

Analysis on Financing Efficiency of Communication and Related Equipment Manufacturing Enterprises

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Abstract

This paper constructs a DEA model, collects data from 67 listed companies in the communications and related equipment manufacturing industry, selects total assets, asset-liability ratio and operating cost as input indicators, and selects total assets turnover rate, growth rate of main business income and return on net assets as output indicators, and makes a comparative analysis of technical efficiency, pure technical efficiency and scale efficiency between 2016 and 2017. The empirical results show that the financing efficiency of communication and related equipment manufacturing industry as a whole belongs to a higher level, but the number of enterprises with relatively effective financing efficiency in the industry is very small, and most enterprises need to improve their financing efficiency. According to the analysis of pure technical efficiency and scale efficiency, the paper puts forward some measures to improve the financing efficiency, such as improving the enterprise's R & D ability and management ability, broadening the financing channels, and expanding the financing scale.

Keywords

Communications and related equipment manufacturing, DEA, Financing efficiency.

1. Introduction

With the 40th anniversary of China's reform and opening up, China's mobile communication technology has achieved a leapfrog development from transmitting text, language, images and videos to virtual reality. 4G technology has changed people's lives. 5G technology will change the whole society. At present, 5G technology is the main development direction of China's mobile communication technology. 5G technology is the integration of communication technology and vertical industry. It is a long-term and arduous project that requires constant investment and innovation. From 1G, 2G to 3G, 4G and 5G technology being developed, China's communication and related equipment manufacturing industry is constantly innovating, and innovation cannot be separated from capital investment, capital is the blood of enterprises, the sources of capital are mainly internal and external, and external financing is the main financing method of China's communication and related equipment manufacturing enterprises. Due to the constraints of the external financing environment, the external financing cost is high. Therefore, this paper chooses to study the financing efficiency of the communication and related equipment manufacturing enterprises, and helps the communication and related equipment manufacturing enterprises improve the financing efficiency according to the results of the empirical analysis of the financing efficiency.

2. Literature Review

With regard to financing efficiency, Thomas(2005) thinks that financing efficiency of enterprises refers to the allocation efficiency of funds and the use efficiency of funds^[1]. At home, financing efficiency means the efficiency and efficiency achieved by enterprises in financing activities. Kanglin Zeng (1993) first proposed the concept of financing efficiency. Wenbing Song (1997) thinks that financing efficiency includes transaction efficiency and allocation efficiency. This paper believes that financing efficiency refers to the ratio of input to output in financing activities of enterprises.

For the analysis method of financing efficiency, most experts and scholars in China use DEA method. By constructing DEA model, Lihui Du and Shizhuan Han(2018) analyzed the financing efficiency of 17 listed companies in port industry, and according to the results of empirical analysis, they came to the conclusion that the financing efficiency of listed companies in ports in China is relatively high^[2]. Xuemei Wang and Qiqi Jia(2018) use DEA-Malmquist index to analyze the financing efficiency of SMEs listed on Shenzhen Stock Exchange. The empirical results show that the financing efficiency of SMEs is decreasing year by year, while the financing efficiency of manufacturing enterprises is at a higher level^[3]. Li Yan(2018) analyzed the financing efficiency of 34 listed companies in the GEM manufacturing industry in Beijing - Tianjin - Hebei region. The results show that the overall financing efficiency of the enterprises is low. According to the results of the study, strategies are proposed to improve the financing efficiency, such as expanding the amount of internal financing, enriching the external financing channels, improving the pure technical efficiency, improving the scale efficiency, and improving the comprehensive efficiency^[4]. Yongmei Tu and Wen Cheng(2018) analyzed the financing efficiency of 30 small and medium-sized science and technology enterprises in China, compared the financing efficiency in 2015 and 2016, and reached the conclusion that the financing efficiency of small and medium-sized science and technology enterprises in China is relatively ideal in 2016. At the same time, they put forward measures to improve the financing efficiency of small and medium-sized science and technology enterprises: improving their ability to innovate scientific research technology independently and accelerating the industrialization of scientific and technological achievements^[5]. Yanjie Chen and Jing Ji(2018) used DEA-Malmquist index to analyze the three types of enterprises in the industry chain of new energy vehicles, vehicle manufacturing and battery power supply, and reached the conclusion that the financing efficiency of enterprises in the new energy vehicles industry is low. Based on the perspective of the industry chain, they put forward strategies to improve the financing efficiency of enterprises in the new energy vehicles industry^[6]. It can be seen that domestic scholars use DEA method to analyze the financing efficiency of enterprises in different industries, and then put forward relevant suggestions with certain reference value. The communication and related equipment manufacturing industry is an industry vigorously developed by the country, and the technology has been updated rapidly. It is of certain practical significance to study the financing efficiency of enterprises in this industry and to help enterprises in this industry find ways to improve the financing efficiency while analyzing the existing problems.

3. Sample Source and Model Construction

3.1 Input-Output Indicator Selection

The financing efficiency of an enterprise mainly analyzes the ratio of input to output of the enterprise. In terms of the selection of input indicators, this paper selects three indicators such as total assets, asset-liability ratio and operating cost as input indicators. The more total assets of an enterprise, the larger the enterprise, the stronger its financing capacity. At the same time, the total assets also indicate the funds occupied by the enterprise in building its assets. The larger the total assets, the more funds needed, and the larger the financing scale. The asset-liability ratio reflects the capital structure of the enterprise, and can be seen as the source of funds and financing of the enterprise. At the same time, the asset-liability ratio reflects the solvency of the enterprise, the degree of utilization of financial leverage and the size of financial risk. Operating cost refers to the investment of funds in the process

of enterprise operation, reflecting the way and efficiency of enterprise funds. Generally speaking, the higher the operating cost, the lower the financing efficiency.

In the selection of output indicators, this paper selects three indicators as output indicators: return on net assets, growth rate of main business income and turnover rate of total assets. The rate of return on net assets is the ratio of net profit to net assets, which reflects the ability of enterprises to use their own funds to make profits and can indicate the efficiency of using their own funds. The growth rate of main business income reflects the income-generating capacity of enterprise products. The larger the index value, the stronger the income-generating capacity of enterprise products, the higher the efficiency of fund use, and the stronger the enterprise development capacity. Total assets turnover rate refers to the ratio of sales revenue to total assets, reflecting the efficiency of the use of enterprise assets. The larger the index value, the higher the enterprise's management level of assets, the stronger the enterprise's operational capability, and the higher the efficiency of the use of assets.

3.2 Sample Selection and Data Source

First of all, according to the classification results of listed companies in China Securities Regulatory Commission, excluding ST and *ST samples, this paper selects 67 listed companies in the communications and related equipment manufacturing industry, and based on the annual reports of 67 listed companies in this industry in Sina Finance and Economics, collects the financial data in 2016 and 2017 as sample data for empirical analysis.

3.3 Construction of DEA Model

Data Envelopment Analysis (DEA) was proposed by Charnes, an American strategist in 1978, and is an effect evaluation method. This method takes each evaluation object as a decision-making unit to measure the relative efficiency of each decision-making unit in the same period. DEA model mainly includes two kinds, one is CCR model and the other is BCC model. The precondition of CCR model is that the scale reward remains unchanged, and the estimated comprehensive efficiency value is used to judge whether the decision-making unit has achieved both technical effectiveness and scale effectiveness. The BCC model considers the scale reward to be variable, and the model can calculate the comprehensive efficiency, pure technical efficiency and scale efficiency of the decision-making unit. This paper uses BCC model to calculate the financing efficiency.

4. Empirical Results Analysis

The DEA model is constructed, and the input-output indexes of 67 listed companies in the communications and related equipment manufacturing industry are analyzed by using DEAP2.1 software. The calculation results of financing efficiency are shown in Table 1.

Table 1 Calculation Results of Financing Efficiency

firm	2016				2017			
	crste	vrste	scale	irs	crste	vrste	scale	irs
Tcl communication	0.62	0.624	0.994	irs	0.541	0.545	0.992	irs
Kang Xin's New Materials	0.979	0.997	0.982	irs	0.923	0.994	0.929	irs
Jiang Su Etern	0.888	0.981	0.906	irs	0.854	0.974	0.876	irs
China Spacesat	0.8	0.946	0.846	irs	0.826	0.936	0.883	irs
Ningbo Bird	0.963	1	0.963	irs	0.772	1	0.772	irs
Daheng technology	0.791	0.986	0.802	irs	0.774	0.983	0.787	irs
Yangtze communication	0.935	0.997	0.938	irs	1	1	1	-
Xinwei Technology	0.868	0.996	0.872	irs	0.468	0.994	0.471	irs
Hengtong Optic-electric	0.875	0.905	0.967	irs	0.789	0.833	0.947	irs
Fiberhome Telecommunication	0.762	0.877	0.869	irs	0.69	0.813	0.849	irs

Zhongtian technology	0.856	0.898	0.954	irs	0.83	0.84	0.988	irs
Nanjing panda	0.827	0.973	0.85	irs	0.79	0.964	0.819	irs
Eastern Communications	0.878	0.985	0.891	irs	0.9	0.982	0.917	irs
Sun Create Electronics	0.864	0.984	0.878	irs	0.904	0.978	0.924	irs
Gongjin Electronics	0.848	0.965	0.879	irs	0.783	0.955	0.82	irs
Thinker Automatic Equipment	1	1	1	-	0.979	1	0.979	irs
China Tianying	0.848	0.996	0.851	irs	0.856	0.991	0.864	irs
ZTE Corporation	0.563	0.613	0.919	irs	0.553	0.568	0.974	drs
SDG Information	0.936	0.979	0.956	irs	0.849	0.969	0.876	irs
Addsino	0.964	0.988	0.976	irs	0.836	0.981	0.853	irs
Digital China Information	0.796	0.949	0.838	irs	0.743	0.925	0.803	irs
Fenghuo Electronics	0.834	0.995	0.839	irs	0.785	0.993	0.79	irs
Huiyuan Communications	0.801	1	0.801	irs	0.736	1	0.736	irs
Sichuan Jiuzhou Electric	0.828	0.974	0.85	irs	0.698	0.965	0.723	irs
Xinmao Technology	0.872	0.989	0.882	irs	0.889	0.99	0.898	irs
Soyea Technology	0.777	0.987	0.788	irs	0.873	0.991	0.881	irs
Coship Electronics	0.596	0.996	0.598	irs	0.777	0.995	0.781	irs
New Sea	0.781	0.984	0.794	irs	0.652	0.981	0.664	irs
Sunwave Communications	0.803	0.994	0.808	irs	0.771	0.99	0.778	irs
BDStar Navigation	0.919	0.99	0.928	irs	0.801	0.981	0.817	irs
Invengo	0.857	0.999	0.859	irs	0.787	0.998	0.788	irs
Allwin Telecommunication	0.89	0.999	0.891	irs	0.798	0.999	0.798	irs
Accelink Technologies	0.853	0.977	0.873	irs	0.856	0.972	0.88	irs
Splendor Technology	0.842	0.999	0.843	irs	0.674	0.998	0.675	irs
Sunsea AIoT	0.792	0.98	0.807	irs	0.78	0.969	0.805	irs
Zowee Technology	0.789	0.988	0.798	irs	0.753	0.975	0.772	irs
Unistrong	0.898	0.995	0.903	irs	0.897	0.992	0.905	irs
Star-Net	0.883	0.973	0.908	irs	0.906	0.973	0.93	irs
SUNA	0.63	0.999	0.631	irs	0.871	1	0.871	irs
Echom	0.869	0.982	0.885	irs	0.692	0.978	0.707	irs
Shenglu Telecommunication	0.899	0.994	0.904	irs	0.807	0.993	0.813	irs
Haige Communications	0.846	0.975	0.867	irs	0.783	0.973	0.805	irs
Tongding Interconnection	0.906	0.976	0.927	irs	0.803	0.964	0.833	irs
Yinhe Electronics	0.912	0.988	0.923	irs	0.792	0.986	0.804	irs
Hytera Communications	0.896	0.983	0.911	irs	0.812	0.963	0.844	irs
Soling Industrial	0.835	0.995	0.839	irs	0.883	0.991	0.891	irs
Transtree	0.877	1	0.877	irs	0.83	1	0.83	irs
Shuzhi Technology	0.829	0.994	0.834	irs	1	1	1	-
Sumavision Technologies	0.997	0.998	0.999	drs	0.836	0.99	0.844	irs
Gosuncn	0.919	0.994	0.925	irs	0.874	0.987	0.886	irs
CORPRO Technology	0.897	0.999	0.898	irs	0.832	0.999	0.832	irs
Tatfook Technology	0.865	0.982	0.881	irs	0.672	0.979	0.687	irs
Sunway Communication	1	1	1	-	1	1	1	-
Hi-target	0.902	0.997	0.905	irs	0.876	0.996	0.879	irs
Yitong High-tech	0.903	1	0.903	irs	0.87	1	0.87	irs
Jiaxun Feihong	0.86	0.994	0.864	irs	0.817	0.992	0.824	irs

CNCR-IT	1	1	1	-	0.977	1	0.977	irs
Kingsignal	1	1	1	-	1	1	1	-
AVIT	0.886	1	0.886	irs	0.663	1	0.663	irs
Joyware Electronics	0.861	1	0.861	irs	0.852	1	0.852	irs
Wutong Holding	0.917	0.986	0.929	irs	0.935	0.986	0.948	irs
Boomsense Technology	0.787	0.999	0.787	irs	0.603	0.999	0.604	irs
Speed	1	1	1	-	0.853	0.996	0.856	irs
Kyland Technology	0.987	0.998	0.989	irs	0.855	0.997	0.858	irs
Tian He Defense	1	1	1	-	0.933	1	0.933	irs
Quanxin	0.94	1	0.94	irs	0.976	1	0.976	irs
Eastern Communications	0.878	0.985	0.891	irs	0.9	0.982	0.917	irs
mean	0.865	0.974	0.889		0.816	0.966	0.847	

Note: crste represents technical efficiency, vrste represents pure technical efficiency, scale represents scale efficiency, IRS, DRS, - respectively represent incremental, decreasing and constant scale returns.

4.1 Technical Efficiency Analysis

Technical efficiency represents comprehensive financing efficiency and is the product of pure technical efficiency and scale efficiency. As can be seen from Table 2, in 2016, the technical efficiency of six listed companies in communications and related equipment manufacturing industry, such as Thinker Automatic Equipment and Sunway Communication, was relatively effective, accounting for 8.96%. In 2017, four listed companies in communications and related equipment manufacturing industry, such as Yangtze communication and Shuzhi Technology, achieved relatively effective technical efficiency, accounting for 5.97%. indicating that only a small number of listed companies in the communications and related equipment manufacturing industry achieved effective utilization of funds. The average technical efficiency has been around 0.8 for two years, indicating that the overall financing efficiency of listed companies in the communications and related equipment manufacturing industry is at a higher level. Compared with 2016, the number of enterprises that achieved relatively effective technical efficiency in 2017 decreased, accounting for a lower proportion. At the same time, the average technical efficiency in 2017 decreased compared with 2016, indicating that the financing efficiency of listed enterprises in the communications and related equipment manufacturing industry decreased in 2017. According to further statistics, the number of enterprises with higher-than-average technical efficiency is 36 in 2016 and 2017, accounting for 53.73%, indicating that the financing efficiency of different listed companies in the communications and related equipment manufacturing industry varies greatly, and nearly half of the listed companies need to improve their financing efficiency.

Table 2 Technical Efficiency Comparison Results

Effective technology Degree	2016		2017	
	Quantity	Proportion (%)	Quantity	Proportion (%)
Relatively effective	6	8.96	4	5.97
Relative ineffectiveness	61	91.04	63	94.03
Average technical efficiency	0.865		0.816	

4.2 Pure Technical Efficiency Analysis

Pure technical efficiency indicates whether production technology can be fully utilized to maximize the efficiency of capital in generating income and increasing profits. As can be seen from Table 3, compared with 2016, the number of enterprises with relatively effective pure technical efficiency in 2017 is relatively low, but the absolute value has increased. At the same time, the average value of pure technical efficiency is 0.974 and 0.966 respectively, and the average value in 2017 has decreased. Further statistics show that the number of listed enterprises with pure technical efficiency above the

average value in 2016 and 2017 is 56 and 55 respectively. The proportion was 83.58 % and 82.09 % respectively, indicating that the overall level of pure technical efficiency of listed companies in the communications and related equipment manufacturing industry is relatively high, but the pure technical efficiency of most listed companies is not relatively effective. The listed companies in the communications and related equipment manufacturing industry still need to improve their management ability, research and development ability, technological achievements transformation ability, and full utilization of production technology to further maximize the efficiency in the use of funds.

Table 3 Comparison Results of Pure Technical Efficiency

Pure technical effectiveness	2016		2017	
	Quantity	Proportion (%)	Quantity	Proportion (%)
Relatively effective	13	19.40	15	22.39
Relative ineffectiveness	54	80.60	52	77.61
Pure technical efficiency mean	0.974		0.966	

4.3 Scale Efficiency Analysis

Scale efficiency indicates whether the ratio of output to capital input is appropriate, i.e. the efficiency of revenue brought by capital scale input. As can be seen from Table 4, the number of enterprises listed in the communications and related equipment manufacturing industry that achieved relatively effective scale efficiency in 2016 and 2017 is very small, and the number of enterprises listed in the communications and related equipment manufacturing industry that achieved relatively effective efficiency in 2017 and 2016 decreased, indicating that the scale of capital investment of the listed enterprises in the communications and related equipment manufacturing industry does not match the revenue.

Table 4 Comparison Results of Scale Efficiency

Effective in scale Degree	2016		2017	
	Quantity	Proportion (%)	Quantity	Proportion (%)
Relatively effective	6	8.96	4	5.97
Relative ineffectiveness	61	91.04	63	94.03
Mean Scale Efficiency	0.889		0.847	

4.4 Scale Compensation Analysis

Scale reward refers to the change in output level caused by an increase in a certain proportion of production factors of an enterprise. As can be seen from Table 5, the number of enterprises with increasing returns to scale in 2017 and 2016 reached 60, and increased in 2017 compared with 2016, indicating that listed companies in the communications and related equipment manufacturing industry are still in the growth period and need to increase capital investment, research and development investment, business scale expansion and production expansion.

Table 5 Results of Scale Compensation Comparison

Scale compensation	2016		2017	
	Quantity	Proportion (%)	Quantity	Proportion (%)
Increment	60	89.55	62	92.54
invariability	6	8.96	4	5.97
Decrease progressively	1	1.49	1	1.49

5. Conclusions and Suggestions

According to the results of the empirical analysis, the following conclusions can be drawn: from the technical efficiency point of view, The overall financing efficiency of the communications and related equipment manufacturing industry is relatively high, but the number of enterprises with relatively effective financing efficiency in the industry is very small, and the financing efficiency of enterprises accounting for more than 90% needs to be improved. The technical efficiency is further divided into pure technical efficiency and scale efficiency. The analysis shows that the overall level of the communication and related equipment manufacturing industry is relatively high in terms of pure technical efficiency, however, the pure technical efficiency of listed companies accounting for about 80 % is not relatively effective. In terms of scale efficiency, the scale of capital investment in the industry does not match the revenue. At the same time, according to scale compensation, about 90 % of listed enterprises in the industry are in growth period, with scale compensation increasing and capital demand being relatively large.

In general, most enterprises in the communications and related equipment manufacturing industry need to improve their financing efficiency, and the following measures can be taken to improve their financing efficiency:

One is to improve the enterprise's R & D and management capabilities. Communication and related equipment manufacturing industry is an industry with continuously upgraded technology. It needs continuous innovation, enterprises pay attention to R & D, increase R & D investment and guarantee the funds needed for R & D. At the same time, enterprises should also improve their research and development ability, improve the transformation ability of technological achievements, shorten the cycle of scientific research investment into product achievements, and then shorten the cycle of capital use and improve the efficiency of capital use through production. In addition, the enterprise should strengthen its management ability, manage its financing, research and development, production and other activities, and coordinate the progress of relevant activities.

The second is to broaden financing channels and expand financing scale. As can be seen from the scale compensation, the communication and related equipment manufacturing enterprises are in the growth period and need a large amount of capital. At the same time, from the scale efficiency, most of the enterprises in this industry are in the state of inefficient scale efficiency because the supply of various factors of production cannot keep up with the enterprises. The expansion of the scale, therefore, enterprises should expand the scale of financing, increase the amount of financing funds, and need enterprises to broaden financing channels. On the one hand, an enterprise can strengthen its own technology, increase its retained earnings and use its own internal accumulation of financing. On the other hand, enterprises can actively seek external financing. In addition to indirect financing by banks, they can also find financing methods suitable for enterprises according to their market environment and their own development characteristics. At the same time, enterprises should also improve their credit system, reduce default, improve credit level and develop multi-channel financing. In addition, the communications and related equipment manufacturing industry is the industry vigorously developed by the country. Under the background of the country's vigorous economic development and "the Belt and Road initiative", enterprises in this industry can also seek the help of relevant government departments, seize development opportunities, finance and develop vigorously.

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