Electrical Vehicle Companies' Quantitative Stock Selection Strategy Based on Fundamental Factors in China A-Share Market

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Abstract. As one of the most rapidly evolving industries, Electric Vehicles (EV) have drawn significant attention due to their tremendous growth and development potential. In this paper, we used a multifactor model to develop a quantitative stock selection strategy based on fundamental factors of EV companies in the China A-share market. We scrutinized 33 fundamental factors of 12 listed EV companies from February 1, 2016, to July 15, 2023, and narrowed them down to 11 useful factors by assessing their IC values. The backtest revealed that using a 30-day rolling weighting method to compound the 11 factors to select top-performing EV stocks could yield an additional 19.15% annualized return compared to the benchmark.

Keywords: quantitative stock selection strategy, fundamental factors, multifactor model, electrical vehicle company

1 Introduction

With the development of technologies, quantitative investment has become one of the most popular investment methods. It relies on mathematical models, statistical analysis, and computer algorithms to achieve high returns with low risks. It has seven main advantages: systematic decision-making, repeatability, data-based decision-making, transaction automation, rapid response capabilities, risk control capabilities, and fund management capabilities [1]. The most widely used model in stock selection is the multifactor stock selection model, which is built on the theoretical foundations of the Capital Asset Pricing Model (CAPM), Arbitrage Pricing Theory (APT), Fama-French three-factor and five-factor models, among others. The definition of the multifactor model is finding effective factors with a high correlation with the stock return rate from the candidate factor pool and using these effective factors as the standard for stock

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selection [2]. The general idea of constructing a multifactor stock selection model is to extract effective factors from the candidate factors first, and then establish an appropriate model based on the effective factors to predict stock price changes and use the prediction results as the basis for stock selection [3].

People usually decide whether to choose a factor from the factor pool based on the factor of Information Coefficient (IC), which is the correlation coefficient between each factor and stock returns [2]. This study used Rank IC to calculate the correlation coefficient since the data was not normally distributed.

The global focus on environmental sustainability has led to significant growth in EVs. In 2021, global EV sales reached 6.6 million units, doubling from the previous year. In 2022, the stock of EVs on the road reached 26 million units, a 60% increase from 2021. Pure electric and plug-in hybrid vehicle sales also reached 10 million units, with China accounting for 60% of the total Global EV market [4,5,6,7]

This research is about quantitative investment strategy on EV companies in China A-share market by selecting the most influential fundamental factors. We aimed to find a trading strategy that can generate high Alpha value, i.e., the excess return of an investment above the benchmark returns when adjusted for risk. Twelve EV manufacturers were included in this study with 33 fundamental factors being analyzed. Eleven factors were filtered by evaluating their IC values. The backtest showed using the 30-day rolling weighting method to compound the 11 factors to select top performance EV stocks could result in additional 19.15% (Alpha value) annualized return than the benchmark, China Securities' Smart and Electric Vehicle Index (H11052.XSHG).

2 Methods

Quantitative investment research requires a large amount of high-quality data, making a reliable data source crucial. Researchers can freely access abundant data for their studies thanks to major quantitative trading platforms in China. This article utilized the RiceQuant quantitative investment platform (https://www.ricequant.com/) to obtain financial data for research purposes. Founded in 2014, RiceQuant is a quantitative platform that integrates data, investment research, risk performance attribution, and integrated asset management functions. The distinctive feature of RiceQuant is its provision of rich and well-organized financial data and user-friendly and efficient API interfaces for professional investors. In this research, we used RQData's Python API to access to the financial data and analyze the information.

Our research focused on 12 electric passenger car manufacturers listed on the A-share market in China, excluding companies that produce new energy buses. The companies included in our study are BYD (SZSE: 002594), Great Wall Motors (SSE: 601633), SAIC Motor (SSE: 600104), Changan Automobile (SEE: 601633), GAC Group (601238), Seres (SSE: 601127), JAC Motors (SSE: 600418), BAIC BluePark New Energy Technology (SSE: 600733), Foton Motor (SSE: 600166), Zotye Auto (SZSE: 000980), Jiangling Motors (SZSE: 000550), and Dongfeng Motor (SSE: 600006).

The sample period for this study spanned 13 years from February 2016 to June 2023. The factor screening period for selection was from February 1st, 2016, to July 15th, 2023, totaling more than 7 years. The selected 12 stocks traded normally during the sample period and were listed for more than three months in February 2016.

To establish a fundamental factor-based stock selection model, it is necessary to first choose a pool of candidate factors. In this study, we primarily selected candidate factors from the perspective of company fundamentals. Specifically, we considered profit factors, growth factors, operational efficiency factors, earnings quality factors, safety factors, valuation factors, and size factors, comprehensively examining multiple dimensions. For each factor category, we selected 4 to 6 factors and conducted effectiveness tests specifically for the 12 selected stocks (Table 1). The selected factors were based on the Information Coefficient (IC) obtained by the report from quantitative team of China International Capital Corporation Limited (CICC). The CICC team calculated IC values of stocks in three indexes: entire market, the CSI 300, and the CSI 500 (excluding ST stocks, suspended stocks, stocks with limit-up or limit-down, and stocks listed for less than one year) during January 4, 2010, to April 1, 2022 [8]. In each factor category, the IC values were ranked, and the top 50% of the factors were assigned scores based on the ranking, with the highest-ranking factor receiving a score of 10, and the second highest receiving 9, and so on. Finally, the scores for the factors in each of the three indexes were added up, and the top 50% of the factors with the highest scores were selected into our candidate factor pool, ending up with 33 factors.

Table 1. Candidate Fundamental Factor Pool

Factor category	Factor Abbreviation	Factor Full Name	Calculation Method
Profit Factor	ROE-TTM	ROE TTM	Net Profit TTM/Net Assets
	ROA-TTM	Return on Assets TTM	Net Profit TTM/Total Assets
	ROIC-TTM	return on capital TTM	Operating profit before interest and tax TTM/input cost
	CFOA	Total Assets Cash Recovery Rate TTM	Net Operating Cash Flow TTM/Total Assets
	ROED	Changes in ROE	Return on net assets for the current period TTM-Return on net assets for the previous period TTM
Growth Factor	NP-Q-YOY	Profit margin growth rate (single quarter year-on-year)	(Net profit for this quarter - Net profit for the same quarter last year) / Net profit for the same quarter last year
	OP-Q-YOY	Operating profit growth rate (single quarter year-on-year)	(Operating profit for the current quarter - Operating profit for the same quarter last year) / Operating profit for the same quarter last year
Operational Efficiency Factor	OPMD	Operating margin change	Operating profit margin of the current period - operating profit margin of the previous period
	OPM-TTM	Operating Margin TTM	Operating Profit TTM/Operating Income TTM
	GPMD	Gross Margin Change	Gross profit margin of the current period TTM - Gross profit margin of the previous period TTM
	NPM-TTM	Net Profit Rate TTM	Net Profit TTM/Operating Income TTM
	OPtoGR-TTM	Operating Profit to Gross Margin	Operating Profit TTM/Gross Profit TTM
	ATD	Change in asset turnover	Current asset turnover ratio TTM - previous asset turnover ratio TTM
Earnings Quality Factor	CSR	Cash ratio	Cash and cash equivalent assets/current liabilities
	CSRD	Changes in Cash Ratio	Current Cash Ratio - Previous Cash Ratio
	APRD	Changes in the proportion of accrued profits	Proportion of accrued profit for the current period - Proportion of accrued profit for the previous period
	APR-TTM	Proportion of accrued profit	Accrued Profit TTM/Operating Profit TTM
Safety Factor	CCR	Cash flow debt ratio	Net Operating Cash Flow/Current Liabilities
	DAD	Changes in asset-liability ratio	Current asset-liability ratio - previous asset-liability ratio

	CCRD	Change in cash flow to debt ratio	Current cash current debt ratio - previous cash current debt ratio
	QR	Quick ratio	(Current assets - inventory - non-current assets due within 1 year - deferred expenses - prepayments) / current liabilities
	CUR	Current ratio	Current Assets/Current Liabilities
Valuation Factor	EP-TTM	Reciprocal P/E Ratio	Net profit TTM/total market capitalization
	DP	Dividend yield	Dividend TTM/total market capitalization
	OCFP-TTM	Operating cash flow TTM to total market capitalization	Operating Cash Flow TTM/Total Market Cap
	BP-LR	Reciprocal price-to-book ratio	Net assets/total market capitalization in the latest financial report
	SP-TTM	Reciprocal price-to-sales ratio	Operating Income TTM/Total Market Cap
	FCFP-TTM	Free Cash Flow TTM vs Total Market Cap	Free Cash Flow TTM/Total Market Cap
Scale Factor	Ln-FC	Logarithm of circulating market capitalization	Logarithm of circulating market capitalization
	Ln-MC	Logarithm of total market capitalization	Logarithm of total market capitalization
	FC-MC	Circulating market capitalization ratio to total market capitalization	Circulating market value/total market value
	FC	Circulating market value	Circulating market value
	MC	The total market capitalization	The total market capitalization

Next, we cleaned the data, including removing outliers and conducting neutralization processing, which resulted in the calculation of IC values for 33 factors. Generally, when the absolute value of the average IC for a single factor is greater than 0.03, it is considered to have good predictive power [2,9]. We selected factors with absolute IC values greater than 0.03 and removed the rest of the factors. Subsequently, we conducted a correlation test on the selected factors to reduce dimensionality. For two factors with a correlation greater than 0.85, we considered them to have high correlation and retained only the factor with a higher IC value. Finally, we combined the selected 11 factors into a single composite factor in equal weighting and 30-day rolling weighting respectively to compound the factor, calculated its IC value, and used this factor as the EV stock selecting strategy to trade the stocks and backtested this strategy. Our trading strategy was only buying the top 5 stocks with equal value in the portfolio and the stocks were adjust monthly. Since we researched on EV stocks, we chose China Securities' Smart and Electric Vehicle Index (H11052.XSHG) as our benchmark in the backtest [10]. This index includes 50 companies in EV manufacturing, power system, software, charging piles in China A-share market and the weight of a single stock does not exceed 15%. The stocks in the portfolio for backtesting were adjusted every six months.

3 Results and Discussion

After filtering the factors by IC value and correlations, we resulted in 11 factors as showed in Table 2.

Table 2. Eleven Fundamental Factors with High IC Values in Chinese EV Stocks

Growth Factor	NQ-Q-YOY
Operational Efficiency Factor	NPM-TTM
	OPtoGR-TTM
Safety Factor	DAD
	CCRD
	CUR
Valuation Factor	DP
	OCFP-TTM
	BP-LR
	SP-TTM
Scale Factor	FC

The backtest showed both EV stock selecting strategies of equal weighting and 30-day rolling weighting methods generated higher return than the benchmark (Table 3). The rolling weight strategy had a better performance than the equal weighting strategy and also gained additional 19.15% annualized return than the benchmark. Both strategies had similar maximum drawdown and volatility with the benchmark which meant the strategies shared similar risks of the EV industry but gain extra returns (Fig.1, Fig2).

Table 3. Results of two EV stock selecting strategies

		Value	Annualized Return	Sharpe Ratio	Maximum Drawdown	Annualized Volatility
Equal Weighting	Net	3.4890	19.01	0.52	44.11	31.03
	Alpha	1.2396	3.04	0.00	49.63	25.70
	Benchmark	2.8147	15.51	0.40	46.73	30.89
30-day Rolling Weighting	Net	7.9553	34.57	0.98	45.41	32.08
	Alpha	3.3992	19.15	0.64	47.71	25.35
	Benchmark	2.3403	12.95	0.32	46.73	30.69

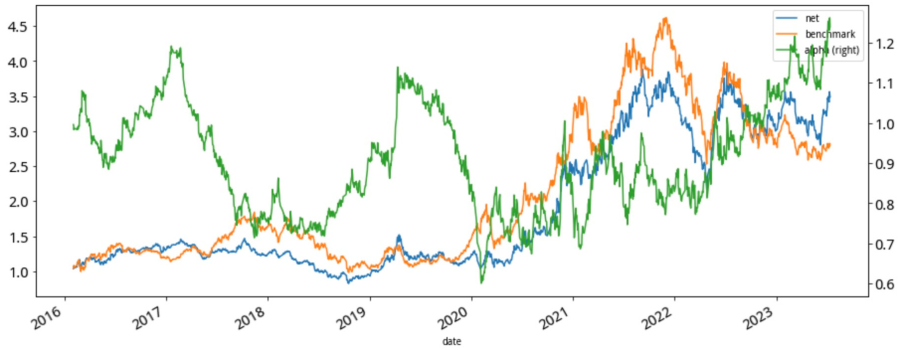

Fig. 1. The performance of portfolio using equal weighting method vs benchmark

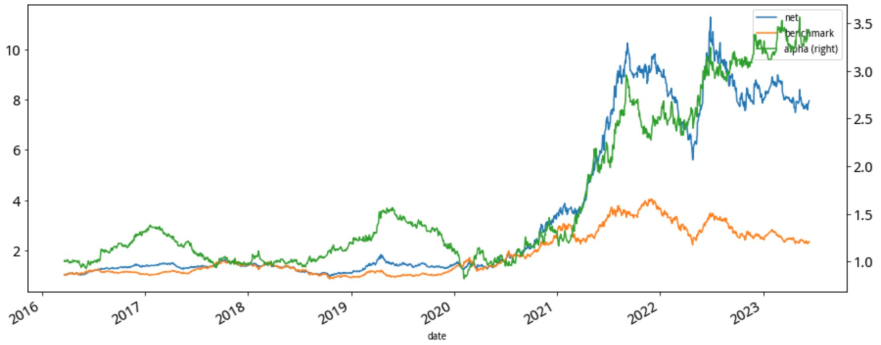

Fig. 2. The performance of portfolio using 30-day rolling weighting method vs benchmark

The result also showed that the instability of the compound factor's Alpha, for example, a decline happened from mid of 2019 to 2020. We can also see a steep increase of Alpha during the first half of 2021. More studies need to be done to improve the performance of the compound factors. For example, we can include the factors of technical analysis and other fundamental factors such as government factors and analyst factors. We didn't consider the impact of events and news in this strategy, with may cause fluctuations and changes in the industry and public's perception [11]. So in future's study, we can integrate news and discussion on social media to develop additional factors to improve Alpha value and stability.

4 Conclusions

We studied seven major fundamental factors (profit factor, growth factor, operating efficiency factor, earnings quality factor, safety factor, valuation factor and scale factor) of 12 EV listed companies in China A-share market from February 1, 2016, to July 15, 2023, and constructed a compound factor by using multifactor model. The backtest by using 30-day rolling weighting method to synthesize factor and select top performance companies resulted additional 19.15% annualized return than the benchmark. This research contributes to the development of quantitative stock selection strategy for EV stocks in China A-Share market.

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