

# Analysis of Financial Statements of the Panel Industry under the Harvard Analytical Framework

## —Taking BOE as an Example

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**Abstract.** As a global leader in the panel industry, BOE's business development plays a pivotal role in the global panel market. During a crucial period of corporate strategic reform and technological innovation, its future development trend will affect the market share of Chinese companies in the global panel industry. Adopting Harvard Analytical Framework and based on the analysis of financial statements from 2013 to 2017, this paper conducts strategic analysis, financial analysis, accounting analysis and prospect analysis for a comprehensive evaluation of BOE to propose corresponding countermeasures for the stakeholders of the enterprise to make more informed decisions.

**Keywords:** financial statement analysis, Harvard Analytical Framework, BOE.

### 1. Research Background and Significance

With the era of information and intelligence setting in, the global market demand for electronic products continues to increase, such as smartphones, tablets, laptops and sweeping robots, of which the central components are sensors, semiconductors, and displays. At present, the development of traditional LED technology is weak with slow market growth, while emerging technologies such as AMOLED are developing rapidly in the display fields such as high-end smart phones and wearable devices, which are favored by many high-tech product companies and thus demonstrate huge market development potential. At the same time, due to the rapid development of artificial intelligence and big data, various industries are seeking to take advantage of more intelligent systems and efficient data analysis to attract more consumers, thereby achieving greater development opportunities and gaining bigger market share.

The research object of this paper, BOE Technology Group Co., Ltd., was established in 1993. It is a provider of Internet of Things technology, products and services, a Chinese high-tech enterprise specializing in the production and operation of liquid crystal displays (LCD) and LCD modules. BOE, whose core business includes display devices, smart systems and health services, launched the DSH strategy in 2014. It is currently the most comprehensive enterprise in the panel industry in mainland China, with shipment volume and market share having ranked among the top five in the global display field [1]. BOE's operating income in 2017 hit 93.8 billion yuan and its net profit was 7.568 billion yuan. In the first half of 2018, its shipment volume of LCD TV panel took the first place around the world, surpassing South Korea's two major panel giants—LGD and Samsung for the first time.

As a global leader in sensor display, BOE has become one of the most innovative semiconductor display companies in the world. However, it has long been known as a high-tech company featuring heavy financing, huge loss and large subsidies. At present, financial studies of technology product and service providers are relatively few in China, most of which are concentrated in the analysis of industry development status and industrial scale. Therefore, this paper, adopting Harvard Analytical Framework and starting with BOE's development strategy, studies BOE's profit and loss through accounting and financial analysis based on its financial statements, and then combines industry trends and macro analysis to better predict the company's development prospects, thus providing useful information for reference.

## 2. An Overview of the Harvard Analytical Framework

The Harvard Analytical Framework, proposed by K.G. Palepu, P.M. Healy, and V.L. Bernard from Harvard University in 2000, is a new framework for financial analysis based on traditional methods. The three scholars believed that financial analysis should not only be based on the traditional methods of data analysis, but be combined with strategic analysis, accounting analysis, financial analysis and prospect analysis to make more scientific and objective analysis and judgment. Starting with strategic analysis, this framework first grasps the overall situation of the company; then, taking accounting analysis and financial analysis as the two main supports, it carries out accounting analysis of the company's solvency, operation, profitability and development capability based on the three major financial statements; finally, ending with prospects analysis, it makes predictions and suggestions on the direction and situation of the company's development. Jumping out of traditional, single financial analysis methods, Harvard Analytical Framework adds the analysis of the company's business environment and strategic goals, and uses various financial methods for qualitative and quantitative analysis [2]. Therefore, Harvard Analytical Framework takes more diverse perspectives, provides more abundant theory and data evidence and more precise content, and becomes increasingly suitable for the development of modern enterprises, thus proving to be an ideal tool for modern financial analysis. [3][4]

## 3. Strategic Analysis

As the top-level design within an enterprise, strategic analysis is used to accurately determine the future direction and find its own foothold. At the same time, it is also the logical start of the Harvard Analytical Framework. In addition to helping users better judge their companies' growth space in their own industries, the strategic analysis can also evaluate the sustainability of their competitive advantages, which will be analyzed in this article from the following two aspects.

### 3.1 Industry Analysis

The global LCD panel market has undergone tremendous changes in recent years. In 2015, South Korea's LG Group and Samsung Electronics were the market leaders, and BOE had significantly narrowed the technological gap with Japanese and Korean companies by investing heavily in technological research and development. However, in terms of high-end products, there is still a certain gap. Due to the high barrier to entry caused by the huge investment cost the LCD panel manufacturing industry incurs, BOE is relatively less threatened by potential entrants. Although suppliers such as BOE can maintain extremely high bargaining power during the negotiation process because oligopolistic companies in the field of LCD panels is highly concentrated, customers' bargaining power keeps rising owing to the increasing concentration of LCD purchases, the continuous improvement of standardization, and the decline in customer profitability. Besides, due to the relentless march of technology, BOE must maintain a high degree of technical sensitivity and always pay attention to emerging display technology to further stimulate and promote technological improvement. [4][5]

### 3.2 Strategic Positioning

BOE has shifted itself from a traditional manufacturing enterprise to an Internet+ one with hardware as the mainstay, combining software and hardware, integrating applications and bettering its service. The core strategic process of BOE's transformation mainly focuses on the two main axes of operating its original core business with greater efficiency and designing new cross-industry business. On the one hand, it must undergo intelligent, platform and marked-oriented transformations during which products to be promoted need to be made intelligent, attention should be paid to the platform and the users rather than just pursuing sales, market-oriented mechanism should be promoted in new departments and platform should be provided to encourage innovation among employees. On the other hand, it needs to promote a user-centered, entrepreneur-oriented, eco-chain-pursued team culture to help companies improve efficiency. [1][6]

## 4. Financial Analysis

### 4.1 Solvency Analysis

The solvency of a company can reflect its financial status and operational capability and its ability to pay various long-term and short-term debts that are due, which is very important for enterprises.

#### 4.1.1 Longitudinal Analysis of BOE's Solvency

Table 1. BOE's solvency indexes from 2013 to 2017

Financial indexes	2017	2016	2015	2014	2013
Asset-liability ratio (%)	59.28	55.14	48.65	43.51	58.77
Equity multiplier	2.46	2.23	1.95	1.77	2.43
Current ratio	2.01	2.20	2.21	3.09	1.21
Quick ratio	1.81	1.99	1.97	2.87	1.09

Data from 2012-2017 annual reports of BOE, see Sina Finance: <http://money.finance.sina.com.cn/>.

It can be seen from Table 1 that the asset-liability ratio and the equity multiplier represent BOE's long-term solvency. From 2013 to 2017, BOE's asset-liability ratio remained unchanged overall. During the five years, it declined in 2014, then slowly increased, and slightly exceeded the original ratio in 2017, which shows that the company's debt management ability was relatively stable. In 2017, the asset-liability ratio was 59.28%, indicating that most of the company's operation funds came from liabilities. On the one hand, the company enjoyed a low-cost source of funds. On the other hand, however, the company had to bear the corresponding financial risks. The equity multiplier kept the same changing trend with the asset-liability ratio, both of which reflected increasing corporate liabilities.

The current ratio and the quick ratio reflect the company's short-term solvency. From 2013 to 2017, BOE's current ratio and quick ratio gradually returned to normal levels from higher values, indicating that business was getting better and better. Reasonable management of liquid assets enabled BOE to cope with its normal liabilities and make full use of cash and other resources in hand at the same time.

#### 4.1.2 Horizontal Analysis of BOE's Solvency

Table 2. Solvency indexes of major competitors from 2013 to 2017

Indexes	Asset-liability ratio (%)			Current Ratio			Quick Ratio		
Year	2017	2016	2015	2017	2016	2015	2017	2016	2015
BOE	59.28	55.14	48.65	2.01	2.2	2.21	1.81	1.99	1.97
Ninestar	79.87	91.55	37.53	0.88	0.79	3.95	0.67	0.56	3.08
WUS	41.79	36.79	40.62	1.58	1.65	1.39	1.18	1.14	1.01
Changxin Tech	41.32	47.88	25.97	0.99	0.97	2.36	0.79	0.68	2.16
Fenghua	27.62	31.64	27.38	1.7	1.68	1.99	1.39	1.42	1.67

The same as above.

It can be seen from Table 2 that BOE's asset-liability ratio is in the middle position compared with several competitors from the same industry and it has increased steadily in the past three years, which is suitable considering the company size. A too low ratio means the company fails to utilize its assets well, which is not conducive to its sustainable development of technology and expansion of business. A too high ratio, however, means the company bears excessive debts, which hinders the company's safe operation and steady development.

In terms of the current ratio and the quick ratio, BOE's indexes are higher and relatively stable compared with competitors, indicating its higher short-term solvency.

## 4.2 Operational Capability Analysis

A company's operation capability mainly refers to its efficiency and effectiveness of utilizing assets. And the efficiency of utilizing assets mainly refers to the turnover rate and turnover velocity of assets. The larger the values of the indexes, the better the company's assets are operated.

### 4.2.1 Longitudinal Analysis of BOE's Operational Capability

Table 3. BOE's Operational Capability Indexes from 2013 to 2017

Indexes	2017	2016	2015	2014	2013
Inventory turnover rate	10.13	9.49	8.88	9.61	11.09
Accounts receivable turnover rate	5.92	5.65	6.57	6.42	6.72
Current assets turnover rate	0.98	0.89	0.79	0.82	1.18
Total assets turnover rate	0.41	0.39	0.34	0.32	0.42

It can be seen from Table 3 that BOE's inventory turnover rate remained at a high, stable level for 5 years, indicating that the company's inventory turnover was fast, the liquidity was very strong, and products sold well. The turnover rate of receivables first rose and then fell, indicating that the BOE's turnover rate of accounts receivable were fast at first and then slowed down. This may be because the company had reduced the credit policy for suppliers and adopted a more relaxed credit sales strategy in order to expand operating income. The efficiency of current assets and total assets turnover first decreased and then increased, indicating that the company's efficiency of utilizing assets for operation first deteriorated, but then slowly improved. This reflected the fact that BOE's operating conditions were in line with the overall depression across the manufacturing industry. The turnover rate of total assets averaged 0.4 in 5 years, indicating that BOE typically belonged to a "money-consuming" industry and required a large amount of cash for guarantee.

### 4.2.2 Horizontal Analysis of BOE's Operational Capability

Table 4. Operational Capability indexes of major competitors from 2013 to 2017

Indexes	Inventory turnover			Accounts receivable turnover			Current assets turnover			Total assets turnover		
	2017	2016	2015	2017	2016	2015	2017	2016	2015	2017	2016	2015
BOE	10.13	9.49	8.88	5.92	5.65	6.57	0.98	0.89	0.79	0.41	0.39	0.34
Ninestar	8.9	3.08	5.33	8.53	3.29	6.97	1.94	0.81	1.24	0.48	0.21	1.08
WUS	6.15	5.93	6.84	4.48	4.64	4.42	1.78	1.79	1.58	0.82	0.7	0.62
Changxin Tech	13.6	14.17	13.61	9.69	11.03	7.07	3.59	3.04	2.11	1.48	1.41	0.95
Fenghua	6.64	5.9	4.58	3.83	3.28	3.06	1.18	0.92	0.68	0.52	0.42	0.33

It can be seen from Table 4 that the inventory turnover rate of BOE steadily increased. It was relatively higher than its competitors in the same industry, indicating that its use of funds was efficient, and that the loss caused by overstocking was relatively lower. In terms of accounts receivable turnover rate, BOE was in a relatively stable middle position compared with its competitors. However, its asset turnover rate was at a lower-middle level, meaning the company should mobilize some idle assets for investment to increase the assets turnover rate. Overall, BOE's turnover rates were relatively stable in the industry, which is conducive to its development and operation.

## 4.3 Profitability Analysis

Corporate profitability mainly refers to the ability to obtain profits, usually expressed as the amount and level of corporate income within a certain period. [7]

### 4.3.1 Longitudinal Analysis of BOE's Profitability

Table 5. BOE's profitability indexes from 2013 to 2017

Indexes	2017	2016	2015	2014	2013
Operating profit ratio (%)	10.31	0.73	1.96	6.27	6.69
Return on Total Assets (%)	4.59	1.78	1.64	2.97	4.18
Return on net assets (%)	3.41	1.14	1.13	2.37	3.72
Primary earnings per share	0.22	0.05	0.05	0.09	0.17
Net profit margin on sales (%)	8.38	2.97	3.37	7.38	8.80
Ratio of profits to cost and expense (%)	11.46	3.67	4.21	9.20	9.59
Net assets per share	3	2.62	2.23	2.18	2.82

It can be seen from Table 5 that over the past five years BOE's profitability indexes had continued to decline from 2013 to 2016. But in 2017 it increased sharply and was basically the same as or higher than the original ratio of 2013. The fact that BOE's profitability indexes fell from 2013 to 2016 indicated that its operating conditions conformed to the overall depression across the manufacturing industry. Its return on total assets and return on net assets declined in 2014 because the increase in total profit failed to keep pace with the total assets and owner's equity. But the reason for the decline in all indexes from 2015 to 2016 was not only business expansion but also the fall in the absolute amount of total profits. The sharp increase of all indexes in 2017 reflected that BOE timely adjusted its corporate strategy, expanded its market scope, consolidated and strengthened the production and sales of core products, and enhanced research and development in as well as production of new products.

### 4.3.2 Horizontal Analysis of BOE's Profitability

Table 6. Profitability indexes of major competitors from 2013 to 2017

Indexes	Return on Total Assets (%)			Return on net assets (%)			Net profit margin on sales (%)		
Year	2017	2016	2015	2017	2016	2015	2017	2016	2015
BOE	4.59	1.78	1.64	3.41	1.14	1.13	8.38	2.97	3.37
Ninestar	-6.58	-1.04	17.82	3.29	-0.98	15.57	6.81	-4.69	14.40
WUS	5.14	3.47	0.32	3.60	2.43	0.10	4.40	3.44	0.16
Changxin Tech	8.97	7.02	7.08	7.44	5.87	5.75	5.03	4.15	6.03
Fenghua	4.79	2.85	1.55	4.03	2.20	1.11	7.81	5.27	3.34

It can be seen from Table 6 that the three indexes of Fenghua and BOE kept similar trends. Changes in the above ratios indicated that BOE's operational capability improved year by year, demonstrating a good trend. Compared with Changxin Tech, however, BOE's operational capability should be further improved to increase corporate return rate.

## 4.4 Development Capability Analysis

Corporate development capability refers to a company's sustainability. Through the analysis of development capability, one can understand a company's overall development status and situation and find the weakness to improve it.

### 4.4.1 Longitudinal Analysis of BOE's Development Capability

Table 7. BOE's development capability indexes from 2013 to 2017

Indexes	2017	2016	2015	2014	2013
Increase rate of main business revenue (%)	36.15	41.69	32.07	9.01	31.05
Increase rate of operating profit (%)	1814.47	-47.02	-58.67	2.20	-411.78
Increase rate of net income (%)	284.34	24.85	-39.68	-8.62	1511.93



It can be seen from Table 7 that although BOE's operating income has maintained a growing trend in the past five years, the growth rate of each year was not consistent. After falling to the lowest level in 2014, its operating income increased significantly in 2015, reflecting that BOE still possessed strong sustainability. The fact that the growth rates of operating income and net income underwent huge fluctuations indicated BOE's lack of effective means for cost control.

#### 4.4.2 Horizontal Analysis of BOE's Development Capability

Table 8. Development capability indexes of major competitors from 2013 to 2017

Indexes	Increase rate of main business revenue (%)			Increase rate of operating profit (%)			Increase rate of net income (%)		
	2017	2016	2015	2017	2016	2015	2017	2016	2015
BOE	36.15	41.69	32.07	1814.47	-47.02	-58.67	284.34	24.85	-39.68
Ninestar	267.31	183.33	327.30	622.94	-230.58	42.93	-633.41	-192.22	40.86
WUS	22.07	12.23	2.59	130.30	-464.56	27.79	55.95	2256.55	-145.73
Changxin Tech	27.43	114.24	142.61	65.83	43.24	60.71	54.63	47.32	45.88
Fenghua	20.94	43.04	-13.72	108.04	312.55	-61.14	79.22	125.70	-31.89

It can be seen from Table 8 that the development capability indexes of both BOE and its competitors underwent ups and downs from 2015 to 2017, but they were all on the rise. In addition, BOE's several indexes increased sharply in 2017, far exceeding its competitors and demonstrating strong sustainability.

To sum up, from 2013 to 2017, BOE enjoyed strong competitive advantages in terms of solvency, operational capability, profitability and development capability. Through continuous improvement of productivity and market share, BOE has achieved a large amount of operating income and accumulated a healthy cash flow. Faced by the changeable environment in future such as the technological revolution in display materials and accelerated upgrading of products, BOE is well prepared.

## 5. Accounting Analysis

### 5.1 Inventory Quality

The core business of BOE is the displays and sensor parts, which accounts for 90% of the company's main revenue and most of the inventory. The inventory volume mainly depends on the market supply and demand environment of the year. If the panel market is sluggish, there will appear overstocking. Besides, the semiconductor industry is developing rapidly and the product life cycle is shortened, which means if the market downturn period is longer than the product life cycle, a large amount of inventory can only be sold at a discount, and the companies must adjust their bad debt reserves. As far as the BOE's inventory turnover rate is concerned, the company's overall inventory turnover rate is relatively high, its use of corporate funds is efficient, and the loss caused by overstocking is relatively low. Overall, BOE's inventory quality is good.

### 5.2 Accounts Receivable

Accounts receivable are an important part of the balance sheet. On the one hand, it is a means of promotion, a preferential condition for customers, which can reduce inventory and accelerate capital turnover. On the other hand, accounts receivable will also incur losses because its formation will reduce the company's investment opportunities and increase the cost of managing those receivables such as the cost of assessing customers' credit and the collection fees of accounts receivable. More importantly, chances are that those receivables become bad debts. If the accounts receivable account for too much capital, the company's operations will be affected in that it does not have enough cash to buy inventory to maintain normal production and operation activities.

It can be seen from Table 9 that the accounts receivable of BOE within a year remained at 98.5% or above. Besides, the proportion of bad debts was 0.3%, 0.9%, 0.6%, 0.2%, and 1.9% from 2013 to 2017 respectively, indicating that its management of accounts receivable was fine, the possibility of recovering receivables was great, and the liquidity was relatively strong.

Table 9. Analysis of BOE's accounts receivable aging from 2013 to 2017 (Unit: 10,000 yuan)

	2017	2016	2015	2014	2013
Within 1 year (including 1 year)	1548215	1615454	815096	661627	469498
1 to 2 years (including 2 year)	29321	3021	6099	3107	16443
2 to 3 years (including 3 year)	1335	3034	1084	2076	682
Over 3 years	2974	808	2105	596	407
Sum	1581845	1622316	824384	667406	487030
Minus: Allowance	30469	3137	5132	5830	1436
Total	1551376	1619179	819251	661576	485594

It can be seen from Table 10 that, from 2013 to 2017, the growth rate of BOE's accounts receivable was -6.55%, 36.24%, 23.83%, 97.64%, and -4.19%, while the growth rate of sales revenue was 30.36%, 9.55%, 31.54%, 42.11%, and 37.78%. The quality analysis of accounts receivable showed that the growth rate of accounts receivable from 2013 to 2015 was inversely proportional to that of sales revenue, which did not conform to the normal situation. From a comprehensive analysis of BOE's development in recent years it can be found that from 2013 to 2015, BOE adopted an expansion strategy of expanding production capacity, upgrading production lines and increasing asset investment in response to rapidly growing market demand. From 2016 to 2017, however, the growth rate of accounts receivable maintained a proportional relationship with that of sales revenue, which was in line with the normal case. The reason for BOE's accounts receivable increased significantly in 2016 was that company was in the expansion phase and its product sales jumped. In 2017, however, accounts receivable was slightly fewer than those of 2016, which was probably because the company enhanced its management of accounts receivable in 2017.

Table 10. Annual analysis of BOE's accounts receivable from 2013 to 2017 (Unit: 10,000 yuan)

Compared items	2017	2016	2015	2014	2013
Opening balance of accounts receivable	1619179	819251	661576	485594	519604
Closing balance of accounts receivable	1551376	1619179	819251	661576	485594
Increase rate of the opening balance	-4.19%	97.64%	23.83%	36.24%	-6.55%
Average balance of accounts receivable	1585278	1219215	740414	573585	502599
Closing balance of bad debt reserve	30469	3137	5132	5830	1436
Accrual ratio	1.96%	0.19%	0.63%	0.88%	0.30%
Sales revenue of last year	6651889	4680844	3558586	3248270	2491806
Sales revenue of this year	9164885	6651889	4680844	3558586	3248270
Increase rate of revenue	37.78%	42.11%	31.54%	9.55%	30.36%
Receivables turnover ratio	5.92	5.65	6.57	6.42	6.72
Receivables days	60.81	63.72	54.79	56.07	53.57
Ratio of receivables to revenue	16.93%	24.34%	17.50%	18.59%	14.95%

## 6. Prospect Analysis and Countermeasures

### 6.1 Prospect Analysis

At present, BOE enjoys extremely valuable development opportunities from the country's emphasis on high technology and various policy encouragement, rapid industry development, huge market demand, technological innovation at home and abroad, and increasing consumption capacity and health awareness [8]. Meanwhile, BOE also possesses such advantages as many years of technology and talent accumulation, relatively leading production capacity, abundant products, industrial chain cooperation and initially formed layout [9]. Although BOE's strategic planning and

business expansion has brought its more possibilities, it may incur revenue loss due to a series of tactical moves such as increased investment on technological research and development as well as competition for market share. Nevertheless, the short-term pain is laying the foundation for the long-term sustainable development of the company. It is foreseeable that BOE possesses broad future development prospects. As a leading company in the field of LCD panels, BOE can also better promote the development of other enterprises in the same industry in China, thus driving the development of the entire Chinese market around the world.

## 6.2 Countermeasures

Facing both opportunities and challenges, BOE can better achieve its development goals and strategies from the following three aspects based on the above financial analysis. First is to improve organizational structure, adjusting, strengthening, and redefining product planning and the functions of market segmented departments. At the same time, it should clarify the functions and objectives of market sales and marketing teams, establish a complete human resources management system, and enhance capital operation to improve the leadership of the management, and build enterprise technological innovation systems using the requirements of enterprise transformation. Second is to rely on quality to win the market, accelerate the transformation to emerging display technology products and intelligent products, and enhance the core value of its brand. Third is to vigorously develop innovative capabilities, promote the Internet + strategy, enhance the ability of combining life science and information technology, and promote the company's innovate transformation as well as the rapid and stable development of the DSH business.

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