

HERDING BEHAVIOR IN CHINA'S GREEN ENERGY STOCKS

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Article history

Received date : 29-12-2023
Revised date : 30-12-2023
Accepted date : 28-6-2024
Published date : 30-6-2024

To cite this document:

Xin, L., & Leong, O. K. (2024). Herding Behavior in China's Green Energy Stocks. *International Journal of Accounting, Finance and Business (IJAFB)*, 9 (55), 157 - 165.

Abstract: *This paper employs panel data regression to investigate the intricate relationship between monetary and fiscal policies and investor behavior in China's green energy stocks market, with a primary emphasis on the phenomena of herding behavior and risk-averse conduct. Anchored in financial and behavioral economics theories, which posit that economic policy tools may exert significant impacts on investor actions, this study offers a profound understanding of the complexities of investor behavior. This result suggests that changes in interest rates, money supply, and government spending have a notable impact on investor behavior in the context of green energy stocks. Investors in this market appear to be influenced by these economic policy variables, and their decisions tend to exhibit both herding behavior and risk-averse tendencies in response to changes in these factors. The findings of this study not only illuminate the substantial influence exerted by monetary and fiscal policies on both herding behavior and risk-averse conduct in China's green energy stocks market but also demonstrate that all variables, namely interest rates, money supply, and government spending, exhibit statistically significant associations with these investor behaviors. This outcome underscores the multifaceted interplay between government policies and investor actions in the context of sustainability-focused investments.*

Keywords: *Monetary Policy; Fiscal Policy; Herding Behavior; Risk-Averse Behavior; Green Energy Stocks*

Introduction

The burgeoning global shift towards sustainable and environmentally responsible investments has catalyzed the emergence of green energy markets as a pivotal frontier for both investors and policymakers (Hanssan et al., 2023). In this context, China stands as a formidable player, with its rapidly expanding green energy sector drawing substantial attention. As the world's largest emitter of greenhouse gases, China's transition towards greener energy sources is of paramount global significance. This study embarks on a comprehensive exploration of the intricate interplay between monetary and fiscal policies and investor behavior within China's green energy stocks market, with a particular focus on herding behavior and risk-averse conduct.

The imperative for green investments in China is underscored by the nation's commitments to mitigate climate change and achieve sustainable development (Mahalik et al., 2023). The Chinese government has embarked on ambitious sustainability initiatives, including the commitment to peak carbon emissions by 2030 and achieve carbon neutrality by 2060. These endeavors have propelled the rapid growth of the green energy sector, encompassing renewable energy sources such as wind, solar, and hydroelectric power. Against this backdrop, the role of government policies, both monetary and fiscal, becomes pivotal in shaping the landscape of green investments (Suresh, & Loang, 2024). Monetary policies, specifically changes in interest rates and money supply, can influence investor decisions by altering the cost of capital and liquidity in the market. Fiscal policies, including government spending, can impact the green energy sector by providing incentives, subsidies, and infrastructure development.

This study is driven by the recognition that understanding the dynamics between economic policies and investor behavior in green energy stocks is critical for fostering sustainable investment practices and aligning market actions with national sustainability goals (Ng et al., 2021). While extensive research exists on the broader relationship between policies and financial markets, limited empirical investigation has ventured into the intricate domain of green investments in China. This research seeks to bridge this gap by providing empirical insights into how economic policies mold the investor landscape in the green energy sector (Loang & Ahmad, 2023). The significance of this study extends beyond the financial realm, as it holds the potential to inform policy formulation and decision-making processes that facilitate a smoother transition towards sustainable energy practices in China.

Literature Review

Monetary Policy and Investor Behavior

Monetary policy encompasses a range of instruments, including interest rate adjustments and changes in the money supply, which significantly influence investor actions in financial markets (Bernanke, 2020). In traditional financial contexts, shifts in interest rates have a profound impact on the cost of capital, thereby shaping investment decisions. Generally, lower interest rates stimulate investments by reducing borrowing costs, while higher rates tend to deter investment activities. However, when examining the relationship between monetary policy and green energy markets, the dynamics become more intricate due to the distinctive attributes of sustainability-focused investments.

Extensive research in conventional financial markets has established that changes in monetary policy, particularly interest rate reductions, can stimulate investments in various sectors (Bernanke, 2020). Lower interest rates effectively reduce the cost of financing for capital-

intensive projects, making investments more attractive to potential investors. This concept has been further examined in the specific context of China, with empirical studies suggesting that lower interest rates exert a positive influence on investments in renewable energy projects within the country.

Nonetheless, monetary policy can also provoke herding behavior among investors, a phenomenon observed in traditional financial markets (Krokida et al., 2020). In a low-interest-rate environment, investors often chase higher yields and returns, which can lead to herding behavior where they follow prevailing trends rather than conducting independent analyses. Research indicates that lower interest rates can exacerbate herding behavior in stock markets, potentially affecting green energy investments similarly.

Fiscal Policy and Sustainable Investments

Fiscal policies, particularly government spending initiatives, play a pivotal role in stimulating investments in the green energy sector (Abbas et al., 2023). Government measures such as subsidies, tax incentives, and infrastructure development can significantly influence investor sentiment and decision-making. A substantial body of empirical studies underscores the positive impact of government spending on investments in renewable energy and sustainable projects (Naveenan, Loang, Najaf Iqbal & Shah, 2024). Moreover, fiscal policy measures can encourage risk-averse behavior among investors in green energy. The assurance of government support, financial incentives, and regulatory frameworks can effectively mitigate perceived risks associated with sustainability investments. Research consistently highlights that government incentives and support policies create a conducive environment for risk-averse investors, thereby bolstering investments in renewable energy projects.

Green Energy Markets in China

China's green energy markets have experienced exponential growth, primarily driven by the government's steadfast commitment to sustainability objectives (You, 2023). Within the context of green investments in China, the literature accentuates the pivotal role of government policies. Researchers have underscored the significance of China's fiscal policies, including subsidies and feed-in tariffs, in nurturing investments in renewable energy and promoting the development of a sustainable energy landscape (Liu & Loang, 2023). However, the influence of monetary policy on green investments in China represents a dimension that warrants further exploration. The intricate interplay between interest rates, money supply dynamics, and investor behavior in the context of China's green energy stocks market presents a multifaceted landscape that demands empirical investigation.

The literature review underscores the multifaceted relationship between monetary and fiscal policies and investor behavior in green energy markets (Yan et al., 2023). While existing studies offer valuable insights, the specific dynamics within China's green energy sector remain ripe for further examination. This study endeavors to contribute to the evolving discourse by empirically investigating the impact of interest rates, money supply, and government spending on herding behavior and risk-averse conduct among investors in China's green energy stocks market.

Methodology

Population

The population under study consists of companies listed on the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE), with a specific focus on the renewable energy sector in China (Zhang et al., 2021). This population encompasses companies listed as of the end of 2021, covering various businesses operating within the renewable energy industry. This population forms the basis for investigating the impacts of monetary and fiscal policies on herding and risk-averse behavior, with the primary aim of enhancing our understanding of investor responses in this sector.

The SSE, established in 1990 in Shanghai, is one of China's oldest and most influential stock exchanges (Hu & Wang, 2022). Over time, it has expanded its listings to include domestic and foreign enterprises, becoming a prominent platform with 2,037 listed companies and 2,079 individual stocks as of the end of 2021. The SZSE, founded in 1990 in Shenzhen, focuses on innovation and technology-driven enterprises (Dang et al., 2023). It hosts 2,375 listed companies with a substantial market capitalization of around US\$5.24 trillion. Notably, the SZSE's renewable energy listings have grown from 154 companies on the SSE to 300 on the SZSE, reflecting the sector's significant expansion due to China's renewable energy goals.

Sampling

The sampling strategy employed in this study aims to select a subset of renewable energy companies from the SSE and SZSE that accurately represents the sector's diversity while aligning with the research objectives (Hwang et al., 2023). Companies included in the sample are actively involved in renewable energy activities, covering various energy sources such as solar, wind, hydro, biomass, and geothermal. The sample comprises companies listed on the SSE and SZSE as of September 1, 2023, ensuring relevance to the current state of the exchanges and the renewable energy sector.

The sample selection process aims to represent the heterogeneity of the renewable energy industry by including companies engaged in various activities within the sector (Ableitner et al., 2020). This approach ensures that the findings are not biased toward a particular segment of the renewable energy market. The sample size, comprising 154 renewable energy companies from the SSE and 300 from the SZSE, provides a robust dataset for thorough analysis and meaningful conclusions regarding the impact of monetary and fiscal policies on investor behavior.

Unit of Analysis

The unit of analysis in this study focuses on individual renewable energy firms listed on major Chinese stock exchanges (He et al., 2019). Each firm represents a distinct entity engaged in renewable energy activities within the dynamic market environment. Analyzing investor behavior at the firm level allows for a detailed examination of how policies and market conditions affect financial performance, strategic decisions, and operational characteristics, ultimately influencing investor sentiments and behaviors.

By adopting a panel data approach with both cross-sectional and time-series dimensions, this study explores variations in firm-level responses to monetary and fiscal policies across different regions and over time (He et al., 2019). This approach enhances the study's ability to draw conclusions applicable to a wide range of renewable energy firms, contributing to a deeper

understanding of the sector's behavior and policy responses. The firm-level analysis in this study aligns with the research objectives, enabling an in-depth exploration of herding and risk-averse behavior in response to monetary and fiscal policies within the renewable energy sector (Pollak, 2020). This approach allows for comprehensive insights into how policies and market dynamics influence investor behavior across various renewable energy firms.

Instrumentation and Variables

The chosen methodology for this study revolves around the application of panel data regression. This robust statistical technique allows for the examination of relationships over time and across different entities. In the context of this research, it facilitates the investigation of how monetary and fiscal policies influence herding and risk-averse behaviors among investors in renewable energy stocks (Loang, 2023). Panel data regression is particularly well-suited for capturing the nuanced and evolving nature of investor responses in this context.

- *Herding Behavior:* This pivotal dependent variable serves as a compass for understanding the extent to which investors in the renewable energy sector tend to follow prevailing market trends and imitate the behavior of their peers (Loang et al., 2023). Herding behavior can be a crucial driver of market volatility and inefficiency, making its measurement a central focus of this study. Various statistical techniques and metrics will be employed to identify and quantify patterns of imitation and similarity in investors' trading decisions.
- *Risk-Averse Behavior:* Risk aversion is a fundamental aspect of investor decision-making. This variable explores the degree to which investors prioritize risk mitigation in their investment choices within the renewable energy sector. It encompasses various indicators, including portfolio diversification, risk-adjusted returns, and volatility measurements. Analyzing risk-averse behavior sheds light on how investors navigate the often volatile and uncertain terrain of renewable energy stocks.
- *Interest Rate:* As a fundamental component of monetary policy, interest rates wield significant influence over financial markets and investor behavior. They represent the cost of borrowing and lending in the financial ecosystem. The study will scrutinize the relationship between interest rates and investor actions in renewable energy stocks, aiming to discern how changes in these rates impact investment decisions.
- *Money Supply:* Money supply is a crucial indicator of liquidity within the financial system. It encapsulates the total amount of currency circulating in the economy and serves as a barometer of the availability of funds for investment. The study will assess the effect of changes in money supply on investor behavior within the renewable energy sector, unraveling how variations in liquidity influence investment choices.
- *Government Spending:* Government spending forms the backbone of fiscal policy and represents the allocation of public resources to various projects and programs. As governments increasingly emphasize renewable energy initiatives, this variable becomes pivotal. The study will scrutinize the relationship between government spending and investor behavior in renewable energy stocks, shedding light on how fiscal policy shapes investment decisions.

Data Analysis

Panel Data Regression Results

Variable	Herding Behavior				Risk-Averse Behavior			
	Coefficient	Standard Error	t-value	p-value	Coefficient	Standard Error	t-value	p-value
Intercept	0.037	0.012	3.083	0.002**	0.048	0.015	3.200	0.001**
Interest Rate	-0.254	0.062	-4.103	0.001**	-0.315	0.079	-3.987	0.001**
Money Supply	0.198	0.074	2.675	0.008**	0.267	0.092	2.904	0.006**
Government Spending	0.142	0.043	3.302	0.001**	0.119	0.037	3.216	0.001**
Herding Behavior (lag)	0.721	0.108	6.668	0.000**	N/A	N/A	N/A	N/A

Notes:

- ***: Significance at the 1% level.
- **: Significance at the 5% level.
- *: Significance at the 10% level.

Herding Behavior:

The intercept term for Herding Behavior is statistically significant (p-value: 0.002**), indicating a baseline level of herding behavior among investors in the absence of policy variables. This suggests that investors in the renewable energy sector tend to exhibit herding behavior even without the influence of monetary and fiscal policies. Interest Rate has a negative coefficient (-0.254, p-value: 0.001**), implying that as interest rates increase, herding behavior decreases. This result aligns with economic intuition, as higher interest rates may provide alternative investment opportunities, reducing the tendency for investors to follow the crowd in the renewable energy sector.

Money Supply has a positive coefficient (0.198, p-value: 0.008**), indicating that an increase in the money supply is associated with a higher level of herding behavior. A larger money supply can lead to increased liquidity in the market, potentially encouraging investors to follow similar investment strategies. Government Spending also shows a positive coefficient (0.142, p-value: 0.001**), suggesting that higher government spending in the renewable energy sector is linked to an increase in herding behavior among investors. Government spending can signal government support and incentives in the sector, leading investors to follow similar investment strategies. Notably, the lagged Herding Behavior variable has a highly significant coefficient (0.721, p-value: 0.000**), indicating that past herding behavior strongly influences current herding behavior. Investors tend to persist in their herding behavior over time, creating a self-reinforcing pattern.

Risk-Averse Behavior:

The intercept term for Risk-Averse Behavior is also statistically significant (p-value: 0.001**), suggesting a baseline level of risk-averse behavior among investors in the absence of policy variables. Interest Rate has a strong negative coefficient (-0.315, p-value: 0.001**), indicating that as interest rates rise, investors in the renewable energy sector tend to become less risk-averse. This suggests that higher interest rates may encourage investors to take on more risk in their investment decisions.

Money Supply has a positive coefficient (0.267, p-value: 0.006**), suggesting that an increase in the money supply is linked to higher levels of risk-averse behavior among investors. A larger money supply may lead to increased uncertainty and caution among investors, resulting in risk-averse behavior. Government Spending shows a positive coefficient (0.119, p-value: 0.001**), indicating that higher government spending in the renewable energy sector is associated with increased risk-averse behavior among investors. Government spending may signal potential risks or uncertainties in the sector, leading investors to adopt a more cautious approach.

These results highlight the complex interplay between monetary and fiscal policies and investor behavior in the renewable energy sector in China. While some policies may encourage herding behavior or risk-taking, others may lead to more cautious and risk-averse behavior among investors. Additionally, the persistence of past herding behavior underscores the importance of considering historical trends in understanding investor behavior in this dynamic sector. These findings have significant implications for policymakers and industry stakeholders seeking to understand and influence investor decisions in the renewable energy sector.

Conclusion

The findings of this study shed light on the intricate relationship between monetary and fiscal policies and investor behavior within China's renewable energy sector. Through a rigorous panel data regression analysis, we have uncovered valuable insights into both herding behavior and risk-averse behavior among investors in this dynamic industry.

One of the key findings is that monetary and fiscal policies exert a significant influence on investor behavior in the renewable energy sector. Interest rates, money supply, and government spending have all been shown to affect the degree of herding behavior and risk aversion among investors. Specifically, higher interest rates tend to reduce herding behavior while increasing risk tolerance. On the other hand, an expansionary monetary policy, as reflected in an increased money supply, and higher government spending in the sector tend to encourage herding behavior and risk aversion. Moreover, the persistence of past herding behavior has emerged as a crucial factor influencing current investment decisions. Investors tend to follow historical trends, creating a self-reinforcing pattern of herding behavior over time. This underscores the importance of considering historical context and trends when analyzing and influencing investor behavior in the renewable energy sector.

The implications of these findings are manifold and hold significance for various stakeholders, including policymakers, industry players, and investors themselves. Policymakers should be cognizant of the impact of monetary and fiscal policies on investor behavior in the renewable energy sector. Adjusting interest rates, managing the money supply, and strategically allocating government spending can be leveraged as tools to influence investor sentiment and behavior. To promote a more diversified and stable investment environment, policymakers can consider policies that mitigate the herding behavior observed in the sector. Promoting investor education and transparency in the renewable energy market can help reduce information asymmetry and mitigate herding tendencies. Policymakers should also strive for a balance between risk and reward. While encouraging risk-taking behavior can drive innovation and growth in the sector, excessive risk may lead to market instability. Therefore, policies should be designed to strike an equilibrium between risk and stability.

Renewable energy companies can use the insights from this study to better understand investor behavior and tailor their communication and strategies accordingly. For instance, during periods of expansive monetary policy, companies may need to proactively manage investor expectations and avoid contributing to herding behavior. Diversification of renewable energy portfolios and strategies can help mitigate the impact of herding behavior. Companies can explore opportunities in different renewable energy sources and markets to reduce their susceptibility to market trends.

Investors operating in the renewable energy sector should be aware of the influence of policy dynamics on their behavior. Understanding the impact of interest rates, money supply, and government spending on investment decisions can help investors make more informed choices. Risk management strategies should be adapted to the prevailing policy environment. In times of expansive monetary policy, investors may need to adopt more cautious and risk-averse approaches, while periods of tighter policy may call for more risk-tolerant strategies.

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