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Impact of Different Subjective Thoughts Based on Internet Data on Modern Economic Development

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Abstract: With the rapid development of digital economy, network technology has become increasingly prominent in the national economy. The Internet has an impact on modern economic development through wireless communication technology. This paper explored the impact on modern economic development based on different subjective ideas of Internet data analysis. Based on this, this paper proposed the data envelopment analysis algorithm, which played an important role in the development of modern economy in the following text. It can not only ensure the integrity and reliability of data, but also ensure the consistency of data. At the same time, it was also targeted at the impact of modern economic development in the experimental part. The experimental results of this paper could be seen that the investment and financing of network finance had the most stable impact on hotels, catering industry and financial industry, and its relative efficiency had remained around 1 for a long time. It showed that the network finance investment and financing had a good effect on the two industries. For other industries, the overall trend was downward. This was enough to show how to better integrate with the real economy, which was an important direction for the development of Internet finance in the future.

1. Introduction

With the rapid development of Internet technology, it has become a favorable carrier of modern social information, people's communication and even capital circulation in all sectors of society. The scope of influence of Internet technology has exceeded many people's imagination, and its influence is not limited to the way of information dissemination and capital circulation. In recent years, the rapid development of Internet technology has further shortened the distance between people and enabled people to obtain more information. At the same time, it has also made government and company decisions more transparent, expanded people's employment scope and

increased investment opportunities. Therefore, it is not difficult to find that the development of Internet technology plays an important role in people's lives, industry development and even national economy.

According to the research progress at home and abroad, different researchers have also made corresponding cooperative research on modern economic development: Zhang R selected Zhanjiang, a city in the southwest of Guangdong Province, and made an empirical analysis of the economic development of Zhanjiang from three national levels [1]. Shirov A A believed that the evolution of structural economics in the last century had a close relationship with economic development and was consistent with the rich economic policy objectives [2]. Gulnar D discussed and analyzed the impact of innovation on economic development, the status quo and development of innovation activities [3]. Sapir believed that the current monetary policy posed a crisis to European integration, that is, the single currency of the EU could hinder economic development [4]. However, these scholars' exploration of modern economic development lacks some technical demonstration. It was found that Internet based data analysis had better findings in the research of modern economic development. In this regard, relevant literature on Internet data analysis was consulted.

Some scholars also have some research on Internet data analysis: Zi H Y analyzed the impact of network and economic factors of Asian economies in 1997-2017 [5]. Starting from the reality of "reverse agglomeration" in the rapid development stage of China's Internet, Yang C used a new economic geography model, the "gravity mechanism" based on the impact of the Internet on companies, to derive the impact of the Internet on China's economy [6]. In many countries, SMEs are the mainstay of economic development. Sharifonnasabia F evaluated the economic role of the perspective of network use, the actions and scale of SMEs in the authoritative implementation of this industry [7]. However, these scholars did not explore the impact of different subjective ideas based on Internet data analysis on modern economic development, but only unilaterally explored its significance.

This paper proposed a data envelopment analysis method, which could ensure the integrity and reliability of the data and ensure the consistency of the data. The final experimental results showed that Internet finance had the greatest impact on hotel, catering industry and financial industry, which was at the level of 1 for a long time, indicating that the impact of Internet finance on the two industries was very significant. Other industries showed an overall downward trend. This also fully showed how to better integrate into the real economy, which was a major trend in the development of network finance in the future.

2. Methods Based on Internet Data

2.1 Internet Economic Characteristics

The Internet is the networking of economic activities, in which information plays an important role; the Internet can cause the transformation of traditional industries, promote the transformation of economic paradigm, and produce new economic forms; the Internet is actually the integration of real economy and virtual economy [8-9]. The Internet economy based on wireless communication can play a certain role in promoting the overall national economy. Figure 1 shows the characteristics of the Internet economy.

(1) Combination of virtual and real

The virtual characteristics of the Internet economy, on the one hand, reduce production costs, expand business areas, expand enterprise marketing channels, thus bringing benefits to enterprises. On the other hand, the Internet has expanded the depth of enterprises, and the development of the Internet has made industrial integration a normal state. The Internet economy can open up the physical and virtual space, realize the unification of online value and offline value, and the

unification of enterprise internal value and external value [10].

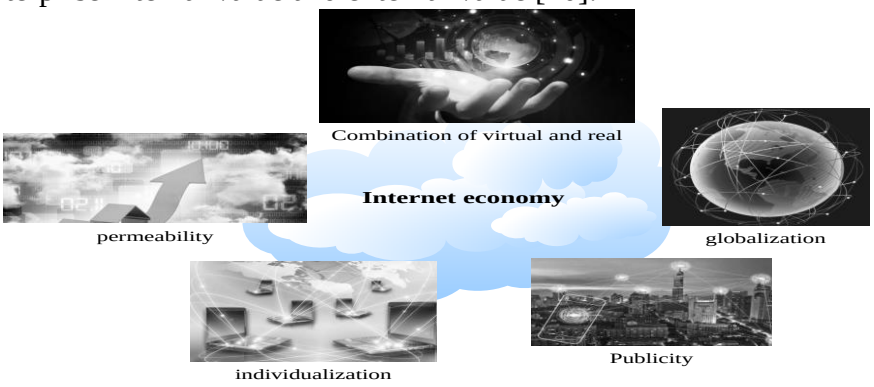

Figure 1. Internet economy

(2) Permeability

On the one hand, the Internet has promoted the "flat" business model and improved the flexibility of enterprises. It not only makes it possible for employees to participate in corporate governance and supervision, but also makes the enterprise more closely connected with consumers, reducing costs and improving the efficiency of economic activities. On the other hand, information technology represented by the Internet has influenced human production activities through digitalization [11].

(3) Globalization

In terms of integrating information resources, the Internet economy has broken the constraints of time and space, and achieved a powerful function of information transmission, so that the connection between people is no longer restricted. On the one hand, users publish their own opinions, enrich their own opinions and express their own needs through communication tools; e-commerce and other platforms are used for group buying. The alliance and binding relationship between users can improve the bargaining power of consumers and their position in the market. The Internet can break through the limitation of space, bring all regions of the world under the Internet, use information technology and the Internet of Things technology to create a big data era, transfer information and demand from all regions through the Internet platform, and promote the free flow of global factors of production [12].

(4) Personalization

The Internet economy is dominated by data and information, and economic activities have increasingly become dominated by technology and knowledge from the original resources. The unique feature of the Internet is that it directly connects various economic entities and closely links R&D, production and sales, thus making it possible to realize the personalized economy [13].

(5) Publicity

From the perspective of resource attributes, the Internet has a certain degree of publicity. The Internet is a quasi-public good, not exclusive. Because most of the network infrastructure is built by the state, everyone can enjoy the experience brought by the Internet as long as they have computers and networks, that is, they can obtain resources at a very low cost, and it is difficult to exclude others [14].

2.2 Data Envelopment Analysis (DEA) Model

The basic idea of DEA data analysis is relative efficiency. Convex analysis and linear programming are used as an evaluation method for modeling and analysis. Each decision-making unit is reasonably evaluated to provide each decision-making unit with the optimal input and output

strategies, which more objectively and ideally reflects the information and characteristics of each decision-making unit; at the same time, the comprehensive analysis of some complex systems containing multiple inputs and outputs also has its uniqueness [15]. This method can solve the benefit evaluation problem of multiple output indexes and multiple input indexes.

DEA model is based on the comparison among decision making units, and has relative effectiveness. The efficiency evaluation index of each decision-making unit is determined by its output synthesis and input synthesis ratio X_k. That is:

$$\mathrm{k} = 1,2,\cdots\cdots,\mathrm{Z} \quad (1)$$

Efficiency evaluation index X_k is the relative effectiveness evaluation value, equivalent to the "comprehensive evaluation" value [16].

The effectiveness of the $k_0(1 \le k_0 \le M)$-th decision-making unit is evaluated [17]. The relative effectiveness evaluation model of the k_0-th decision-making unit is obtained:

$$\begin{gathered} \mathrm{St} \le 1 \;\; \mathrm{k} = 1,2,\cdots,\mathrm{Z} \\ \mathrm{o} = 1,2,\cdots,\mathrm{Z};\;\; \mathrm{t} = 1,2,\cdots,\mathrm{D} \end{gathered} \quad (2)$$

If ordered:

$$\mathrm{C_k} = (\mathrm{c_{1k}}, \mathrm{c_{2k}}, \cdots, \mathrm{c_{zk}})^{\mathrm{Y}}, \mathrm{k} = 1,2,\cdots.\mathrm{M} \quad (3)$$

$$\mathrm{U_k} = (\mathrm{u_{1k}}, \mathrm{u_{2k}}, \cdots, \mathrm{u_{dk}})^{\mathrm{Y}}, \mathrm{k} = 1,2,\cdots.\mathrm{M} \quad (4)$$

$$\mathrm{b}` = (\mathrm{b_1}, \mathrm{b_2}, \cdots, \mathrm{b_z})^{\mathrm{Y}} \quad (5)$$

$$\mathrm{i}` = (\mathrm{i_1}, \mathrm{i_2}, \cdots, \mathrm{i_d})^{\mathrm{Y}} \quad (6)$$

The rectangular form is more concise:

$$\begin{gathered} (\mathrm{i}` \;\mathrm{u_o}/\mathrm{b}` \;\mathrm{c_o}) \\ \mathrm{St}\ \mathrm{i}` \;\mathrm{u_o}/\mathrm{b}` \;\mathrm{c_o} \le 1, \mathrm{k} = 1,2,\cdots,\mathrm{Z} \\ \mathrm{i,b} \ge 0 \end{gathered} \quad (7)$$

The values of i and b are calculated to maximize the effectiveness measure of the o th decision-making unit, and all the effectiveness measures are less than 1. One of the problems with calculating this particular ratio is that there are countless solutions [18]. To avoid this problem, $b`c_o = 1$ can be defined, and then:

$$\begin{gathered} \max_{\mathrm{i\,b}}(\mathrm{i}` \;\mathrm{u_o}) \\ \mathrm{St}\ \mathrm{b}`\mathrm{c_o} = 1 \\ \mathrm{i}` \;\mathrm{u_o} - \mathrm{b}`\mathrm{c_o} \le 0 \\ \mathrm{k} = 1,2,\cdots,\mathrm{M} \\ \mathrm{i,b} \ge 0 \end{gathered} \quad (8)$$

Here, the sign changes of i and b reflect their quasi changes. This scheme is generally called multiplication of linear programming problems. Through the duality of linear programming, the same envelope form as this problem can be obtained:

$$\begin{gathered} \min_{\varphi,\gamma}\ \varphi \\ \mathrm{st}\ \ -\mathrm{u_o} + \mathrm{U}\gamma \ge 0 \\ \varphi\,\mathrm{c_o} - \mathrm{C}\gamma \ge 0 \\ \gamma \ge 0 \end{gathered} \quad (9)$$

It satisfies $\varphi \le 1$. When the value is 1, it means that the point is on the frontier, that is, the

DMU is effective [19].

In practice, sometimes the technical efficiency value φ of multiple decision-making units is equal to 1, so it is not possible to rank each decision-making unit according to the efficiency value. In this case, DEA provides a super efficiency model, and the efficiency value φ calculated according to this model can be greater than 1. Basically, all decision-making units can be sorted. This paper aims to analyze and discuss the impact of different subjective ideas of Internet data analysis on modern economic development, and measure China's economic development from the four variables of the Internet as representative indicators.

3. Experimental Results of the Impact of the Internet on Economic Development

3.1 Source of Data Selection

This paper selected 2018-2021 as the research period, and the selected indicator was a relatively new development model of Internet finance. Considering the feasibility and reliability of data analysis, this paper analyzes the data in the form of quarterly data. This not only ensures the integrity and reliability of the data, but also gives consideration to the consistency of the data and the practical significance of the analysis.

Combined with the theme direction of the impact of different subjective ideas of Internet data analysis on China's economic growth, this paper mainly selects authoritative indicators representing the current development of China's Internet finance, including the scale of peer-to-peer (P2P) online lending market (A), the scale of Internet finance investment and financing (B), the scale of Internet crowdfunding market (C), and the scale of Internet third-party payment transactions (D) as representative indicators to measure the development of China's Internet finance. The development level of various industries and fields, including the added value of agriculture, forestry, animal husbandry and fishery (E), industrial added value (F), wholesale and retail added value (G), accommodation and catering added value (H), and financial added value (I), are selected as the measurement standards representing China's economic growth. The final sample data collected in this paper is shown in Table 1.

Table 1. Development status of Internet finance and added value data of various industries (100 million yuan)

	A	B	C	D	E	F	G	H	I
Q1 2018	127. 03	12.8	1.35	10181	7427.6	50128.5	12979.2	2394.5	10381.2
Q2 2018	187. 25	18.6	2.4	11216.5	11196.5	55267.2	13511	2341.1	10160.4
Q3 2018	265. 43	20.1	5.6	18731.5	17049.6	55883.3	14093.1	2608.7	10293.8
Q4 2018	317. 39	28.7	3.8	14205.8	21299.9	61058.6	15700.8	2884	10355.6
Q1 2019	363. 37	37. 6	7.78	18406.6	7776. 7	52797.1	14465.7	2617.8	11755.9
Q2 2019	483.23	38. 3	5.8	18126.3	12039.6	58607.6	15080.2	2561	11311.7
Q3 2019	729. 2	49.4	16.4	20154.3	18185.1	59061.7	15623	2840	11567.3
Q4 2019	952. 37	58. 4	21.8	23511.5	22164.4	63389.9	17254.6	3139.6	12030.3
Q1 2020	1185.56	116.2	30. 6	24308.8	8079.7	53796.7	15302.5	2841	14452.2
Q2 2020	1820.64	205.8	47.8	40584.3	12924.7	59734.4	15939.6	2780.4	14385
Q3 2020	2951.64	233.6	45.6	28136.5	18645.9	59362.5	16589.1	3106.8	14407.9
Q4 2020	3798.06	294.4	59.14	35481.3	23261.5	63612.6	18355.5	3425.5	14627.6
Q1 2021	3865.21	299.8	48.9	30747.9	9153	54110.2	16265.6	3105.7	15777.7
Q2 2021	4624.79	406.4	60.8	49584.3	13779.4	61490.1	17038.1	3037.5	15333.5
Q3 2021	5687. 2	415.6	51.2	45582.5	19184	62507.7	17850.4	3389.6	15472.5
Q4 2021	6526.21	513.2	107.6	56248.9	23848	69752.1	19959.3	3748	15548.7

3.2 Data Processing Results Analysis

After DEA model analysis of the standardized data, the trend results of the impact of Internet finance on various industries from the first quarter of 2018 to the fourth quarter of 2021 are obtained. As shown in Figure 2, Figure 2 (a) refers to the years 2018-2019, and Figure 2 (b) refers to the years 2020-2021. Among them, 1 represents the first quarter of 2018, 2 represents the second quarter of 2018, 3 represents the third quarter of 2018, and 4 represents the fourth quarter of 2018; 5 represents the first quarter of 2019, 6 represents the second quarter of 2019, 7 represents the third quarter of 2019, and 8 represents the fourth quarter of 2019; 9 represents the first quarter of 2020, 10 represents the second quarter of 2020, 11 represents the third quarter of 2020, and 12 represents the fourth quarter of 2020; 13 represents the first quarter of 2021, 14 represents the second quarter of 2021, 15 represents the third quarter of 2021, and 16 represents the fourth quarter of 2021.

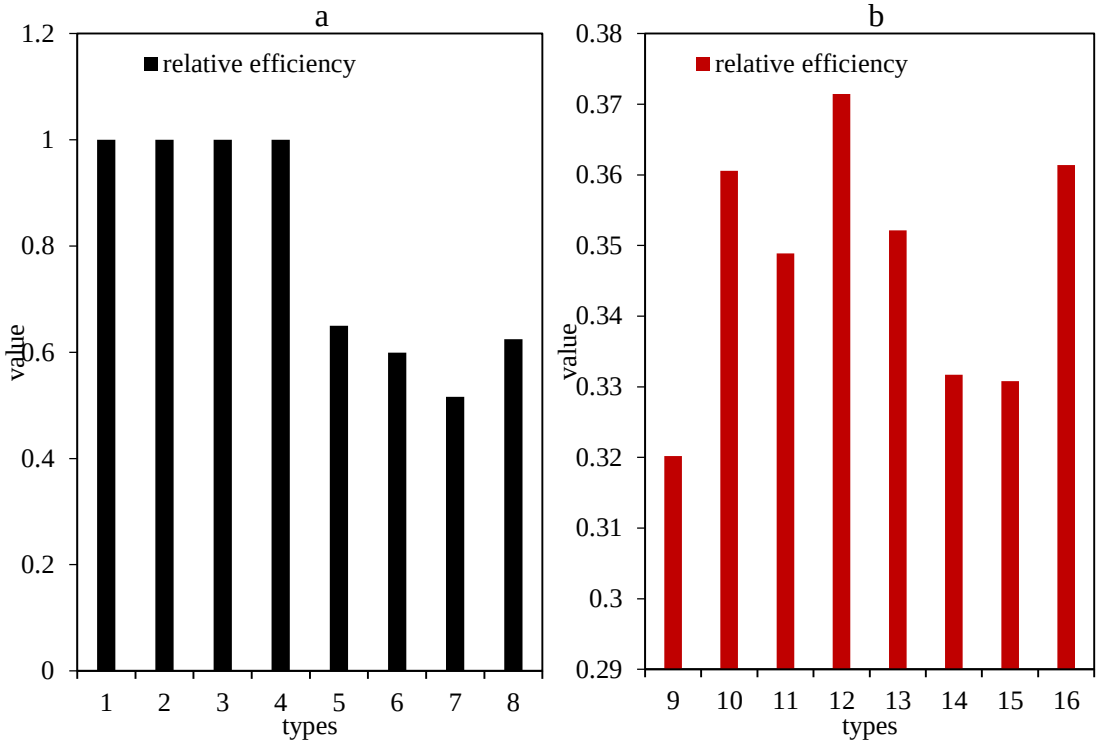

Figure 2. The impact of Internet finance on China's economic growth

It can be found that the relative efficiency is 1 from the first quarter of 2018 to the fourth quarter of 2018. This indicates that the DEA is effective during this period, but the ranking of each decision-making unit cannot be carried out. Therefore, the super efficiency model analysis of DEA has been further carried out, so that the specific relative efficiency of each decision-making unit can be accurately calculated, and it can also be easily sorted. The results are shown in Figure 3. Among them, Figure 3 (a) is from 2018 to 2019, and Figure 3 (b) is from 2020 to 2021.

Through the DEA model analysis of the data, it can be preliminarily analyzed that the concomitant efficiency of the Internet financial industry's impact on economic growth is gradually decreasing. It can be clearly seen from the figure that from the first quarter of 2018, the relative growth efficiency of the Internet financial industry for China's various industries was first greater than 1 and then less than 1. This shows that the Internet financial industry has invested too much and has not achieved the expected results and achieved the corresponding output.

Through the previous analysis, the indicators of the Internet finance industry are used as inputs, and

the growth of various industries in China is used as outputs for analysis. Although the trend of the impact of Internet finance industry on the overall economic growth can be analyzed, the relative efficiency of the impact of Internet finance on economic growth cannot be subdivided into each industry. Therefore, next, this paper will take each indicator of the Internet finance industry as an input, and take the economic growth of each industry as an output to conduct DEA data analysis again. In this way, the efficiency of the impact of the Internet financial industry on economic growth can be accurate to each industry, and the results are shown in Figure 4. Among them, Figure 4 (a) is from 2018 to 2019, and Figure 4 (b) is from 2020 to 2021.

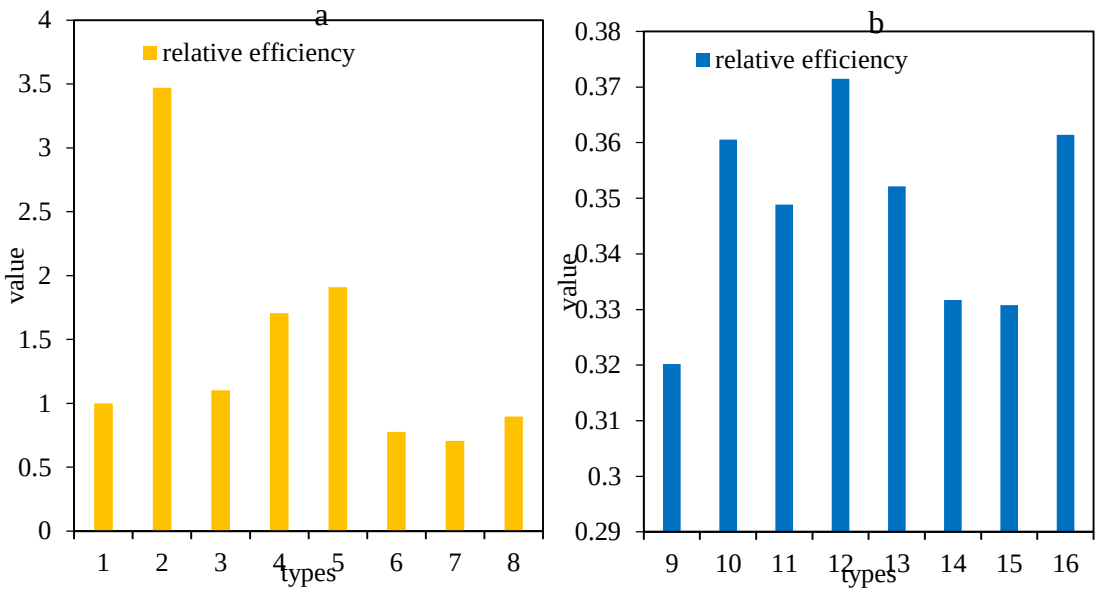

Figure 3. The DEA super efficiency trend of the impact of Internet finance on China's economic growth

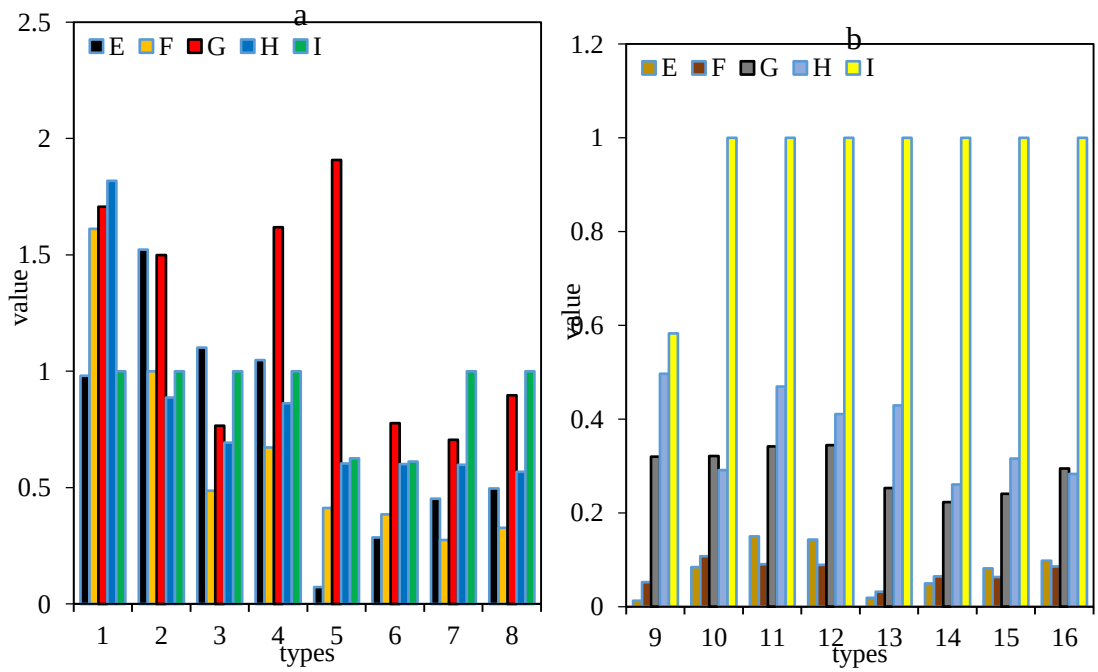

Figure 4. The relative efficiency of Internet finance on the growth of various industries

From the previous analysis, the linear trend of the impact of the Internet finance industry on the overall economic growth can be obtained, but it is impossible to rank the impact of each indicator on each industry. Therefore, this paper will analyze the impact efficiency of each indicator of the Internet finance industry on each industry, and draw the impact of each indicator of the Internet finance industry on each industry.

From the perspective of P2P online loan market, the impact trend of P2P online loan market scale on the overall economic growth and various industries is shown in Figure 5 through DEA data analysis. Among them, Figure 5 (a) is from 2018 to 2019, and Figure 5 (b) is from 2020 to 2021.

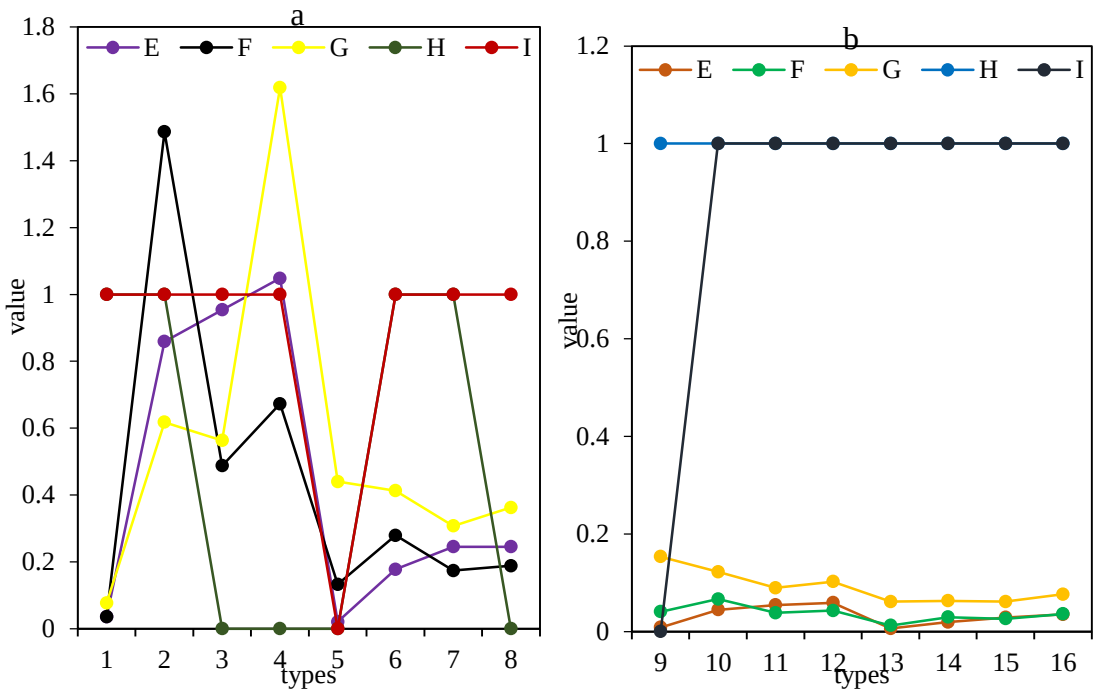

Figure 5. Efficiency of the impact of P2P online loan market size on the growth of various industries

From the perspective of P2P network lending scale, it can be concluded that: The P2P online lending industry has the most stable impact on the accommodation and catering industry and the financial industry, with a value of 1 for a long time, indicating that the P2P online lending industry is DEA effective for these two industries. For other industries, the trend is generally downward.

From the perspective of Internet finance investment and financing scale, DEA data analysis shows that the impact of Internet finance investment and financing scale on overall economic growth and on various industries is shown in Figure 6. Among them, Figure 6 (a) is from 2018 to 2019, and Figure 6 (b) is from 2020 to 2021.

From the perspective of Internet finance investment and financing scale, the conclusions can be drawn as follows: The Internet financial investment and financing industry has the most stable impact on the accommodation and catering industry and the financial industry. Its value has been stable at 1 for a long time, which indicates that the Internet financial investment and financing industry is DEA effective for these two industries. For other industries, the trend is generally downward.

From the perspective of Internet crowdfunding market scale, DEA data analysis shows that the impact trend of Internet crowdfunding market scale on economic growth and various industries is shown in Figure 7. Among them, Figure 7 (a) is from 2018 to 2019, and Figure 7 (b) is from 2020 to 2021.

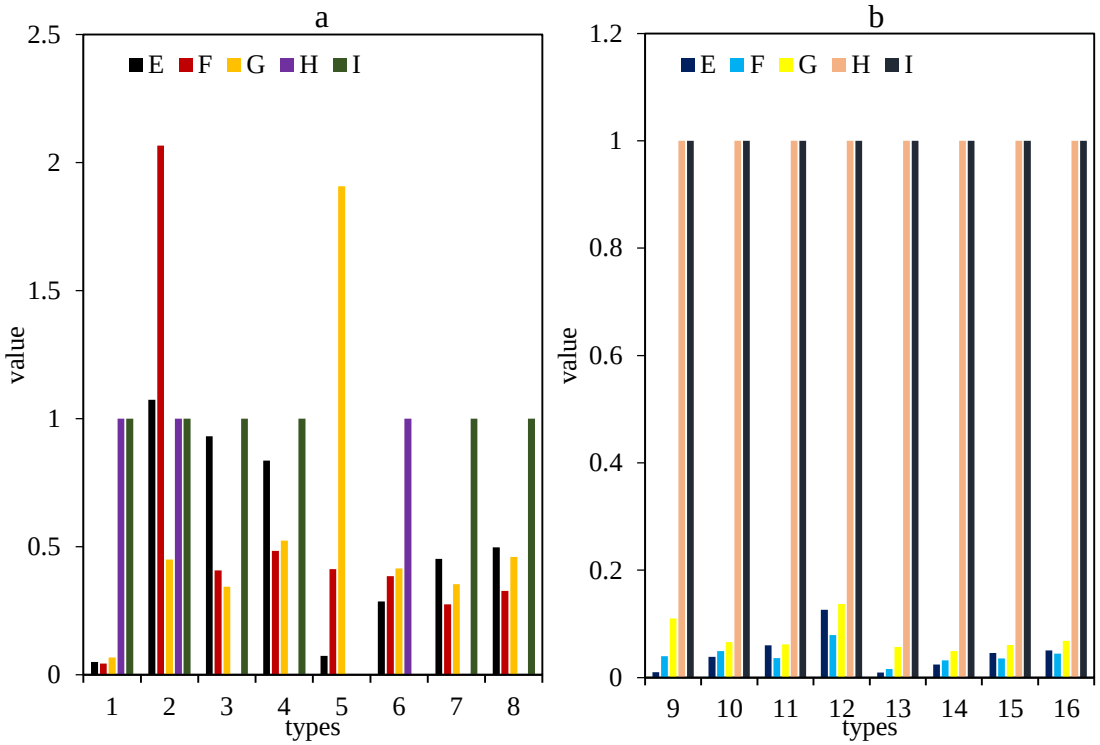

Figure 6. Efficiency of the impact of Internet finance investment and financing scale on the growth of various industries

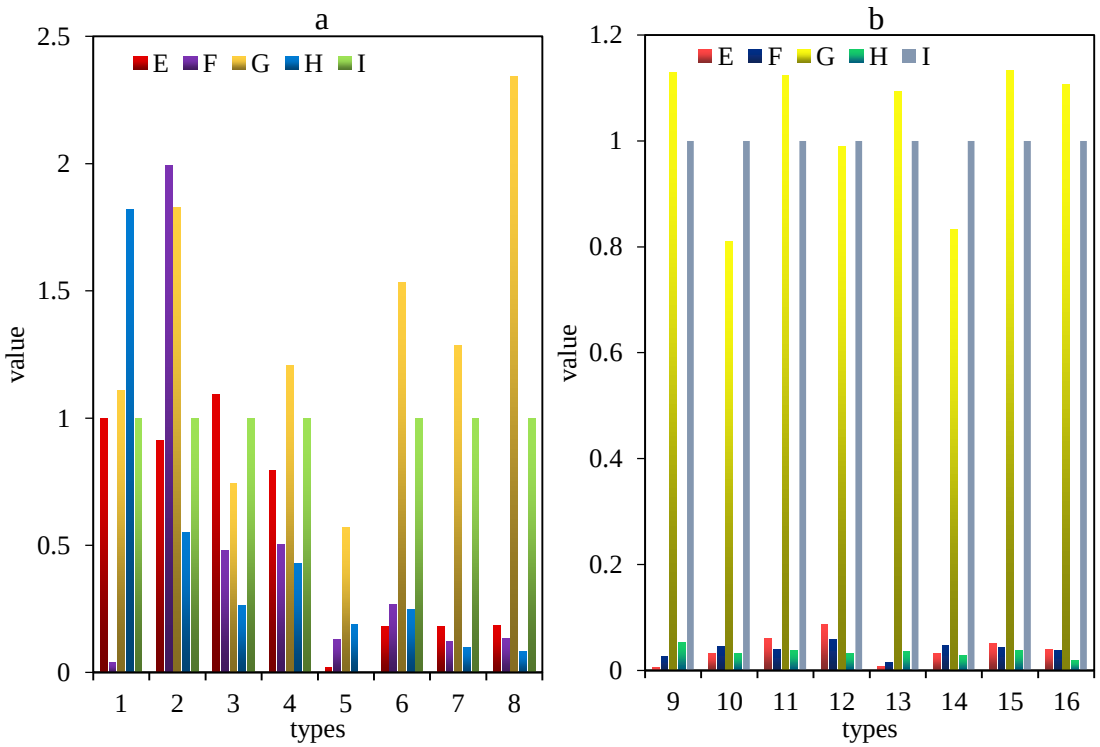

Figure 7. Efficiency of the impact of Internet crowdfunding market size on the growth of various industries

From the perspective of Internet crowdfunding market scale, the conclusions can be drawn as follows: The Internet crowdfunding industry has the most stable impact on the financial industry, with a value of 1 for a long time, which indicates that the Internet financial investment and financing industry is DEA effective for this industry. The impact of the Internet crowdfunding industry on the wholesale and retail industries is relatively stable, which shows that the impact of the Internet crowdfunding industry on the wholesale and retail industries is basically DEA effective. However, the impact of the Internet crowdfunding industry on other industries shows a downward trend.

From the perspective of the scale of Internet third-party payment transactions, DEA data analysis shows that the impact of the scale of Internet third-party payment transactions on economic growth and various industries is shown in Figure 8. Among them, Figure 8 (a) is from 2018 to 2019, and Figure 8 (b) is from 2020 to 2021.

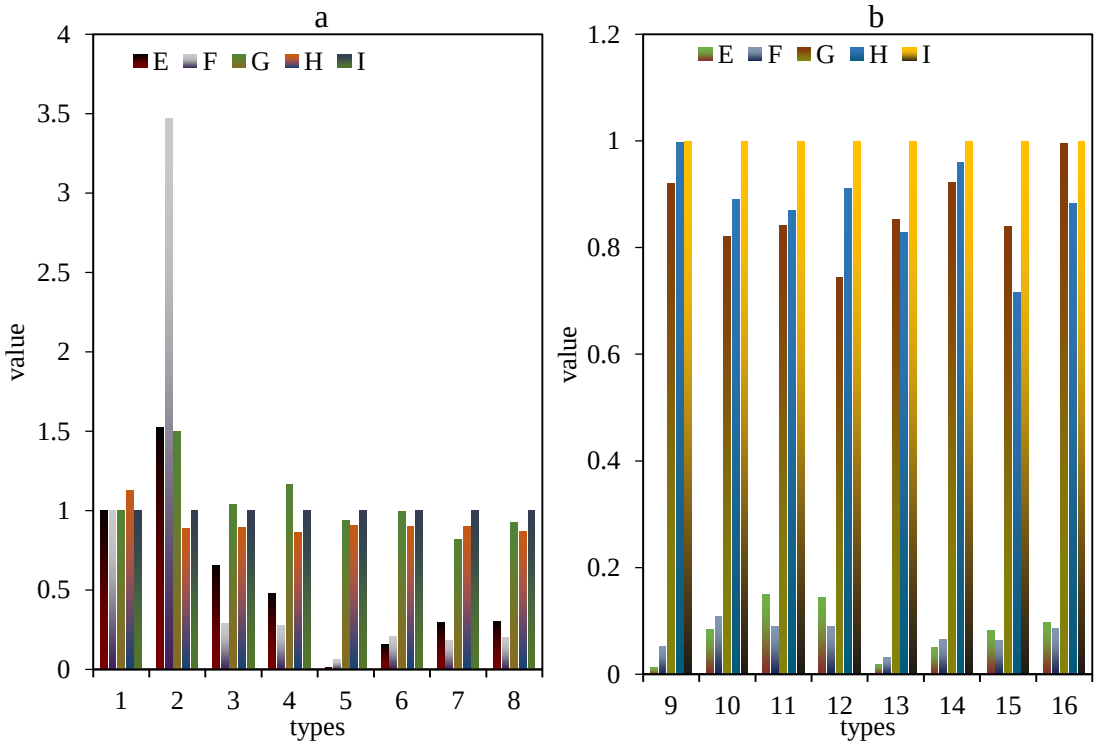

Figure 8. Efficiency of the impact of the scale of Internet third-party payment transactions on the growth of various industries

From the perspective of the scale of the Internet third-party payment transaction market, the conclusions can be drawn as follows: The Internet third-party payment transaction industry has the most stable impact on the financial industry, with a long-term stable value of 1, which indicates that the Internet third-party payment transaction industry is DEA effective for this industry. The impact of the Internet third-party payment transaction industry on the accommodation and catering industry and the wholesale and retail industries is relatively stable. This shows that the impact of the Internet third-party payment industry on these two industries is basically DEA effective.

4. Conclusions

The development of Internet finance is no longer a simple third-party payment, but includes online crowdfunding, P2P online lending, online investment and financing, third-party payment, etc. Under the combined effect of so many development models, the Internet finance industry has

become one of the fastest growing industries. However, most of the current focus and funds of Internet finance are invested in the virtual economy industry, and have no great impact on the real economy. This paper believes that the essential purpose of the development of Internet finance is to improve the service experience of finance to the public, and to give play to the huge advantages of the combination of Internet technology and financial institutions, so that Internet financial services can truly enter the real economy. The real economy has always been a difficult area for the Internet finance industry to involve, but there are many good ideas and projects for real economy enterprises that need the support of the Internet finance industry. Therefore, how to integrate Internet finance into the real economy better and faster is the focus of Internet finance development in the future.

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If any, should be placed before the references section without numbering.

Data Availability

The datasets used during the current study are available from the corresponding author on reasonable request.

Conflict of Interest

The author states that this article has no conflict of interest.

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