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Research on the Relationship Between Average Cigarette Price per Box and Government Procurement in City A Based on a Regression Model

Yao Nie[1,2]*, Hongbo Wan[2], Mingming Mao[3]

[1]Guizhou University for Nationalities, Anshun 561000, Guizhou Province, China
[2]Anshun City Branch of Guizhou Tobacco Company, Anshun 561000, Guizhou Province, China
[3]Guizhou Normal University, Anshun 561000, Guizhou Province, China

***Corresponding author:** Yao Nie, 531268518@qq.com

Abstract: This study aims to analyze and predict the relationship between the average price per box in the cigarette market of City A and government procurement, providing a scientific basis and support for decision-making. By reviewing relevant theories and literature, qualitative prediction methods, regression prediction models, and other related theories were explored. Through the analysis of annual cigarette sales data and government procurement data in City A, a comprehensive understanding of the development of the tobacco industry and the economic trends of tobacco companies in the county was obtained. By predicting and analyzing the average price per box of cigarette sales across different years, corresponding prediction results were derived and compared with actual sales data. The prediction results indicate that the correlation coefficient between the average price per box of cigarette sales and government procurement is 0.982, implying that government procurement accounts for 96.4% of the changes in the average price per box of cigarettes. These findings offer an in-depth exploration of the relationship between the average price per box of cigarettes in City A and government procurement, providing a scientific foundation for corporate decision-making and market operations.

Keywords: Cigarette marketing; Regression model; Predictive model; Government purchasing

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1. Introduction

The cigarette market encompasses the entire process of cigarette production, supply, and sales, including the production, distribution, storage, transportation, wholesale, and retail of cigarettes [1]. By scientifically and accurately forecasting the relationship between the average price per box of cigarette sales and government procurement, it becomes possible to monitor cigarette consumption and behavior in real time and efficiently following the introduction of national policies [2]. This contributes to the development of the cigarette industry

and the formulation, adjustment, and development of consumer behavior. Furthermore, this approach enables tobacco industry enterprises to better respond to market and product changes [3], thereby improving product quality, minimizing costs, and achieving maximum economic benefits for tobacco commercial companies and tobacco industry enterprises.

2. Multiple regression prediction model

In an economic system, there are often multiple correlations between economic parameters [4], such as between per capita income and per capita consumption expenditure, or between commodity prices and demand. These relationships can take various forms [5], with causality being the most significant. Based on causal relationships, mathematical models can be established from statistical information to make predictions [6], a method known as causal relationship prediction. The most commonly used approach for this is regression analysis. The prediction method based on regression analysis involves three key steps: modeling, parameter estimation, and testing [7].

3. Analysis of the impact of the tourism market on cigarette sales

To further explore the potential of the tourism-related cigarette market and promote improvements in cigarette sales and structure within this market [8], it is important to analyze the impact and extent of the tourism market's influence on cigarette sales volume and structure in City A. The direct impact primarily refers to the influence of tourists' direct purchases of cigarette products on the sales volume and structure of City A's cigarette market [9]. The indirect impact relates to the income increase generated by tourism development for urban and rural residents in City A, which subsequently affects the quantity and structure of cigarette consumption among these residents.

Generally, tourist groups not only tend to increase their cigarette consumption but also possess higher disposable incomes and a greater willingness to spend compared to local residents [10]. As a result, their cigarette consumption structure is superior, with a higher proportion purchasing mid- to high-end cigarettes, which can enhance the sales structure in City A. Additionally, the tourism market can indirectly increase the incomes of urban and rural residents, leading to changes in the quantity and structure of local cigarette consumption.

4. Analysis of the relationship between the average price per box of cigarette sales and government procurement

Based on the number of tourists and the demand for cigarettes, the relationship between the average price per box of cigarette sales and government procurement was further investigated. Correlation analysis was used to study the relationship between these two variables, with the Pearson correlation coefficient indicating the strength of the correlation. The analysis revealed that the correlation coefficient between the average price per box of cigarette sales and government procurement is 0.982, with a significance level of < 0.001, indicating a significant positive correlation between the two variables (**Tables 1–3**).

Table 1. Summary of linear regression model between the average price per box of cigarette sales and government procurement

Model summary				
Model	**R**	**R^2**	**Adjusted R formula**	**Error in standard estimation**
1	0.982*	0.964	0.960	1,072.21309

Change statistics				
R^2 variation	**F variation**	**Degree of freedom 1**	**Degree of freedom 2**	**Significant F change amount**
0.964	243.932	1	9	< 0.001

*Predictive variable: Conventional, government procurement

Table 2. Linear regression coefficient between the average price per box of cigarette sales and government procurement

Model B		Non-standardized coefficient		Standardization coefficient
		Standard error	**β**	
1	Constant	12,810.772	1,146.673	
	Average price	311.725	19.981	0.982
	t	Significance	95% confidence interval for B	
			Lower limit	Upper limit
	11.142	< 0.001	10,216.816	15,404.727
	15.601	< 0.001	266.525	356.926

Note: Dependent variable, average price.

Table 3. ANOVA value of the linear regression between the average price per box of cigarette sales and government procurement

ANOVA*						
Model		**Square sum**	**Freedom**	**Mean square**	**F**	**Significance**
1	Regression	279,813,436.263	1	279,813,436.263	243.392	0.000†
	Residual	10,346,768.282	9	1,149,640.920		
	Total	290,160,204.545	10			

*Dependent variable: average price per box; †Predictive variable: (constant) government procurement

5. Research conclusion

Using SPSS for linear regression analysis, with the average price of a single box of cigarettes as the dependent variable and government procurement as the independent variable, the model formula was calculated as follows: Average price of a single box of cigarettes = 12810.772 + 311.725 × government procurement.

The R-squared value of the model is 0.964, indicating that government procurement explains 96.4% of the

variation in the average price of a single box of cigarettes. According to the ANOVA values obtained from the linear regression analysis (as shown in the table), the model passed the F-test (F = 243.392, $P = 0.000 < 0.01$), confirming that government procurement has a significant positive impact on the average price of a single box of cigarettes.

The regression model between the average price of a single box of cigarettes and government procurement is as follows:

$$A_{pi} = B + 3.11.725 \times G \quad (1)$$

Where: i is the average price per box of cigarettes in a certain year, G is the government procurement in City A, and B is the calculated constant 12,810.772.

According to the tourist reception plan for the end of the 14th Five-Year Plan period, the government procurement growth rate in City A is expected to be 8% in 2023, with an estimated value of 83.46% in 2023.

Using **Equation (1)**, the predicted average price of a single box of cigarettes for 2023 is calculated as follows:

$A_{p2023} = 12810.772 + 311.725 \times 83.46 = 38827.3405$

$A_{p2022} = 36931$

The increase in average price per box in 2023 compared to 2022 is:

$A_{p2023} - A_{p2022} = 38827.3405\text{-}36931 = 1896.3405$

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Disclosure statement

The authors declare no conflict of interest.

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