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Research on the Current Situation and Suggestions for the Development of China's Low-Altitude Economy Based on the Empirical Analysis of the Stock Market

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Abstract: As an emerging economic sector in China, the low-altitude economy is experiencing rapid growth driven by technological advancements and strategy support. This paper focuses on stocks in the low-altitude economy sector within China's stock market, exploring its development characteristics and trends through an analysis of the sector's industrial distribution, regional development dynamics, and stock market performance. The study reveals that the low-altitude economy is dominated by industrial and information technology sectors, with distinct regional development disparities and a stock market that is both active and prone to volatility. Based on these findings, this paper puts forward recommendations to promote the sustainable development of the low-altitude economy, including improving supporting regulatory frameworks, enhancing regional coordination, providing targeted strategy support and guidance, and encouraging technological innovation.

Keywords: Low-Altitude Economy; Industry Distribution; Regional Development; Stock Market

1. Introduction

1.1 Definition and Development Background of Low-altitude Economy

The low-altitude economy refers to the aggregate of diverse economic activities formed through the development and utilization of low-altitude resources, with low-altitude airspace (below 3,000 meters) as its foundation. Driven by the continuous advancement of technologies in areas such as helicopters, unmanned aerial vehicles (UAVs) [1], and flying cars, the low-altitude economy has demonstrated tremendous development potential across multiple fields including tourism, logistics, and emergency rescue, emerging as a new engine for economic growth [2]. In recent years, the global low-altitude economy market has maintained a momentum of expansion [3,4]. Its development can not only propel the upgrading of related industries but also generate a large number of job opportunities, which holds great significance for economic structural adjustment and coordinated regional development [5,6]. In China, the low-altitude economy has also garnered widespread attention, with various regions deploying related industrial layouts to accelerate its rapid development [7].

1.2 Research Significance

A thorough analysis of the current development status and evolving trends of China's low-altitude economy holds significant theoretical and practical value [8,9]. At present, research in this field remains in an exploratory stage, with relatively limited systematic analysis regarding its industrial distribution, regional development disparities, and stock market performance [10,11]. Therefore, in-depth research on these three dimensions – industrial layout, regional development status, and stock market dynamics – is crucial for gaining a comprehensive understanding of the low-altitude economy's development landscape. From an industrial perspective, such research can clarify the positioning and growth trends of each sector within the low-altitude economy, thereby laying a solid foundation for formulating targeted industrial policies. At the regional level, it helps identify gaps in regional development, which in turn facilitates the promotion of coordinated inter-regional growth. From the stock market perspective, it can not only provide investors with science-based decision-making references but also offer strong support for the financing and sustainable development of enterprises engaged in low-altitude economy-related businesses.

2. Industry Analysis

2.1 Industry Composition of Wind Low-altitude Economic Index

The Wind Low-altitude Economy Index (8841750. WI) is an important indicator for measuring the development of the low-altitude economy, with its constituent stocks covering industries such as industry, information technology, optional consumption, materials, and communication services. As of December 9, 2024, the index includes 70 constituent stocks, with the industrial sector accounting for the highest proportion, reaching 44 stocks; The information technology industry ranks second with 13 companies; There are 9, 3, and 1 available in the consumer, materials, and communication service industries respectively (see Figure 1). From the perspective of industry proportion, industry has the highest proportion, fully demonstrating its important position in the low-altitude economy. Information technology and optional consumption also occupy a considerable share, jointly constituting the main industry sectors of the low-altitude economy. From the distribution of total market value (see Figure 2), the total industrial market value is 816.375 billion yuan, information technology is 235.051 billion yuan, optional consumption is 125.882 billion yuan, materials is 20.109 billion yuan, and communication services is 91.12 billion yuan. The industrial and information technology industries dominate. This indicates that the core driving force of the low-altitude economy is concentrated in the high-end manufacturing and information technology fields.

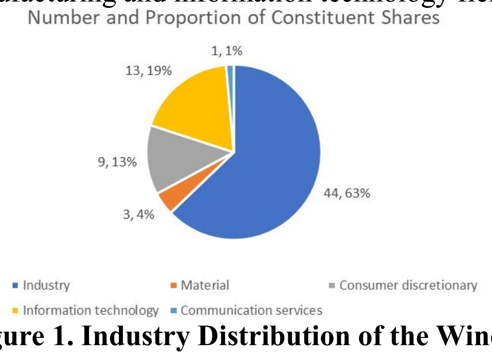

Figure 1. Industry Distribution of the Wind Low-Altitude Economic Index Constituent Shares (Data as of December 9, 2024)

The first number of each sector represents the number of shares attributable to the sector among all constituents, and the second number represents its proportion of the total number of constituents. The figure shows that industrial constituents have the highest proportion of the five sectors.

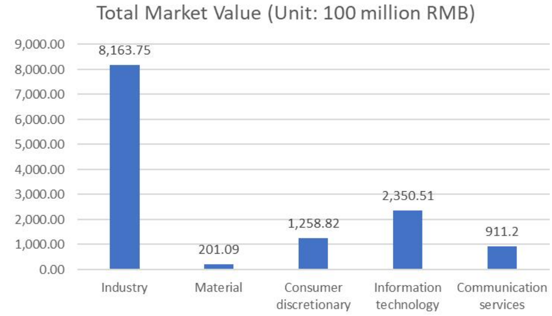

Figure 2. Industry Distribution of Total Market Value of Wind Low-Altitude Economic Index Constituent Shares (Data as of December 9, 2024)

The vertical axis represents the total market value (unit: 100 million RMB) of the constituent stocks attributable to each industry, and the horizontal axis represents the five industries. The numbers above the bars represent the specific values of the total market value of the constituents in each sector. The figure shows that industrial constituents have the highest market value of the five sectors.

2.2 Industry Constituent Shares and Market Value Trends

Since 2015, there have been significant changes in the industry distribution of low-altitude economic index constituent stocks. The number of constituent stocks and total market value in the industrial sector have both shown an upward trend (see Figures 3 and Figure 4), with the number of constituent stocks gradually increasing from 26 in 2015 to 44 in 2024, and the total market value fluctuating from 5571.18 billion yuan in 2015 to 816.375 billion yuan in 2024, indicating the continuous consolidation of its dominant position in the low-altitude economy. The information technology industry has grown rapidly in the past two years, with the number of constituent stocks reaching 13 in 2024, a significant increase compared to before. The total market value has grown from 123.487 billion yuan in 2015 to 235.51 billion yuan in 2024, reflecting the increasing importance of digital technology in the low-altitude economy. In contrast, the number and market value growth of constituent stocks in the optional consumption and materials industries are relatively slow, indicating that these industries have limited support in the low-altitude economy.

The vertical axis represents the number of constituent stocks, and the horizontal axis represents the year. Curves of different colors represent different industries. The number above each trend line represents the number of constituents owned by the sector during the year. The figure shows that the number of industrial constituents has increased significantly over the past decade.

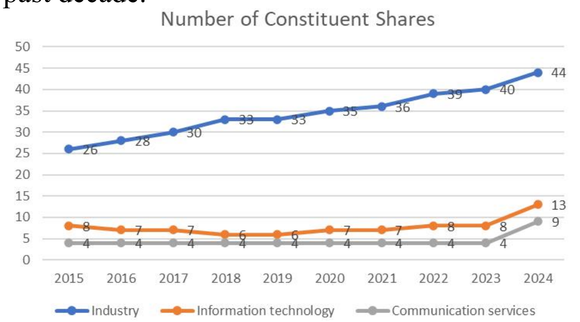

Figure 3. Development Trend of the Number of Constituent Shares of the Wind Low-Altitude Economic Index (Data as of December 9, 2024)

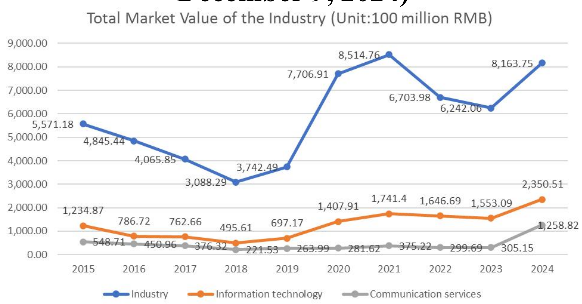

Figure 4. Trend of Total Market Value of Wind Low-Altitude Economic Index Constituent Shares (Data as of December 9, 2024)

The vertical axis represents the total market value (in units of RMB 100 million), and the horizontal axis represents the year. Curves of different colors represent different industries. The number above each trend line represents the total market value of constituents owned by the sector during the year. The figure shows that the total market capitalization of the industrial constituents has been running at a high level since 2020.

3. Current Situation of Regional Development

3.1 Ranking of Urban Low-Altitude Economic Development Index

According to the "2024 China Urban Low-altitude Economy Development Index Report" released by 36Kr Research Institute, key cities involved in the low-altitude economy industry in China were evaluated from five dimensions: development environment, capital investment, innovation capability, basic support, and development effectiveness. Beijing ranked first in the country with a total index of 91.26, while Shenzhen, Shanghai, Guangzhou, and Nanjing ranked second to fifth with scores of 84.53, 76.09, 76.02, and 73.22, respectively. The report divides the TOP20 cities into three tiers: the first tier consists of Beijing(BJ) and Shenzhen(SZ), the second tier consists of 8 cities including Shanghai(SH), Guangzhou(GZ), Nanjing(NJ), Chengdu(CD), Xi'an(XA), Hangzhou(HZ), Chongqing(CQ), and Suzhou(SZ), and the third tier consists of 10 cities including Changsha(CS), Tianjin(TJ), Wuhan(WH), Qingdao(QD), Shenyang(SY), Harbin(HB), Zhuhai(ZH), Hefei(HF), Ningbo(NB), and Jinan(JN) (see Figure 5). There are significant differences in the development of low-altitude economy among cities in different tiers, reflecting the differences in resources, capabilities, and strategies for low-altitude economic development among cities.

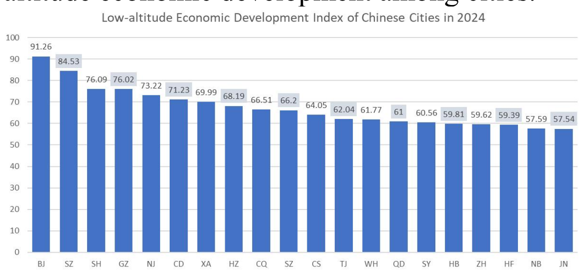

Figure 5. Top 20 Low-Altitude Economy Index of Chinese Cities in 2024

The vertical axis represents the Low-altitude Economic Development Index value (published by the "2024 China Urban Low-altitude Economic Development Index Report"), and the horizontal axis represents the city (denoted by abbreviation). The values above the bars represent the specific values of the Low-altitude Economic Development Index. The figure shows that Beijing's index value is at the top of the list.

3.2 Regional Development Characteristics

This article selects cities with high rankings and a large number of Wind Low-altitude Economy Index Constituent Shares, including Beijing, Shenzhen, Shanghai, Guangzhou, Nanjing, and Chengdu, to examine the situation of listed companies in these cities. It can compare and predict the development status and trends of the low-altitude economy stock market in each city (see Table 1). Beijing has 8 constituent stocks, covering industries such as industry, information technology, and communication services. Enterprises in the industrial and information technology fields have a large scale and influence, such as 600118.SH and 600372.SH, reflecting Beijing's diversified and high-end advantages in the low-altitude economy industry. Shenzhen has 2 constituent stocks, Shanghai and Guangzhou have 2 and 4 constituent stocks respectively, and the industry distribution is mainly concentrated in industry and information technology. There are 5 constituent stocks in Nanjing and 8 constituent stocks in Chengdu, but the total market value of the 8 stocks in Chengdu is relatively small, and the overall return rate is low.

As a leader in the low-altitude economy, Beijing has a significant market share due to its strength in the industrial and information technology fields. Although Shenzhen has a relatively small number of constituent stocks, its stock returns are high, demonstrating strong market activity. Cities such as Shanghai, Guangzhou, and Nanjing have also shown outstanding performance in the low-altitude economy, but there is a certain gap compared to Beijing and Shenzhen. There are significant differences in the development of the low-altitude economy among different tier cities. The first-tier cities have advantages in technological innovation and capital investment, while the third-tier cities need to further enhance their development environment and basic support capabilities.

Table 1. List of Constituent Shares of the Wind Low-Altitude Economic Index in 6 Cities (Data as of December 9, 2024)

Code	Total market value (Unit: 100 million RMB)	City	Wind first level Industry	City plate weight
300045.SZ	159.97	BJ	Information technology	0.0697
300213.SZ	50.17	BJ	Information technology	0.0219
300719.SZ	48.77	BJ	Industry	0.0213
600118.SH	336.54	BJ	Industry	0.1467
600372.SH	605.83	BJ	Industry	0.2641
600435.SH	156.42	BJ	Industry	0.0682
601698.SH	911.2	BJ	Communications services	0.3972
688287.SH	25.16	BJ	Industry	0.0110
000099.SZ	205.97	SZ	Industry	0.8120
002577.SZ	47.69	SZ	Information technology	0.1880
600843.SH	106.9	SH	Industry	0.7723
603037.SH	31.51	SH	Consumer discretionary	0.2277
002465.SZ	307.75	GZ	Information technology	0.4508
002544.SZ	145.63	GZ	Information technology	0.2133
300424.SZ	43.09	GZ	Industry	0.0631
688248.SH	186.24	GZ	Industry	0.2728
300975.SZ	82.99	NJ	Information technology	0.1329
600501.SH	88.9	NJ	Industry	0.1424
600562.SH	238.06	NJ	Industry	0.3813
603666.SH	57.3	NJ	Industry	0.0918
688631.SH	157.09	NJ	Information technology	0.2516
002023.SZ	79.94	CD	Industry	0.1243
002253.SZ	38.04	CD	Information technology	0.0592
002935.SZ	73.26	CD	Industry	0.1140
002977.SZ	37.56	CD	Information technology	0.0584
600391.SH	61.87	CD	Industry	0.0962
603261.SH	24.95	CD	Industry	0.0388
688070.SH	34.8	CD	Industry	0.0541
688297.SH	292.48	CD	Industry	0.4549

The first column is the stock code, the second column is the total market value of the stock, the third column is the city where the stock is issued, and the fourth column is the Wind industry classification to which the stock belongs. The fifth column is the ratio of the market capitalization of the stock to the total market capitalization of all constituent shares in the city to which it belongs.

4. Empirical Research

4.1 Definitions and Methods

(1) Weekly Weighted Logarithmic Return

Suppose the city has k constituent stocks and the length of close price series is n. The stock i's closing prices at week t is denoted as $P_{i,t}$,where $i = 1, 2, \cdots, k$ and $t = 1, 2, \cdots, n$. The weekly logarithmic return of stock i is calculated by $r_{i,t} = \log(\frac{P_{i,t}}{P_{i,t-1}})$, $t = 2, \cdots, n$. Then the length of the weekly logarithmic return series is n-1, which can be denoted as m. The proportion of a single stock's market value to the total market value of its constituent stocks in the city is denoted by w_i (as shown in the 5th column of Table 1). Now we define the weekly weighted logarithmic return of the city's low-altitude economic sector stocks, which is denoted as

$$*WR_t = \sum_{i=1}^{k} w_i r_{i,t} , \quad (1)$$

where the star can be replaced by the abbreviation of the city.

The average of *WR is calculated by

$$Mean_* = \frac{1}{m} \sum_{t=1}^{m} *WR_t . \quad (2)$$

The standard deviation of *WR is calculated by

$$Volatility_* = \frac{1}{m-1} \sum_{t=1}^{m} (*WR_t - Mean_*)^2 . \quad (3)$$

(2) Correlation Analysis

This article selects Pearson linear correlation test and Spearman rank correlation test to examine the correlation between weighted returns of constituent stocks between cities. Take *WR and #WR as example(where both of "*" and "#" can be replaced by the abbreviations of the cities), the Pearson correlation coefficient is calculated as follows,

$$r_{pearson} = \frac{\sum_{t=1}^{m} (*WR_t - Mean_*)(\#WR_t - Mean_\#)}{\sqrt{\sum_{t=1}^{m} (*WR_t - Mean_*)^2} \sqrt{\sum_{t=1}^{m} (\#WR_t - Mean_\#)^2}} .$$

Denote R_t as the rank of the sample point $*WR_t$ in samples $\{*WR_t\}_{t=1,2,\cdots m}$, and Q_t as the rank of the sample point $\#WR_t$ in samples $\{\#WR_t\}_{t=1,2,\cdots m}$. $Mean_R$ and $Mean_Q$ are denoted as the averages of R_t and Q_t separately. The Spearman correlation coefficient is calculated as follows,

$$r_{spearman} = \frac{\sum_{t=1}^{m} (R_t - Mean_R)(Q_t - Mean_Q)}{\sqrt{\sum_{t=1}^{m} (R_t - Mean_R)^2} \sqrt{\sum_{t=1}^{m} (Q_t - Mean_Q)^2}}$$

In order to measure whether the correlation between $\{*WR_t\}$ and $\{\#WR_t\}$ is significant, we use the Pearson linear correlation test and the Spearman rank correlation test. The correlation coefficient of two populations is denoted as ρ . The null hypothesis and alternative hypothesis are $H_0 : \rho_{pearson} = 0$ and $H_1 : \rho_{pearson} \neq 0$ respectively.

The test statistics of Pearson's linear correlation test is $T = r_{pearson} \times \sqrt{\frac{n-2}{1 - r_{pearson}^2}}$. When the null hypothesis is true, the test statistic obeys a t-distribution with a degree of freedom of 2. Supposing the observation of T is t, the p-value of the test is calculated by $p = 2 \times \min[P(T \geq t), P(T \leq t)]$. At the 0.05 significance level, we reject the null hypothesis when $p < 0.05$.

The test statistics of Spearman rank correlation test is $r_{spearman}$. The distribution of $r_{spearman}$ under the null hypothesis is available in the distribution table. And at the 0.05 significance level, we reject the null hypothesis when $p < 0.05$. In this paper, the test results are all obtained by R software.

(3) Augmented Dickey-Fuller Test

Unit root sequences are the most common class of nonstationary sequences. The unit root test is a test of the stationarity of a sequence. The null hypothesis is the sequence has a unit root (i.e., the sequence is non-stationary). And alternative hypothesis there is no unit root for the sequence (i.e. the sequence is stationary). Dickey & Fuller proposed Augmented Dickey-Fuller (ADF) test to test higher-order autoregressive models. It is assumed that time series $\{x_t\}$ obey a process $AR(p)$,that is

$$x_t = \phi_1 x_{t-1} + \phi_2 x_{t-2} + \cdots + \phi_p x_{t-p} + \varepsilon_t ,$$

where ε_t is white noise. The hypothesizes of ADF test are $H_0 : \rho = 0$ and $H_1 : \rho < 0$, where $\rho = \phi_1 + \phi_2 + \cdots + \phi_p - 1$. The test statistics of ADF test is $\tau = \frac{\hat{\rho}}{\sigma_{\hat{\rho}}}$,where $\hat{\rho}$ is the least-squares estimate under the null hypothesis, and $\sigma_{\hat{\rho}}$ is the sample standard deviation of the parameter ρ . The distribution of τ can be obtained by the Monte Carlo method. At the 0.01 significance level, we reject the null hypothesis when $p < 0.01$, which means the series is stationary. Otherwise, the series is judged to be non-stationary.

(4) Ljung-Box Test

When we identify a sequence as stationary, we need to further analyze whether the sequence is a white noise sequence to confirm whether further analysis of autocorrelation is warranted for the sequence.

Denote the lag order is i and the autocorrelation coefficient of the lagging i-order is $\rho(i)$, $i = 1, 2, \cdots, m$. The null hypothesis is $H_0 : \rho(1) = \rho(2) = \cdots = \rho(m) = 0, \forall m \geq 1$. It means that sequences with a delay period less than or equal to m are not correlated with each other. The alternative hypothesis is $H_1 : \exists i \in \{1, 2, \cdots, m\}, s.t. \rho(i) \neq 0$, indicating that there is some correlation between sequences with a delay period less than or equal to m.

The test statistics of Ljung-Box test is $Q_{LB} = n(n+2)\sum_{i=1}^{m} \frac{\hat{\rho}^2(i)}{n-i}$,where n is the length of the sequence. When the null hypothesis is true, the test statistic obeys a Chi-square distribution with a degree of freedom of m. Supposing the observation is $\hat{Q}_{LB}$, the p-value of the test is calculated by $p = P(Q_{LB} \geq \hat{Q}_{LB})$. At the 0.01 significance level, we reject the null hypothesis when $p < 0.01$, which means there is an autocorrelation between sequences. Otherwise, the sequence is judged to be white noise.

(5) Quadratic Moving Average

Moving averages are often used to analyze serial trends. In order to reduce the lag deviation between the smoothing value and the actual value, the quadratic moving average method is more suitable for series with obvious linear trends. The quadratic moving average method is based on the sequence obtained by the simple moving average method, and generally speaking, the number of terms of the two moving averages should be equal.

The original sequence is denoted as X_t .The n-term moving average of the sequence and the quadratic n-term moving average of the sequence is denoted as L_t and M_t separately, which are calculated by the following formulae,

$$L_t = \frac{X_{t-n+1} + X_{t-n+2} + \cdots + X_t}{n}, \quad M_t = \frac{L_{t-n+1} + L_{t-n+2} + \cdots + L_t}{n}.$$

Based on the series after the two moving averages, the long-term trend of the original series can be obtained, which is denoted as T_t. It is calculated by $T_t = 2L_t - M_t$ and can be used to fit the long-term trend of the original series.

4.2 Analysis of Constituent Shares in Various Cities

Taking Beijing as an example, it owns 8 Wind constituent shares. Select the weekly closing price data of stocks from January 1, 2024, to December 9, 2024, which length is 48. Among them, the prices of four stocks, 600118.SH, 300045.SZ, 601698.SH, and 300719.SZ showed a significant upward trend in the fourth quarter, while the prices of the other four stocks remained relatively stable throughout the year (see Figure 6).

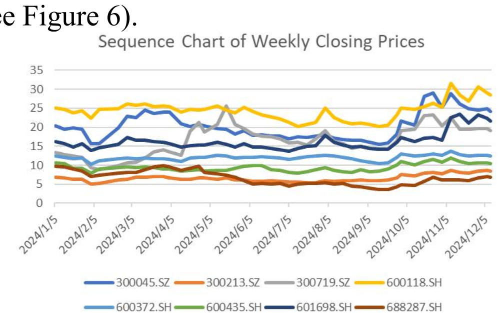

Figure 6. Sequence Chart of Weekly Closing Prices (Unit: RMB) of Beijing's Constituent Shares (January 1, 2024- December 9, 2024)

The vertical axis represents the weekly closing price of the stock, and the horizontal axis represents the date. Trend lines of different colors represent different stocks. Every closing price curve shows a steady fluctuation trend.

Now we use formula (1) to define the weekly weighted logarithmic return of Beijing's low-altitude economic sector stocks (denoted as BJWR), where k=8 and n=48. Based on the calculated sequence values, the average of BJWR is calculated by formula (2), which is 0.32% in 2024. The standard deviation of BJWR is calculated by formula (3), which is 0.0571 in 2024. BJWR can reflect the comprehensive development of the constituent stocks of Beijing's low-altitude economic sector, and it shows a stable trend (see Figure 7).

The vertical axis represents the weekly weighted return value, and the horizontal axis represents the date. Yields are positive for most of the weeks.

Similarly, using the formula (1), we can define the weekly weighted returns of the low-altitude economic sector stocks in Shenzhen, Shanghai, Guangzhou, Nanjing, and Chengdu, which are recorded as SZWR, SHWR, GZWR, NJWR, and CDWR. The return sequences of each city show relatively stable trends, with little difference in average returns and significant fluctuations in the sequences, indicating that the trading volume is relatively active (see Figure 8).

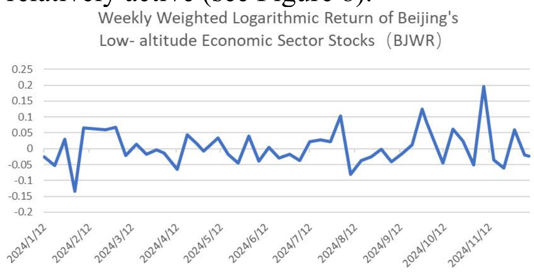

Figure 7. Sequence Chart of Weekly Weighted Return of Beijing's Constituent Shares (January 1, 2024- December 9, 2024)

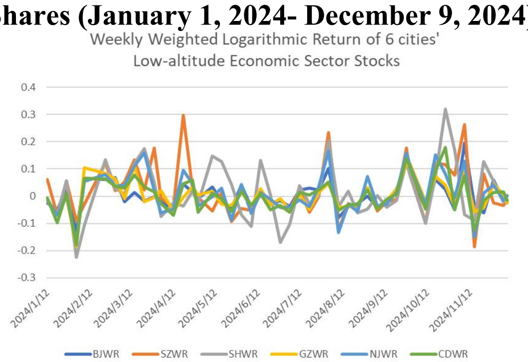

Figure 8. Sequence Chart of Weekly Weighted Return of 6 Cities' Constituent Shares (January 1, 2024- December 9, 2024)

The vertical axis represents the weekly weighted return value, and the horizontal axis represents the date. The trend lines of different colors represent different cities. The average and volatility of the weekly weighted returns of 6 cities are given in Table 2. The figure visualizes the trend of each series, with Shenzhen and Shanghai fluctuating more dramatically.

Using the formula (2) and (3), we analyze the average and volatility of returns in 2024 (see Table 2). The results showed that the low-altitude economic sector stocks in Shenzhen had the highest weekly return rate of 0.019, followed by Shanghai (0.015), while Chengdu had the lowest return rate (0.002). From the perspective of volatility, the volatility of Shenzhen and Shanghai is 0.099 and 0.103, respectively, significantly higher than other cities. The data shows that the stock trading in the low-altitude economy sectors of Shenzhen and Shanghai is relatively active, and the market pays high attention to low-altitude economy-related enterprises in these two cities, with frequent capital flows. Although Chengdu has relatively many listed companies, its overall return rate is relatively low, with an average of 0.002, reflecting its relatively weak performance in the stock market, which is not proportional to the number of enterprises owned by the city. This further confirms the impact of the small total market value of Chengdu's low-altitude economy listed companies.

Table 2. Characteristics of the Weekly Weighted Returns of Constituent Stocks in 6 Cities (Data as of December 9, 2024)

value \ City	BJWR	SZWR	SHWR	GZWR	NJWR	CDWR
Mean of return	0.003	0.019	0.015	0.003	0.011	0.002
Volatility of return	0.057	0.099	0.103	0.057	0.078	0.064

The mean returns and volatility of Shenzhen and Shanghai are higher than other cities, showing better market liquidity.

4.3 Correlation Analysis of Constituent Shares between Cities

Except for two stocks, most of the constituent stocks owned by the six cities belong to the industrial and information technology industries, with a certain degree of overlap. This article selects the Pearson linear correlation test and Spearman rank correlation test to examine the correlation between weighted returns of constituent stocks of two cities. Any two cities are selected for calculation, and the correlation coefficient calculation results are shown in the Table 3 and 4.

Table 3. Pearson Correlation Coefficient of Stock Weighted Return in 6 Cities

Pearson Linear Correlation	BJWR	SZWR	SHWR	GZWR	NJWR	CDWR
BJWR	1.0000					
SZWR	0.6447	1.0000				
SHWR	0.3161	0.4743	1.0000			
GZWR	0.8411	0.5567	0.4082	1.0000		
NJWR	0.7634	0.7876	0.5825	0.7736	1.0000	
CDWR	0.7735	0.6777	0.5958	0.8540	0.8610	1.0000

At the 0.05 significance level, there is a significant linear relationship between the weighted yields of each city. To a certain extent, the value of the correlation coefficient reflects the strength of the correlation between cities in the development of the low-altitude economy.

Table 4. Spearman Rank Correlation Coefficient of Stock Weighted Return in 6 Cities

Spearman Rank Correlation	BJWR	SZWR	SHWR	GZWR	NJWR	CDWR
BJWR	1.0000					
SZWR	0.5736	1.0000				
SHWR	0.3248	0.5734	1.0000			
GZWR	0.8634	0.6252	0.3635	1.0000		
NJWR	0.7596	0.8026	0.5669	0.7828	1.0000	
CDWR	0.8432	0.7260	0.4667	0.8604	0.9072	1.0000

The conclusions reflected by the Spearman rank correlation coefficient are similar to those in Table 3.

The p-values of two correlation tests are less than 0.05, indicating that the correlation between any two cities' stock markets is significant at the significance level of 0.05. It is also found that there is a strong correlation between cities such as Beijing and Guangzhou, Shenzhen and Nanjing, Chengdu, and Guangzhou and Nanjing, with correlation coefficients exceeding 0.75. For example, the Pearson linear correlation coefficient between Beijing and Guangzhou is 0.8411, and the Spearman rank correlation coefficient is 0.8634. In contrast, Shanghai has weaker connections with other cities, which may be related to its unique position as a financial center. Shanghai's low-altitude economic industry development model and industrial structure are different significantly from other cities. This correlation, to some extent, reflects the synergy or policy impact of low-altitude economic industries between regions, as well as the independence and differences in low-altitude economic development in different cities, providing a reference for investors to make cross-regional investment decisions.

4.4 Research on the Market Sequence of Wind Low-altitude Economy Index

The stock market provides important financing channels for low-altitude economy-related enterprises, effectively promoting the innovation and development of the low-altitude economy. Wind has launched the Low-altitude Economy Index (8841750. WI), which includes 70 constituent stocks from 32 cities in 20 provinces, with nearly half of the stocks having a total market value exceeding 10 billion yuan, indicating a considerable scale.

This article selects the daily closing prices of the Wind Low-altitude Economy Index (8841750. WI) from January 1 to December 9, 2024, which length is 225. The graph shows that the index has a relatively stable trend throughout the year, but there has been an upward trend since October, and the sequence exhibits non-stationary characteristics (see Figure 9). This trend is influenced by various factors, including industry development trends, macroeconomic environment, policy changes, etc. For example, major technological breakthroughs or new policies in the industry may stimulate the index to rise, while macroeconomic downward pressure or intensified industry competition may lead to index fluctuations. To eliminate the influence of random factors, the first-order difference is performed for the original sequence. The post-differential series fluctuates up and down around 0, and there is no obvious trend change or aggregation effect (see Figure10).

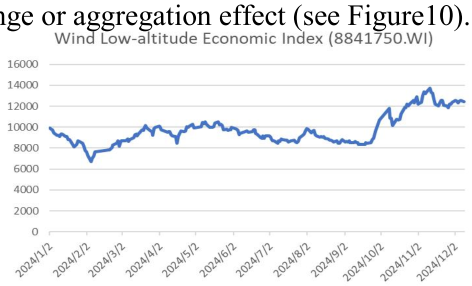

Figure 9. Trend of the Daily Closing Price (Unit: RMB) of Wind Low-altitude Economic Index (January 1, 2024- December 9, 2024)

The vertical axis represents the daily closing price, and the horizontal axis represents the date. The sequence shows a slow upward trend.

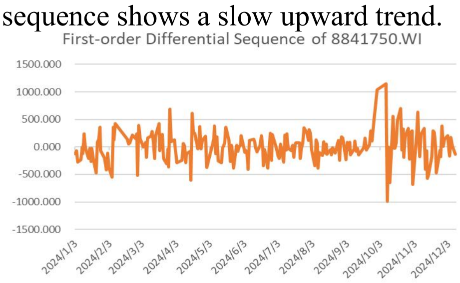

Figure 10. Trend of the First-order Difference Series of the Daily Closing Price of Wind Low-altitude Economic Index (January 1, 2024- December 9, 2024)

The vertical axis represents the first-order difference value, and the horizontal axis represents the date. Post-differential sequence fluctuates up and down around the value of 0 and shows a stable characteristic.

In this article, the Augmented Dickey-Fuller test and the Box-Ljung test are used to explore the stationarity and autocorrelation of the data, respectively. The test results of 8841750. WI and its first-order difference series are shown in Table 5. The results indicate that at a significance level of 0.01, the differential sequences are stationary and non-autocorrelated, suggesting that the Wind Low-altitude Economic Index sequence is greatly affected by random fluctuations and difficult to model based on historical observations of the sequence.

Table 5. P-values of Statistical Test Results

Methods / Sequences	8841750. WI	First-order Difference Sequence of 8841750. WI
Augmented Dickey-Fuller test	0.76	<0.01
Ljung-Box test	<0.01	0.69

At the 0.05 significance level, the results of the Augmented Dickey-Fuller test show that the original sequence is not stationary, but the post-differencing sequence is stationary. The results of the Box-Ljung test show that there is autocorrelation in the original sequence, but the post-differential sequence has no autocorrelation.

The article attempts to choose the quadratic moving average to explore the trend of Wind Low-altitude Economic Index. Considering the prediction timeliness and smoothness, n=5 is selected as the number of moving items. The long-term trend T_t can be calculated, as shown by the orange line in the figure below. The results show (see Figure 11) that the smoothed data has a good fitting effect. This provides methodological support for short-term forecasting of the index. Although it's difficult to model accurately, the long-term trend can reflect the index's changes to some extent, and provides a reference for investors and market analysts.

The vertical axis represents the numeric value, and the horizontal axis represents the date. The blue trend line represents the original series, and the orange represents the long-term trend T_t calculated by $T_t = 2L_t - M_t$. The two curves fit well.

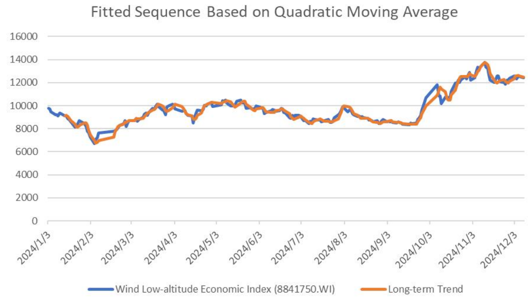

Figure 11. Daily Closing Price and Long-term Trend (Unit: RMB) of Wind Low-altitude Economic Index (January 1, 2024- December 9, 2024)

5. Conclusion and Suggestions

5.1 Research Conclusion

This article examines the industrial distribution, regional development dynamics, and sectoral stock index performance of China's low-altitude economy from a stock market perspective. The findings are as follows:

First, the low-altitude economy is anchored in the industrial and information technology sectors, which dominate both the quantity and market value of constituent stocks. Exhibiting a sustained growth trajectory, these sectors serve as the core drivers propelling the development of the low-altitude economy.

Second, the development of the low-altitude economy exhibits distinct regional disparities, with significant variations in development levels and the structure of listed companies across cities. Beijing and Shenzhen take a leading position, while Chengdu, despite hosting a relatively large number of enterprises, has a smaller total market value. It is imperative for relevant cities to further optimize their development environments and enhance innovation capacities for the low-altitude economy.

Third, stock trading in the low-altitude economy sector is vibrant yet highly volatile, particularly in the Shanghai and Shenzhen markets. The stock market returns of low-altitude economic sectors across different cities display varying degrees of correlation, which reflects the industrial synergy effects between regions.

Fourth, although the overall trend of the low-altitude economy sector's stock index remains stable, it is susceptible to substantial random fluctuations, rendering modeling based on historical data challenging. Nevertheless, the moving average method can be employed to a certain extent for data smoothing and trend forecasting.

5.2 Research Suggestions

First, improve supporting regulations. In response to the rapid development of the low-altitude economy, it is recommended to formulate and improve unified national-level regulations related to the low-altitude economy. On this basis, we should give full play to local initiatives and encourage localities to formulate and improve regional supporting regulations in a differentiated way according to their actual conditions. It is suggested that the legislative purpose of the low-altitude economy should be to ensure the absolute safety of flight services, the rational use of low-altitude airspace, and the continuous optimization of the business environment. The scope of regulations should cover the entire industrial chain of the low-altitude economy, and fully take into account technical factors such as information and communication base stations, networks, monitoring, and navigation. The regulatory content should clarify the main responsibilities of operators, drone manufacturers, and backend platforms. It should also define airworthiness certification standards for new low-altitude aircraft that are in line with market development, reasonably plan low-altitude flight routes, optimize airspace management, improve airspace utilization, strengthen the management of low-altitude flight activities, regulate the market order of the low-altitude economy, and promote the safe and orderly development of the low-altitude economy industry.

Second, strengthen regional collaboration. It is recommended that cities with sound development of the low-altitude economy carry out cooperation with surrounding cities, share technologies and experiences, and promote coordinated regional development. With leading cities such as Beijing and Shenzhen as the core, we will drive the common development of surrounding cities and form a regional low-altitude economic development pattern with complementary advantages. For example, Beijing, which has strengths in aerospace technology and high-end manufacturing, can cooperate with surrounding cities in parts production and supporting services. For cities like Shanghai that have relatively weak connections with other cities, we can actively explore industrial integration cooperation models in the Yangtze River Delta, strengthen cooperation with other cities in technological research and development and industrial chain integration, and promote industrial docking and resource sharing.

Third, provide support and guidance. Considering that the low-altitude economy is still in the early stage of development, it is recommended that the government increase support for small and medium-sized enterprises in the low-altitude economy by establishing special funds and providing tax incentives to help them solve financing difficulties. At the same time, it can provide diversified financing tools for enterprises related to the low-altitude economy, such as bond financing, equity financing, and venture capital, to expand their financing channels, provide more financial support, and help them grow and develop. It is suggested to focus on supporting the development of the low-altitude economy industry in the fields of industry and information technology, and guide and promote the expansion and commercialization of application scenarios such as drones and flying cars. For instance, in the logistics field, enterprises are encouraged to increase the research and application of drone delivery to improve delivery efficiency; in the tourism field, diversified low-altitude tourism projects are developed.

Fourth, encourage technological innovation. Technology is the primary productive force. It is proposed that the government increase investment in research and development in the field of the low-altitude economy, encourage cooperation between enterprises, universities, and research institutions, strengthen industry-university-research collaboration, promote the transformation of scientific research achievements, break through the technological bottlenecks restricting the development of the low-altitude economy, and promote the sustainable development of the low-altitude economy industry. For example, we should strengthen the research and development of key technologies such as drone endurance and flight safety. We should also encourage enterprises in industries such as industry and information technology to make breakthroughs in key technologies of the low-altitude economy, accelerate the application of technological innovations such as aircraft manufacturing technology and communication technology in the low-altitude economy industry, and enhance the core competitiveness of the industry.

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