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Volatility Prediction of China's New Energy Stock Market Based on OVX jumps

Yaoyang Yi[1], Hehuan Li[2], Junjie Bian[3]

[1] School of Finance, Anhui University of Finance & Economics, Bengbu Anhui 233030, China

[2] School of Languages and Media, Anhui University of Finance & Economics, Bengbu Anhui 233030, China

[3] School of Accountancy, Anhui University of Finance & Economics, Bengbu Anhui 233030, China

Abstract

In recent years, with the development and improvement of the new energy industry, the trend of its transition from supplementary energy to alternative and mainstream energy has been apparent. This paper focuses on the results of OVX jumps in predicting the volatility of China's new energy stock market, and explores the degree of improvement of the model's prediction under different time periods. Firstly, we provide a preliminary understanding of volatility prediction through the background of the era and literature review, then analyze the results of volatility prediction of China's new energy stock market based on OVX jumps, and finally put forward relevant countermeasure suggestions. The findings of this paper can help traders to grasp the changes in the domestic new energy market and understand its risk profile. At the same time, to a certain extent, it also enriches the related research on volatility, which is of great significance for grasping the direction of the stock market.

Keywords

OVX jumps, new energy stock market, volatility forecast.

1. Introduction

Due to the non-renewable nature of traditional energy, in recent years, countries have opened up the strategic layout of new energy industry based on political and economic games. On the one hand, crude oil, as an important strategic resource and energy material, is inextricably linked to economic operation and world economic development, and its volatility index is an important weathervane in the energy market and an important factor affecting the macroeconomy. On the other hand stocks are important assets in a standard investment portfolio, and stock market prices are seen as a useful indicator of future economic performance. In this paper, we will capture the OVX jumps and analyze the prediction results of the volatility of China's new energy stock market. And based on this, we will explore the degree of improvement of the model's prediction under different time periods. This will help market participants to forecast more accurately and further grasp the changes in the domestic new energy market and understand its risk profile.

2. Literature Review

The research in this paper is related to three types of literature. First, it examines the existence of time-varying jumps in OVX and the capture of the OVX jump phenomenon. Min Liu et al. (2021) use an EGARCH model that introduces structural mutation points and combines the generalized error distribution (GED) and the skewed student's t-distribution to model the

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volatility of the WTI and the CSI Mainland New Energy Theme Index. It is found that the impact of negative news on market volatility is stronger than the impact of positive news on market volatility, and that the choice of EGARCH model combined with structural mutation points is applicable to study the volatility between the international crude oil futures market and China's new energy stock market.Anupam Dutta et al. (2022) estimate the entire sample period through a GARCH-jump model based on the the results of daily data. It reveals that time-varying jumps do exist in OVX with time-varying jump strength. and the correct specification of the GARCH-jump model in capturing the OVX jumps.Ugur Soytas et al. (2022) show that the time-varying jump intensities are persistent through the full-period analysis.Feng Liu et al. (2023) quantify the impact of policy changes and jump dynamics on the oil price by building a joint EGARCH-MIDAS-ARJI model for oil price volatility, and their results show that the jump component is much larger in periods of lower volatility and relatively smaller in periods of higher volatility.

The second is the methodology in the literature for predicting volatility in China's new energy stock market based on the HAR-RV family of models.The empirical results of Shephard et al. (2010) on volatility prediction using daily data show that the HAR model has a better performance compared to the GARCH and stochastic volatility models. Gong Xu et al. (2020) evaluate the forecasting ability of the HAR family of volatility models using the MCS test. It reveals that among the existing classical or frontier HAR family models, considering both the leverage effect and the structural mutation factor can improve the model's forecasting ability of market volatility.Anupam Dutta et al. (2022) show that the HAR-RV-JI method has the lowest RMSE statistics for daily and weekly volatility models through the forecasting evaluation of RMSE and DM tests. And it produces more accurate volatility forecasts compared to the now available HAR-RV methods.

The third is on the empirical side to further explore the degree of improvement in model forecasting under different time periods. Gong Xu et al. (2020) use the MCS test to evaluate the forecasting ability of the HAR family of volatility models with leverage versus their counterparts without leverage, and further explore the model with the strongest forecasting ability for out-of-sample volatility in the Chinese stock market.Anupam Dutta et al. (2022), based on the results of the MZ model regression, show that for the weekly volatility model, the HAR-RV-JI method produces the best forecasts. Moving to the monthly volatility model, HAR-CJ-JI outperforms the other models. For the daily volatility model, the HAR-RV-IV-JI model provides optimal forecasts.

3. Volatility Prediction Results of China's New Energy Stock Market Based on OVX Jumps Under Different Market Conditions

3.1. Bull market conditions

During the bull market, the market as a whole shows an upward trend, investor sentiment is more optimistic, and a large amount of money flows into the market. At this time, the forecast of the garch-midas-ji model based on ovx jumps shows that the volatility of the new energy stock market has risen, but the overall is relatively stable. On the one hand, the optimistic atmosphere of the market makes the development prospects of new energy companies generally favorable, and investors are full of confidence in the long-term investment value, which to a certain extent cushions the impact of the ovx jump. On the other hand, the instability in the oil market reflected by the ovx jump, in a bullish environment, some investors saw it as an opportunity for the development of new energy, believing that new energy will replace traditional energy sources, which further pushed the new energy stock market up and offset some of the volatility factors. For example, when the ovx jumped, the model predicted a brief rise in volatility in the new energy stock market, but then, due to market optimism and

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continued capital inflows, volatility quickly returned to a relatively stable level and new energy stock prices continued to rise.

3.2. Bear market conditions

Entering the bear market, the overall market downturn, investor confidence is frustrated, capital outflow from the market. In this case, the model predicts a significant increase in the volatility of the new energy stock market. ovx jumps in the bear market on the new energy stock market has been amplified by the negative impact of the instability of the oil market exacerbated investor panic. Due to the poor economic environment, the future development expectations of new energy companies are also affected, and the market expects lower earnings growth for new energy companies. When ovx jumps, investors have sold new energy stocks, resulting in a sharp drop in stock prices and a sharp rise in volatility. For example, in a certain bear market phase, ovx has a large jump, the model accurately predicts that the volatility of new energy stock market climbs rapidly, and the stock price continues to fall, and the decline is far more than the performance during the bull market when ovx jumps.

3.3. Oscillator market conditions

In the oscillator market, the market lacks a clear upward or downward trend, and stock prices fluctuate within a certain range. The garch-midas-ji model based on ovx jumps predicts that the volatility of the new energy stock market shows frequent fluctuations. ovx jumps become an important trigger for market fluctuations, and whenever ovx jumps, the volatility of the new energy stock market changes immediately. Because in the oscillator market, investors are more cautious in their decision-making and sensitive to market signals, the uncertainty of the energy market brought by ovx jumps makes investors constantly adjust their investment strategies and frequently buy and sell new energy stocks, which leads to frequent fluctuations in the volatility of new energy stock market. For example, over a period of time, ovx has several small jumps, and the model predicts that the volatility of the new energy stock market will also rise and fall many times, and the stock price will fluctuate more in the oscillatory range.

3.4. Policy adjustments to market conditions

The new energy industry is strongly influenced by policy. When the government introduces policies to encourage the development of new energy, such as increasing subsidies and relaxing market access, the model predicts that the volatility of the new energy stock market may increase in the short term, but will stabilize in the long term. Favorable policies make the market for new energy companies in the future earnings expectations increased significantly, attracting a large influx of funds, the short-term stock price volatility increased. However, with the gradual implementation of the policy and corporate development on track, volatility will gradually stabilize. On the contrary, if the policy is tightened, such as reducing subsidies and raising industry standards, the model predicts that volatility will rise rapidly and stock prices will face downward pressure. This is because unfavorable changes in policy will cause investors to worry about the future development of new energy companies, and capital will flow out, leading to a decline in stock prices and a rise in volatility. The impact of ovx jumps in the process of policy adjustment is also more complex. When the policy is favorable, the negative impact of ovx jumps on the new energy stock market may be weakened; while when the policy is unfavorable, the negative effect of ovx jumps will be further highlighted.

3.5. Critical Incident Market Conditions

When encountering unexpected major events, such as global public health events and geopolitical conflicts, the garch-midas-ji model based on ovx jumps predicts that the volatility of the new energy stock market will fluctuate dramatically. Sudden major events can increase market uncertainty dramatically, ovx jumps intensify, and the new energy stock market is

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impacted by multiple factors. On the one hand, the event leads to the restriction of economic activities, the production and sales of new energy companies are affected, and corporate earnings are expected to decline. On the other hand, investor panic spreads and a large number of stocks are sold, resulting in plummeting stock prices and a sharp rise in volatility. In the early stage of the outbreak of a global public health event, the ovx jumped dramatically, and the model accurately predicted that the volatility of the new energy stock market spiked instantly, and the stock price fell sharply. As the event develops and the market gradually digests the impact of the event, the model predicts a gradual return of volatility, but it is still higher than the pre-event level and fluctuates more frequently, reflecting the market's continued concern about the future development of the new energy industry.

4. Suggested Responses

4.1. Recommendations for countermeasures in bull market conditions

4.1.1. Investors

Moderate increase in risk exposure: In a bull market with an overall upward trend, the garch-midas-ji model based on OVX jumps predicts that the volatility of new energy stocks is relatively flat and has room to rise. Investors can moderately increase the proportion of new energy stocks in their portfolios to gain higher returns while controlling risks. For example, the proportion of new energy stocks in the portfolio, which originally accounted for 30% of the portfolio, could be increased to 40%-45%.

Focus on industry leaders: Funds tend to flow into high-quality companies in a bull market. Investors should focus on leading companies in the new energy industry, which tend to have stronger risk resistance and growth potential. Even if the OVX jump brings short-term volatility, leading companies are more likely to recover quickly and continue to grow thanks to their technology, market share and brand advantages. For example, Ningde Times, LONGi Green Energy, etc., investors can hold long-term and appropriate position.

Diversification into different segments: The new energy industry covers a number of segments such as photovoltaics, wind power and new energy vehicles. Despite the overall bull market, the performance of each segment may vary. Investors can diversify their funds into different segments to reduce the risk of fluctuations in a single area. For example, maintain a certain ratio of funds invested in new energy automobile companies to those invested in photovoltaic companies, such as 4:6 or 3:7.

4.1.2. Market regulators

Strengthen market monitoring and guidance: Pay close attention to the potential risks arising from the OVX jump and bullish optimism in the new energy stock market, such as excessive speculation. We have issued market risk alerts through official channels to guide investors to invest rationally. At the same time, we will strengthen the supervision of market trading behavior to prevent market manipulation, insider trading and other illegal behaviors, and maintain a fair and impartial market.

Encourage long-term investment: formulate relevant policies to encourage investors to make long-term investments, such as tax incentives and other policy support for investors who hold new energy stocks for a long period of time. This will help stabilize the market, reduce excessive trading triggered by short-term fluctuations and promote the healthy development of the new energy stock market.

4.1.3. Business decision makers

Accelerate expansion and innovation: Take advantage of the favorable financing environment and market demand brought about by the bull market to accelerate the pace of business expansion. Increase R&D investment and technological innovation to enhance product

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competitiveness. For example, new energy automobile enterprises can accelerate the R&D and production of new models, and photovoltaic enterprises can improve the conversion efficiency of batteries to consolidate and expand their market share.

Strengthening strategic cooperation: Strengthen strategic cooperation with upstream and downstream enterprises to stabilize the supply of the industrial chain. In a bull market, cooperation between enterprises is easier to reach. For example, new energy automobile enterprises signed long-term supply contracts with battery suppliers to ensure a stable supply of raw materials and reduce the risk of raw material price fluctuations due to OVX jumps.

4.2. Recommendations for countermeasures in bear market conditions

4.2.1. Investors

Reducing Risk Exposure: The market is moving downward in a bear market, and the model based on OVX jumps predicts that the volatility of the new energy stock market has increased dramatically. Investors should decisively reduce the proportion of new energy stocks in their investment portfolio and move their funds to relatively safe assets, such as bonds and money funds. For example, reduce the proportion of new energy stocks from 40% during the bull market to 20%-15%.

Focus on defensive new energy companies: Some new energy companies have a certain degree of defensiveness in the bear market, such as companies engaged in new energy infrastructure construction and operation, their cash flow is relatively stable. Investors can focus on such enterprises, appropriate allocation of their stocks to reduce investment losses.

Utilizing hedging tools: Hedging tools such as stock index futures and options are used to hedge the risks of new energy stock portfolios. For example, investors can buy put options so that when the price of new energy stocks falls due to OVX jumps and bear market effects, the gains from the options can make up for part of the stock investment losses.

4.2.2. Market regulators

Stabilizing market confidence: A series of policy measures have been introduced to stabilize the market, such as reducing transaction costs and suspending the implementation of some policies that are not conducive to market stability. Stabilize investor confidence and prevent excessive market panic through policy guidance

Strengthening support for enterprises: Provide policy support to new energy enterprises facing difficulties, such as tax breaks and financial subsidies, to help them tide over difficulties and maintain stable operation of the market.

4.2.3. Business decision makers

Cost cutting and structural optimization: Cut unnecessary expenses across the board, optimize the internal structure of the enterprise and improve operational efficiency. For example, reduce investment in non-core business, streamline personnel, lower operating costs, and enhance the survivability of the enterprise in the bear market.

Seek diversified financing channels: In addition to traditional equity financing and bank loans, actively seek other financing channels, such as issuing corporate bonds and introducing strategic investors. Diversified financing channels can reduce the enterprise's dependence on a single financing method and alleviate capital pressure.

4.3. Suggestions for countermeasures in oscillating market conditions

4.3.1. Investors

Flexibility to adjust the portfolio: The model based on OVX jumps in the shock market predicts frequent fluctuations in the volatility of the new energy stock market. Investors should maintain the flexibility of the investment portfolio and make timely adjustments according to market fluctuations. When the market rises, increase the proportion of new energy stocks

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appropriately; when the market falls, reduce holdings in a timely manner. For example, set a volatility threshold, when the volatility exceeds the threshold, reduce a certain percentage of new energy stocks, and vice versa, increase holdings.

Adopt a swing operation strategy: Take advantage of the market's oscillating fluctuations. Buy when the stock price falls to a certain extent, and sell when it rises to a certain extent, to earn the difference in price. However, it should be noted that the swing operation of the investor's technical analysis ability and market judgment ability requires a high degree of investors need to operate with caution.

Attention to the rotation of market hotspots: market hotspots tend to rotate rapidly in the oscillating market. Investors should pay close attention to the hotspot changes in different segments within the new energy industry, and adjust the investment direction in a timely manner. For example, when the photovoltaic plate has become a market hot spot, timely transfer of funds from other underperforming new energy segments to the photovoltaic plate.

4.3.2. Market regulators

Maintaining market order: Strengthening market supervision to ensure trading order in the market during shocks. Crack down on malicious market manipulation, dissemination of false information and other behaviors that disrupt the market order, and provide a fair and transparent trading environment for market participants.

Strengthening information disclosure management: New energy enterprises are required to disclose corporate operating information and financial status in a timely and accurate manner, so as to reduce market fluctuations caused by information asymmetry. At the same time, the regulator can issue regular industry analysis reports to guide investors to correctly recognize the market situation.

4.3.3. Business decision makers

Optimize products and services: Optimize the products and services of enterprises in a timely manner according to changes in market demand. For example, new energy automobile enterprises can adjust model configurations and launch more cost-effective products according to consumers' demand preferences in a shaky market.

Expanding emerging markets: in the shock market, the domestic market competition is fierce, enterprises can try to expand emerging markets, looking for new growth points. For example, some new energy companies can export their products to countries along the "Belt and Road" to develop international market share.

4.4. Policy Adjustment Market Condition Response Recommendations

4.4.1. Investors

Layout in advance: Pay attention to the direction of the national policy adjustments to the new energy industry, and lay out the relevant enterprises in advance. When the policy is favorable, such as increasing subsidies and relaxing market access, investors can buy stocks of new energy companies with development potential in advance. For example, before the introduction of the policy, in line with the policy-oriented new energy enterprises for research and screening, once the policy is announced, quickly buy the relevant stocks.

Pay attention to the effect of the policy on the ground: after the policy adjustment, pay close attention to the implementation of the policy on the ground. If the policy implementation process encountered problems or the effect is less than expected, timely adjustment of investment strategy. For example, if the new energy subsidy policy in the implementation of the process of delayed issuance of funds and other issues, may affect the corporate cash flow, investors should consider reducing the relevant corporate stocks.

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4.4.2. Market regulators

Ensure effective implementation of policies: Strengthen the supervision and inspection of the implementation of policies for the new energy industry to ensure that the policies can truly benefit enterprises and the market. For problems arising in the process of policy implementation, coordinate and solve them in a timely manner to ensure the stable operation of the market.

Adjustment of policies based on market feedback: Collecting market feedback on policy adjustments and optimizing and adjusting policies according to the actual situation. For example, if a policy leads to excessive market volatility or unfair competition, the policy will be revised in a timely manner.

4.4.3. Business decision makers

Positively respond to policies: Enterprises should actively respond to national policy adjustments and adjust their development strategies according to policy guidance. If the policy encourages new energy enterprises to carry out technological innovation, enterprises should increase R&D investment and develop new technologies and products in line with policy requirements.

Strengthening communication with the government: Maintain close communication with government departments to keep abreast of policy developments and seek policy support. At the same time, provide feedback to the government on the problems encountered by enterprises in the process of policy implementation, so as to provide reference for policy optimization.

4.5. Suggested responses under market conditions for critical incidents

4.5.1. Investors

Stay calm and stop loss in time: Sudden major events lead to a sharp increase in market uncertainty, and the model based on OVX jumps predicts dramatic fluctuations in volatility in the new energy stock market. Investors should remain calm and avoid blindly following the wind. For investments that have incurred large losses, stop losses in a timely manner to prevent further expansion of losses.

Focus on the sustainability of the impact of the event: Analyze the long-term impact of sudden major events on the new energy industry. If the event is only a short-term impact, and the long-term development trend of the new energy industry remains unchanged, investors can buy stocks of high-quality companies at a lower price after the market panic subsides. For example, at the beginning of the global public health incident, the new energy stock market fell sharply, but with the epidemic under control, the new energy industry is gradually recovering, investors can layout at this time.

4.5.2. Market regulators

Prompt stabilization of the market: In the event of a major emergency, the regulator should take prompt measures to stabilize the market, such as suspending trading and issuing emergency announcements. At the same time, coordinate the resources of all parties to ensure the normal operation of the market.

Formulation of contingency policies: Depending on the nature and impact of the event, targeted contingency policies should be formulated. For example, in the event of sudden geopolitical conflicts that lead to volatility in the energy market, policies to stabilize the supply of new energy markets will be put in place to safeguard corporate production and market demand.

4.5.3. Business decision makers

Formulate contingency plans: Enterprises should formulate contingency plans in advance to cope with major emergencies, and make clear the measures to be taken in the event of an

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incident. For example, during an epidemic, a new energy company should make contingency plans for employee safety and protection, production plan adjustment, supply chain protection, etc.

Finding new opportunities: Finding new opportunities in a crisis. Sudden major events may change the structure of market demand, enterprises should be keen to capture these changes and adjust the direction of products and services. For example, during the epidemic, the demand for new energy logistics vehicles increased, the relevant enterprises can adjust the production plan in time to meet market demand.

5. Conclusion

Under different market conditions, the volatility of China's new energy stock market based on OVX jumps shows different change characteristics. Financial market participants and policy makers should flexibly apply the above countermeasure suggestions according to market changes and make reasonable investments and decisions in order to achieve sustainable development and risk control in the new energy sector. Both investors in portfolio adjustment, market regulators in policy formulation and implementation, and corporate decision makers in corporate strategic planning need to fully consider the impact of OVX jumps and changes in market conditions on the new energy stock market, so as to grasp the opportunities and cope with the challenges in the complex and changing market environment.

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