Forecasting Cash for Companies-The Case of CATL

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ABSTRACT

CATL, as a provider of power batteries, is now regarded at the top of the world. It is not only a company in hot business that responds to carbon neutralization policy but also a high-value stocks concerned by investors. However, it is now faced with fierce market competition and many uncertainties. Our paper has identified and analyzed uncertainties like more intense competition and exploration of new business to see what will happen owing to these issues. We researched for ample information about the possible future condition for CATL from resources like the official website of the company, research reports from financial experts, and also financial database. Then, we forecasted by including the possible future market share and new business-battery swap business. After that, several autoregression models (Applicated Software: Stata & Excel) were established to forecast required accounting items such as capital expenditure and debt issuance and finally we got the simulated future cash flow statement of CATL. Based on the simulation, we analyzed future cash conditions for CATL influenced by the new market structure and battery swap business, concluding that this company won't face liquidity problems. In general, our paper conducted a forecast of CATL's future cash condition based on the predicted situation. More importantly, we emphasize the significance of cash forecast and management because forecasting in advance will be beneficial for corporations to deal with predicted troubles and then grow sustainably. Since our simulation method is easy-understanding and convenient-for-use, it can be applied by most companies to forecast future financial situations as well.

Keywords: cash forecasting, future cash situation, liquidity, CATL, battery swap business

1.INTRODUCTION

"Cash is king" is a popular saying in the business field. For each company, cash flow is their center of financial operation, and efficient cash flow management has a deep influence on the further development of a company since it's only possible for a company to withstand unexpected risks when it has adequate cash [1]. This is absolutely the same for Contemporary Amprex Technology Co. Limited (referred to as CATL), which was established in 2011 and is now the best provider of power batteries in the world. After 2018 when CATL was listed on Shenzhen Stock Exchange, the company's market value skyrocketed, as figure 1 shows. This is mainly due to the fact that CATL is in one of the most promising industries so investors have an optimistic expectation of it. Additionally, brilliant technology on power battery manufacture also helped CATL become the leader in the entire industry, occupying a large market share. Besides, since CATL is a company that responds to carbon neutralization policy, government support was another factor boosting the rapid growth of CATL's stock price. In general, CATL is now indispensable for the stock market because of the huge market value, thus both investors and government pay much attention to its future cash condition.
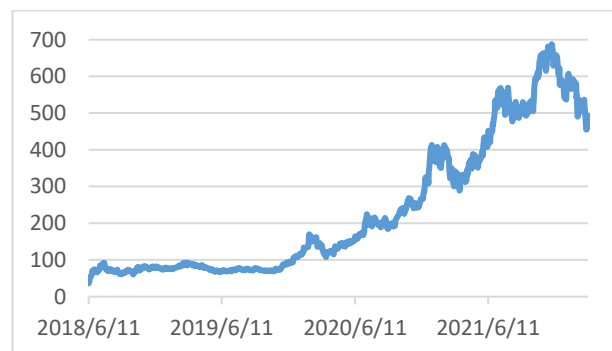

Figure 1 Trend of CATL's stock price.

We have already read all annual reports and found out that CATL grew steadily in the past five years, from 2016

to 2020. Nevertheless, this doesn't doom that CATL will remain prosperous forever, as it faces uncertainties in the future as well. For instance, other battery manufacturers are growing at the same time so CATL's market share may be invaded. Moreover, CATL will possibly try new things like entering a fresh business [2], leaving so much undetermined factors. Therefore, forecasting CATL 's cash condition is meaningful.

In our research, we first did some forecasting on CATL's future business. To make it more convincing, our assumptions were all based on references like periodicals in energy or technology fields, dissertations, and research reports from securities companies. We predicted two situations, respectively about future market share and investment in the battery swap business. After that, by including our forecasts into the financial performance of CATL, we used different methods to calculate corresponding accounting items in the future five years. Our methods mainly contained information searching, scenario analysis, and regression model building. After we synthesized all predicted accounting items, we input them into our simulation sheet and acquire the predicted cash flow statement for CATL. By analyzing this statement, we concluded that CATL won't have liquidity problems in the future 5 years even though it will face problems like lower market shares and large investments in new business.

Forecasting the financial situation is one necessary task for each company, but there are so much different methods for it. Some use one advanced model to forecast company financial distress [3], some combine different models to forecast financial risk for listed companies [4]. Although their work provided an accurate model for use and offered excellent examples of forecasting, seldom of them only focus on forecasting cash situations. Compared to their work, our research concentrated only on accounting items related to cash flow statements so our method is more targeted. Moreover, our method of forecasting is pretty simple to carry out and it is very appropriate for companies to make a rough forecast.

The remainder of the paper is organized as follows: the forecasting part contains a detailed explanation about why we choose revenue and a new business as our scenario and how we set up these situations. Next is the discussion part, we divide our discussion into three parts, respectively demonstrating how we calculate accounting items related to investing activities, items related to financing activities, and the process of analysis on future cash situation. At the end of the discussion part, we give our summing-up about CATL's future cash situation. Lastly, the conclusion part reviews what we complete in this paper, how we do the forecast, and the discussing results of this paper. Some shortages and possible ways to improve our research are also introduced in this part.

2.FORECASTING BASED ON FINANCIAL CONDITION

Cash comes from revenue, mainly. "Revenue is vanity", but it still represents the potential profits and development of a business.

CATL's 2021 Third Quarterly Report showed that its revenue was 73,361 million RMB [5]. Together with it was in 2020, we predicted the revenue growth is 110%, which means CATL doubled its revenue in the past year.

It is similar to the growth rate of China's total export-import volume in 2021. According to data from China customs, this growth rate skyrocketed from 1% to 30%. Recent research showed that the outbreak and spread of pandemics weakened the global economy, strongly. Global demands were thus restricted. However, due to the reduced toxicity of COVID and well control by some countries, the economy recovered increasingly, and suppressed demands in 2020 also grew rapidly, which led to the unexpected result of growth in 2021 [6].

We choose two important ratios, market shares and proportion of the main business to estimate other further years' growth.

Market share measures the percent of total sales in an industry generated by a particular company, reflecting the position of one company in the market [7]. A report from SNE research, a Korean company established to provide global market research and consulting services for rechargeable battery industries, showed that the global battery market was occupied by several Asian companies [8]. Their historical market shares are listed below:

Table 1. Market share of several main companies in the global battery industry.

	2016	2017	2018	2019	2020	2021
CATL	7.60%	19.25%	23.40%	27.87%	24.60%	32.58%
BYD	8.60%	11.55%	11.80%	9.52%	6.70%	8.86%
LG Chem	11.40%	7.22%	7.50%	10.55%	23.40%	20.28%
Panasonic	12.40%	16.04%	21.30%	24.10%	18.40%	12.16%
SAMSUNG SDI	11.10%	4.90%	3.50%	3.60%	5.50%	4.45%

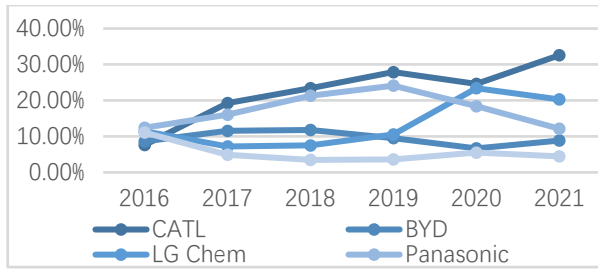It shows that CATL's market share fluctuated around 25% in recent years:

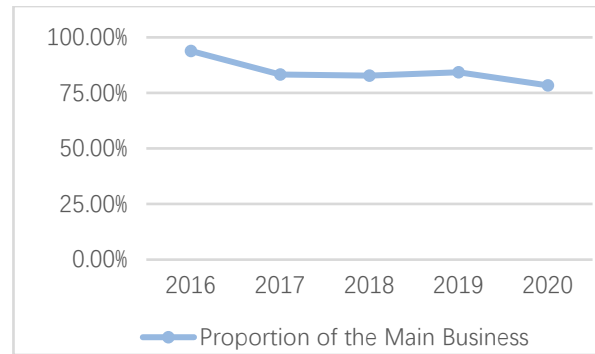**Figure 2** Market share of main companies

According to Table 1 and Figure 2, we assumed that CATL will keep this proportion in the following 5 years.

The main business of CATL is manufacturing and selling battery. With historical financial data in past 5 years we drew a graph illustrating the revenue created by battery business:

Figure 3 Proportion of main business

We assume this ratio will be constant at 80% in the following 5 years based on Figure 3.

SNE Research's report also illustrated historical global demands and forecasted future demands for battery [8].

Table 2. Global demands for battery. (Unit: GWH)

	2019	2020	2022	2025	2028	2030
VW	5	15	51	131	257	398
Tesla	28	33	88	191	301	383
R-N-M	7	10	26	84	162	253
HKMC	5	7	23	70	146	235
GM	2	2	12	62	156	264
Stellantis	0	5	20	70	127	191
Toyota	1	1	7	48	116	200
Ford	0	0	9	39	94	171
Geely	4	4	11	29	56	86
Honda	1	1	3	19	46	79
BMW	3	4	13	30	53	76
Daimler	1	5	11	33	55	78
Global	96	126	376	999	1891	2867

According to Table 2, CATL's sales of batteries are estimated as total global demands * CATL's market share. Sales in 2022 is thus 376GWH*25%=94GHW; Sales in 2025 is 999GHW*25%=249.75GWH.

According to CATL's 2020 annual report, it can gain 1,160 million RMB/GWH. Revenue created by a battery in 2022 and 2025 will be 109,040 million RMB, 289,710 million RMB. With the proportion of main business, total revenue in these 2 years will be 109,040 million RMB/80%=136,300 million RMB, 289,710 million RMB/80%=362,138 million RMB. Revenue growth thus is calculated by geometric mean as 38.5% from 2020 to 2025.

With an increasing number of competitors, CATL

cannot maintain its biggest market share forever if it only relies on old business and outdated technology, since other energy battery suppliers now can provide their products at a low price as well. Therefore, CATL has to find a way of building more stable bonds with new energy car manufacturers to guarantee sales. Moreover, "EVOGO" can solve problems of lithium resource shortage through recycling of batteries [9]. As a result, in order to maintain its marketplace, CATL is highly possible to invest more in this business.

3.DISCUSSION

3.1Investment and related operating activities

Based on this scenario, firstly we forecast capital expenditure for the year 2021 to 2025. By observing the historical data of sales revenue and capital expenditure, we recognize the correlated relationship between these two items, and this correlation is proved by a correlation efficient of 0.92. Then, since we already have forecast future revenue, we decide to use regression. In our forecast model, revenue is an independent variable while capital expenditure is the dependent variable. After the regression process, we get $Y = 0.23X + 553.55$, so we can get the result of capital expenditure by ignoring extra investment in the battery swap business. The complete outcome of calculated capital expenditures is illustrated in table 3.

Table 3. Unadjusted forecast of capital expenditures

	2021	2022	2023	2024	2025
Revenue	105604	136251	188712	261371	362007
Capital Expenditures (￥000,000)	24842.47	31891.28	43957.31	60668.88	83815.16

According to the minister of the Department of Industry and Information Technology, till the end of 2021, there were a total 2449 battery swap stations in China. In order to compete against competitors in this area, we assume CATL will manage to acquire 50% market share in it. Add the fact that during 2022 other companies will also increase stations to double 2449, that is a totally 4898 in 2023, we forecast CATL will build 4898 battery swap stations in 2023. As for the cost of stations, we find related information on an energy science website: a single battery swap station requires about 5 million yuan [10]. Thus, we can calculate extra capital expenditure in 2023: 4,898*5 = ￥24,490 million. Add this with the initial amount, assuming there is no other capital expenditure in continuing five years, our forecast of capital expenditure is demonstrated in table 4.

Table 4. Adjusted forecast of capital expenditure

	2021	2022	2023	2024	2025
Revenue	105604	136251	188712	261371	362007
Capital Expenditures (￥000,000)	24842.47	31891.28	68447	60668.88	83815.16

After that we turn to depreciation, which is recognized to be correlated with capital expenditure as well (the correlation coefficient is 0.93). Consequently, we apply historical data to do regression and obtain the model: $Y = 0.42X - 790.8$ (Y is depreciation while X is capital expenditure). Using the model, we get the outcome of unadjusted depreciation $ amortization, illustrated in table 5.

Table 5. Unadjusted forecast of depreciation & amortization

	2021	2022	2023	2024	2025
Capital Expenditures (￥000,000)	24842	31891	43957	60669	83815
Depreciation & Amortization	9642.84	12603.42	17671.14	24690.18	34411.5

As we know, former capital expenditure brings new fixed assets, so depreciation next year will change because of it. According to the energy science website again, the annual depreciation of a station is approximately 0.5 million yuan so the extra depreciation due to extra stations is 4898 * 0.5 = ￥2449 million. Add this amount to the

depreciation of 2024 and 2025 (we assume the construction will be completed at the near end of 2023 so we just ignore 2023 for depreciation), our forecast of depreciation for the next five years is illustrated in table 6.

Table 6. Adjusted forecast of depreciation & amortization

	2021	2022	2023	2024	2025
Capital Expenditures (￥000,000)	24842	31891	43957	60669	83815
Depreciation & Amortization	9642.84	12603.42	17671.14	27139	36861

Because our target is the ratio of depreciation, we use the correlation between revenue and properties & equipment (correlation coefficient is 0.96) to get future PPE. The outcome of calculated property & equipment is shown in table 7.

Table 7. Forecast of property & equipment

	2020	2021	2022	2023	2024	2025
Reveneue	50319	105604	136251	188712	261371	362007
Property & Equipment	25372	50887	65904.03	116099.9	127212.8	176524.5

Later, we combine this with future depreciation to calculate the ratio of depreciation, which is demonstrated in table 8.

Table 8. Calculation of depreciation & amortization ratio

FINANCIAL STATEMENTS	2021	2022	2023	2024	2025
Depreciation & Amortization	9642.84	12603.42	17671.14	24690.18	34411.5
Property & Equipment (open bal)	25372	50887	65904.03	116099.9	127212.8
Depreciation & Amortization (% of PP&E Open Bal)	38%	25%	27%	21%	27%

Last but not least, although carrying out the battery swap business is beneficial in the long run, it's difficult to make difference in a few years because the spread of the battery swap business requires standardization of vehicles' structure, which is impossible to realize in two years. In addition, the current market size for a new vehicle with a battery swap pattern is so small to take advantage of all finished swap stations [11]. Considering this, we assume that CATL's investments in battery swap business won't bring extra revenue in later years.

Moreover, CATL may no longer a leading enterprise in this industry because one of its main competitors, LG Chem showed rapid growth in recent years, challenging CATL greatly. To find an answer, we assume that CATL's bargaining power will reduce due to the failure in competition. We assume the accounts payables by day will decrease from 2023, so it has to use more money. Our forecast of AR by day is shown in table 9.

Table 9. Accounts receivable by day

	2021	2022	2023	2024	2025
Accounts Receivable (Days)	133	129	139	141	140

3.2 Financing activities

CATL needs to balance the three kinds of cash flows circulating in the operating, investing, and financing activities, and ensure the adequacy of working capital to afford the expansion and revolution. In this case, we have carried out predictions of the two main components of financing activities, which are the issuance of debt and the issuance of equity [12].

According to the previous scenario of new investments in 2023, firstly, there would be a forecast for the issuance of debt for the year 2021 to 2025. Since we have already obtained the prediction for results of future capital expenditures, we decide to use the method of autoregression to set up the prediction model.

By observing the historical data of capital expenditure, we could recognize the underlying correlated relationship between these two accounting items. The conclusion of the autoregression turned out to be the line of $Y = 0.6724X - 394.7392$, with the R-Square of 0.8972. Depending on our statistic data, the correlation can be proved by a comparatively high correlation coefficient, which remarkably approaches to 1. Then, we get the predicting results of debt issuance for the following years. In the last part, we took the influence of investments on new business into consideration, and come up with an added value in our result. The forecast of adjusted issuance of debt is shown in table 10.

Table 10. Forecast of issuance of debt

	Capital Expenditure (millions)	Issuance of Debt (millions)
2016	2796	1931
2017	7179	4477
2018	6629	4123
2019	9612	4617
2020	13302	9451
2021	24842	16309.52
2022	31891	21049.41
2023	43957 (Adjusted 68447)	29162.83 (Adjusted 45630.4)
2024	60669	40400.32
2025	83815	55964,15

There would also be a forecast for the equity issuance. Since CATL has just gone public three years ago in 2018 and has only issued stocks in 2018 and 2020, there is comparatively little information to refer to in our prediction. But we also find that CATL has been already approved of issuing 45 billion stocks in 2022 [13]. Considering this and our former scenario, we guess the purpose of equity issues at that time is to ensure adequate cash flow for next year's investments in battery swap business, and, as a conservative estimate, we regard that there would be no more equity issues in the following three years from 2023 to 2025. Our forecast of issuance of equity is demonstrated in table 11.

Table 11. Forecast of issuance of equity

	Capital Expenditure (millions)	Issuance of Equity (millions)
2021	24842	0
2022	31891	45000

2023	43957 (Adjusted 68447)	0
2024	60669	0
2025	83815	0

3.3Situation of cash

Till now, we complete all our assumptions. With all assumptions, a predicted cash flow statement will be automatically provided by our simulated sheet, with which we analyze possible cash situations for CATL in later years. In order to discover changing pattern of cash from different activities, we included increase rate1,2 and 3 respectively stand for year-on-year growth rate of cash from operating activities, investing activities and financing activities in future years. Table 12 illustrates the predicted cash flow statement and these increase rates.

Table 12. Simulated cash flow statement in future

Cash Flow Statement	2020	2021	2022	2023	2024	2025
Net Earnings	6184	460	14445	22035	40813	44499
Plus: Depreciation & Amortization	827	12118	11153	17645	24392	41156
Less: Changes in Working Capital	1838	(41157)	11421	32484	33888	33829
Cash from Operations	5173	53735	14177	7195	31317	51827
Increase Rate1		939%	-74%	-49%	335%	
Investments in Property & Equipment	13302	24842	31891	68447	60669	83815
Other Investment	8138	(18381)	0	0	0	0
Cash from Investing	13302	24842	31891	68447	60669	83815
Increase Rate2		87%	28%	115%	-11%	0
Issuance (repayment) of debt	9451	16310	21049	45630	40400	55964
Issuance (repayment) of equity	0	0	45000	0	0	0
Cash from Financing	9451	16310	66049	45630	40400	55964
Increase Rate3		73%	305%	-31%	-11%	0
Net Increase (decrease) in Cash	1322	45203	48335	(15622)	11048	23976
Opening Cash Balance	211069	212392	257594	305929	290308	301356
Closing Cash Balance	212392	257594	305929	290308	301356	325,332

First of all, CATL 's cash from operations will boost in 2021 but then decline in 2022 and 2023, and finally recover. Respectively due to quick recovery from epidemic and more intense competition. The recession in 2023 is caused by new business——large expense but comparably low income. Secondly, in the future 5 years, CATL will invest more and the highest growth rate of investing cash will appear in 2023 because of the extensive construction of battery swap stations we mentioned before. Eventually, financing activities peak in 2022 because of the issuance of equity.

In all, net cash increase will always be positive except for year 2023 because of the new business, but thanks to an adequate cash basis, they won't have serious problems.

Additionally, total cash stands for a comparably high ratio of total assets in first three years. Table 13 shows these ratios.

Table 13. Ratio of cash to total assets

Total Assets	398050	456160	526126	612692	751340
Ratio of Cash to Total Assets	65%	67%	55%	49%	43%

According to the structure of cash receipts, except for year 2021 when operating earnings is enormously high, receipts from financing always occupy much more than operating cash. Both ratios of cash from operations and the ratio of cash from financing are demonstrated in table 14. We think that's partly due to the market's high expectation towards the new energy industry and investors are willing to lend money to CATL. But CATL still has to pay attention to it.

Table 14. Structure of cash receipts

Total cash receipts	70045	80226	52825	71717	107791
Ratio of Cash from Operations	77%	18%	14%	44%	48%
Ratio of Cash from Financing	23%	82%	86%	56%	52%

To sum up, with our assumptions, cash structural problems and cash decrease might appear in the following years as there are uncertainties about intense competition and new businesses. Hence, to remain its leading status in the battery industry, CATL is supposed to handle carefully both its traditional and new businesses and get financing at the correct time.

4.Conclusion

Cash always has a great impact on a business, especially for big companies like CATL, determining their operation and life. In this paper, we forecast the amount of cash from 2021 to 2025 to check whether CATL will face liquidity problems or not. We use autoregression with historical data from CATL's financial reports to predict figures of several main accounting items and input all these numbers on a designed simulation, thus getting a predicted statement of cash flow in the following years of CATL.

Due to the newly announced business, battery swap, and more intensive competition in the following years, two accounting items will change unexpectedly. One is capital expenditure, affecting the depreciation, amortization, and some fixed assets. The other is the insurance of debt, which will change radically with the increase of capital expenditure. Based on our simulation, though these figures will lead to a huge variation in the statement of cash flow, CATL will not encounter a serious liquidity problem because its revenue will grow constantly, providing an adequate basis of cash. However, it is still supposed to carefully handle its traditional and new business in order to guard against unpredicted liquidity risk.

However, considering the crucial role of CATL acting in the Chinese capital market, the main shortcoming in this paper is the lack of potential prediction for the issue of equity because it went public just 4 years ago. Due to the fact that CATL just issued 45 million stocks this year, we assume there will not be an issue of equity. Another shortage of our discussion is the rough regression model, which is acquired only by the correlation between two accounting items rather than considered with other possible independent variables. For instance, property & equipment open balance is not always directly related to revenue while the issuance of debts is sometimes even not for capital expenditure. In the future, we will refine our autoregression by collecting more data and information on battery swap business and considering in more detail to show a more accurate prediction of potential liquidity problems of CATL.

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