INVESTORS' RATIONAL CONFORMITY TO GOVERNMENT'S EXCESSIVE BEHAVIOR IN PPP PROJECT: FORMS AND MEASUREMENT

Jiaqi LIU[1], Haodong LIU[1], Zehui BU[2], Peifen HE[3], Jicai LIU[2*]

[1] School of Economics and Management, Southwest University of Science and Technology, Mianyang, China
[2] School of Economics and Management, Southwest Jiaotong University, Chengdu, China
[3] Capital Construction Department, Southwest University of Science and Technology, Mianyang, China

Abstract. In PPP projects, there is a tendency for investors to follow the government's excessive behavior, which is not conducive to controlling the behavior risks of the project. Due to the differences in conformity purposes, it is important to determine the form and tendency of investor conformity to understand the reasons for conformity and propose control suggestions. Referring to the research of Song et al., the study constructs an initial scale that investor's rational conformity to the government's excessive behavior. 269 and 244 data are used for the pre-test and validation of the scale, respectively. After adjusting the scale and analyzing reliability and validity by using SPSS and AMOS, the forms of investor conformity are divided into abidance, compliance, and obedience. Meanwhile, the measurement scales of three conformity tendencies are determined. These findings are conducive to quantitatively evaluating the risk level of investors' conformity and deepening managers' understanding of rational investor conformity, which is beneficial for reducing the risk of investor conformity and thus reducing the risk of the government's excessive behavior.

*Corresponding author. E-mail: *jicailiu@126.com*

1. Introduction

In public-private partnership (PPP) projects, studying the behavioral risks of stakeholders is an important topic to improve the success rate of the project and ensure the healthy development of the PPP scheme. As the core decision-makers of PPP projects, the behavior of the government and investors directly determines the performance of the project. For example, in the Dabhol Power Company project in India, investors still participated in the investment and financing activities of the project that the local government did not carry out the preliminary evaluation as required, failing the project due to insufficient income; In the early stage of the BOT (build-operate-transfer) project of Shanghai Dachang Water Plant, when the local government provided the investors with fixed return terms, the investors still accepted the terms and participated in the investment and financing process of the project, and the project went bankrupt and was repurchased eventually. In the above cases, on the one hand, the failure of the project was caused by government violations or unreasonable excessive behavior (Liu et al., 2022; Xing et al., 2020); On the other hand, investors did not reject the excessive behavior proposed by the government, ultimately leading to the emergence of risks. Therefore, analyzing the risks of the government's excessive behavior and investors' conformity behavior is important for improving the success rate of projects. Based on the theory of field dynamics, Liu et al. (2022) analyzed the influence mechanism of the external environment and demand factors on the government's excessive behavior and determined the key influence path. However, research on the risk of investor conformity has not yet been conducted under the conditions of the government's excessive behavior.

In PPP projects, as partners, investors can choose to reject unreasonable government decisions to avoiding the occurrence of projects with low performance. However, as in the above case, there is still the phenomenon that investors agree or follow the government's irrational decisions, which is manifested as conformity. This conformity refers to investors changing their existing beliefs or behaviors under real or imagined pressure, and exhibiting behaviors and attitudes consistent with the following object (Yang et al., 2015). Accordingly, in PPP projects, investors' conformity to the government's excessive behavior has two important reasons. First, under the influence of external pressure from the control rights of government, investors are forced to follow the government's excessive behavior; Second, investors do not only pursue the investment income of the project but also expect to establish

good cooperative relations with local governments, corporate reputation, and high industrial competitiveness etc. (Esen, 2013; Liu & Liu, 2024). Accordingly, the conformity behavior of investors is affected by the government's control rights and requirements, which is manifested as purposeful rational conformity (Song et al., 2012; Song, 2005). According to the purpose of investor conformity and the research of Song et al. (2012) and Song (2005), rational conformity of investors can be divided into abidance, obedience, and compliance. The purpose and representation of the three forms in PPP projects all have differences, and their responses to excessive government behavior also vary. Therefore, analyzing the performance and propensity measurement scales of the three forms of conformity not only helps to improve the understanding of investor conformity risk but also lays the foundation for further analysis of investor conformity mechanisms.

2. Literature review

2.1. Research on the PPP

In the PPP scheme, the related research has gone through four stages: from initiation, formation, growth, to expansion (Narbaev, 2022). Project risk management, project performance evaluation, and project investment and financing design (such as value for money, pattern design, and cost control) have always been the focus of attention for scholars. Osei-Kyei et al. (2023) conducted a scientometric analysis on 1730 PPP risk management publications. Among them, risk identification and risk sharing are the core of PPP project risk management. In systematic risk identification, researchers should fully utilize qualitative and quantitative methods to determine risk factors due to the influence of project characteristics and complex stakeholders (Sun et al., 2022; Dorfeshan et al., 2022; Pellegrino, 2021; Aladag & Isik, 2020; Wang & Gao, 2020). These research contents lay the foundation for reasonable risk sharing, which is conducive to fully leveraging the advantages of PPP to promote real value for money of PPP (Xu et al., 2018; Ameyaw et al., 2015). Otherwise, commitment errors, disputes, and contradictions may occur during project implementation (Ke et al., 2013). Share allocations, concession period decisions, incentive strategies, etc. belong to project governance mechanisms and are important bases for achieving scientific decision-making (Guo et al., 2022; Li et al., 2022; Xiong & Han, 2023). A reasonable concession period decision is also beneficial for the fairness of PPP risk sharing and promoting a win-win situation (Carbonara et al., 2014). In order to ensure the high-quality development of infrastructure, PPP sustainability-related issues should be addressed (Narbaev, 2022). For example, how to achieve the high performance and sustainable goals of projects through contract design (Li et al., 2023; Su et al., 2023; Cai et al., 2021). However, the above studies overlooked the behavioral risks generated by stakeholders. Although some scholars believe that risk behaviors such as excessive commitment, tunneling, and

speculation should be avoided, research on the relationship between subject behaviors is still insufficient (such as Luo et al., 2022; Gao & Liu, 2020; Wang et al., 2019). Especially when the government engages in excessive behavior that is detrimental to project performance, investor conformity is harmful.

2.2. Research on investors' conformity behavior

Conformity psychology is a common phenomenon in society. It reflects the situation in the people change their original attitude under the influence of the external environment or groups pressure to maintain the same attitude with the group or the majority. In decision-making, the subject often considers the behavior tendency of others, which makes self-perception differences and self-insecurity, and then gradually produces the phenomenon of convergence with most people. In management psychology, conformity behavior is not only affected by personal characteristics (such as emotion) but also by decision-making methods and the external environment (Tang et al., 2023; Basarir & Yilmaz, 2019). According to the psychological characteristics of investors, Lu (2007) divided the decision-makers from the securities market into the following crowd, independent and stable, and environmental adaptation. Based on the investment stock selection process, Che et al. (2002) clustered individual investors in the securities market into comprehensive types, conformity types, and analysis types.

Due to the subjectivity of the influencing factors, the conformity of investors is usually studied as "herd behavior" in capital trading systems such as finance, stocks, and venture capital. This behavior is irrational under group pressure (Basarir & Yilmaz, 2019). Devenow and Welch (1996) also believed that herd behavior is wrong, and the behavior choice of decision-makers often deviates from the information they own, which is an irrational behavior that does not conform to the information as the basis for decision choice. Bikhchandani and Sharma (2001) showed that this irrational behavior is aimed at keeping the group attitude consistent or meeting the expectations of others, and is a behavior of following others' behavior decisions. Irrational herd behavior can lead to further expansion of market losses (Demirer et al., 2010). In addition to irrational herd behavior, Lin et al. (2013) considered the situation that investors are informed traders in trading decisions and are rational "herding" with superior information, that is, some investments will show rational herd behavior. Therefore, investors' herd behavior can be divided into rational conformity based on superior information or external incentives, irrational conformity based on psychological activities or emotions (blind conformity), and near-rational conformity in the middle (Devenow & Welch, 1996; Bian & Li, 2009).

Although there is sufficient research on investors' herd psychology, the definition of investors' herd behavior from a financial perspective is still vague. There are differences

and consistency between investors' conformity and herd behavior (Jiang et al., 2010). The consistency lies in the fact that both are behaviors that are consistent with the group and are influenced by the opinions of others; The difference is that herd behavior in the financial capital market is caused by the pressure caused by the difference in capital information, while conformity behavior is mainly caused by the standardization of the group or the pressure of the object itself. Therefore, the following target of herd behavior is mainly the same type of investors, while the following object of conformity behavior is diverse. In social management, conformity behavior is more universal, and herd behavior is only a special kind of conformity in the financial market. In the social environment, investors' behavior is not only affected by the behavior intention of the same type of investors but also affected by other types of transaction subjects, such as the government and the public. Therefore, in PPP projects, the conformity of investors is affected by the pressure of government rights, status, resources, etc. However, in the management of PPP projects, there has been a lack of attention to the phenomenon of investors following government behavior, and how to measure the degree of investor conformity has not been determined yet. Therefore, this study analyzes the forms and measurement scales of investors' conformity in the context of excessive government behavior, which is beneficial for managers to improve their understanding of rational conformity and achieve a qualitative evaluation of conformity risk. At the same time, this is also conducive to the improvement of the PPP project behavior management knowledge system.

3. The development process of investor rational conformity initial scale

Referencing the scale development program conducted by Liu et al. (2023), as shown in Figure 1, a formal scale of investors' conformity behavior is built.

First, based on the concept of conformity and relevant research literature, in group discussions, combined with the characteristics of PPP projects, the performance and initial scale of investors' rational conformity under the government's excessive behavior are determined.

Second, pre-testing the initial scale. The study constructs a structured questionnaire containing scale items and selects appropriate participants to collect data. Using SPSS (Statistical Product and Service Solutions) and AMOS (Analysis of Moment Structures) software to conduct reliability and validity, factor analysis on the data, and remove items that do not meet the requirements to form a formal scale.

Third, based on the research of Liu et al. (2022), collect conformity survey data from investors in the context of excessive government behavior. Conduct reliability and validity analysis on the data to verify the accuracy and applicability of the formal scale.
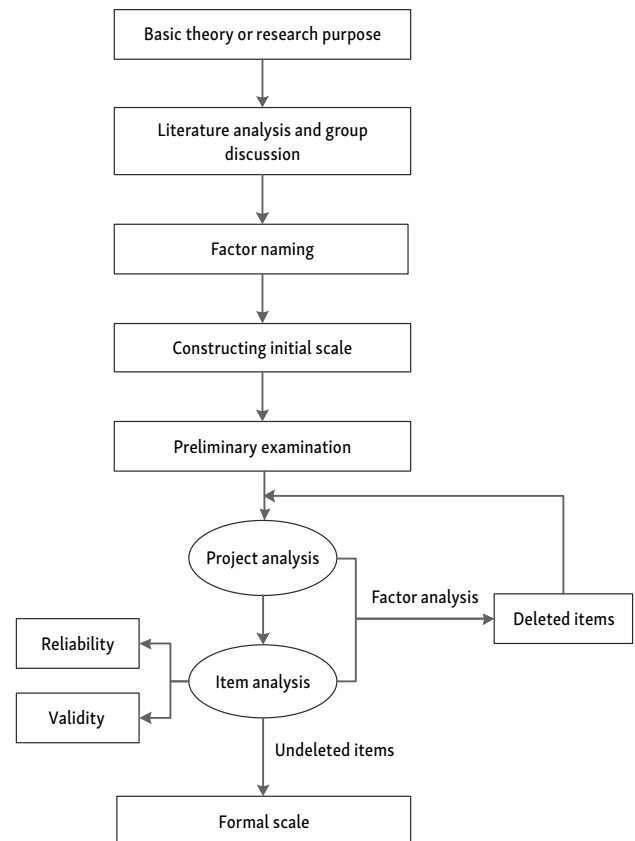

Figure 1. Scale development procedure in the study of Liu et al. (2023)

3.1. Measurement items of investors' conformity behavior

Conformity is a usual behavior in management or social activities, which means that individuals in groups change their original beliefs or behaviors under the pressure of imaginary or actual objects (Yang et al., 2015). The behavior of conformity essentially reflects the passivity of the members. The pressure in the group is the main reason for the members to follow the crowd. The pressure may be the specific threat or punishment clause established in the group or the hidden threat generated under the ideology of the members. Conformity has positive effects that can enhance the cohesion of the group and strengthen the goal consistency of members. It also has the effect of deconvolution the lack of innovation of group decision-makers, the expansion of losses caused by irrational group decision-making, and the inhibition of individual thinking leading to "blind obedience". According to the purpose of the individual's conformity behavior and the means of handling information during its occurrence, conformity is divided into rational and irrational (Song et al., 2012; Song, 2005) (see Table 1).

Rational conformity refers to the behaviors and attitudes that are consistent with the object or agree with the object to achieve the demands after studying and judging the behavior and relevant information in a specific situa-

tion. Irrational conformity means that in a specific situation, the subject follows or agrees with the behavior and attitude of the object based on intuition or instinct (Song et al., 2012; Song, 2005). The intuition and instinctive activities of irrational conformity are usually difficult to express in logic, and they are more inclined to the intuition generated by experience accumulation (Easen & Wilcockson, 1996). Therefore, one of the significant differences between rational and irrational conformity is whether the information provided by the object or environment has the logical reasoning process of integration. Song (2004) first proposed and used the conformity behavior measurement questionnaire in the study of abidance behavior. This study investigated undergraduate attitudes to the behavior of closed management during the SARS period. According to the purpose difference of implementing closed management, Song (2004) divided students' conformity behavior into abidance, compliance, and obedience. Three types of conformity of students are distinguished from the attribution of behavior, emotional experience, and will process (see Table 2). Because there is no absolute opposition between the three types of conformity, that is, there is a certain correlation between them, which will be transformed with the accumulation of time and subject experience (Song et al., 2008). The study takes three types of conformity as three potential variables to measure in the questionnaire to analyze the relative conformity of subjects.

Investors' conformity has the purpose of meeting the demand. In the context of the government's excessive be-havior, investors have the characteristics of economic men who pursue the maximization of interests, including investment income, enterprise development, future market, etc. For the phenomenon of aimlessness and blind herd without information judgment caused by empiricism, more in-depth analysis will be made in the future. Therefore, the study only analyzes the purposeful abidance, compliance, and obedience of investors. Table 3 explains the three types of conformity of investors in PPP projects under the government's excessive behavior.

According to Table 1 and Table 2, we can effectively distinguish and measure the three types of conformity from the behavior nature, characteristics, will process, and emotional experience. These four aspects are used to construct initial measurement projects for conformity (see Table 5). In PPP projects, the government and investors are cooperative, and the government will not force investors to follow their own behavior decisions. This scenario is different from the "closed management" behavior in the study of Song (2004). The "closed management" implemented is the direct order and requirement of teachers, leaders, and superiors. Investors follow the government due to the influence of the government's status, power, and advantageous resources. Investors will potentially follow the "requirements" of the government's decisions, resulting in conformity. This conformity is to avoid the government's punishment or seek the government's advantageous resources and other benefits. Therefore, the characteristics of "others' require" are not used as items to measure obedience.

Table 1. Division of conformity forms

Rationality	Dimension	Interpretation	Behavioral purpose	Character
Rational conformity	Abidance	In an objective or psychological situation with fuzzy nature, the subject is in order to understand things or implement certain actions; The criterion for judging this behavior is to follow the attitude of the object	The purpose of recognizing things or taking correct actions is to obtain a correct understanding of behavior or to test the correctness of one's own behavior	Impartial
	Obedience	The subject adopts the same attitude or behavior as the object for the purpose of avoiding punishment or obtaining rewards after research and judgment based on the information of the subject in a specific situation	Avoiding punishment or seeking reward from the object	Self-interest
	Compliance	In a specific situation, based on emotional experience, the attitude or behavior that is generated after studying and judging the behavior of the subject with the goal of meeting the expectations of the other party	Cater to the expectations of the object	Altruism
Irrational conformity	Follow blindly	Driven by intuition, experience and instinct, the subject takes the same behavior or attitude as the blind follower	No purpose, no clear reason for behavior	–

Table 2. Attribution, emotion and volitional reaction of three types of conformity in the research of Song (2004)

Types	Attribution type/behavioral characteristics	Volitive process	Emotional experience
Abidance	Correctness of regulations; Most people are more correct	Active	Willing and have positive emotion
Compliance	Others' expectations	Neutral	Neutral
Obedience	Others' requirements	Passive	Unwilling and have negative emotions

Table 3. Three conformity behaviors of investors under the government's excessive behavior in PPP project

Conformity	Representation
Abidance	Based on the contradiction of the objectives of the stakeholders and the lack of decision-making information, in the same scenario, investors believe that the government's behavior is right due to the following or approving behavior of other investors. Investors expect to judge the correctness of their decisions through abidance and actively safeguard the correctness of government actions
Obedience	The government has many advantageous resources in PPP projects. In order to obtain the resources beneficial to the development of their own enterprises and avoid the government's blame, investors show the attitude of following or agreeing with the government's behavior
Compliance	The government's behavior has certain demand satisfaction. The government expects investors to agree with their behavior choices to gain benefits. Affected by the pressure of the superior government, enterprises are not willing to deviate from the expectations of the government. At the same time, enterprises also expect to meet the requirements of the government for partners in the process of project procurement or cooperation through continuous practice

3.2. Pre-testing and project analysis of the initial conformity scale

(1) Data collection for pre-test

The development of the scale is not intended to truly determine the conformity tendency of investors towards government behavior. Therefore, the participants selected for the pre-testing only need to have PPP project research or practical experience. In this part, government, investors, and PPP researchers were selected as effective subjects. The questionnaire was produced through professional websites, and the links to the questionnaire were pushed to different PPP academic exchange groups through *We-Chat* and *QQ* chat software (including the "Fourth China PPP Academic Summit Forum" and "China PPP Forum"), and the group members were encouraged to fill in the questionnaire using funds. At the same time, the team members will also invite scholars and relevant PPP personnel in the field to fill in the questionnaire and ask the fillers to push the questionnaire to others. To ensure the quality of the answer, each respondent is limited to answering once by IP address. A total of 291 data were collected, and invalid data were eliminated: including cases without PPP research or practical experience; Choose the "unheard" answer sheet for PPP understanding; Fill in the answer sheet maliciously or at will; The case of not paying attention to the behavior of PPP government or investors; For the items with an obvious contradiction between the information items of the subjects and the cases in which the interested parties selected "other", 269 valid data were finally retained. Stevens (2010) suggests that the valid data for factor analysis should be at least five times the total project. There are 38 items in the study, and the number of samples is seven times higher than the items. Therefore, 269 samples are acceptable and meet the requirements of subsequent analysis. The background of the participants is shown in Table 4.

(2) Scale reliability and factor analysis

Reliability: the reliability analysis shows that the conformity scale is 0.65 less than the acceptable standard of 0.7. Therefore, the questionnaire is revised through factor analysis.

The factor analysis shows that four common factors are extracted, of which the items *A*1 and *A*4 became a separate category. The factor loads of *A*1 and *A*4 under the abidance factor are less than 0.4. In the questionnaire, *A*1 and *A*4 respectively said that investors believed that it is "correct" and "fair" to comply with the government's excessive behavior. In practice, most of the government's excessive behavior is incorrect, that is, there is the correctness of investors' direct judgment behavior in the process of answering, resulting in the low score of this item (the average value is 3.83). Due to the unscientific, unreasonable, and excessive behavior of the government in violation of the contract and regulations in PPP projects, the interest conflicts between the stakeholders and the imbalance of resource acquisition will be caused, such as tunneling, collusion, breach of contract, etc. These behaviors are essentially based on sacrificing the interests of others and lack certain fairness. Therefore, there will be a bias of fairness perception in the judgment process of investors. Items *A*1 and *A*4 were deleted, and the reliability and validity were tested again (Table 5).

Table 5 shows that the reliability of the revised investor conformity scale is 0.73, which is greater than the acceptable standard of 0.7. KMO (Kaiser-Meyer-Olkin) test and Bartlett test show that investors' conformity items (KMO = 0.834, $p < 0.001$) are suitable for factor analysis. Removing *A*1 and *A*4, three common factors (characteristic value greater than 1) are extracted from the 13 observation items, with the cumulative variance contribution rate of 74.57% greater than the acceptance level of 0.60, and the factor load of each index on the common factor is greater than 0.5 (Greene & Krcmar, 2005). At the same time, the intra-group correlation of each observation variable is greater than the inter-group correlation. The data has good reliability and convergence validity. The method of Harmon's single-factor test proposed by Podsakoff and Organ (1986) is applied to carry out a non-rotating factor analysis on the corresponding data of the scale. The results show that the maximum variance of the extracted factors is 35.808%, less than 40%. Therefore, no single common factor accounts for the majority of the total variance, that is, the common method deviation of the questionnaire is not a problem. The above data shows that the scale of investors' conformity to the government's excessive behavior constructed in this study (excluding items *A*1 and *A*4) is reliable.

Table 4. Background of participants participating in the scale pre-test

Characteristic	Category	Frequency	Percentage (%)
Stakeholders	Government	34	12.64
	Investors (banks and other financial institutions or strategic investors: including contractors, operators and other professional service companies)	77	28.62
	PPP scholars	158	58.74
	Others	0	0.00
Project experience	≤2 years	51	18.96
	2~5 years	167	62.08
	5~10 years	47	17.47
	>10 years	4	1.49
Degree of understanding PPP	Never heard	0	0.00
	Basic	33	12.27
	Very	161	59.85
	Master	67	24.91
	Expert	8	2.97
Pay attention to the government behavior decision in PPP projects	No	0	0.0
	Occasional	49	18.2
	Sometimes	116	43.1
	Often	87	32.3
	Always	17	6.3
The degree of attention to investors' behavior decisions in PPP projects	No	0	0.0
	Occasional	51	18.96
	Sometimes	115	42.75
	Often	84	31.23
	Always	19	7.06
Total	–	269	100.0

Note: "0" in the table indicates that the corresponding case has been eliminated.

Table 5. Reliability and validity and factor analysis of the pre-test data

Latent variable	Observed variable	Factor load	Percent Variance	Cumulative (%)	α	KMO and Bartlett
Obedience	O1	0.87	34.47	34.47	0.73	0.83***
	O6	0.86				
	O3	0.85				
	O4	0.84				
	O5	0.83				
	O2	0.82				
Abidance	A2	0.90	22.57	56.04		
	A3	0.90				
	A5	0.80				
	A6	0.78				
Compliance	C2	0.91	18.52	74.57		
	C3	0.88				
	C1	0.88				

Note: *** in the table indicates the significance of Bartlett test < 0.001.

(3) Confirmatory factor analysis of the scale

Building a measurement model of conformity by AMOS (analysis of moment structures). Running the investor conformity measurement model and establishing the correlation between the errors of *A6* and *A5*, *A6* and *O4*, *O5* and *O6* in turn.

3 times the standard deviation of the data is less than the corresponding average value, and the data has good stability (Table 6). The fitting index of the model has reached an acceptable standard (Seyal et al., 2002). Normed chi-square: $\chi^2/df = 1.82 < 3$; root mean square error of approximation: RMSEA = 0.06 < 0.08; comparative-fit index: CFI = 0.98 > 0.9; goodness-of-fit index:

GFI = 0.94 > 0.9; Tacker-Lewis index: TLI = 0.97 > 0.9; incremental fit index: IFI = 0.98 > 0.9. Table 6 summarizes the standardized factor load of each observation variable on the latent variable.

Since the standardized factor load is required to be greater than 0.7 in the measurement model. Item *A6* in Table 6 does not meet the requirements. *A6*: "I am in a positive mood in the process of doing this" is the measurement item of investor abidance. According to the concept of conformity, the government's pressure assumed by investors is an important reason for abidance. Emotion is the internal experience of investors in decision-making behavior. Under the pressure of the superior government, some investors are still in a low mood even if they take the initiative to comply. When the government has more advantageous resources, investors will gradually form passive obedience, and the negative sentiment also increases (the factor load of item *O4* in the table is normal). Therefore, item *A6* is eliminated.

After deleting the controversial items, the results show that the modified measurement models have a good fitting level, and the standardized load of each observation item has reached the acceptable standard of 0.7 (Fornell & Larcker, 1981). The correlation of each latent variable, AVE (average variance extracted), and composite reliability are summarized in Table 7. The maximum correlation between all latent variables is 0.24, and the minimum value less than the root mean square of AVE is 0.77 (Lim & Loosemore, 2017). Therefore, the revised questionnaire items (see Table 8) have good convergence validity and differential validity, which means that the conformity scale after removing items *A*1, *A*4, and *A*6 is reliable and can be used for subsequent research on the mechanism of investors' conformity behavior.

Table 7 shows that the three forms of conformity are less relevant. In terms of results, the three types of conformity reflect the approval or following of the attitude or behavior of the object, but in terms of the purpose, nature, and emotional process of the behavior, the three types of conformity have essential differences (Table 1 and Table 2). Accordingly, the latent variables of conformity have differences in scores, resulting in low correlation.

4. Verification of formal scales

4.1. Data collection for verification

To ensure the accuracy and applicability of the scale, the study tested the formal scale of investors' rational conformity under excessive government behavior. The study measures the government's excessive behavior from the scientificity, rationality, and contract regulations of lack in the questionnaire conducted by Liu et al. (2022). Investors who have conformity behavior for certain purposes or reasons are required to evaluate their preferences for three types of conformity based on the items in Table 8.

Through *QQ* chat software, investors with practical experience from China's PPP Lecture Hall were invited to fill

Table 6. Standardized factor load of confirmatory factor analysis

Latent variable	Observation items	Mean	Standard deviation	Standardized factor load
Obedience	O1	3.83	1.38	0.86
	O2	4.81	0.90	0.78
	O3	4.71	0.88	0.85
	O4	4.65	0.87	0.81
	O5	4.89	0.75	0.75
	O6	4.91	0.72	0.80
Abidance	A2	4.77	0.88	0.92
	A3	4.71	0.87	0.91
	A5	4.87	0.86	0.65
	A6	4.93	0.81	0.61
Compliance	C2	5.05	0.82	0.81
	C3	4.91	0.86	0.87
	C1	5.04	0.94	0.82

Table 7. Comparison between latent variable correlation and AVE square root

Latent variable	Composite reliability	AVE	Obedience	Abidance	Compliance
Obedience	0.92	0.65	**0.81**		
Abidance	0.87	0.70	−0.13	**0.84**	
Compliance	0.87	0.70	0.06	0.00	**0.84**

Note: The data in bold diagonal represents the square root of the AVE.

in the research questionnaire. The participants were also asked to push the questionnaire to other investors after completing their responses. According to the requirements of research objectives for the screening of subjects, during the questionnaire recovery process, invalid cases were directly eliminated through the logical setting of the questionnaire. A total of 993 members were invited to participate in the survey, and 256 data were collected, the valid data retained is 244. Although the effective response rate of the questionnaire is relatively low (less than 24.6%), the valid data is about 5 times the total score of 51 items (Tinsley & Tinsley, 1987), and is greater than 103 of the same type of research (Osei-Kyei & Chan, 2017). Therefore, the effective sample size can meet the requirements for subsequent data analysis. The background of effective subjects is shown in Table 9.

4.2. Reliability and validity of scale

The reliability of each segment of the scale is greater than 0.8, indicating that the research questionnaire has very good reliability and good data stability (Table 10). Research builds a measurement model that includes all latent variables and performs confirmatory factor analysis. The results show that the normalized factor load for each observation variable is higher than 0.7 ($p < 0.001$).

Table 8. Formal scale for rational conformity of investors

Scale	Latent variable	Measurement items
Investors' evaluation of conformity	A: Abidance	A2: Most investors do this, so I think it's right
		A3: Most investors do this, and I don't think too much
		A5: I did it out of my own initiative
	C: Compliance	C1: The government expects me to do this
		C2: I do not want to deviate from the expectations of the superior government
		C3: I think this is beneficial to the government
	O: Obedience	O1: I follow or agree with the government's behavior to take into account the government's position, power and resource advantages
		O2: I think it's good for me to do this
		O3: I am passive in the process of doing this
		O4: My emotions in the process of doing so are unwilling and negative
		O5: I did this to avoid being blamed by the government
		O6: I did this to get the support of the government
Investors' evaluation of government's excessive behavior	EB: Government excessive behavior	NS: The government's behavior decision lacks relevant theoretical basis and standards in line with objective facts
		UR: The government's behavior decision is inconsistent with responsibilities, and the reasons for explaining the behavior are not convincing
		NR: The government's behavior decision is inconsistent with the existing PPP contracts and regulations

Note: Abbreviations in the table represent the labels of the corresponding latent variables and measurement items; Table contains items for measuring government excessive behavior, derived from Liu's research.

Table 9. Background of participants in the study of investor conformity

Characteristic	Category	Frequency	Percentage (%)
Stakeholders	Investors	244	100.0
Investment experience	≤2 years	33	13.5
	2~4 years	119	48.8
	4~6 years	78	32.0
	>6 years	14	5.7
Total	–	244	100.0
Types of PPP projects participated in (multiple choice)	Transportation: highway/railway/bridge/tunnel/aviation/urban rail transit	91	–
	Municipal utilities: electricity/water plant/sewage and garbage treatment/ underground comprehensive pipe gallery	89	
	Agriculture, forestry, water conservancy, and environmental protection: agriculture/forestry/water conservancy/wetlands/environmental protection/energy	59	
	Social undertakings and others: medical care/elderly care/education/tourism/ affordable housing	57	
	Comprehensive urban development	42	
	Others	43	

The minimum AVE is 0.62 greater than 0.5, and the minimum composite reliability is 0.83 greater than 0.7. The data prove that each part of the scale has good internal consistency (Fornell & Larcker, 1981). The absolute values of the correlation coefficients between latent variables are all smaller than the square root of the AVE value (Table 11). It is shown that the research data has good differential validity (Lim & Loosemore, 2017).

The correlation between the three conformists in Table 11 is consistent with the results of the pre-test data results (Table 7). The data results in Tables 11 and 12 indicate that the rational conformity scale for investors toward the government's excessive behavior is reliable and can be used for similar research. Table 10 shows that the average value of the government's excessive behavior in PPP projects is close to 5, indicating that this behavior is considered by investors to exist and can affect their herd choice. The average values of the three types of conformity tendencies are 4.35, 4.96, and 4.81, respectively, indicating that investors prefer to produce compliant behavior. From the perspective of behavioral purposes, there are many cases where investors follow government decisions in order to meet the expectations of partners. On the one hand, under the influence of collectivist culture, investors tend to prefer to maintain the face and needs of others. On the other hand, safeguarding the interests of the cooperating parties is also an important part of seeking opportunities for cooperation and external resources.

Table 10. Reliability and validity test of the scale of investor's conformity

Measurement	Items	Mean	Standard deviation	Standard factor load	α	KMO and Bartlett	Composite reliability	AVE
A	A2	4.39	0.85	0.86	0.88	0.87	0.88	0.71
	A3	4.34	0.88	0.86				
	A5	4.33	0.96	0.81				
C	C1	4.91	0.87	0.84	0.89		0.89	0.72
	C2	5.00	0.93	0.86				
	C3	4.96	0.94	0.86				
O	O1	4.86	0.97	0.84	0.93		0.93	0.69
	O2	4.68	0.94	0.82				
	O3	4.87	0.93	0.85				
	O4	4.66	0.95	0.80				
	O5	4.87	0.88	0.83				
	O6	4.89	0.94	0.86				
EB	NS	4.96	0.90	0.80	0.84	0.72	0.83	0.62
	UR	4.95	0.94	0.80				
	NR	4.87	0.92	0.76				

Note: The Bartlett sphericity test in the table has reached a significance of 0.001.

Table 11. Comparison between latent variable correlation and AVE square root

Latent variable	EB	A	C	O
EB	**0.79**			
A	−0.03	**0.84**		
C	0.37	−0.11	**0.85**	
O	0.48	−0.26	0.01	**0.83**

Note: Data with bold diagonal lines represent the square root of the average variance extracted from latent variables.

5. Conclusions

Through theoretical analysis and data testing, a formal measurement scale of investors' conformity to the government's excessive behavior is constructed (see Table 8). Under the government's excessive behavior, investors may generate three rational conformity (abidance, compliance, and obedience) due to differences in purpose, and investors are more inclined towards compliance. This may indicate that when local governments engage in excessive behavior, under the influence of collectivist culture, investors may pay more attention to the expectations of the government to obtain opportunities to participate in projects. The specific impact relationship can be further studied in the future.

In practice, the government should avoid the occurrence of excessive behavior, which can lead to decision-making difficulties for investors due to differences in demand satisfaction. The government needs to improve its own regulation and behavioral constraints to avoid the negative impacts of its behavioral risks on projects and partners. For investors, achieving their own needs should be based on scientific decision-making basis, and placing personal interests under the overall performance of the project. Avoid conformity decision-making caused by irrational factors, such as social culture, government status, long-term cooperation, and the need for project resources. Meanwhile, the impact of control differences caused by incomplete contracts on investor obedience should be taken into consideration. When investors perceive greater government control rights, the risk of investor obedience increases to avoid punishment. At this point, sound PPP contract regulations are important for reducing information asymmetry between the government and investors. Certainly, local governments need to put down the traditional "great arrogance" and participate in PPP projects as collaborators, adhering to the concept of win-win cooperation to reduce investors' overestimation of the government's control rights and form conformity behavior.

Implications for engineering managers

According to the findings reported in this study, engineering managers can assess investors' reactions to the government's excessive behavior and analyze their tendency to conformity. Based on the analysis results, the reasons for investors following the crowd can be judged from different perspectives (see Exhibits 2 and 3), and targeted control measures can be formulated. For example, managers can reasonably assess the government's control rights and emphasize fair decision-making, which requires contractual protection; Strengthen the guidance of the concept of win-win cooperation, correct the goals of investors, and emphasize the performance standards of the project; Do a good job in emotional management, actively carry out psychological education for employees, ensure their mental health, and enable them to actively respond to negative events.

Research contributions

First, the study analyzed the herd response of investors to government behavior, which is an extension of existing risk management research and provides ideas for analyzing the interaction relationships between stakeholders. Second, this study increased managers' attention to investor needs and rational conformity behavior throughout the PPP process and explains the performance of three types of rational conformity in PPP projects, which increased managers' awareness of investor behavioral risks. Third, the study has identified a scale of investors' conformity to the government's excessive behavior, which is beneficial for managers to assess investor conformity tendencies and develop avoidance strategies. The scale has laid the foundation for future research on investor conformity mechanisms.

Limitations and future directions of research

Due to the object requirements of conformist behavior, the scales developed through research have specific application scenarios. But it can still provide a reference for similar research. At the same time, there is no attention paid to the phenomenon of aimless and irrational blind obedience. Research has found that the government's excessive behavior exists and can lead to investor conformity. However, there is a lack of further impact analysis.

The form of investor conformity is related to differences in demand and is also related to the size of the government's control rights. Therefore, based on the field dynamics theory, it is important to further analyze the mechanism of rational investor conformity under the scale of this study in the future. Blind conformity is aimless and mainly caused by psychological factors. It is feasible to analyze the blind conformity psychology and influence mechanism of investors without considering their purposes.

Disclosure statement

No potential competing interest was reported by the authors.

Data availability statement

Some or all data, models, or code that support the findings of this study are available from the corresponding author upon reasonable request.

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References

Aladag, H., & Isik, Z. (2020). The effect of stakeholder-associated risks in mega-engineering projects: A case study of a PPP airport project. *IEEE Transactions on Engineering Management*, *67*(1), 174–186. https://doi.org/10.1109/TEM.2018.2866269

Ameyaw, C., Adjei-Kumi, T., & Owusu-Manu, D. G. (2015). Exploring value for money (VFM) assessment methods of public-private partnership projects in Ghana: A theoretical framework. *Journal of Financial Management of Property and Construction*, *20*(3), 268–285. https://doi.org/10.1108/JFMPC-01-2015-0003

Basarir, A., & Yilmaz, Z. (2019). Herd behavior and its effects on the purchasing behavior of investors. *Contemporary Studies in Economic and Financial Analysis*, *101*, 215–226. https://doi.org/10.1108/S1569-375920190000101015

Bian, J., & Li, X. (2009). Corporate investment decision under irrationality – A behavioral corporate finance explanation of inefficient investment. *China Industrial Economics*, *7*, 152–160.

Bikhchandani, S., & Sharma, S. (2001). Herd behavior in financial markets. *IMF Staff Papers*, *47*(3), 279–310. https://doi.org/10.2307/3867650

Cai, F., Mo, J., Xie, L., & Ye, H. (2021). Research on performance management of PPP project in China. *Research in Economics and Management*, *6*(1), 96–104. https://doi.org/10.22158/rem.v6n1p96

Carbonara, N., Costantino, N., & Pellegrino, R. (2014). Concession period for PPPs: A win–win model for a fair risk sharing. *International Journal of Project Management*, *32*(7), 1223–1232. https://doi.org/10.1016/j.ijproman.2014.01.007

Che, H. S., Yang, L. Q., Zhu, M., & Wang, X. H. (2002). Analysis of latent categories of individual investors in Chinese stock markets. *Journal of Management Sciences in China*, *5*(5), 23–29.

Demirer, R., Kutan, A. M., & Chen, C. D. (2010). Do investors herd in emerging stock markets? Evidence from the Taiwanese market. *Journal of Economic Behavior and Organization*, *76*(2), 283–295. https://doi.org/10.1016/j.jebo.2010.06.013

Devenow, A., & Welch, I. (1996). Rational herding in financial economics. *European Economic Review*, *40*(3–5), 603–615. https://doi.org/10.1016/0014-2921(95)00073-9

Dorfeshan, Y., Taleizadeh, A. A., & Toloo, M. (2022). Assessment of risk-sharing ratio with considering budget constraint an disruption risk under a triangular Pythagorean fuzzy environment in public-private partnership projects. *Expert Systems with Application*, *223*, Article 117245. https://doi.org/10.1016/j.eswa.2022.117245

Easen, P., & Wilcockson, J. (1996). Intuition and rational decision-making in professional thinking: A false dichotomy? *Journal of Advanced Nursing*, *24*(4), 667–673. https://doi.org/10.1046/j.1365-2648.1996.02413.x

Esen, E. (2013). The influence of corporate social responsibility (CSR) activities on building corporate reputation. *Advances in Sustainability & Environmental Justice*, *11*, 133–150. https://doi.org/10.1108/S2051-5030(2013)0000011010

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/10.1177/002224378101800104

Gao, R. L., & Liu, J. C. (2020). Value of investors' escalation of commitment in PPP projects using real option thinking. *International Journal of Strategic Property Management*, *24*(5), 348–364. https://doi.org/10.3846/ijspm.2020.13120

Greene, K., & Krcmar, M. (2005). Predicting exposure to and liking of media violence: A uses and gratifications approach. *Communication Studies*, *56*(1), 71–93. https://doi.org/10.1080/0008957042000332250

Guo, J., Chen, J., & Xie, Y. (2022). Determining a reasonable concession period for risky transportation BOT projects with government subsidies based on cumulative prospect theory. *Engineering Construction & Architectural Management*, *29*(3), 1396–1426. https://doi.org/10.1108/ECAM-11-2019-0612

Jiang, D., Xu, F. M., Chen, X. L., Liu, T. F., & Zhang, J. W. (2010). The psychological mechanism and influence factors of herd behavior of investors in the capital market. *Advances in Psychological Science*, *18*(5), 810–818.

Ke, Y. J., Wang, S. Q., & Chan, A. P. C. (2013). Risk misallocation in public-private partnership projects in China. *International Public Management Journal*, *16*(3), 438–460. https://doi.org/10.1080/10967494.2013.825508

Li, H., Su, L., Zuo, J., Zhao, X., Chang, R., & Wang, F. (2022). Incentive mechanism for performance-based payment of infrastructure PPP projects: Coupling of reputation and ratchet effects. *International Journal of Strategic Property Management*, *26*(1), 35–55. https://doi.org/10.3846/ijspm.2022.15969

Li, Y., He, N., Zhang, Y., Li, H., & Zhang C. (2023). Optimization of capital structure for urban water PPP projects using mezzanine financing: Sustainable perspective. *Journal of Construction Engineering and Management*, *149*(8), Article 04023059. https://doi.org/10.1061/JCEMD4.COENG-12830

Lim, B. T. H., & Loosemore, M. (2017). The effect of inter-organizational justice perceptions on organizational citizenship behaviors in construction projects. *International Journal of Project Management*, *35*(2), 95–106. https://doi.org/10.1016/j.ijproman.2016.10.016

Lin, W. T., Tsai, S. C., & Lung, P. Y. (2013). Investors' herd behavior: Rational or irrational? *Asia-Pacific Journal of Financial Studies*, *42*(5), 755–776. https://doi.org/10.1111/ajfs.12030

Liu, J., He, P., & Meng, Q. (2023). Meeting investors' demands in PPP project to improve enthusiasm for participating in green and low-carbon. *Economic Research-Ekonomska Istraživanja*, *36*(1), Article 2167224. https://doi.org/10.1080/1331677X.2023.2167224

Liu, J. Q., & Liu, J. C. (2024). The demand hierarchy of the government and investors in PPP projects. *Engineering, Construction and Architectural Management*, *31*(4), 1539–1555. https://doi.org/10.1108/ECAM-01-2022-0052

Liu, J. Q., Liu, J. C., Bu, Z, H., Zhou, Y. N., & He, P. F. (2022). Path analysis of influencing government's excessive behavior in PPP project: Based on field dynamic theory. *Transportation Research Part A: Policy and Practice*, *166*, 522–540. https://doi.org/10.1016/j.tra.2022.11.011

Lu, J. Q. (2007). An empirical study on the herd behavior of Chinese securities investors. *Psychological Science*, *30*(2), 431–433.

Luo, Q., Gao, R., Liu, J., & Li, Y. (2022). Path analysis on escalation of commitment of investors in different project scenarios of PPPs. *International Journal of Strategic Property Management*, *26*(2), 127–140. https://doi.org/10.3846/ijspm.2022.16477

Narbaev, T. (2022). A meta-analysis of the public-private partnership literature reviews: Exploring the identity of the field. *International Journal of Strategic Property Management*, *26*(4), 318–331. https://doi.org/10.3846/ijspm.2022.17860

Osei-Kyei, R., & Chan, A. P. C. (2017). Comparative analysis of the success criteria for public-private partnership projects in Ghana and Hong Kong. *Project Management Journal*, *48*(4), 80–92. https://doi.org/10.1177/875697281704800407

Osei-Kyei, R., Jin, X., Nnaji, C., Akomea-Frimpong, I., & Wuni, I. Y. (2023). Review of risk management studies in public-private partnerships: A scientometric analysis. *International Journal of Construction Management*, *23*(14), 2419–2430. https://doi.org/10.1080/15623599.2022.2063013

Pellegrino, R. (2021). Effects of public supports for mitigating revenue risk in public–private partnership projects: Model to choose among support alternatives. *Journal of Construction Engineering and Management*, *147*(12), Article 04021167. https://doi.org/10.1061/(ASCE)CO.1943-7862.0002098

Podsakoff, P. M., & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of Management*, *12*(4), 531–544. https://doi.org/10.1177/014920638601200408

Seyal, A., Rahman, M. N. A., & Rahim, M. M. (2002). Determinants of academic use of the internet: A structural equation model. *Behaviour & Information Technology*, *21*(1), 71–86. https://doi.org/10.1080/01449290210123354

Song, G. D. (2004). An investigative study on conformity. *Psychological Science*, *27*(3), 657–661.

Song, G. D. (2005). A new view on conformability. *Psychological Science*, *28*(5), 1174–1178.

Song, G., Ma, Q., Wu, F., & Li, L. (2012). The psychological explanation of conformity. *Social Behavior & Personality an International Journal*, *40*(8), 1365–1372. https://doi.org/10.2224/sbp.2012.40.8.1365

Su, L., Cao, Y., & Li, H. (2023). Performance-based payment structural design for infrastructure PPP projects. *International Journal of Strategic Property Management*, *27*(2), 133–145. https://doi.org/10.3846/ijspm.2023.19180

Sun, G., Sun, J., & Li, F. (2022). Influencing factors of early termination for PPP projects based on multicase grounded theory. *Journal of Construction Engineering and Management*, *148*(11), Article 04022120. https://doi.org/10.1061/(ASCE)CO.1943-7862.0002388

Song, G. D., Yang, Z. T., & Cui, M. (2008). A psychological study of obedience in psychology. *Journal of Psychological Science*, *31*(1), 249–252.

Stevens, J. (2010). Applied multivariate statistics for the social sciences. *Garden City*, *52*(3), 418–420. https://doi.org/10.1111/1467-9884.00369_23

Tang, H., Zhu, R., Liang, Z., Zhang, S., Su, S., & Liu, C. (2023). Enhancing and weakening conformity in third-party punishment: The role of empathic concern. *Journal of Behavioral Decision Making*, *36*(4), Article e2315. https://doi.org/10.1002/bdm.2315

Tinsley, H. E., & Tinsley, D. J. (1987). Uses of factor analysis in counseling psychology research. *Journal of Counseling Psychology*, *34*(4), 414–424. https://doi.org/10.1037/0022-0167.34.4.414

Wang, Y., Gao, H. O., & Liu, J. C. (2019). Incentive game of investor speculation in PPP highway projects based on the government minimum revenue guarantee. *Transportation Research Part A: Policy and Practice*, *125*(7), 20–34. https://doi.org/10.1016/j.tra.2019.05.006

Wang, Y., & Gao, R. (2020). Risk distribution and benefit analysis of PPP projects based on public participation. *International Journal of Strategic Property Management*, *24*(4), 215–225. https://doi.org/10.3846/ijspm.2020.12329

Xing, H., Li, Y., & Li, H. (2020). Renegotiation strategy of public-private partnership projects with asymmetric information – An evolutionary game approach. *Sustainability*, *12*(7), Article 2646. https://doi.org/10.3390/su12072646

Xiong, W., & Han, Y. (2023). Incentives of early termination compensation in public-private partnership projects. *IEEE Transactions on Engineering Management*, *70*, 2220–2232. https://doi.org/10.1109/TEM.2021.3074662

Xu, Z., Yin, Y., Li, D., & Browne, G. J. (2018). Owner's risk allocation and contractor's role behavior in a project: A parallel-mediation model. *Engineering Management Journal*, *30*(1), 14–23. https://doi.org/10.1080/10429247.2017.1408388

Yang, H., Zheng, Q., Li, M., & Sun, Y. (2015). How to avoid herd behavior: A stochastic multi-choice scheduling algorithm and parameters analysis in grid scheduling. *International Journal of Information Technology & Decision Making*, *14*(2), 287–315. https://doi.org/10.1142/S0219622014500734