitramani (2018); Akhtar & Das (2019)
	IT2	I plan to open one or more new fixed-deposit accounts in the coming quarter.	Mildenberger (2019); Kumari, Senani & Ajward (2022)
	IT3	I will allocate a portion of my savings to physical or digital gold investments in the near future.	Mildenberger (2019); Sashikala & Chitramani (2018)
	IT4	I intend to start or increase systematic mutual-fund investments (e.g., SIPs) within the next year.	Tsiaplias, Zeng & Lim (2023); Kumari, Senani & Ajward (2022)
	IT5	I plan to subscribe to post-office savings schemes (e.g., PPF, NSC) in the next six months.	Sashikala & Chitramani (2018); Mildenberger (2019)
	IT6	I will actively look for new investment opportunities in capital markets over the coming months.	Tsiaplias, Zeng & Lim (2023); Akhtar & Das (2019)
	IT7	I intend to grow my overall investment portfolio by atleast 10 % over the next year.	Akhtar & Das (2019); Kumari, Senani & Ajward (2022)
	IT8	I plan to diversify my investments across different financial instruments (shares, FDs, gold, mutual funds, post-office) soon.	Sashikala & Chitramani (2018); Mildenberger (2019)
	IT9	I will consult a financial advisor or other expert before making significant new investments in the near future.	Tsiaplias, Zeng & Lim (2023); Sashikala & Chitramani (2018)
	I10	I intend to monitor my investments regularly and adjust them based on market conditions.	Mildenberger (2019); Kumari, Senani & Ajward (2022)

Table 1 : Item Code for Each Construct and Item

Indicators	Awareness	Attitudes	Intentions
a1	0.813		
a2	0.833		
a3	0.138		
a4	0.750		
a5	0.825		
a6	0.712		
a7	0.784		
a8	0.707		
a9	0.742		
a10	0.684		
at1		0.804	
at2		0.879	
at3		0.680	
at4		0.733	
at5		0.669	
at6		0.772	
at7		0.683	
at8		0.763	
at9		0.699	
at10		0.754	
i1			0.808
i2			0.803
i3			0.751
i4			0.779
i5			0.652
i6			0.723
i7			0.850
i8			0.734
i9			0.811
i10			0.739

Table 2 : Factor Loadings

The factor loading table (Table 2) from the PLS-SEM analysis shows that most indicators load strongly on their respective constructs, indicating good convergent validity. For the Awareness construct, most items (e.g., a1, a2, a5) have loadings above the recommended 0.70 threshold, except a3, which has a very low loading (0.138) and should be considered for removal, however overall construct reliability needs to be seen for deletion. The Attitudes construct shows consistently high loadings across all indicators, demonstrating strong measurement reliability. Similarly, the Intentions construct exhibits solid item loadings, with all values close to or above 0.70, except i5, which is slightly lower but still acceptable. Overall, the model displays a well-structured reflective measurement model with very little scope for improvement in the Awareness construct.

3.2 RELIABILITY AND VALIDITY MEASURES

From the factor loadings estimated in Table 2, now other reliability and validity measures can be computed such as AVE (Average Variance Extracted), CR (Composite Reliability) (rho_C) and Cronbach's Alpha. Table 3 shows the AVE, CR and Alpha for all the constructs.

Construct	Cronbach's Alpha	Composite Reliability (rho_C)	AVE	Dijkstra-Henseler's ρA
Awareness	0.903	0.912	0.526	0.928
Attitudes	0.927	0.926	0.557	0.929
Intentions	0.935	0.934	0.588	0.936

Table 3 : Reliability

Table 3 shows the reliability and convergent validity statistics for the three latent constructs of the model, namely, Awareness, Attitudes, and Intentions. In the PLS-SEM model, all constructs exhibit high internal consistency, as indicated by Cronbach's Alpha (α), with values ranging from 0.903 to 0.935, well above the recommended threshold of 0.70. Composite reliability (ρC), which is often preferred in PLS-SEM due to its sensitivity to differing item loadings, also shows strong values for all constructs (Awareness: 0.912; Attitudes: 0.926; Intentions: 0.934), confirming the constructs are measured reliably. Dijkstra-Henseler's rho_A (ρA), another reliability measure that accounts for construct flexibility, this statistic also mirrors these results, further supporting internal consistency. Importantly, the Average Variance Extracted (AVE) values for all constructs exceed the minimum acceptable threshold of 0.50 (Awareness: 0.526; Attitudes: 0.557; Intentions: 0.588), indicating good convergent validity. These AVE values suggest that, on average, each construct explains more than half of the variance in its indicators. Together, these metrics confirm that the measurement model is both reliable and exhibits strong convergent validity across all constructs (Hair et al., 2021).

	Awareness	Attitudes	Intentions
Awareness	**0.725**	–0.044	0.442
Attitudes	–0.044	**0.746**	0.419
Intentions	0.442	0.419	**0.767**

Table 4 : Fornell and Larcker Criterion for Discriminant Validity

The Fornell and Larcker criterion is used to assess discriminant validity by comparing the square root of the Average Variance Extracted (AVE) of each construct with its correlations with other constructs. In the table, the diagonal values (Awareness = 0.725, Attitudes = 0.746, Intentions = 0.767) represent the square roots of AVE, while the off-diagonal elements show the inter-construct correlations. According to the criterion, a construct should share more variance with its own indicators than with other constructs in the model (Fornell & Larcker, 1981). In this case (Table 4), each construct's diagonal value is greater than its correlations with any other construct in the matrix (e.g., √AVE for Intentions = 0.767 is greater than its correlations with Awareness = 0.442 and Attitudes = 0.419), confirming the presence of discriminant

validity. Therefore, the constructs in the measurement model are empirically distinct and measure different theoretical concepts, satisfying the Fornell-Larcker condition.

	Awareness	Attitudes	Intentions
Awareness	–	0.080	0.478
Attitudes	0.080	–	0.443
Intentions	0.478	0.443	–

Table 5 : Discriminant Validity using HTMT Criteria

The HTMT (Heterotrait-Monotrait Ratio) criterion provides a more modern and stringent method for assessing discriminant validity in PLS-SEM models. The Table 5 shows the HTMT values between constructs such as 0.080 for Awareness–Attitudes, 0.478 for Awareness–Intentions, and 0.443 for Attitudes–Intentions. All values are well below the suggested threshold of 0.85, indicating strong evidence of discriminant validity. Unlike the Fornell and Larcker (1981) criterion, which compares the square root of AVE with inter-construct correlations, HTMT evaluates the ratio of average heterotrait–heteromethod correlations to the average monotrait–heteromethod correlations. Henseler, Ringle, and Sarstedt (2015) demonstrated that Fornell and Larcker's approach may not reliably detect discriminant validity issues, especially in complex or highly correlated models. HTMT on the other hand has shown higher sensitivity and accuracy in simulation studies making it a preferred and more robust method for assessing whether constructs are empirically distinct. Therefore, while Fornell and Larcker remains a useful preliminary check, HTMT offers a more dependable confirmation of discriminant validity.

4. CONCLUSION

Based on the comprehensive analysis, the measurement model demonstrates strong reliability and validity across all three constructs such as teachers Investment Awareness, Investment Attitudes, and Investment Intentions. Internal consistency is confirmed through acceptable Cronbach's Alpha (≥ 0.903), Composite Reliability (≥ 0.912), and rhoA (≥ 0.928), all well above the accepted threshold of 0.70 (Hair et al., 2021), indicating that the items consistently measure their respective constructs. Convergent validity is also established, as all constructs show Average Variance Extracted (AVE) values exceeding 0.50, and most indicators have strong loadings above 0.70. Discriminant validity is confirmed using both the Fornell and Larcker (1981) criterion, where the square roots of AVEs are greater than inter-construct correlations, as well as the HTMT ratio, with all values well below the conservative 0.85 threshold. Together, these results affirm that the constructs are measured reliably, capture sufficient variance from their indicators, and are empirically distinct from one another, supporting the overall soundness of the measurement model.

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