# Analytic Hierarchy Process Research on the Pricing Mechanism of Mobile Postgraduate Entrance Examination Products

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# Abstract

With the development of the economy and society, the craze for college graduates to take the postgraduate entrance examination has been on the rise, and the market for postgraduate entrance examination products is also extremely rich. In order to gain the recognition of candidates and increase the market share of mobile postgraduate entrance examination products, it is necessary to set reasonable prices for these products. For the pricing of mobile postgraduate entrance examination products, three representative online postgraduate entrance examination institutions in the market were selected for analysis. Analytic Hierarchy Process (AHP) was used and MATLAB programming and testing were used. From the perspective of consumer preference, weighting was performed based on various indicators. By calculating the comprehensive scores of each postgraduate entrance examination product, the reasonable price range of the product was estimated to be 3070-3670 yuan. Finally, a comprehensive evaluation was conducted on the established model, believing that the research results have certain reference value for the reasonable pricing, development trends, and delivery plans of online postgraduate entrance examination products. Based on the research results, targeted solutions were proposed.

# Keywords

Mobile postgraduate entrance examination products; Analytic Hierarchy Process; MATLAB.

# 1. Introduction

According to a survey conducted by relevant departments, the number of graduates has increased rapidly in recent years. Some graduates choose to join the postgraduate entrance examination army in order to delay employment or find their desired job, leading to a new wave of postgraduate entrance examination fever. Furthermore, from a policy perspective, the introduction of part-time policies provides more opportunities for non fresh students to pursue further education. From a social perspective, the work pressure of fresh graduates has increased, and a series of companies such as state-owned enterprises have also followed the trend of the times. The educational threshold for recruitment is no longer limited to undergraduate students. From an economic perspective, the state subsidizes graduate tuition fees through national financial allocations in the form of scholarships, and gradually improves various educational loan mechanisms. In summary, the number of students taking the postgraduate entrance examination will continue to increase, and the pressure on them will also increase. The postgraduate entrance examination products have become a must-have for students taking the postgraduate entrance examination. With the popularization of the Internet and related electronic products, many face-to-face postgraduate entrance examination education activities have gradually shifted from offline to mobile internet online platforms such as mobile phones. More and more students are choosing mobile postgraduate entrance

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examination products, so the rationality of pricing mobile postgraduate entrance examination products is becoming increasingly important.

# 2. Literature Review

The earliest product pricing method came from the United States. In 1996, the discrete time model was used by Bensaid and Lesne to study the current situation of monopolistic companies and derive the optimal dynamic pricing strategy. Furthermore, Mason (2000) extended the above model by adding relevant variables on top of the original model, and Oz Shy (2001) used game theory to derive that manufacturers implement differential pricing.

Due to the late popularization of the Internet compared to foreign countries, research on the pricing of network products only began after 2000. Tang Xiaoyong (2015) conducted in-depth research on the algorithm of Markov chain problems, which provided a clear idea for us to use Markov chain to study the pricing of postgraduate entrance examination products. Chen Hao (2017) used the two-way market theory to study the pricing mechanism of online video media platforms and elucidated the theoretical basis for selecting pricing strategies for online video media platforms. By taking the postgraduate entrance examination, one can enhance their academic qualifications, which is conducive to expanding their knowledge and horizons. Through the accumulation of experience during graduate studies, one can also improve their self-management abilities. Zhu Shan et al. (2018) pointed out that with the rise of the postgraduate entrance examination craze in recent years, various institutions and apps related to the postgraduate entrance examination have gradually emerged and become popular among candidates. Ren Haixia (2018) analyzed the market share of postgraduate entrance examination products through multiple linear regression, and finally proposed that reasonable pricing of postgraduate entrance examination products can significantly increase market share. Therefore, by studying the pricing mechanism of mobile postgraduate entrance examination products and estimating the reasonable price range of various products, on the one hand, it enriches and develops the theoretical research of product pricing models, and on the other hand, provides a more scientific and effective selection of postgraduate entrance examination products for the majority of candidates in practice, thereby increasing the activity of the entire postgraduate entrance examination market.

# 3. Research on the Pricing Mechanism of Mobile Postgraduate Entrance **Examination Products**

#### 3.1. **Pricing process based on Analytic Hierarchy Process**

### 3.1.1. Research ideas

Firstly, it is necessary to compare the online postgraduate entrance examination products that exist in the market and find representative brand organizations. Through analysis and investigation, the author chooses three postgraduate entrance examination institutions: New Oriental, Wendu, and Qihang. Secondly, from the perspective of postgraduate entrance examination consumers, assuming they have the choice of these three products, biased selection is made based on various indicators (after-sales service, content integrity, teacher occupancy rate, and postgraduate entrance examination pass rate). Analytic Hierarchy Process is used to weight each indicator. Based on the scores and weights of each indicator by consumers, we can obtain the comprehensive scores of each postgraduate entrance examination product, The more favored the product price by market consumers, the more in line with the public taste, and it is also a widely accepted price by consumers.

### 3.1.2. Establishment of hierarchical structure

The hierarchical structure is mainly divided into three levels: target layer, criterion layer, and element layer. Generally, the elements of the previous level have a constraint effect on the elements of the next level. According to the relevant characteristics of the pricing of postgraduate entrance examination products, the target layer of this structure is to select and purchase online products, while the criterion layer includes four aspects: after-sales service, content integrity, occupation rate of famous teachers, and postgraduate entrance examination pass rate. There are three options for postgraduate entrance examination consumers to choose from: A (New Oriental), B (Wendu), and C (Qihang). They will repeatedly consider and compare various aspects such as after-sales service, content integrity, the occupancy rate of famous teachers, and select the most satisfactory product from them.

3.1.3. Constructing a Comparative Judgment Matrix

The matrix  $A=(a_{ij})_{n\times n}$  composed of  $a_{ij}$  can also be called a comparative judgment matrix. According to the comparison scale, the corresponding discrimination matrix is obtained, as shown in Table 1.

Satisfied postgraduate entrance examination products	After-sale service	Content Integrity	Share of Famous Teachers	Pass rate
After-sale service	1.00	0.33	0.20	0.14
<b>Content Integrity</b>	3.00	1.00	0.33	0.20
Share of Famous Teachers	5.00	3.00	1.00	3.00
Pass rate	7.00	5.00	0.33	1.00

Table 1. Discriminant Matrix

## 3.1.4. Sorting under single criteria

For a certain level (also known as a standard), calculate the relative weight of each candidate element. There are two main methods for calculating the weight of the judgment matrix, namely the geometric mean method (root method) and the standard column mean method (summation method).

Geometric average method (root method): ① Calculate the product of each element in each row of judgment matrix A; ② Calculate the nth root of each element in each row; ③ Normalize the vector to obtain the desired weight vector.

Standard column averaging method (sum method): ① Calculate the sum of each element in each row of judgment matrix A; ② Normalize the sum of elements in each row of A to obtain the obtained weight vector; ③ Calculate the maximum eigenvalue of matrix A.

Next, run MATLAB software to obtain the maximum eigenvalue and weight vector of the corresponding judgment matrix.

A =	1.0000	0.3333	0.2000	0.1429
	3.0000	1.0000	0.3333	0.2000
	5.0000	3.0000	1.0000	3.0000
	7.0000	5.0000	0.3333	1.0000

Weight vector  $W = \begin{bmatrix} 0.0551 & 0.1178 & 0.4888 & 0.3383 \end{bmatrix}$ , maximum eigenvalue  $\lambda_{max} = 4.2626$ . Table 2. Criteria Layer Indicator Weights

Criterion layer	After-sale service	Content Integrity	Share of Famous Teachers	Pass rate
Weight	0.0551	0.1178	0.4888	0.3383

Therefore, in terms of mobile terminal postgraduate entrance examination pricing, the relative importance of the four indicators of after-sales service, content integrity, teacher occupancy rate, and postgraduate entrance examination pass rate is: teacher occupancy rate>postgraduate entrance examination pass rate>content integrity>after-sales service 3.1.5. Consistency inspection

From a random judgment matrix of over 1000 times calculate the maximum eigenvalue of max is calculated from CI to calculate the average value of RI, which is called the average random consistency index. As shown in Table 3.

Table 3. RI Values									
n 1 2 3 4 5 6 7 8 9							9		
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45

In the table, when n=1, 2, RJ=0, this is because the 1,2 judgment matrix is always consistent; When CR<0, the consistency of the comparison matrix is acceptable, otherwise the judgment matrix must be corrected.

Requested  $\lambda_{max}$ =4.2626, n=4, as shown in the table, n=4, RI=0.9

$$CI = \frac{(\lambda_{max} - n)}{(n-1)} = 0.0875, CR = \frac{CI}{RI} = \frac{0.0875}{0.9} < 0.1.$$

Therefore, the consistency test passed.

3.1.6. Overall sorting optimization

According to the relevant questionnaire survey, students' evaluations of the various indicators of the three different institutions' postgraduate entrance examination products can be obtained, as shown in Table 4.

Table 1. Evaluation Table for Each mack of the Timee Major Institutions					
	After-sale	Contont Intogrity	Share of Famous	Pass rate	
	service	content integrity	Teachers		
Unit	%	%	%	%	
New Oriental	85	86	7	70	
Wendu	90	77	65%	75%	
Setting sail	60	75	70%	65%	

Table 4. Evaluation Table for Each Index of the Three Major Institutions

Calculate the comprehensive scores of each postgraduate entrance examination institution based on the evaluation table of each indicator of the three major institutions, as shown in Table 5:

Code	Institution	Scores
Α	New Oriental	75.1553
В	Wendu	71.1741
С	Setting sail	68.3465

Table 5. Comprehensive Scores

From the above table, it can be seen that the comprehensive rating of New Oriental institutions is 75.1553, the comprehensive rating of Wendu institutions is 71.1741, and the comprehensive rating of Qihang institutions is 68.3465, because consumers have a preference for the products of the three institutions as A>B>C.

According to the product prices on the official websites of the three major institutions, Table 6 is compiled

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Online products	Extre me value]	English online course	Political Online Course	Mathematics online course	Total
Now Oriontal	max	1390	890	1390	3670
New Oriental	min	1390	890	790	3070
Wendu	max	1000	700	500	2200
	min	796	596	396	1788
Setting sail	max	1580	1580	1580	4740
	min	1380	1380	1380	4140

Table 6. Online postgraduate entrance examination product quotations of various institutions

From the above table, it can be concluded that the price range of New Oriental is 3070-3670 yuan, the price range of Wendu is 1788-1788 yuan, and the departure price range is 4140-4740 yuan. Combined with the comprehensive scores of the postgraduate entrance examination products of New Oriental, Wendu and Qihang, SA=75.1553, SB=71.1741SC=68.3465, it can be seen that people are more willing to accept the A product for the postgraduate entrance examination. If the indicators such as the occupancy rate of famous teachers and the passing rate of the postgraduate entrance examination are close to the A product, the pricing should be in the range of 3070-3670, Do not exceed 4740 and fall below 1788, as demand is less than supply and product sales are very low. And products priced over 3670 yuan have a higher overall index factor than the three best products in the market.

# 3.2. Suggestions for pricing mobile postgraduate entrance examination products

The price of postgraduate entrance examination products should not only consider the proportion of famous teachers, the success rate of graduate entrance exams, the completeness of content, after-sales service, but also analyze the feasibility of placement of postgraduate entrance examination products, the local economic and social situation, and the level of graduate education.

Pay close attention to the pricing and corresponding expenses of each product, have a keen insight to distinguish market reactions when prices are too high or too low, and make corresponding adjustments in a timely manner. Make corresponding price adjustments based on customers' love and attention towards the product. Do the corresponding financial work well, not only focus on short-term benefits, but also on long-term strategies, in order to have a greater possibility of profitability.

Gradually increase prices, avoid bidding up prices, adopt a method of gradually increasing prices, and then put in effort to promote the advantages and disadvantages of the product to customers, making it easier for them to accept the price increase.

By enriching the diversity of products, it is more convenient for customers to choose, while also providing customers with recognition of the product.

# 4. Conclusion

Under the promotion of enrollment expansion policies, the number of undergraduate students on campus has rapidly increased in recent years, leading to a decline in employment quality. The negative effect is that it is difficult to find satisfactory jobs. On the other hand, it is also to improve one's competitiveness in the job market, enhance one's education and comprehensive abilities, and then choose to take the postgraduate entrance examination. Under the increasing pressure of graduate entrance exams, various postgraduate entrance examination institutions and products have emerged. Regardless of the initial state, enterprises need to strengthen

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management and control measures to enhance their core competitiveness, thereby increasing market share and obtaining more profits.

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