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Combination Procurement Decision under Market and Preference Uncertainty

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Abstract

This paper mainly studies the combinatorial procurement rejection problem under market uncertainty and uncertain buyer behavior preferences. The article first obtained the construction through literature analysis, constructed a theoretical model, and then verified the hypothesis through survey questionnaire data. Further confirmatory factor analysis was conducted to identify the core influencing factors. Research has found that market uncertainty and uncertainty in buyer behavior preferences have significant impacts on corporate portfolio procurement decisions. At the same time, market uncertainty also has an impact on buyer behavior preferences and further affects portfolio procurement decisions. Among many refined indicators, the effects of time efficiency, experience judgment, unexpected events, contract supplier breach, and delayed supply are more significant.

Keywords

Procurement; Decision-making; Market Uncertainty; Preference Uncertainty.

1. INTRODUCTION

Uncertainty is an important source of operational risk for enterprises. There are many sources of uncertainty in the market, on the one hand, including uncertainty in the quantity of demand on the demand side, diversity of demand, short life cycle of products, etc. On the other hand, it also includes uncertainty in price changes on the supply side, product supply uncertainty, product liquidity constraints, supplier default, emergency replenishment, etc. These uncertainties, especially those on the supply side, have a significant impact on the formulation and implementation of portfolio procurement decisions, posing challenges for enterprise procurement risk management. In addition, due to the differences in the purchase behavior preferences of enterprises themselves, loss aversion, regret behavior, inertia behavior, time preference and other behavior preference factors will have an important impact on the actual purchase decisions of enterprises. How does market uncertainty and buyers' behavioral preferences affect procurement decisions? This article mainly discusses this issue.

According to the existing literature, some literature has explored some situations of market uncertainty. Some studies provide factual evidence for the impact of market price changes on procurement decisions. Classical economic models generally assume that market demand is exogenous, which means that market demand is not related to product prices. However, in practice, many scholars have relaxed this hypothesis in their research, such as Berlin and Rosling(2005)[1], which found that different price risks have a significant and profound impact

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on traditional ordering strategies. When demand obeys Poisson distribution and price obeys Markov process, Yang and Xia (2006) [2] concluded that the enterprise's basic inventory strategy is the optimal strategy. Hu Xiongying, Hu Bin, and Zhang Jinlong (2008) [3] studied a product procurement cost optimization model under the environment of seasonal random price fluctuations, introducing a probability distribution function during this period, and analyzing the optimal procurement strategy under stochastic and deterministic economic environments through examples. Berlin and Martinez de Albeniz (2011) [4] studied the properties of price dependent basic inventory strategies when procurement prices and market demand are uncertain and the price change process is continuous and random. S. M. Hosseini Motlag et al. (2022) [5] analyzed pricing, warranty replacement, and sales service strategies in decentralized, semi centralized, centralized, semi coordinated, and coordinated scenarios. By comparing cases of endogenous and exogenous wholesale prices, it is shown that compared to exogenous wholesale prices, endogenous wholesale prices are more advantageous for customers and sales channels. Some other literature addresses the behavioral preferences of buyers. Keren et al. (2006) [6] studied the optimal purchase quantity of the expected utility model of risk aversion newsboy, and obtained the properties of the optimal solution and its relationship with the utility function parameters. Arcelous et al. (2012) [7] constructed a newsboy model based on expected utility based on different optimization objectives and risk attitudes, and explained the properties of the model through numerical analysis. Nagarajan and Shechter (2014) [8] conducted a comprehensive study of the newsboy problem based on prospect theory for the first time, analyzing in depth the relationship between the optimal purchase quantity of newsboys based on prospect theory and the optimal purchase quantity of classical newsboys. Unfortunately, their research did not consider the situation of repurchase and the existence of out of stock penalty factors in practice. Some similar studies are as follows: Xu et al. (2019)[9], Liu et al. (2019)[10], Xu et al. (2022))[11], Zhang et al. (2022)[12], Liu et al. (2022)[13] .

Although scholars have begun to pay attention to market uncertainty and purchasing behavior preferences, there is still relatively little literature on the same role of wages between the two, which is worthy of in-depth research.

2. THEORETICAL MODEL

From the above analysis, it can be seen that studying the impact of market supply uncertainty and procurement behavior preferences on portfolio procurement decisions has important theoretical and practical significance. The uncertainty of market supply is mainly manifested in the uncertainty of market price, market supply, supplier default, and supply chain adjustment under the influence of emergencies. The uncertainty of the market has brought market anxiety to the combined procurement of enterprises, which is a negative constraint that seriously affects the expected utility of the combined procurement of enterprises, and thus affects the decision-making of the combined procurement of enterprises. The behavioral preferences of enterprise portfolio procurement are mainly manifested as loss aversion preferences, risk aversion preferences, regret behavioral preferences, inertia behavioral preferences, etc. Purchasing behavioral preferences will affect the expected benefits or procurement costs of enterprise portfolio procurement from different angles, bring negative effects on enterprise portfolio procurement, and also profoundly affect enterprise portfolio procurement decisions. Based on the above analysis, the following assumptions can be made.

H1: Market supply uncertainty is correlated with the procurement of enterprises.

H2: There is a correlation between purchaser behavior preferences and enterprise procurement.

H3: There is a correlation between market supply uncertainty and buyers' behavioral preferences.

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Under the same framework of market supply uncertainty and procurement behavior preferences, this study investigates the mechanism of their impact on enterprise portfolio procurement decisions, and constructs a theoretical model as follows(Figure 1).

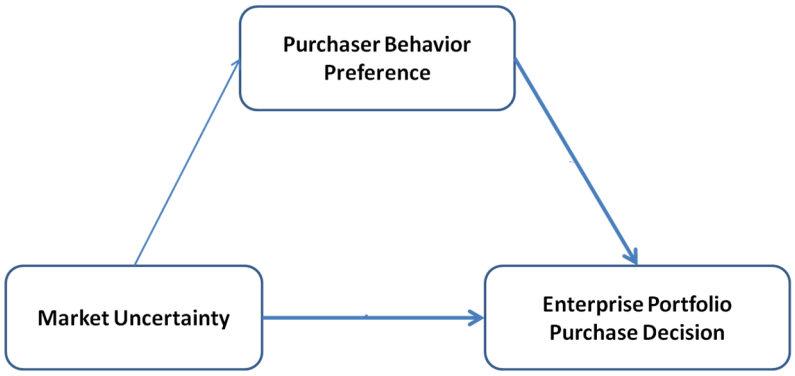

Figure 1. Combination procurement decision mechanism under market and preference uncertainty

3. RESEARCH PROCESS

3.1. Questionnaire investigation

Using a questionnaire survey method, the investigation of the impact of market supply uncertainty factors adopts the Likert seven level scoring method, where 1 represents "strongly disagree" and 7 represents "strongly agree". The influencing factors of buyer behavior preferences are adopted in the same way.

The survey targets procurement staff, procurement managers, or senior leaders in charge of procurement in enterprises. The survey method is online anonymous survey, with a preset answer time of 5 minutes. Distribute questionnaires to 58 enterprises, with 135 questionnaires collected and 128 valid questionnaires.

3.2. Reliability and validity testing

Calculate and analyze Cronbach's α for each latent variable using SPSS. From the calculation results, it can be seen that they are all within the range of 0.814 to 0.905 (Table 1), exceeding the acceptable level of 0.7, indicating that the variables have passed the reliability test and that the scales for each concept have high reliability.

Table 1. Reliability test of internal items of different variables

Variable	Item	Cronbach's α
Q14	B1 B2 B3 B4 B5 B6	0.901
Q16	B7 B8 B9 B10	0.905

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The KMO values of the five items calculated using SPSS software are all greater than 0.8 (Table 2), indicating that they have passed the KMO and Bartlett tests. Therefore, factor analysis can be performed.

Table 2. KMO value and bartlett test of internal items of different variables

Var	Item	KMO	Bartlett χ 2	P	Load factor
Q14	B1	0.858	244.989	0.000	0.843
	B2				0.822
	B3				0.865
	B4				0.854
	B5				0.858
Q16	B6	0.877	268.245	0.000	0.784
	B7				0.800
	B8				0.901
	B9				0.892
	B10				0.893

3.3. Hypothesis testing

Conduct frequency analysis on the impact of market supply uncertainty and buyer behavior preferences on procurement volume, and obtain relevant data. Analyzing the data, it can be found that the evaluation results of the tested samples have a good concentration, and the attitudes of buyers are also relatively consistent. Except for the cumulative percentage of neutral evaluation or above in the regret experience item, which is 77.1%, the cumulative percentage of neutral evaluation or above in all other items is higher than 81%. From this, it can be seen that market uncertainty and procurement behavior preferences have an impact on the procurement volume of enterprises, and hypothesis H1 is tested.

Conduct frequency analysis on the impact of market supply uncertainty and buyer behavior preferences on expected returns, and obtain relevant data. Analyzing the data, it can be found that the evaluation results of the tested samples have good concentration, and the attitudes of buyers are also relatively consistent. Except for the cumulative percentage of neutral evaluation or above in the regret experience item, which is 74.7%, the cumulative percentage of neutral evaluation or above in all other items is higher than 80%. From this, it can be seen that market uncertainty and procurement behavior preferences have an impact on the expected returns in the procurement of enterprises, and hypothesis H2 is tested.

Conduct frequency analysis on the impact of market supply uncertainty on the behavioral preferences of buyers, and obtain relevant data. Analyzing the data, it can be found that the evaluation results of the tested samples have good concentration, and the attitudes of the purchasers are also relatively consistent. The cumulative percentage of neutral evaluations or above for each item is higher than 83%. From this, it can be seen that market uncertainty and preference for procurement behavior of enterprises have an impact, and hypothesis H3 is tested.

3.4. Confirmatory factor analysis

Using Amos software to construct SEM initial models of the variables that affect expected returns (Figure 2).

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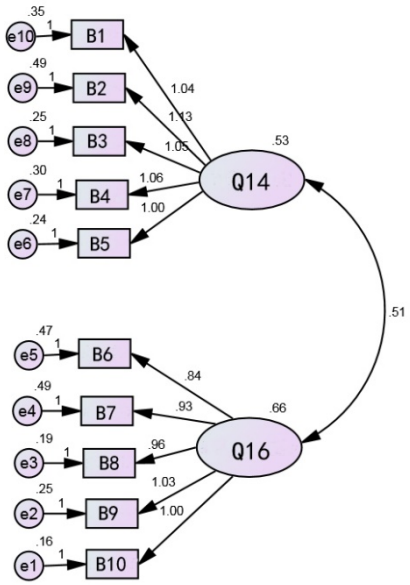

Figure 2. Initial SEM model for analyzing the factors influencing expected returns

Through analysis, it was found that the initial model's χ^2/ df =2.246, root mean square error (RMR) is 0.043, comparative fit index (CFI) is 0.932, incremental fit index (IFI) is 0.933, and normative fit index (NFI) is 0.886. The NFI did not reach the ideal value and the model needs to be modified. There is a strong correlation between the observed variables of unexpected events in the initial model's market supply uncertainty latent variable and the observed variables of channel inertia in the purchasing behavior preference latent variable. In order to improve the model's fit, a new modified SEM model was established by removing the observed variables of channel inertia (Figure 3).

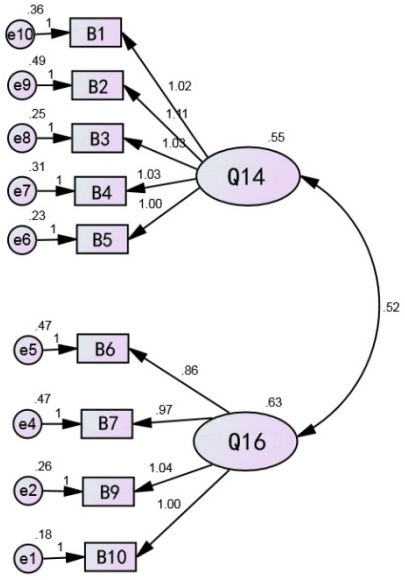

Figure 3. Modified SEM model for analyzing the impact factors of expected returns

Transforming the model χ^2/ df =1. 77, Root Mean Square Error (RMR) is 0.041, Comparative Fit Index (CFI) is 0.96, Incremental Fit Index (IFI) is 0.961, and Normative Fit Index (NFI) is 0.915. All parameters meet the guidance standards. Compared with the original model, the fitting degree is improved (Table 3).

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Table 3. SEM model fitting index for analyzing the impact factors of expected returns

Fitting index	Ideal value	Initial model	Transformation model
Absolute index			
χ^2/ df	1-3	2.246	1. 77
RMR	<0.05	0.043	0.041
Relative index			
CFI	>0.9	0.932	0.96
IFI	>0.9	0.933	0.961
NFI	>0.9	0.886	0.915

The final fitting SEM found that the factor load between each observed variable and latent variable was>0 5. Reaching a significance level indicates that the observed variables can accurately reflect latent variables. Through regression analysis of SEM measurement model correlation, it can be seen that the observation variables with higher standardization coefficients are B10 (0.881), B9 (0.853), B5 (0.841), B3 (0.834), and B4 (0.809). See Table 4.

Table 4. Regression analysis of the correlation between SEM measurement models and factors affecting expected returns

Latent variable	Observed variable	Denormalization coefficient	Standardization coefficient	SE	CR	P
Q14	B1	1.016	0.783	0.122	8.357	0.000
	B2	1.107	0.760	0.138	7.994	0.000
	B3	1.031	0.834	0.112	9.207	0.000
	B4	1.035	0.809	0.118	8.777	0.000
	B5	1.000	0.841			
Q16	B6	0.863	0.707	0.116	7.47	0.000
	B7	0.970	0.749	0.119	8.158	0.000
	B9	1.042	0.853	0.103	10.124	0.000
	B10	1.000	0.881			

4. CONCLUSION

Through the analysis of survey data, it can be seen that market uncertainty and buyer behavior preferences have a significant impact on the procurement volume and expected returns of combined procurement. At the same time, market supply uncertainty also shows a significant impact on buyers' behavioral preferences. In the factor analysis of the impact on expected returns, it was found that the observed variables with higher standardized coefficients were time efficiency (B10, 0.881), empirical judgment (B9, 0.853), impact of unexpected events (B5, 0.841), contract supplier default (B3, 0.834), delayed supply (B4, 0.809), etc. This indicates that the focus on long-term returns in the enterprise portfolio procurement process has a significant impact on empirical judgment, At the same time, we pay more attention to the impact of unexpected events on the expected returns of portfolio procurement and express concerns about contract supplier default.

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