Risk of CAPM Model Apply in Chinese Concept Stocks based on Python

Hechen Wang

Management and Marketing, Durham University, Durham, DH1 1NY, U.K.

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Abstract: Sharpe developed the Capital Asset Pricing Model, which was completed by Lintner and Mossing based on portfolio theory and capital market theory. The Chinses Concept stocks have a particular situation in the US stock market because of enterprises' backgrounds. The paper will apply CAPM model in two Chinese Concept Stocks NIO and LKNCY by using python to analyse data. The risks are analysed by unsystematic and systematic risks and the special situation of Chinese Concept Stock will be also discussed as factors. The data analysis through python will be more accurate and less lab or cost. The purpose of this research is to provide more objective investment suggestions to Chinese concept stocks investors.

1 INTRODUCTION

Sharpe (1964) developed the Capital Asset Pricing Model, which was completed by Lintner (1965) and Mossin (1966) based on portfolio theory and capital market theory, with a focus on the relationship between the expected return of assets and risk assets in the securities market, as well as the formation of equilibrium price. The Capital Asset Pricing Model is the foundation of modern financial market pricing theory, and it is applied in the fields of investment and corporate finance. The Capital Asset Pricing Model The theoretical and practical value of the CAPM model has been proved under ideal circumstances. CAPM model classifies risk into two types: systematic risk and unsystematic risk. Furthermore, since the US stock market permits enterprises globally to IPO and the Chinese stock market has restricted regulations.

As a result, many Chinese companies are listed on the US stock market, such as NIO and Alibaba. On the other hand, Chinese concept stocks are a group of Chinese stocks listed outside of China and include companies that are registered in mainland China and listed abroad, as well as enterprises that are registered in mainland China but have their primary business and relations in mainland China. Those stocks are heavily influenced by the expected trend of overseas investors on mainland China's economy, and they are

limited by foreign investors' lack of understanding of China.

Thus, this article will apply the close prices between 2019-2020 in python and analyze the risk of the CAPM model in Chinese concept stocks by calculating expected returns and actual returns for two Chinese concept stocks: NIO and LKNCY. More importantly, the research will provide a more productive analysis for Chinese concept stock investors.

2 LITERATURE OVERVIEW

CAPM theory has been widely adopted in the modern finance theory, and numerous researchers have studied it. Under ideal circumstances and assumptions that the investors are rational and diversified invest strictly in a portfolio from somewhere along the efficient frontier according to the rules of the Markowitz model (Markowitz, 1967), as well as the capital markets, are fully efficient markets with no frictions hindering investment, CPAM model confirms the linear relationship between risk and returns under the CAPM model showing that greater exposure to risk provides higher returns.

In addition, Black (1972) claimed that the line connecting the anticipated return on an efficient portfolio to its beta is made up of two straight line

segments, with the lower-risk section having a steeper slope than the higher-risk one. However, Dempsey (2012) argued that the facts of the experiments don't support the CAPM model. Contrary, Gençay et al. (2005) suggested that the CAPM's predictions are more meaningful in the medium to long term range. Thus, in the portfolio selection issue, CAPM may be significant decision-making challenge for most companies.

3 METHODOLOGY

First of all, expected returns and real returns will be calculated. The study CAPM model is a line equation that determines the capital return on assets. The equation of the CAPM model is:

$$E(R_i) = R_f + \beta(R_m - R_f). \qquad (1)$$

$E(R_i)$: capital asset expected return

β: sensitivity $E(R_m)$: expected return of the market

R_f: risk-free rate of interest

The beta coefficient is the sensitivity of individual stock returns relative to the overall market, and it is determined by the connection between market swings and the price variations of individual stocks or groups, implying that the model use market risk to explain the risk of individual stocks:

$$\beta = COV(i, m) / \sigma^2 \qquad (2)$$

When $\beta = 1$, the price of the security correlated to the market.

When $\beta < 1$, the price of the security less violate than the market.

When $\beta > 1$, the price of the security fluctuates more than the market.

The study uses NIO Inc. (NYSE: NIO) and Luckin Coffee Inc (OTCMKTS: LKNCY) as sample data to analyze and uses python to compute Expected returns and plot regression lines between individual security and the market portfolio. Secondly, since a risk-free asset should have zero deviation, so the U.S government ten years treasury bill is utilized as a risk-free asset.

Therefore, the Rf is calculated as 0. Thirdly, S&P 500 is applied as a market portfolio because it is the market-capitalization-weighted index of the top 500 companies in the U.S. stock market.

In addition, in order that the two stocks used as examples can be compared relatively fairly, the variables is reduced so that 'Close' data from June 1, 2019 to June 1, 2020 and data from June 1, 2020 to June 1, 2021 are chosen since Luckin Coffee Inc. has been listed on May 24, 2019.
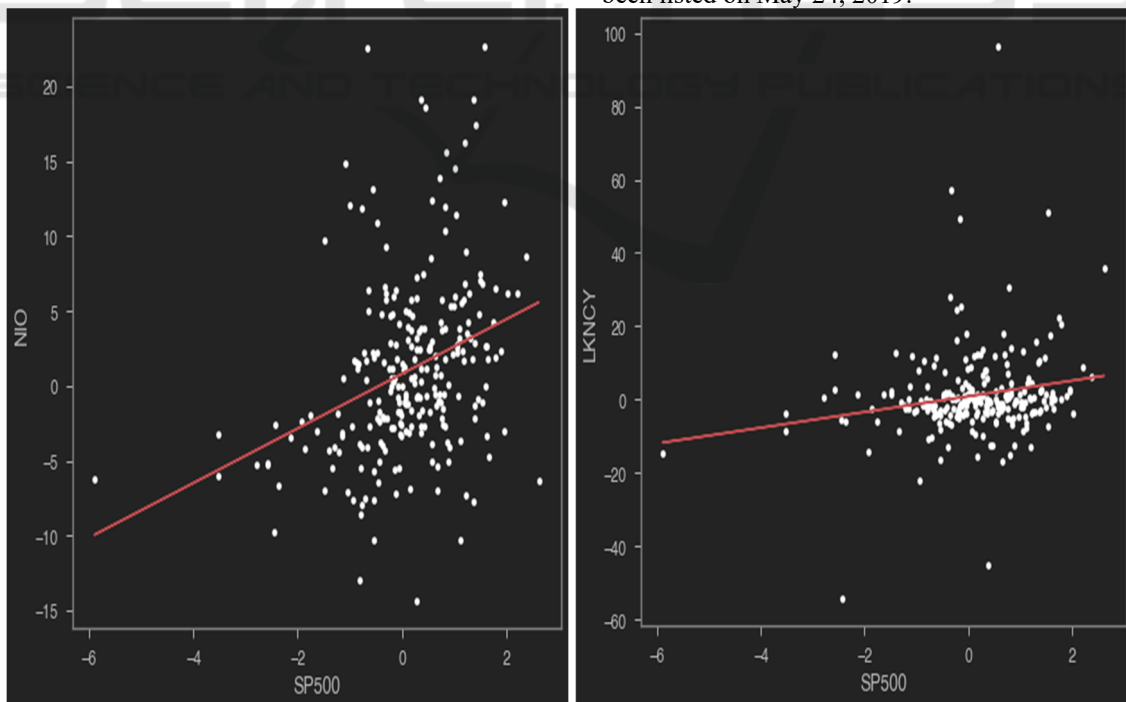

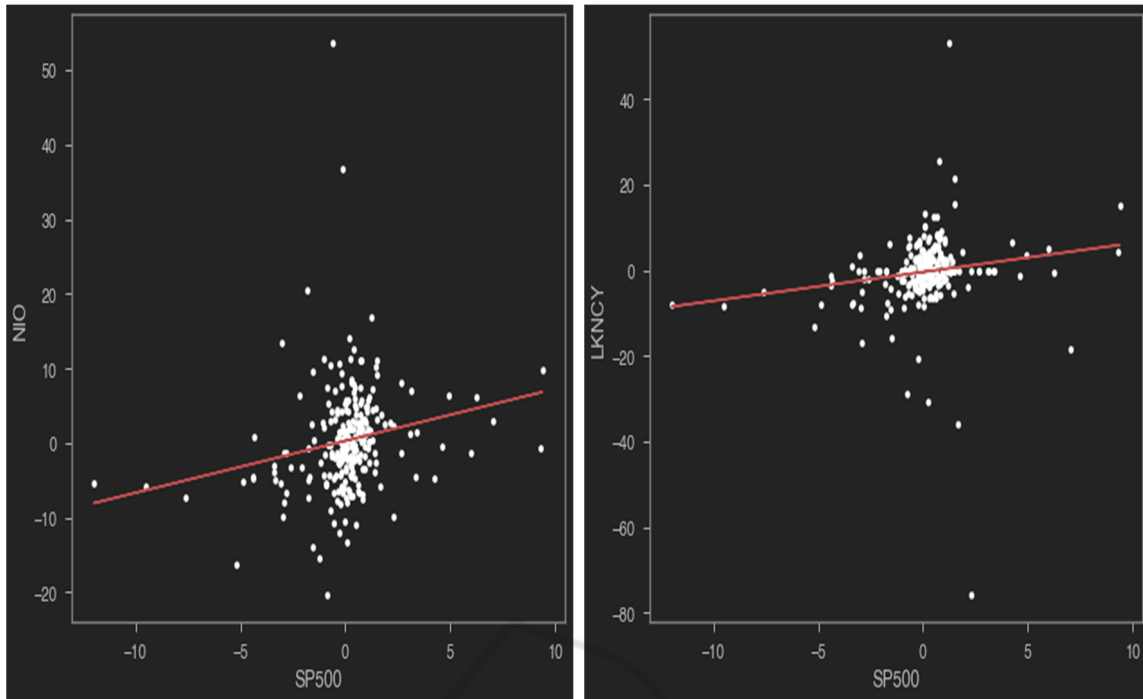Figure 1: CAPM model applied in NIO (Left) and LKNCY(Right) in 2019-2020.

Figure 2: CAPM model applied in NIO (Left) and LKNCY(Right) in 2020-2021.

Table 1: Beta coefficient, expected return and real return of NIO and LKNCY in 2019-2020.

2019-2020	Beta	expected return	real return (ROR)
NIO	0.697	11.01%	34%
LKNCY	0.674	10.65%	-90%

Table 2: Beta coefficient, expected return and real return of NIO and LKNCY in 2020-2021

2020-2021	Beta	expected return	real return (ROR)
NIO	1.824	60.92%	807%
LKNCY	2.140	71.49%	260%

According to Figure 1 and Table 1, the Beta value of two stocks from 2019-2020 are both less than 1, which means the price of the security less violate than the market.

However, from Figure 2 and Table 2, the Beta value of the two stocks are greater than 1, which means they are more sensitive than the market. Additionally, LKNCY is more sensitive than NIO. The expected return of NIO for two ranges are 11.01% and 60.92% and the expect return of LKNCY for two ranges are 10.65% and 71.49% respectively. Besides, comparing the four sets of expected return and real return data, the results indicate that all of them have the varied extent of differences. The results will be discussed in the discussion section.

4 EFFECTS OF RISK ON COMPANY VALUE

As the model mentioned above, total risk = systematic risk + unsystematic risk. Firstly, risks will be categorized as market and unsystematic risks.

Market risk refers to market risks that cannot be eliminated through diversification, such as interest rates, recession, and war. For example, in mid-March 2020, the U.S. stock market triggered a trading curb mechanism four times separately.

As a result, the Dow Jones Industrial Average reduced about 35%, which was the worst level in 100 years. The trading curb mechanism has been triggered five times in the history of the U.S. stock market and four times in 2020 alone, so this market has performed very poorly in all such cases. Delta Air Lines has dropped over 40% on March 19. Therefore, when the systematic risk is relatively difficult to avoid, when the systematic risk is high, choosing individual stocks with a beta coefficient less than one will be relatively less risky.

On the other hand, unsystematic risk, also known as unique risk, is the risk associated with a particular stock that can be eliminated by rebalancing the stock portfolio. Take Luckin Coffee Inc as an example, 2020 April, the company admitted to a fraudulent financial statement. There were indeed several cases of material misstatement of financial statements before that, however, Luckin Coffee Inc. had a tendency to ignore the material misstatements and Chinese companies listed in the U.S. were reportedly not required to comply with SEC audit and disclosure procedures because the Chinese government made some patronizing moves (Kukreja, 2021).

Thus, Luckin Coffee Inc. has been delisted from The Nasdaq Stock Market in 2021 June. Hence, this demonstrates that non-systematic risk is less market correlated, so it can be hedged by selecting several individual stocks in different sectors in a portfolio.

5 DISCUSSIONS

The discussion part will be separated in three parts:

First, the expected return differs from the real return in the following aspects; Second, the assumptions with CPAM model; Third, special situation of Chinese Concept stock.

5.1 Results from Expected and Real Return

The results from data of 2019-2020 indicate that when the beta coefficient is less than one, stocks are less sensitive compare to market volatility. Therefore, the expected return and real return of NIO in 2019-2020 the difference is not particularly unexpected. Moreover, LKNCY's underperformance is due to the

company's financial fraud scandal. Furthermore, according to the results from 2020-2021 group, the beta coefficients of both stocks are greater than one, indicating that both stocks are significantly sensitive to market volatility.

Also, because the U.S. stock market has performed well since the four crashes in 2020, so both stocks have exceeded expectations by a remarkable amount especially for the NIO.

However, what can't be ignored is that NIO has risen more than eight times also because the entire EV sector stocks are hot stocks in 2020-2021. Therefore, in the process of applying CAPM model, in order to reduce the difference between expected and real returns, it is also necessary to consider individual stocks, such as the performance of its sector in the market.

5.2 The Assumptions with CPAM Model

Firstly, the effectiveness of CAPM models is based on a number of rigorous assumptions. In the real world, these assumptions are not so easily satisfied. In principle, there is no dynamic short-selling profit behavior since the CAPM is a single period model. In fact, because the CAPM assumes that all investors have the same information and risk preferences, they all assign the same equilibrium price to assets, and because investors can expect a negative return if they deviate from the equilibrium price (due to the possibility of short selling), any rational investor will take action to avoid this behaviour.

Secondly, the model assumes that all investors are rational, but in 2020 there are many irrational investors in the market. In the particular case of covid-19, with the U.S. government giving bailouts to people and more young people losing their jobs due to the epidemic, these young risk-takers enter the stock market with their money like entering a casino. They would ignore the stock's fundamentals and enjoy more the sense of achievement of getting rich overnight. A suitable case is Gamestop (NYSE: GME), a company that financial performance was almost bankrupt, the stock has been skyrocketed because of these young irrational investors.

Thirdly, an asset's market exposure or beta, completely explains the return on an asset in the CAPM calculation, the market portfolio may not explain all of ROA in the CAPM formula. In reality, ROA may be influenced by more than just market conditions. Their contribution to ROA will be disregarded if we examine all other variables in the firm's diversified risk. As a consequence, if the

ignored variables have a substantial impact on the ROA at certain points in time, the CAPM model's findings will be skewed.

Fourthly, under various market circumstances, market capitalization weighting may provide different outcomes. For example, if a significant quantity of money flows into high-cap companies causes the index to increase under present market circumstances, market capitalization weighting will be useful in positioning positions. Otherwise, if the majority of money flows into small and mid-cap companies, the cap-weighted strategy may miss the rise or even lose money as a result of a downturn in high-cap stocks.

5.3 Special Situation of Chinese Concept Stock

The unique characteristics of Chinese stocks also increase the risk. First, most U.S.-listed Chinese companies have accurate and credible financial statements, but earnings fraud is also a possible risk. In addition to Luckin Coffee's fraudulent financial data, 2021 Guangzhou EHang Intelligent Technology Co. Ltd (NASDAQ: EH) was also found to have falsified sales data after Wolfpack's investigation.

The second point is that since most Chinese companies are based in China, there may be a lag in information about the company's operations. Moreover, investors who do not have an understanding of the Chinese culture may find it challenging to understand the company's operations, such as the reasons for Bilibili's (NASDAQ: BILI) large number of young users, in addition to the public information about the company. Therefore, this information inequality increases unsystematic risk.

6 SUGGESTIONS

The CAPM methodology's disadvantage is that the analytical model is overly subjective, and the data is dependent mainly on analysts' projections for future growth.

As a result, a sensitivity analysis will be an essential component of the CAPM model study. In addition, in the application of the CAPM model to Chinese stocks, apart from using historical data to calculate expected returns, more consideration should be given to non-systematic risk factors such as the truthfulness of financial statements.

So, investors may want to hedge risk by choosing multiple different types of stocks or by buying

Chinese concept stocks that have been established for a long time and have a large user base in China.

7 CONCLUSIONS

In conclusion, the study uses data from two Chinese Concept stocks compare with S&P 500 by applying the CAPM model formula and contrasts expect the return and real return to analyse the risk of the CAPM model in two types. Despite the CAPM model's numerous flaws in fitting actual data, the CAPM model's correct derivation procedure and essence as an equilibrium model define its place in the area of financial economics. In applying this model to Chinese Concept stocks, more consideration needs to be given to the non-systematic risks associated with unique attributes. The limitation of this study is the inadequacy of the sample data and the fact that the politics of China and the U.S. are not considered at risk. More researches need to be done in the future.

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