

Research on Financial Development Capability of Listed Companies Based on Multiple Regression Model——Take BYD as an Example

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Abstract: The stock price is an important criterion for the outside world to measure the development status of listed companies, and the financial index information regularly disclosed by listed companies reflects the company's operating results during the period to a certain extent, which will affect the outside world's assessment of the company's development capabilities. This paper selects BYD Co., Ltd. as the research object, fully excavates and measures the stock price information disclosed by Shanghai and Shenzhen stock exchanges and the financial indicators of various dimensions reflected in BYD's financial reports, conducts correlation analysis and selects effective indicators for building multiple linear regression Model, in-depth analysis of the relationship between the financial indicators of each listed company and its development ability is significant. The study found that cost control, cash flow manipulation and debt solvency improvement have a greater impact on the stock price of listed companies. This conclusion can be used as a reference standard for BYD and other similar listed companies to improve the performance of their development companies to a certain extent. Outside investors provide certain advice.

Keywords: financial development; multiple regression model; correlation analysis; BYD company

1. Introduction

In 2021, the Shenzhen Municipal Development and Reform Commission officially issued a notice on the extension of the validity period of the policy of "Several Measures for the Promotion and Application of New Energy Vehicles in Shenzhen to Respond to the Impact of the New Coronary Pneumonia Epidemic", fully affirming the contribution of new energy vehicles to the construction of the city's green economy and giving car buyers In addition, the National Development and Reform Commission also released a new reform policy on the business environment in June , and proposed a total of 222 reform tasks in 26 areas, mainly including promoting innovation-driven , building an industrial development ecology, etc., which emphasized Standardized construction of the new energy vehicle market. These new energy vehicle-related economic policies have put Shenzhen-based BYD Co., Ltd. in the spotlight.

Founded in 1955, the company is one of the major listed new energy vehicle companies in China. Its business spans four major industries: automobiles, rail transit, new energy and electronics. Its operating income and market value both exceed 100 billion yuan, of which new energy The annual sales volume of automobiles reaches more than 100,000 units, accounting for 13.4% of the market share of China's new energy vehicle industry. (2020 Prospective Industry Research Institute) However, as the industry heats up, foreign-funded new energy vehicle companies, represented by Tesla, have come to China to build factories, and Japanese and Korean car companies with lower prices are gradually going public. Market competition has undoubtedly brought certain industry challenges and pressures to BYD, and also prompted it to further grasp the company's competitive advantages and plan its development. As a listed company, BYD's disclosed key financial indicators can be used to evaluate and grasp the company's development status and future development potential. Therefore, this paper selects this company for research.

2. Literature review

By analyzing the existing literature of scholars, it is found that the market value (stock price) of the listed company is generally used as the main factor to measure the development ability of listed companies. liquidity) and other factors to reflect the future development potential of the enterprise. (Financial risk analysis for the construction industry based on financial indicators—logistics model—taking BY shares as an example (2021)) Based on the selected development capability factors, most of the research adopts principal component analysis, correlation analysis and Hessman The relevant financial indicators and information of the enterprise are mined by means of inspection, etc., to determine whether there is a relationship between each financial indicator and the development capability of the enterprise, so as to screen out the effective accounting information indicators that can have a significant impact on the development of the enterprise. (Correlation Analysis between Stock Returns of Listed Companies and Financial Indicators (2019)) The effective indicators determined by these methods are mainly asset interest rate, sales interest rate, total operating cost growth rate, sustainable asset growth rate, current asset turnover rate and current/quick ratio, etc. (Research on Stock Price Prediction Algorithms Based on Financial Indicators (2020)) After that, the research mainly reflects the specific connection between various financial accounting indicators and enterprise development by constructing regression models (such as multiple linear regression) and EVA value-added models. , and quantify the impact of financial accounting indicators on the future development of an enterprise by means of prediction or fitting. (Research on the Effect of Accounting Profit, Cash Profit and EVA on Value (2017)) Most of the studies have judged that indicators such as corporate financial profitability and liquidity have a major impact on corporate development through the above main processes, and the remaining indicators have corresponding Auxiliary effects.

The existing literature research has carried out basic analysis and quantitative assessment on the impact of accounting information on enterprise development, but there are still some shortcomings: the selection of factors that reflect enterprise development is difficult to grasp, the excavation of financial information indicators is not deep enough, various the contribution of indicators to enterprise development is not differentiated enough. This paper will construct a multiple regression model, comprehensively consider various factors that reflect the development of enterprises, and analyze the impact of accounting information on the development of enterprises with examples.

3. Target object selection

In order to better study the relationship between various financial indicators and the development capabilities of listed companies, this paper screened the listed companies and found that BYD Co., Ltd., as a major independent high-end brand in the automobile, rail transit, new energy and electronics industries, has With a high market share and a high market value exceeding one trillion yuan, it has a great development advantage in the future automobile-related fields, and the company's financial reports in the past ten years contain complete information on various accounting indicators of operating capabilities. The data has been verified by many analysis institutes, and the accuracy is guaranteed, so this company is selected as the research object for empirical analysis.

As a listed company, BYD's financial status reflects the company's various operating capabilities and risk conditions, and its control of various financial indicators reflects the business development potential of an enterprise. The stock price is a comprehensive indicator of the performance of an enterprise's business development over a period of time. Companies whose stock prices can continue to rise tend to have relatively high growth ^[1]. Therefore, this article will build a financial indicator system based on the information disclosed in BYD's financial accounting statements, which are mainly divided into profitability indicators, operating capacity indicators and solvency indicators, including main business profit rate, inventory turnover days, and liquidity. ratio and quick ratio, etc. ^[2], and then select effective indicators through correlation analysis, analyze the impact of various financial capability indicators on the company's stock closing price, and obtain the specific contribution of each financial indicator to the development of the enterprise.

4. Research design

4.1 Variable selection and data sources

After selecting BYD Co., Ltd. as the research object, this paper collects the financial indicators and

stock closing price data of BYD Co., Ltd. from 2011 to 2021. The main sources of the data are those disclosed by Shanghai Stock Exchange and Shenzhen Stock Exchange. Stock market information and financial report information disclosed by BYD Co., Ltd. Among them, the closing price data is recorded on a daily basis, and the financial indicator information is recorded according to the date of disclosure of the financial report. Therefore, in order to match the time period corresponding to the variable data, this paper averages the information of the stock closing price.

In order to ensure the integrity of the financial indicator system, this paper selects the indicators in Table 1 by examining the main indicators disclosed in the financial reports of listed companies, and combining with the similar indicator systems in the financial information analysis literature in recent years.

Table 1: Index System

Profitability Metrics		Operational Capability Index		Solvency Indicator	
Variables	Meanings	Variables	Meanings	Variables	Meanings
ROTA	return on total assets	TR Turnover	Receivable Transfer Turnover	Current Ratio	current ratio
PM	OPE	TR Days	Accounts Receivable Turnover Days	Quick Ratio	quick ratio
ROA	return on total assets	INV Turnover	Inventory turnover	Cash Ratio	cash ratio
RPCE	cost profit margin	TA Turnover	Total asset turnover	Int Coverage Ratio	Interest payment multiple
OPR	operating profit margin	INV Days	Inventory Turnover Days	Debt Ratio	Assets and liabilities
Rate of COS	main business cost	TA Days	Total asset turnover days	Equity Ratio	Shareholders' Equity Ratio
NPMOS	Sales margin	CA Turnover	current asset turnover	LDEBT	long-term debt ratio
ROE	Roe	CA Days	Current Assets Turnover Days	Debt to Equity Ratio	Debt to Owner's Equity Ratio
RONA	return on equity	NCF Ratio (SR)	Operating cash flow to sales ratio	Ratio of LTA to LTF	Long-term assets to long-term funding ratio
ROPE	The proportion of the three expenses	NCF Ratio (NP)	Operating cash flow to net profit ratio	Cap Ratio	capitalization ratio
MBRG	Main business income growth rate	NCF Ratio (L)	Net operating cash flow to gearing ratio	Cap Immobilized Ratio	capital fixation ratio
NPG	Net profit growth rate	CF Ratio (Ope)	cash flow ratio	LV Ratio	Net operating cash flow to gearing ratio
NAG	net asset growth rate				
TAG	total asset growth rate				

4.2 Variable Descriptive Statistics and Data Processing

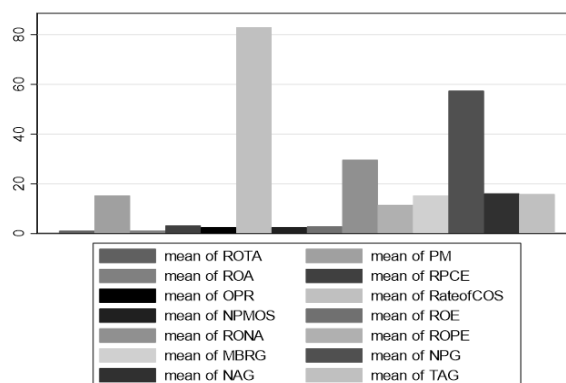


Figure 1: Descriptive statistics of the mean value of profitability indicators before processing

After initially collecting the original data, use Stata15.1 software to perform descriptive statistics on the three-dimensional financial management capability indicator data. Taking profitability as an example, the mean value of unprocessed index data is shown as Figure 1.

At the same time, the standard deviation, maximum value and minimum value of the profitability indicator information are also obtained, as shown in the Table 2.

Table 2: Other descriptive statistical results of profitability before treatment

VARIABLES	(1) N	(2) sd	(3) min	(4) max
ROTA	44	0.942	0.0800	3.780
PM	44	2.423	11.51	19.80
ROA	44	1.020	0.0800	4.210
RPCE	44	1.959	0.620	7.220
OPR	44	2.046	-0.650	6.200
Rate of COS	44	2.262	78.92	87.41
NPMOS	44	1.510	0.420	5.490
ROE	44	2.633	0.0600	9.860
RONA	44	28.38	0.220	79.99
ROPE	44	2.298	6.280	15.64
MBRG	44	22.43	-35.06	108.3
NPG	44	149.2	-86.65	485.6
NAG	44	17.89	0.680	67.48
TAG	44	10.32	-3.750	47.14

Combining the descriptive statistical results of all indicators, within this decade, the profit rate of BYD's main business was 19.80% at the highest, 11.51% at the lowest, and 15.35% on average. It can be seen that the profitability is better; and the highest value of the current interest rate It is 1.240, the lowest value is 0.610, and the average value is 0.868, which shows that the company's solvency is also at a high level. But at the same time, it can be seen that the standard deviations of the financial capability indicators of each dimension fluctuate greatly, and the differences of the mean values are obvious, so it is necessary to carry out corresponding processing on the basis of the original data.

In this paper, the mean value interpolation method is used to fill in the few vacancies in different indicators, and the very few outliers in the indicator data are eliminated, and the data of each indicator is standardized with the method of standard deviation.

Table 3: Descriptive statistical results of profitability after processing

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
ROTA	44	-0	1	-1.114	2.815
PM	44	0	1	-1.585	1.836
ROA	44	0	1	-1.093	2.954
RPCE	44	-0	1	-1.330	2.040
OPR	44	-0	1	-1.545	1.804
Rate of COS	44	0	1	-1.792	1.961
NPMOS	44	0	1	-1.400	1.957
ROE	44	-0	1	-1.074	2.648
RONA	44	-0	1	-1.038	1.773
ROPE	44	0	1	-2.287	1.787
MBRG	44	-0	1	-2.247	4.145
NPG	44	-0	1	-0.966	2.870
NAG	44	0	1	-0.863	2.870
TAG	44	0	1	-1.899	3.031

After the above processing, the descriptive statistical analysis of the accounting information indicators of the three capability dimensions is carried out again, and the profitability indicator is also taken as an example. The results are listed in Table 3:

After processing, the mean value of the independent variables in each dimension is 0, the variance is 1, and the volatility is significantly reduced, which can be used for subsequent analysis and interpretation.

4.3 Correlation analysis and index screening

This paper collects balanced panel data, so Pearson index correlation analysis method is used to

study the correlation between financial indicator data and BYD 's stock closing price ^[3]. The formula is:

$$\rho_{xy} = \text{cov}(x, y) / \rho_x \rho_y \quad (1)$$

Among them, the P value reflecting the correlation is in the range of (-1, 1). If the value is greater than 0, it means that the indicator variable is positively correlated with the closing price of the company's stock. If the value is less than 0, it means that the indicator variable and the closing price is negatively correlated. And the larger the absolute value of the value, the stronger the correlation. Through Stata15.1, the correlation test of the three dimensions of financial capability indicators is carried out, and the results are listed in Table 4:

Table 4: Correlation analysis between each capability index and stock market closing price

Profitability Metrics		Operational Capability Index		Solvency Indicator	
	Closing Price		Closing Price		Closing Price
ROTA	0.205	TR Turnover	-0.072	Current Ratio	0.583
PM	-0.196	TR Days	0.045	Quick Ratio	0.498
ROA	0.209	INV Turnover	0.046	Cash Ratio	0.725
RPCE	0.100	TA turnover	0.256	Int Coverage Ratio	0.219
OPR	0.201	INV Days	0.160	Debt Ratio	-0.207
Rate of COS	0.307	TA Days	-0.307	Equity Ratio	0.207
NPMOS	0.102	CA Turnover	-0.038	LDEBT	-0.209
ROE	0.151	CA Days	0.161	Debit to Equity Ratio	-0.197
RONA	0.142	NCF Ratio (SR)	0.298	Ratio of LTA to LTF	-0.559
ROPE	-0.713	NCF Ratio (NP)	-0.052	Cap Ratio	-0.225
MBRG	0.544	NCF Ratio (L)	0.537	Cap Immobilized Ratio	-0.577
NPG	-0.009	CF Ratio (Ope)	0.513	LV Ratio	0.241
NAG	0.420				
TAG	0.234				

According to the above table, the profitability indicators that have strong correlation with the closing price of BYD's stock can be screened: Rate of COS, NAG, MBRG and ROPE, among which ROPE is negatively correlated with the closing price of the stock, while the other three All indicators show a positive correlation, ROPE has the strongest correlation, and Rate of COS has the weakest correlation; while the operating capability indicators that have strong correlation with the closing price of BYD's stock are: NCF ratio(L), CF ratio(Ope), NCF ratio(SR) and TA days, in which TA days and stock closing prices show a negative correlation (this result is also consistent with the indicator characteristics), and the other three indicators are all positively correlated, NCF ratio (L) has the strongest correlation, and NCF ratio (SR) has the weakest correlation; in addition, the solvency index factors that have a strong correlation with the closing price of BYD's stock are also screened: Cash ratio, Current ratio , Quick ratio, Cap Immobilized ratio and Ratio of LTA to LTF, of which Cap Immobilized ratio and Ratio of LTA to LTF are negatively correlated with the closing price of the stock, and the other three indicators are all positively correlated. At the same time, Cash ratio has the strongest correlation and Quick ratio the weakest.

5. Empirical Research

In this paper, the index information through the correlation test will be retained as an independent variable X_i , and the closing price of BYD's stock will be used as a dependent variable Y to construct a multiple linear regression model as follows:

$$Y = \beta_0 + \sum_{i=1}^j \beta_i X_i + \varepsilon \quad (2)$$

Among them, j is the number of independent variables, and the number of effective indicators of financial ability of each dimension selected after the correlation test, β_i is the regression parameter corresponding to the variable, and the error term ε is a random variable that obeys a normal distribution ^[4].

Firstly, through Stata15.1, the regression coefficient analysis of all the current financial capability

indicators in the three dimensions is carried out, the default 95% confidence interval standard is used, the regression significance of each indicator is tested, and its respective confidence interval range is visualized. According to the visualization results, the independent variable indicators that are obviously and insignificant to the dependent variable (BYD stock closing price) are determined, and they are eliminated. In this paper, the visualization results before and after the elimination are compared and listed as follows:

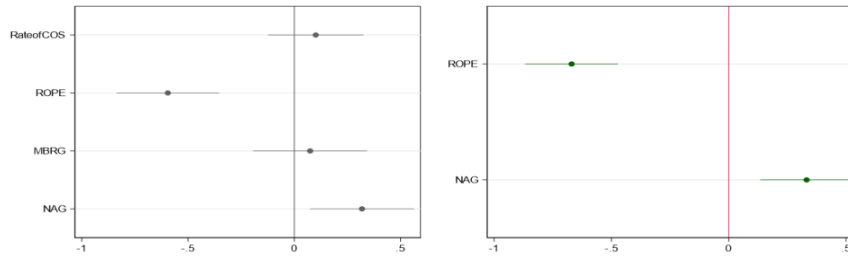


Figure 2: Confidence Interval Range of Two Linear Regression for Profitability Index

It can be seen from Figure 2 that the Rate of COS and MBRG in the indicators were not significant when the profitability index was first fitted by multiple linear regression, so they were screened out and quadratic fitting was performed. The fitting effect is shown as follows:

Table 5: Regression analysis results of profitability indicators

VARIABLES	(1)	(2)
	Coef.	P> t
ROPE	-0.670***	0.000
NAG	0.332***	0.001
Constant	-0.000	1.000
R-squared	0.6173	
Adj R-squared	0.5986	
F test	2.81e-09	
r2_a	0.599	
F	33.06	

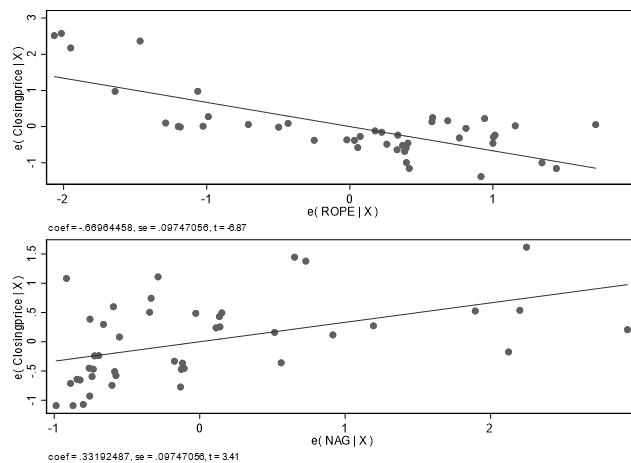


Figure 3: Multiple regression fitting effect of profitability indicators

As can be seen from the Table 5 and Figure 3, the two indicators of ROPE and NAG in the profitability dimension have passed the significance test and are significant within the 1% confidence interval. And the R^2 value of the model presents a higher level, which shows that the fitting effect is better. At the same time, it can be concluded that the closing price of BYD's stock has a significant negative correlation with ROPE in the profitability dimension, and a significant positive correlation with NAG, and the correlation coefficients are -0.670 and 0.332, respectively.

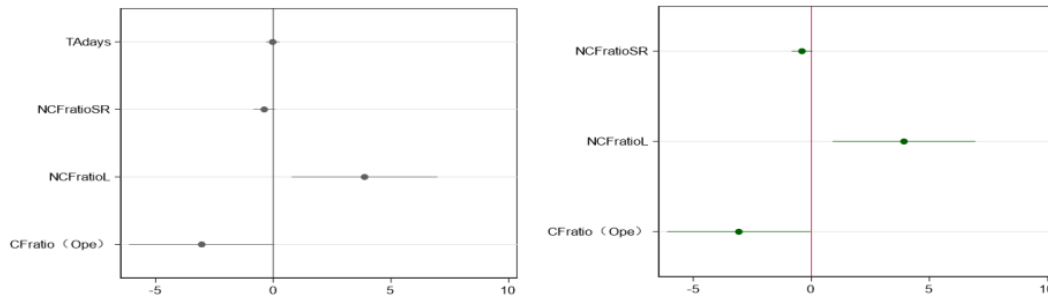


Figure 4: Confidence interval range of two linear regressions for the operational capability index

It can be seen From the figure 4 that when the multiple linear regression fitting was performed on the operating capacity index for the first time, only TA days among the four indicators was insignificant, so it was screened out and a quadratic fitting was performed. The fitting effect is as follows:

Table 6: Regression analysis results of operational capability indicators

VARIABLES	(1)	(2)
	Coef.	P> t
NCF ratio (SR)	-0.398*	0.069
NCF ratio (L)	3.924**	0.012
CF ratio (Ope)	-3.070**	0.047
Constant	-0.000	1.000
R-squared	0.4123	
Adj R-squared	0.3682	
F test	8.24e-05	
r2_a	0.368	
F	9.354	

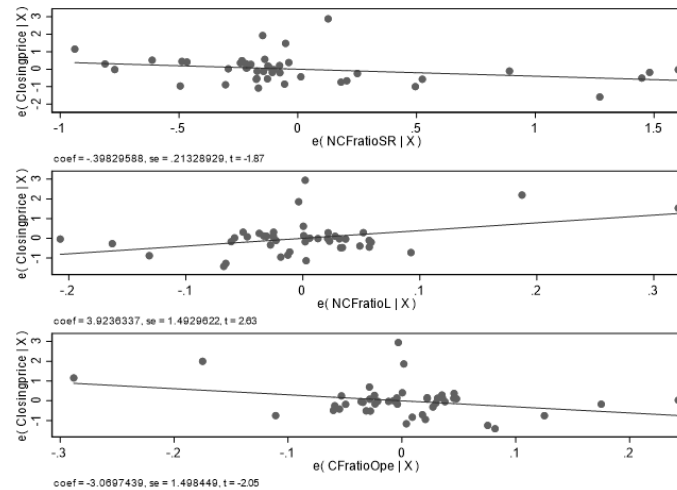


Figure 5: Multiple regression fitting effect of operational capability indicators

As can be seen from Table 6 and Figure 5, the three indicators of NCF ratio (SR), NCF ratio (L) and CF ratio (Ope) in the dimension of operating capacity passed the significance test, among which NCF ratio (L) and CF ratio (Ope) was significant within the 5% confidence interval and the NCF ratio (SR) was significant within the 10% confidence interval. At the same time, it can be found that BYD's stock closing price is significantly negatively correlated with NCF ratio (SR) and CF ratio (Ope), and positively correlated with NCF ratio (L), with correlation coefficients of -0.398, -3.070 and 3.924, respectively.

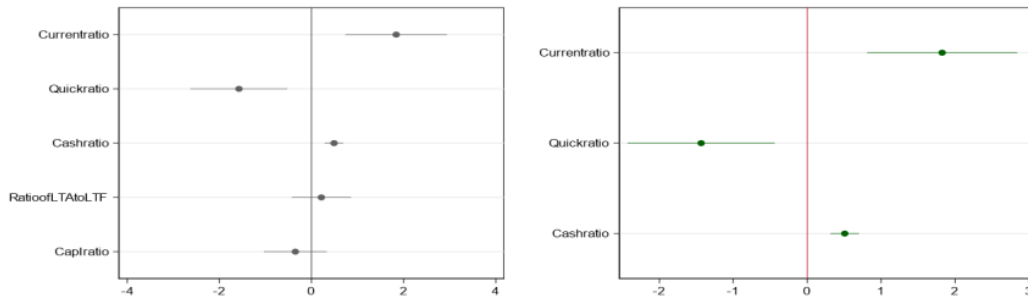


Figure 6: Execution interval range of two linear regressions of solvency index

It can be seen from the Figure 6 that the ratio of LTA to LTF and Cap Immobilized ratio among the five indicators were not significantly related to the stock price when the multiple linear regression fitting was performed on the solvency index for the first time . Perform quadratic fitting, and the fitting effect is as follows:

Table 7: Regression analysis results of solvency index

VARIABLES	(1) Coef.	(2) P> t
Current ratio	1.825***	0.001
Quick ratio	-1.435***	0.006
Cash ratio	0.507***	0.000
Constant	-0.000	1.000
R-squared	0.7170	
Adj R-squared	0.6958	
F test	0	
r2_a	0.696	

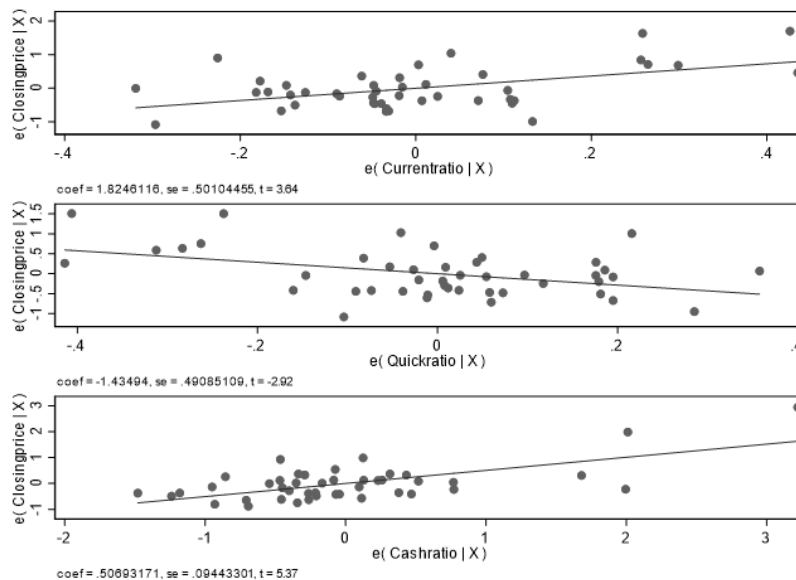


Figure 7: Multiple regression fitting effect of solvency index

As can be seen from Table 7 and Figure 7, three indicators in the solvency dimension also passed the significance test, they are Current ratio, Quick ratio and Cash ratio. And these three indicators are significant within the 1% confidence interval. At the same time, the sum Adj R² of the model is R² also maintained at a high level, which reflects the better fitting effect. In addition, the closing price of BYD's stock has a significant negative correlation with Quick ratio, and a significant positive correlation with Current ratio and Cash ratio, with correlation coefficients of -1.435, 1.825 and 0.507, respectively.

The idea adopted in this paper in the process of building a multiple linear regression model is: first perform regression analysis on all variables, and then screen according to the regression coefficients of the indicators and their respective confidence intervals, and conduct more detailed analysis of the changed variables. Regression fitting, and the final multiple linear regression analysis results are obtained, fully considering various accounting information indicators that may affect the development of various aspects of the enterprise's operating capabilities, making the results more comprehensive and in line with the analysis process of robustness testing.

6. Conclusion and Suggestion

By collecting and analyzing the financial index information of BYD Corporation, this paper finds that the ability of different dimensions reflected by the financial information has a significant multiple linear regression relationship with the overall stock price of BYD Corporation. In terms of profitability, the proportion of the company's three expenses (management expenses, financial expenses, production expenses) and the growth rate of net assets are closely related to the stock price. Along with the growth of net assets, the stock price will gradually increase (the correlation coefficient is - 0.670), and the increase in the proportion of the three expenses will make the stock price fall (correlation coefficient 0.332). In terms of operating capacity, the ratio of cash flow, income, liabilities and other factors of the enterprise plays a key role (the correlation coefficients are -0.398, -3.070 and 3.924 respectively). If the cash flow of the enterprise is well controlled and coordinated, Then its share price will also rise, and its development potential will also be enhanced. In terms of solvency, the three indicators of current ratio, quick ratio and cash ratio have formed a close correlation with the stock price (the correlation coefficients are -1.435, 1.825 and 0.507 respectively), which shows that when the company can be more accurate When estimating its operating costs and balancing its own liabilities in a timely manner, the level of risk faced by the company's operations will be reduced, and its development capabilities will also be affirmed by investors from all walks of life.

Puts forward the following relevant suggestions from the aspects of " profitability", "operational ability" and " solvency ":

In terms of profitability : In the first half of 2022, BYD has surpassed Tesla to become the global new energy vehicle sales leader . BYD has its own unique advantages in the field of new energy vehicle innovation, which is also the source of its core competitiveness. In recent years, the company has continued to fall into the dilemma of "high revenue and low profit". In this regard, BYD should firmly grasp the market opportunity to further improve its profitability; at the same time, it should focus on changing its sales structure, reducing the proportion of low-end cars, and increasing its profit margins. ^[5]

In terms of operational capacity : From 2014 to 2018, the development of BYD's operational capacity was relatively slow, and the corresponding indicators were not high, indicating that BYD Co., Ltd. did not use the assets efficiently. Although the cash flow has a blowout trend in recent years, there are still unstable factors in its future development. In this regard, BYD should adjust some of its internal easing policies, focus on asset management, and improve the company's asset turnover capacity.

In terms of solvency : Today, when the market advocates low-carbon environmental protection, BYD actively caters to the needs of the market and has achieved outstanding achievements. However, in order to achieve this industrial transformation and raise funds for new energy vehicles, the current BYD company has a lot of debt and is moving forward with a heavy load. Through the research of this paper, the solvency is closely related to the development of the enterprise. Therefore, BYD should further explore the business model and management structure in the future, and gradually explore ways to reduce input costs, so as to turn the existing market advantage into a driving force to further improve social competition. At the same time, BYD should also make future financing planning and decision-making in a scientific and prudent manner based on reality, so as to reduce corporate debt repayment pressure and unnecessary financial risks.

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