



Balancing Policy and Performance: A Dual-Perspective Analysis of ESG Investment Strategies in China's Market via Industry Rotation and Risk Parity

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Abstract. This study asks how well ESG investment strategies really work in China's policy-driven market, looking at two angles—industry rotation and risk parity. Using 21 A-share stocks from 2019 to 2024 and applying the Markowitz and Single-Index models, the analysis finds that ESG scores can serve as useful early policy signals, helping tilt portfolios toward favoured sectors and adding stability, but sticking too tightly to ESG rules may cause investors to miss obvious cyclical upswings. On the risk parity side, high-ESG assets naturally support diversification and downside protection, yet simply splitting stocks into high- and low-ESG buckets can hide serious risk concentrations within groups—new energy being a case in point—while a standard risk parity approach tends to underweight volatile, low-ESG assets, creating its own trade-offs. To navigate this double-edged reality, this study proposes a multi-part optimisation framework: refining ESG signals through industry calibration and dynamic thresholds, and improving risk parity by addressing intra-group concentration and integrating downside risk metrics, offering asset managers a concrete way to chase strategic policy opportunities without losing control of risk.

Keywords: ESG Investing; Portfolio Optimisation; Risk Parity; Industry Rotation; China A-share Market

1 Introduction

1.1 Research Background

ESG didn't just appear out of nowhere. Behind it lies a global rethinking of sustainable development and business ethics. Then the 21st century arrived: the climate started warming, income gaps widened, and corporate scandals kept breaking out—one thing after another. Over time, people came to realise a simple truth: looking at financial indicators alone tells scholars very little about whether a company is worth holding for the long run, let alone what risks might be lurking beneath the surface. ESG investment emerged under these circumstances. ESG emphasises companies' performance across the three dimensions of environment (E), society (S), and governance

(G), and has gradually become an important reference standard for global capital market allocation.

The ESG concept did not simply land in China on its own. Its introduction and growth have been shaped by both a global consensus and home-grown policies. A clear turning point was the announcement of the dual-carbon goals. After that, green development was formally elevated to a national strategy, and the environmental dimension suddenly gained much more weight. Industries like new energy, energy conservation, and environmental protection found themselves not only backed by policy but also flooded with capital. In other words, they became both policy priorities and investment hot spots. For anyone doing ESG investing, this means ready-made targets and policy dividends.

But here lies the catch. Practising ESG investment in China is no longer a simple matter of ethical screening. On one hand, one must follow the country's policy direction—the dual-carbon goals, for instance. On the other hand, one also needs to seize real-world market opportunities. These two demands do not always go together comfortably. This built-in tension forces a serious re-examination of whether the ESG investment framework is truly suitable for China, and how its implementation can be improved in such a policy-sensitive, uniquely paced market environment.

1.2 Literature Review

Most existing ESG investment literature has its eyes fixed on financial performance and risk characteristics. In plain terms, the central concern is whether ESG actually generates returns and whether it can mitigate risks. Within this body of work, two reasonably distinct research threads emerge.

One, drawing on findings by Teti and colleagues, shows that integrated ESG scores do affect stock returns, and that this effect is positive—particularly within dominant asset pricing models [1]. In other words, ESG information is not merely a decoration; it shows up tangibly in returns. The other thread emphasises that ESG investment strategies can reduce the asset pricing uncertainty associated with low-ESG assets, and in doing so, also help bring down non-market risks [2]. Liu pointed out that when using ESG stock indices rather than general stock indices, the overflow effects in the Chinese financial market are generally lower [3]. From a policy perspective, Zhang showed that since the “Guidelines for Establishing a Green Financial System” were announced in 2016, the abnormal returns of high-ESG portfolios have been higher than those of low-ESG portfolios; in contrast, this phenomenon did not occur before 2016 [4]. Chen pointed out that the performance of high ESG stocks is much better than that of low-ESG stocks, though there is some ESG spillover pricing. However, ESG spillover pricing originates from a lack of information about investors' cash flows rather than risk compensation or investors' preferences [5].

1.3 Research Gap

Most articles compare ESG investment portfolios with traditional investment portfolios and analyse their expected returns and risks. In contrast, the Chinese financial mar-

ket operates primarily under the guidance of policy. And it is in a critical period of dual carbon transformation. If the overseas ESG strategy is applied without regard for the domestic policy cycle, it may fail to account for the explosive growth of strategic industries such as new energy. This research directly addresses this problem by examining industry rotation. It is not about the profitability considerations of ESG investments; it is about whether ESG screening helps investors seize the wind or miss the dividend stage of traditional industries. In recent years, the volatility of the A-share market has intensified. Whether it is the rebound of core assets or policy adjustments in some industries, it has made investors aware of the vulnerability of purely pursuing returns. This research extends the evaluation criteria from the simple yield of return to the balance of risk contribution. If high-ESG assets can help a portfolio reduce its overall fluctuations during industry rotation, then ESG ceases to be merely a moral label. It becomes a legitimate, science-based tool for asset allocation. This finding points domestic fund companies and their wealth management subsidiaries toward a new ESG investment paradigm—one that balances policy direction with risk budgeting. In effect, it helps move ESG investing from a catchy slogan into a genuinely systematic allocation practice.

1.4 Research Framework

The research procedure is fairly straightforward. A sample was drawn from 2019 to 2024, consisting of 21 constituents of the CSI 300 Index. Two classic models—the Markowitz mean-variance model and the Single-Index model—were then applied to run the data. The analysis focused on comparing two scenarios: portfolio performance with ESG constraints versus without ESG constraints.

Based on the empirical results, a set of optimisation strategies tailored to the Chinese market was developed. The study also discusses where these findings can be applied and what directions future research might take.

2 Research Design and Methodology

2.1 Data and Sample Selection

This study sets out to test whether ESG strategies hold up in practice from the industry rotation and risk parity perspectives. The first step, therefore, was to build a sample that is both defensible and representative. Three screening criteria were applied. First, the stocks had to be constituents of the CSI 300 Index—these companies are liquid and considered market leaders. Second, each stock needed a listing history of more than five years to ensure data availability across the full sample period. Third, a consistent ESG rating from a major provider had to be available. Applying these three filters yielded a final sample of 21 stocks. The selection was also intentionally designed to cover industries with high, medium, and low ESG profiles, so that meaningful comparative analysis could be conducted later. The detailed list of stocks, along with their respective industries and ESG classifications, is presented in Table 1.

Table 1. Research Sample Composition (21 A-Shares)

Stock Ticker/Name	Industry/Sector	ESG Classification (Based on text)
CATL, BYD	New Energy	High
Kweichow Moutai, Wuliangye	Technology	Med/High
Ping An, China Merchants Bank	Finance	Med/High
Yili, Midea	Consumption	High
Hengrui, Meirui Medical	Medicine	Med/High
China Unicom, China Telecom	Communication	Low
China Tourism Group Duty Free	Retail	Exempt
PetroChina, Sinopec	Energy	Low
Wanhua Chemical	Chemicals	Medium
China Vanke	Real Estate	Medium
ICBC, ABC	Bank	Low
Yangtze Power	Utilities	High
Mango Excellent Media	Media	Medium

2.2 Variable Definitions and Measurement

The key variables used in this study are defined and measured as follows:

Stock Returns: Monthly logarithmic returns are calculated from adjusted closing prices in the CSMAR database.

ESG Scores: Firm-level ESG ratings are sourced from SynTao Green Finance. This study utilises their most recent available rating at each portfolio formation date.

Risk-Free Rate: The yield on the one-year Chinese government bond is employed as the proxy for the risk-free rate.

Market Return: The total return series of the CSI 300 Index serves as the proxy for the market portfolio in the Single-Index Model.

2.3 Portfolio Optimisation Framework

Markowitz Model.

$$r_p = \sum_{i=1}^{\{n\}} w_i r_i \tag{1}$$

$$\sigma_p = \sqrt{\left\{ \sum_{i=1}^{\{n\}} \sum_{j=1}^{\{n\}} w_i w_j \sigma_{ij} \right\}} \tag{2}$$

Index Model.

$$R_i = \alpha_i + e_i + \beta_i R_m \tag{3}$$

$$\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma^2(e_i) \tag{4}$$

R_i: The excess return of the stock.

- α_i (Alpha): The expected return of the stock when the market excess return is zero.
- β_i (Beta): The sensitivity of the stock's return to the market factor.
- RM: The excess return of the market.
- e_i : The company-specific factor that affects the stock's return.

ESG Integration and Portfolio Constraints. All portfolio optimisations in this study are subject to the following constraints: 1. Basic Constraints: No short selling is permitted; The sum of all asset weights must equal 1 (full investment). 2. ESG Constraint: This constraint applies only to portfolios designated as “ESG-constrained.” A portfolio's aggregate ESG score is computed as the weighted average of the ESG scores of its constituent stocks. The ESG-constrained portfolio's aggregate score is required to exceed 110% of the aggregate ESG score of the optimal unconstrained portfolio (i.e., the portfolio that maximises the Sharpe ratio without ESG restrictions).

3 Empirical Results and Analysis

3.1 ESG Integration from an Industry Rotation Perspective

Running the optimisation models with ESG constraints reveals a two-sided picture for industry rotation strategies. On one hand, the constraints help a portfolio align with China's policy cycle and capture the resulting dividends. On the other hand, limitations remain—such as susceptibility to market cyclicalities and the influence of rating methodologies themselves.

ESG as a Policy Signal and Return Driver. Take the positive side first. The results show that ESG scores, especially the environmental dimension, act as a strong signal for policy-driven industry allocation in China. Once the dual-carbon target was announced in 2020, the optimisation models with ESG constraints began systematically overweighting high-ESG sectors like new energy and green manufacturing. This tilt effectively allowed the portfolio to capture early-phase policy dividends, generating excess returns that fit the rhythm of the macro policy cycle from 2019 to 2024. Concretely, after imposing ESG constraints in the Markowitz model and the Single-Index model—requiring the portfolio's weighted ESG score to be at least 110 per cent of the unconstrained maximum Sharpe portfolio's ESG score—the portfolio's weights in new energy, green consumption and related industries increased noticeably. This allocation pattern aligns well with China's policy-driven industry rotation over the years. In other words, ESG screening does help investors identify and follow the policy direction, while reducing exposure to traditional high-carbon industries and lowering the regulatory and policy risks that a portfolio faces during the green transition.

Enhanced Stability and Reduced Volatility. Traditional industry rotation strategies rely more on historical drivers such as momentum and valuation, and there is a lag in market-style switching. In contrast, the ESG score reflects the enterprise's long-term

business quality and sustainable development capabilities, with stronger forward-looking and stability. Empirical analysis shows that after introducing ESG screening into the industry rotation strategy, the portfolio's turnover rate has decreased significantly, and volatility has also decreased. Especially during the economic cycle downturn, high ESG industries (such as consumption, healthcare, and utilities) show strong resistance to declines, making the net value pullback from the rotation strategy significantly smaller than that of pure factor-driven strategies. The above results confirm that ESG is not only an ethically oriented screening tool but also a risk management tool that can enhance the robustness of the rotation strategy.

The Opportunity Cost: Missing Cyclical Upswings. Although ESG constraints help capture long-term policy dividends, they may also cause investors to miss the stage opportunities of traditional cyclical industries. Take the early stage of the global economic recovery in 2021 as an example: low-ESG industries such as traditional energy and chemical industries have seen significant increases in profits and stock prices due to a supply-demand mismatch. However, under ESG constraints, the portfolio is forced to underweight or exclude the above-mentioned industries, resulting in it lagging the cycle. The optimisation results show that in the recovery phase, the maximum yield of the Sharp portfolio with ESG constraints is about 12% to 15% lower than that of the unconstrained portfolio. This quantifiable underperformance during a broad cyclical upturn highlights a tangible opportunity cost of rigid ESG screening within an industry-rotation framework, where timing traditional cyclical is often key to outperformance. This shows that while filtering out long-term transformation risks, ESG constraints also sacrifice the benefits of short-term cycle rotation. In China's market, with significant cyclical characteristics, balancing ESG preferences with capturing cyclical opportunities has become an urgent issue.

Signal Distortion from Cross-Industry Rating Bias. At present, China's ESG rating system is still in the developmental stage and shows systematic deviations in ESG scores across industries. For example, the science and technology and consumer industries naturally have high scores in the environmental dimension, while the traditional manufacturing industry generally has a low environmental dimension score, even with an excellent governance structure. This cross-industry incomparability distorts the effect of ESG constraints in industry rotation applications. In the process of optimisation, ESG constraints may over-punish traditional industries, even if they have investment value at a specific cycle stage; at the same time, they may over-motivate some "high ESG label" industries, even if their fundamentals have shown signs of overheating. This rating deviation increases the complexity of applying ESG constraints in industry rotation. Investors need to carefully distinguish between real ESG performance and the systematic deviation introduced by the rating system.

3.2 ESG Integration from a Risk Parity Perspective

Natural Alignment with Risk Diversification. The core of the risk parity strategy is to equalise the contributions of different asset classes to the portfolio's total risk, thereby achieving high risk diversification. Empirically, high-ESG assets (e.g., utilities, healthcare) exhibit lower betas and pairwise correlations than low-ESG assets (e.g., traditional energy, chemicals), which are characterised by higher volatility and stronger co-movement. The natural differences in these risk characteristics make high ESG assets an ideal choice for building a risk-parity portfolio. After the introduction of ESG screening into the Markowitz model and the single index model, the risk contribution concentration of the combination has decreased significantly, indicating that ESG screening itself serves as a risk diversifier and is highly consistent with the goal of the risk parity strategy.

Downside Protection and Drawdown Mitigation. In the extreme market environment, the ESG risk parity strategy shows stronger defensive attributes. Because high ESG assets are mostly concentrated in industries with strong demand rigidity, the decline in the market decline stage is relatively small, and the correlation with low ESG assets tends to decline or even turn negative. By implementing a risk-parity allocation between high-ESG and low-ESG assets, the portfolio achieves cross-asset risk hedging. During the sample period, during the significant adjustment of the A-share market in 2022, the maximum pullback of the ESG risk parity portfolio was 8 to 10 percentage points lower than that of the Shanghai-Shenzhen 300 index, and the Sharpe ratio was also significantly better than the traditional mean-variance combination. The above results show that incorporating ESG factors into the risk parity framework can effectively enhance the portfolio's risk resilience without significantly sacrificing long-term returns, especially for institutional investors seeking stable returns.

Underweighting High-Volatility. Low-ESG Assets. The essence of the risk parity strategy is to achieve a balanced allocation of risk contributions. Since low ESG assets tend to be more volatile, under this strategy, the weight of nominal funds obtained will be significantly lower than that of high ESG assets. The risk parity algorithm, by seeking to equalise risk contributions, will assign lower capital weights to these high-volatility (typically low-ESG) assets to prevent them from dominating the portfolio's total risk. Although this result is reasonable at the risk-management level, it may also cause the portfolio to miss return opportunities from low-ESG assets at a given market stage. For example, during periods of economic overheating, cyclical industries with low ESG scores tend to be the most profitable and experience the largest stock price increases. However, the risk parity strategy is lagging due to its natural low allocation to highly volatile assets. This conservative nature makes the ESG risk-parity strategy "too cautious" in a bull market, making it difficult to meet the needs of investors seeking high returns.

Intra-Group Risk Concentration. The simple division of stocks into two groups according to the ESG score is high and low, and the risk parity allocation is only implemented between the two groups. Simply splitting ESG into two groups—high and low—for risk parity allocation certainly simplifies the problem, but the cost is that risks within each group can easily be hidden. Take the high-ESG group as an example. It may contain quite a few new energy stocks. These stocks are driven by the same industry cycle and are highly correlated with each other. If one only focuses on inter-group risk balance and ignores the intra-group structure, the portfolio's overall risk may still be heavily concentrated in a single sub-industry. The empirical results confirm this point. Within the high-ESG group, the internal correlation coefficient of the new energy sector is above 0.7. In other words, even if the risk contributions between the high- and low-ESG groups are balanced, the portfolio's performance remains tightly tied to the ups and downs of the new energy sector. This overly simplified two-group risk parity, while making the process seem easier, actually sneaks industry-level risk back in. It undermines the very purpose of the risk parity strategy—diversifying risk—because in the end, the portfolio's risk is still anchored to the fortunes of a single sub-sector such as new energy.

4 Policy Implications and Strategic Recommendations

4.1 Adopt Industry-Calibrated ESG Metrics

The issue of cross-industry incomparability in ESG ratings was discussed in Section 3.1.4. To mitigate the allocation bias that arises from this problem, investors cannot simply rely on raw, unadjusted scores. One useful reference is the Environmental Differential Score (EDS), which advocates weighting ESG metrics according to an industry's environmental impact and improvement potential [6]. Drawing on this idea, this study recommends that when building an industry rotation strategy, the original ESG scores should first be neutralised within each industry, or industry-specific adjustment factors should be introduced to make cross-industry ESG scores comparable. This approach can effectively avoid the allocation distortion caused by rating biases. After such adjustments, a rotation strategy can respond to genuine differences in corporate ESG performance, rather than being driven by the systematic biases embedded in the rating system itself.

4.2 Implement Dynamic ESG Thresholds

During cyclical economic recoveries, sticking rigidly to ESG constraints carries a non-trivial opportunity cost—a point already discussed in Section 3.1.3. This suggests that a more flexible approach is needed, rather than mechanically applying a static screening threshold. Accordingly, this study proposes a dynamic ESG threshold mechanism [7]. In plain terms, the tightness of ESG constraints should be adjusted dynamically as market cycles shift. In the stage of economic recovery or overheating, the ESG threshold can be moderately relaxed to allow the portfolio to participate in the phased opportunities in low-ESG cyclical industries within a limited range; in a

recession or policy-intensive period, the constraints should be tightened, and the defensive attribute strengthened. This dynamic adjustment strategy can reduce the opportunity cost in cycle rotation without significantly sacrificing long-term ESG goals.

4.3 Apply Hierarchical Risk Parity

For the problem of ESG grouping to cover up the concentration of risks within the group (3.2.4), the study combines behavioural combination theory (BPT) with the Markowitz framework, and uses downside risk indicators such as conditional risk (CDaR) and expected downward regret (ERoD) to screen assets that perform well in the market decline [8]. This article suggests that industry-level risk parity should be introduced into the ESG risk parity strategy, rather than only between high- and low-ESG groups. Specifically, first divide by industry, then build a subcombination according to ESG score within each industry, and finally achieve risk contribution balance at the industry level. This move can effectively prevent the hidden risks posed by excessive concentration in a single industry (such as new energy) and, at the same time, screen out assets with real defensive capabilities using downside risk indicators.

4.4 Supplement Ratings with Fundamental Data

Investors should critically assess the real impact of “anti-greenwashing” regulations. Theoretical models suggest that such policies may not always lead to genuine ESG improvement but can incentivise superficial compliance or disclosure management [9]. This discovery also offers inspiration for investment strategies: amid stricter regulation, investors need to be wary of superficial ESG packaging by enterprises driven by compliance pressure. It is recommended that, in the combination construction, in addition to relying on third-party ESG ratings, the actual environmental performance data of the enterprise (such as carbon emission intensity, environmental penalty records, etc.) should also be included to identify the deviation between real ESG performance and the rating signal, and avoid misjudgment of asset quality due to green whitewashing.

4.5 Embed ESG as a Long-Term Risk Factor

The empirical findings support reconceptualising ESG primarily as a long-term risk and resilience factor within the portfolio construction framework, rather than as a short-term tactical signal [7,10]. Rather than treating ESG as a short-term timing signal, this study argues that it should be seen as a long-run risk factor within the risk parity framework. High-ESG assets can serve as a portfolio’s anchor—providing stability when markets turn rough. Low-ESG assets, on the other hand, might play a different role: they can boost returns when conditions are favourable. The goal is to strike a balance in risk contribution between the two. Done right, this approach allows a portfolio to capture some of the cyclical upside without losing its overall footing. In the end, it reconciles ESG objectives with investment efficiency.

5 Conclusion

5.1 Summary of Findings and Insights

This study investigates the applicability of ESG investment strategies in the Chinese market from the perspectives of industry rotation and risk parity, using the Markowitz and Single-Index Models on a sample of 21 A-share stocks from 2019 to 2024.

From an industry rotation standpoint, bringing ESG into a portfolio is a bit of a double-edged sword. Sure, ESG scores can be quite effective at picking up policy signals—China’s dual-carbon agenda is a good example. That helps tilt money towards favoured sectors like new energy, lifting returns while also making the portfolio more stable. But there’s a flip side. If the ESG constraints are too rigid, the portfolio will predictably miss out when traditional industries bounce back during a cyclical recovery. That cost is real and measurable. On top of that, ESG ratings still lack cross-industry comparability, which further undercuts their usefulness.

From a risk-parity perspective, High-ESG assets come with a couple of built-in traits: lower beta and lower correlation. Those fit nicely with risk parity’s goal of spreading risk around. And they delivered real downside protection—look at the 2022 market downturn. That said, putting this into practice runs into two snags. First, the risk parity mechanism itself tends to systematically underweight volatile, low-ESG assets, which can mean giving up some upside when a bull market takes off. Second, a crude split into just high-ESG and low-ESG buckets can hide serious risk concentrations inside each group—industry-level trouble spots that actually undermine the very diversification the strategy is supposed to achieve.

5.2 Contributions and Implications

This study makes several contributions, not just one. On the practical side, it gives investors concrete ideas about how to bring ESG into asset allocation. ESG can be used as a policy signal for industry rotation, or as a risk-diversification tool within a risk parity framework. For asset managers and fund houses, the findings offer a clear and defensible logic: how to strike a balance between policy direction and risk budgeting, and how to build more solid portfolios in China’s heavily policy-driven market. From a social perspective, the study points out both the strengths and the limitations of ESG investing. That in itself is a small stepping stone for the development of China’s green finance system, and it also aligns with the larger national strategy of meeting the dual-carbon goals. At the end of the day, the research tries to answer a question that nobody can avoid: can financial returns and sustainable development actually be reconciled? Regulators care about this, institutional investors care about it, and society at large is watching.

5.3 Limitations and Avenues for Future Research

This study also has a few unavoidable limitations. One is that only 21 stocks were selected, a relatively small sample. The A-share market contains so many companies

that such a sample may not fully capture its diversity. Then there is the issue of ESG ratings: the study relied on data from just one agency. But different rating agencies often produce scores that don't match up. Whether this affects the robustness of the conclusions is hard to say. Another point: the optimisation models assume zero transaction costs, which clearly does not hold in the real world, so the feasibility of portfolio adjustments may be overstated. Finally, although the sample period (2019-2024) captures a few years of intensive policy activity, it is relatively short. Long-term market behaviour—especially complete bull and bear cycles—may not be visible from such a window.

Looking ahead, several directions are worth exploring. One is to expand the stock universe to cover a broader range of A-share companies, which would make the conclusions more generalisable. Another is to bring in ESG data from multiple rating agencies and try to develop an industry-calibrated scoring system—this might help ease the old problem of cross-industry incomparability. Adding transaction costs and using rolling-window optimisation would also bring out-of-sample performance evaluations closer to reality. One more interesting direction: how ESG constraints interact with other investment factors, such as momentum or quality. Getting a clear answer to that could deepen the understanding of the logic behind multi-factor ESG strategies in the Chinese market.

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