The Comparative Analysis of the Influence of Shanghai Composite Index and Shenzhen Component Index on Stock Return of Contemporary Amperex Technology Co. Limited (CATL)

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Abstract: CATL has been a popular choice among all the stocks in China's stock market and has been recognized by many investment institutions as a good choice for long-term holding. However, its stock return always varies in Shanghai Composite Index and Shenzhen Component Index and no previous research has been done in terms of this area. Thus, to figure out the influence each market does on CATL's stock, this research applied Capital Asset Pricing Model (CAPM) as the quantitative calculation method and made a linear regression to calculate the difference in return by analyzing the P-value, coefficients (β) and intercepts (α). The findings indicate that CATL's stock price is more highly valued by the Shenzhen Component Index while Shanghai Stock Exchange has a more significant influence on CATL's stock. In addition, the effectiveness of the CAPM model in stock valuation is further verified through the comparative analysis.

Keywords: CATL, CAPM, stock return, Shanghai composite index, and Shenzhen component index

1.   Introduction

CATL has been an active stock and a popular choice in China's stock market, especially in the renewable energy and technology category. Its stock return has been influenced to a different extent by Shanghai Composite Index and Shenzhen Component Index and the purpose of this research is to compare the influence on CATL's stock return under every two indexes.

The Shanghai Composite Index and Shenzhen Component Index are the most important Indexes in China's stock market. The first one refers to the index composed of some representative companies listed in Shanghai while the latter one refers to the index composed of some companies listed in Shenzhen. For investors, the two indexes generally play a guiding role in trading and investing, helping them to understand the stock market and to make investment decisions.

To make a comparative analysis of the influence of the two indexes on CATL's stock return, the CAPM model is adapted as the main method. Capital asset pricing has always been one of the hot topics in the field of modern finance, resulting in many related theories. The Capital Asset Pricing Model (CAPM), which was brought forward by William Sharpe in 1964 has had the greatest influence. The CAPM revolutionized modern finance [1], and its main role generally refers to the

quantitative relationship between the relevant standard deviation and the corresponding expected return of stocks, and then investigating the list but has. The "rationality" of stock with different prices, gives certain help to the price pricing of securities ready to be listed and can affect the determination of stock prices from economic changes, namely macroeconomic changes.

There are 4 main parts to this article. The first part is a description of CATL Co. in terms of company information, business category, financial performance, and stock price. The second part is the linear-regression analysis which adapts CAPM as the main method. The statistics of CATL's stock price and the corresponding Shanghai Composite Index and Shenzhen Component Index have been collected and used in the linear regression. The third part is a further discussion of the CAPM model's advantages, disadvantages, and applications. In the end, drawing the conclusion that CATL's stock price is more highly valued by the Shenzhen Component and outperformed Shanghai Composite Index while Shanghai Stock Exchange has a more significant impact on CATL's stock. The detailed analysis and discussion on the advantages, disadvantages, and applications of CAPM could also provide valuable information for the research personnel, so as to promote the healthy and stable development of the two stock markets.

2.   Company Information

2.1. Company Profile

Contemporary Amperex Technology Co. Limited (CATL) is located in Ningde, Fujian. It's the leader of new innovative technologies in the world, committed to providing superior solutions and services for new energy applications around the globe. The company's main business is using renewable energy to replace the fossil energy. Today, one-third of the world's EV batteries come from CATL.

Business category. The company has core technological advantages and a forward-looking R&D layout in battery-related fields, providing first-rate solutions and services for global new energy applications. Its business covers power battery systems, lithium battery materials, and energy storage systems, including main products such as cells, modules, battery packs, electric box, battery cabinets, ternary precursor (nickel-cobalt manganese hydroxide), ternary cathode material, etc.

2.2. Financial Performance

Overall performance. CATL has stable financial performance and is considered to achieve long-term development compared to companies in its industry, but it also has a tendency to have financial leverage risk. In 2021, its market demand grew rapidly, and the company overcame challenges such as repeated COVID-19 outbreaks and a tight supply of raw materials to strengthen industrial cooperation. It keeps ensuring supply and delivery, deepening customer cooperation to consolidate the market position, and promoting rapid business development, which showed its resilience in facing uncertainties. During the reporting period, the company achieved a lithium-ion battery sales volume of 133.41GWh, with a year-on-year growth of 184.82%, among which, a power battery system sales volume of 116.71GWh, with a year-on-year growth of 162.56%.

Analysis of CATL 's asset structure. From a static perspective, the company's current assets accounted for 57.8% in 2021, among which the proportion of monetary funds reached 50.1%; The proportion of non-current assets was 42.2%, among which the proportion of construction in progress reached 23.9%. According to the company's asset structure, it can be considered that CATL Co., Ltd. has strong asset liquidity and low asset risk.

From a dynamic perspective, the share of liquid assets decreased by 5.7% in 2021 compared to 2020. Among them, the proportion of notes receivable and accounts receivable decreased by 4.7 %, the proportion of money funds decreased by 10.5%, and the range of changes in other items was less significant. The proportion of non-current assets increased by 14.3%, among which the proportion of

construction in progress increased by 10.8%. Therefore, it can be considered that the company's immediate payment ability and liquidity of current assets weakened, and its asset risk increased.

Analysis of CATL 's debt term structure. CATL's current liabilities in 2021 accounted for 69.4%, an increased of 6.6% compared with 2020. This indicates that the company mostly uses short-term funds when using debt funds. However, due to the relatively high liquidity of current liabilities, the debt financing strategy implemented by CATL may increase its debt repayment pressure and incur higher financial risks, but its cost of liabilities will be reduced.

Analysis of the operating profit of the company. The Gross operating profit of the company is calculated as the operating income minus the operating cost. CATL achieved total operating revenue of 19.89 billion yuan in 2021, with a growth of 184.79% compared with the previous year.

Net operating profit refers to the performance achieved by the company in the process of production and business operation. CATL Co., Ltd. achieved a relatively high operating profit of 4.68 and the net profit attributable to shareholders of the listed company was 17.86 billion yuan, with an annual growth of 192.61%. Therefore, CATL Co., Ltd. is in good financial condition overall.
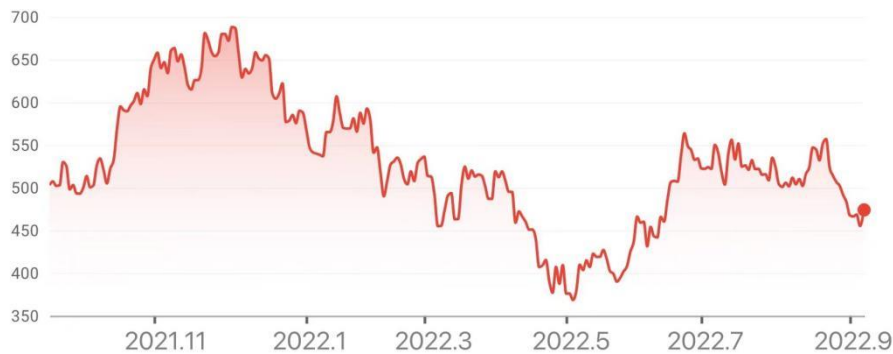
Stock price overview

Figure 1: The figure is the stock price of CATL between November 2021 to September 2022.

Till August 2022, it has a total A-share capital of 2.44 billion shares, including 1.975 billion outstanding A-shares and 465 million restricted A-shares.

The graph shows the trend of its stock price. During the past year (October 2021 to September 2022), it experienced an increase from October 2021 to December 2021 and reached its peak of 688 yuan per share. Since then has had a long declining period and hit the bottom on 9 May 2022, with a stock price of 368.5 yuan. Then there has been a steady rebound from the month end of May till July and has remained around 500 yuan per share till September 2022 (Fig 1).

3.   Linear-regression Analysis

3.1.   An introduction to Capital Asset Pricing Model (CAPM)

The CAPM is a significant area of financial management. In fact, it has even been suggested that financial management was only an academic discipline when William Sharpe published his derivation of the CAPM in 1964[2]. As the first asset pricing model to maximize investors' utility under uncertainty, it revolutionized western financial markets. As a kind of equilibrium pricing model in the transformation economy, capital is recognized and translated. This asset pricing model belongs to the category of positive economics, which reflects the results of the implementation of portfolio theory. The CAPM formula, which is provided below, illustrates the linear relationship between the return on an investment (whether in the stock market or in business activities) and its systematic risk:

$$E_{(ri)} = R_f + \beta_i\big(E_{(rm)} - R_f\big) \tag{1}$$

$E_{(ri)}$= return required on financial asset i

R_f= risk-free rate of return

β_i= beta value for financial asset i

$E_{(rm)}$= average return on the capital market

3.2. Linear-regression Analysis

$$r = r_f + \beta(r_m - r_f) \tag{2}$$

In the CAPM formula, r represents the relevant expected rate of return of investors, r_f represents the risk-free rate of return, r_m represents the relevant expected rate of return of market portfolios, and β represents the correlation coefficient of systematic risk in a portfolio.

$$r = \alpha + \beta \times r_m \tag{3}$$

Referring to the CAPM model, the linear regression formula is simplified into the above equation. The return rate of the Shanghai Composite Index and Shenzhen Composite Index is taken as the dependent variable, set respectively as different r_m, and the return rate of CATL stock is set as r. The risk-free interest rate is α, and β is the correlation coefficient of systematic risk in a portfolio.

A total of sets of returns calculated from the daily K-line data from early January 2021 to early September 2022 were used in the research. The two tables below show the linear-regression results of CATL's return rate and Shanghai Composite Index and Shenzhen Component Index:

Shanghai Composite Index

Table 1: Linear-regression result of Shanghai composite index.

	Coefficients	Standard error	t Stat	P-value	Lower 95%	Upper 95%
Intercept(α)	0.001	0.001	0.786	0.432	-0.002	0.004
Shanghai Composite Index(β)	1.026	0.029	35.528	0.000	0.969	1.083

$$y = 0.001 + 1.026x \tag{4}$$

P-value

P-value of β is 0 goes to 0 indefinitely, proving the linear regression analysis is valid and meaningful.

Coefficient of Shanghai Composite Index (β)

When β=1, it reflects that the risk of this single asset is the same as that of all market portfolios;

When β>1, it shows that the risk level of this single asset is higher than the risk of all market portfolios;

When β<1, it indicates that the risk level of this single asset is lower than the risk of all market portfolios.

The correlation between Shanghai Composite Index and return is1.026, which indicates that there's a positive correlation between x and y, and every one unit increase in x leads to a 1.026 increase in stock yield.

Intercept (α)

The intercept represents the mean value of the variable when all of the predictor variables in the model are equal to zero. In this case, intercept can be regarded as the free-risk rate, where the value of X is 0. The intercept of the Shanghai Composite is 0.001 (Table 2).

Shenzhen Component Index

Table 2: Linear-regression result of Shenzhen component index.

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept(α)	0.002	0.001	1.204	0.229	-0.001	0.004
Shenzhen Component Index(β)	1.048	0.025	42.466	0.000	1.000	1.097

$$y = 0.002 + 1.048x \tag{5}$$

P-value

P-value of β is 0, shows the linear regression analysis is valid and meaningful.

Coefficient of Shenzhen Component Index (β)

The correlation between Shenzhen Component Index and stock return is1.048, indicates a positive correlation between x and y, and every one unit increase in x leads to a 1.048 increase in stock yield, which is higher than 1.026 of the Shanghai Composite Index, indicating that Shanghai Stock Exchange has a more significant impact on CATL's stock.

Intercept (α)

The intercept is 0.002, higher than 0.001 in the Shanghai Composite Index indicates that CATL's stock price is more highly valued in the Shenzhen Stock Exchange compared to and outperformed Shanghai Composite Index.

Through the comparison of linear-regression results of the two markets, the effectiveness of the CAPM model in stock valuation is further verified.

4. Discussion

4.1. Limitations of the CAPM

As many scientific models have their limitations, the CAPM inevitably has its own drawbacks. Since it requires relatively strict assumptions, and at the same time it assumes the security market as an overly ideal and simplistic abstract market, a series of relatively strict assumptions should be made when applying the CAPM.

Firstly, in terms of market efficiency, there is no cost generated in the initial process of information acquisition, and every investor is assumed rational, carrying out capital control on their investment decisions according to the relevant mean-variance model, in which there is usually no capital intervention and relevant restrictions on loan [3-4]. In addition, the CAPM theory summarizes all the existing risk systems into a relative risk system, thus ignoring the influence of other factors on the benefit rate of individual stocks. Also, the CAPM assumes that there are sufficient stocks in the stock market to effectively offset non-systematic risks. In real life, however, it is still difficult for the researchers to meet all the conditions even if the CAPM is applied in relatively mature stock markets [5-7]. Therefore, when the assumption conditions are hard to reach, the CAPM theory has different effects in different stock markets [8-9].

Secondly, China's stock market is not fully developed in terms of inefficient mechanism and lagging operations, which cannot effectively align with various assumptions. The purpose of the speculation on the market at present is still far greater than the purposes of investment, for most of the investments are not made by rational investors, and their decision-makings also influenced by their own blindness and limitations [10]. Therefore, there are still big problems that exist in the application of the CAPM in China's stock market, and there is a big gap between the theory and reality.

Through the continuous research of some experts and scholars, the CAPM theory cannot play its due role in China's stock market and is not applicable to domestic environments. The main reason is that the variables explaining the stock return rate include not only people but also other factors. Therefore, the systemic risk in the domestic stock market is generally large, which makes it impossible to effectively reduce the risk through a diversified portfolio as emphasized by the CAPM theory. Moreover, there is still a certain distance between the stock pricing in the domestic securities market and the mechanism of the CAPM, which leads to the inapplicability of the CAPM to the current stock market.

4.2. Applications of the CAPM

CAPM can be extended to a number of sectors and is useful for portfolio selection, mispriced shares detection, portfolio effectiveness evaluation, and calculating the rate of return on firm projects.

Portfolio selection is one of the most important applications of CAPM. The beta coefficient, which is part of CAPM, is an important figure because it indicates the level of risk of a given share or even the portfolio. As a result, consumers can use this figure to help them decide which stocks to include in their investment portfolio based on their level of risk aversion. Investors who are extremely risk averse should avoid stocks with high beta coefficients and vice versa.

Another important function of CAPM is to detect mispriced stocks. CAPM can rate shares based on their prices by simply entering parameters that determine the share price, such as beta, the market price of risk, and level of risk-free return, to determine a value for the share. Once this value is determined, based on the asset's current market price, investors can speculate and either buy shares if the stock is currently undervalued according to CAPM or sell short if a share is said to be overpriced according to CAPM, too. The inverse relationship between risk and return is critical in determining whether a stock is undervalued or overpriced.

CAPM is also useful in determining the effectiveness of a portfolio. After holding a portfolio for some time, CAPM can be used to calculate the beta coefficient for the portfolio as a whole. Based on this, portfolio managers at asset management and wealth management firms can be evaluated to see if the shares they chose for the firm or client portfolio actually managed the risk appetite that the firm or client favored and requested.

As a result of the CAPM, it is also possible to calculate the required rate of return on firm projects. Due to the CAPM model, the equation can be rearranged after all other parameters are entered to provide the firm's required rate of return on a specific investment in an asset. As a result, the firm can assess whether an investment was successful in the future by determining whether the actual return on the share met, exceeded, or fell below the required rate of return.

5. Conclusion

CATL's stock price is more highly valued by the Shenzhen Component and it outperformed Shanghai Composite Index. On the other hand, Shanghai Stock Exchange has a more significant impact on CATL's stock. This finding will provide a valuable reference to people who are interested in CATL's stock no matter for investment purposes or research purposes. The detailed analysis and discussion of the advantages, disadvantages, and applications of CAPM could also provide valuable information

for the research personnel, so as to promote the healthy and stable development of the two stock markets. However, there are flaws that exist in this article. For example, it didn't give further explanations about the different influences in the two markets and only adapt CAPM as the basic method, which is not comprehensive enough to illustrate the topic.

Since China's financial market started later than developed countries, and its market conditions and developing pattern are different from those of the European and American stock markets, the factors affecting the return rate of stocks are more complex and harder to estimate. Therefore, it is not enough to explain the return rate of stock by systematic risk only, the method applied in testing stock return rate needs to be further optimized as well.

References

[1] Perold, André, & F.: The capital asset pricing model. Journal of Economic Perspectives, 18(3), pp. 3-24 (2004).

[2] Sharpe W. Capital Asset Prices. Journal of Finance (9), (1964).

[3] Ban Dongliang. Risk Analysis of Luzhou Laojiao Co., LTD based on CAPM Model. Economic Research Guide (08), pp. 114-116 (2022).

[4] Lu F.: Analysis on the application of CAPM theory in Chinese securities market, China Market (01), pp.77-78 (2014).

[5] Bao Doan.: Portfolio management with targeted constant market volatility. Insurance: Mathematics and Economics (83), pp. 134-147 (2018).

[6] Siwei Cheng, Ziran Li.: The Chinese Stock Market Volume II. Palgrave Macmillan London, China (2015).

[7] Zhang, X. D., Z. Fang, and Y. Z. Feng.: Spillover effect between Shanghai, Shenzhen and Hong Kong stock market: A comparative analysis based on Through train of Hong Kong stock. IEEE (2009).

[8] Yang Zunhan.: Test of CAPM Model and Fama-French three-factor Model in Chinese A-share market. Economic Research Guide, (08), pp.117-119 (2022).

[9] Levy, Haim.: "The Capital Asset Pricing Model in the 21st Century." Cambridge Books (2012).

[10] Jensen, M. C., Black, F., & Scholes, M. S.: The capital asset pricing model: some empirical tests. Social Science Electronic Publishing.

[11] Yang Zunhan.: The test of the CAPM model and Fama-French three-factor model in China's A-share market, Economic Research Guide (08),117-119 (2022).