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Corporate ESG Performance and Systematic Risk Exposure: Cross-Sectional Evidence from Chinese A-Share Firms

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Abstract:

Environmental, social, and governance (ESG) issues play an increasingly visible role in both academic research and investment practice. However, most existing studies emphasize stock returns or total risk, with relatively limited attention to firms' exposure to aggregate market risk. Using a large sample of Chinese A-share listed firms, this paper studies how cross-sectional differences in ESG performance relate to systematic risk exposure, measured by firm-year CAPM beta.

Firm-year betas are constructed from monthly stock returns using a 36-month rolling window, while ESG performance is obtained from the Huazheng ESG rating system. ESG is treated as a firm-level characteristic, and the analysis relies on cross-sectional regressions with controls for firm size and year fixed effects.

The evidence indicates that firms with stronger ESG performance tend to exhibit lower exposure to market-wide risk. This pattern is observed across firms of different sizes and reflects a combined effect of environmental and governance dimensions rather than a single component. The findings are descriptive in nature and do not imply causal relationships.

Keywords: ESG performance; CAPM beta; Systematic risk Exposure; Cross-sectional analysis; Chinese A-share market

1. Introduction

In recent years, ESG considerations have gained growing attention in both academic research and investment practice. A growing body of literature treats ESG performance as a firm characteristic that is associated with various economic outcomes, notably stock returns and measures of overall firm risk such as return volatility. From an asset-pricing perspective, however, firm risk is not fully characterized by total volatility alone; a central concern is firms' exposure to aggregate market fluctuations, commonly measured by systematic risk exposure.

In asset-pricing models, systematic risk exposure

is commonly summarized by a firm's CAPM beta, capturing how its returns co-move with aggregate market fluctuations. While ESG-related research has expanded rapidly, relatively little empirical evidence examines the cross-sectional relationship between ESG performance and CAPM beta, particularly in emerging-market settings. Much of the ESG literature focuses on returns or total risk [1][2], while a separate strand of asset-pricing research studies systematic risk exposure [3] but often abstracts from firm-level ESG characteristics. More recent work has begun to connect ESG performance with asset pricing and systematic risk exposure [4]. By explicitly focusing on firm–year CAPM beta, this paper bridges these two strands and provides a cross-sectional asset-pricing perspective on ESG - a perspective that is especially timely for the Chinese A-share market, where institutional features, investor composition, and regulatory settings differ markedly from developed markets.

Motivated by this gap in the literature, we examine how cross-sectional differences in firms' ESG profiles are associated with their market-wide risk exposure. Treating ESG as a firm characteristic rather than a time-varying treatment, we focus on the relation between ESG scores and firm-year CAPM beta in a large sample of Chinese A-share listed firms. Our empirical design emphasizes cross-sectional patterns and refrains from pursuing causal inferences.

Using firm-level ESG scores from the Huazheng ESG rating system and firm-year CAPM beta estimates constructed from monthly stock returns, the analysis reveals a statistically significant association between ESG performance and systematic risk exposure. Our baseline results show that firms with stronger ESG performance are associated with lower exposure to aggregate market risk. This relationship remains robust after controlling for firm size and year fixed effects and holds across firms of different sizes. Further analysis shows the association reflects a composite ESG effect, with environmental and governance dimensions playing more prominent roles.

This paper makes three related contributions to the literature. First, it brings an asset-pricing perspective to the ESG literature by focusing on systematic risk exposure rather than returns or total volatility. Second, it provides large-sample evidence from the Chinese A-share market, an important but understudied setting for ESG research. Third, by explicitly distinguishing cross-sectional characterization from causal identification, the paper offers a transparent and methodologically disciplined assessment of the ESG–beta relationship.

The remainder of the paper is organized as follows. Section 2 describes the data and variable construction. Section 3 outlines the empirical methodology. Section 4 presents the main empirical results. Section 5 discusses implications and limitations, and Section 6 concludes.

2. Data

Note that the beta sample primarily covers firm–year observations from 2014 onward, because CAPM betas are estimated with a 36-month rolling window and we use the year-end beta from the final month of each calendar year.

This study combines ESG information with stock return data for Chinese A-share listed firms. The ESG measure is obtained from the Huazheng ESG rating system, accessed via AKShare. The dataset provides firm-level ESG scores as well as separate environmental (E), social (S), and governance (G) sub-scores. Due to data availability, the ESG information is treated as a cross-sectional snapshot rather than a time-varying panel. Accordingly, ESG performance is viewed as a time-invariant firm characteristic in the empirical analysis.

Stock return data and market index data are sourced from TuShare, supplemented by AKShare when necessary. Monthly stock returns are constructed from daily price data. As the proxy for the market portfolio, the CSI 300 index is employed. In cases where CSI 300 data are unavailable for specific periods, an equal-weighted market proxy is used as a robustness check.

Firm-level systematic risk exposure is measured using CAPM beta. For each firm, beta is estimated from a rolling-window regression of monthly stock returns on market returns, using a 36-month window. The estimated beta from the last month of each calendar year is taken as the firm–year CAPM beta. Due to the rolling-window requirement, the beta sample primarily covers firm–year observations from 2014 onward.

The final regression sample consists of firm–year observations for which CAPM beta, ESG measures, and firm size are jointly available. Firm size is proxied by the natural logarithm of year-end market capitalization. All variables are constructed and aligned at the firm-year level.

3. Methodology

We use a cross-sectional regression approach to study how firms' ESG performance relates to their systematic risk exposure. The baseline regression specification is given by:

$$\beta\_\{i,t\} = \alpha + \gamma¡¤ESG\_i + \delta¡¤ln(Size\_\{i,t\}) + \lambda\_t + \epsilon\_\{i,t\}$$

In this specification, firm-year CAPM beta serves as the dependent variable, the ESG score is the primary explanatory variable, and firm size is measured by the natural logarithm of year-end market capitalization. Year fixed effects are included to control for common time-series variation in market conditions, and the error term captures unobserved firm–year shocks.

The analysis focuses on cross-sectional variation rather

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than time-series asset pricing regressions. ESG performance is treated as a firm characteristic rather than a time-varying treatment, reflecting the cross-sectional nature of the ESG data. The regressions are estimated by ordinary least squares (OLS), with standard errors clustered at the firm level to account for within-firm correlation over time.

To further characterize the structure of the ESG–beta association, the baseline specification is extended in two directions. First, the sample is partitioned into subsamples based on firm size to examine size-related heterogeneity in the cross-sectional relationship between ESG performance and systematic risk exposure. Second, the aggregate ESG score is decomposed into its environmental, social, and governance sub-dimensions, which are jointly included in the regression to assess their marginal associations with systematic risk exposure. These extensions are designed to provide structural characterization of the ESG–beta relationship rather than causal identification.

4.Results

4.1 Baseline Results

Table 1 reports the baseline cross-sectional regression results examining the association between firms' ESG performance and systematic risk exposure. The dependent variable is firm–year CAPM beta estimated using monthly returns and a 36-month rolling window, while the key explanatory variable is the firm-level ESG score.

Table 1. Baseline Regression Results

	(1) CAPM Beta
ESG score	−0.0065***
	(0.0011)
ln (Size)	0.0277**
	(0.0120)
Year fixed effects	Yes
Firm-clustered standard errors	Yes
Observations	8,260
Firms	1,002

Notes: The dependent variable is firm–year CAPM beta, estimated using monthly stock returns and a 36-month rolling window. ESG score is measured using the Huazheng ESG rating system and treated as a firm-level characteristic. All specifications include year fixed effects. Standard errors clustered at the firm level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$.

Consistent with the asset pricing perspective that emphasizes risk exposure rather than total volatility, the results indicate that ESG performance is significantly associated with firms' systematic risk exposure in the cross-section. Specifically, the coefficient on the ESG score is negative and statistically significant at conventional levels. This result remains robust after controlling for firm size and year fixed effects, with standard errors clustered at the firm level.

The estimated relationship indicates that firms with stronger ESG performance are associated with lower exposure to aggregate market risk. Note that this result represents a cross-sectional association, not a causal effect. The regression specification is designed to characterize systematic differences in market risk exposure across firms with varying ESG characteristics, rather than to identify the causal impact of ESG performance on risk.

Taken together, the baseline results highlight cross-sectional patterns linking ESG performance-treated as a firm characteristic—to firms' exposure to market-wide fluctuations.

4.2 Size Heterogeneity

To examine whether the baseline association between ESG performance and systematic risk exposure varies across firms of different sizes, we conduct a subsample analysis by partitioning firms based on the median of firm size. Specifically, the sample is split into small and large firms according to the median value of ln (Size), and the baseline regression specification is estimated separately for each subsample.

We find a negative ESG-beta relationship in both small and large firms. While the magnitude and statistical significance of the ESG coefficient differ across subsamples, the direction of the relationship remains consistent. This finding suggests that the baseline ESG–beta relationship is not driven by a single size group but instead reflects a broader cross-sectional pattern across firms of different scales.

Importantly, this heterogeneity analysis is intended to provide a structural characterization of the ESG-beta association rather than to identify differential causal mechanisms across firm sizes. The results further support the interpretation of ESG as a firm characteristic that is systematically

related to market risk exposure across the cross-section.

4.3 ESG Sub-dimensions

To further examine the structure of the baseline ESG–beta association, we decompose the aggregate ESG score into its environmental (E), social (S), and governance (G) components. We then re-estimate the baseline specification by jointly including these three sub-dimensions, while maintaining the same set of control variables and year fixed effects.

The results indicate that the association between ESG performance and systematic risk exposure reflects a composite effect across dimensions. In the joint regression, the coefficients on the environmental and governance components remain statistically significant, whereas the social component exhibits weaker marginal explanatory power. This pattern suggests that the baseline ESG-beta relationship is not mechanically driven by a single dimension but instead captures systematic differences in firms' environmental and governance characteristics that are associated with market risk exposure.

Importantly, this sub-dimension analysis is intended to provide a structural characterization of the ESG-beta association rather than to isolate specific causal channels. The findings reinforce the interpretation of ESG as a multidimensional firm characteristic that is related to systematic risk exposure in the cross-section.

5. Discussion and Limitations

This study documents a systematic cross-sectional association between firms' ESG performance and their exposure to aggregate market risk, as measured by firm–year CAPM beta. Interpreting ESG as a firm characteristic, the results suggest that differences in ESG profiles are associated with systematic differences in market risk exposure across firms. Importantly, this interpretation emphasizes characterization rather than causality.

The findings should be understood within the context of the study's design. Firstly, the analysis focuses on cross-sectional relationships and does not attempt to identify causal effects of ESG performance on risk exposure. While the regression framework controls for firm size and year fixed effects, the estimated coefficients capture statistical associations rather than structural parameters.

Secondly, the ESG measure employed in this study is a cross-sectional snapshot rather than a time-varying panel. As a result, ESG is treated as a time-invariant firm characteristic in the empirical analysis. Although this approach is appropriate for cross-sectional characterization, it limits the ability to examine dynamic adjustments or causal mechanisms linking changes in ESG performance to changes in systematic risk exposure.

Thirdly, because of current data limitations, the baseline model includes only firm size and year fixed effects as controls. While this choice helps preserve sample size and maintain a transparent baseline design, it also implies that the results should be interpreted with caution. Future work could explore the robustness of the documented relationships using richer firm-level financial panels or alternative risk models.

Overall, these points clarify both the strengths and limitations of this study. The findings here describe systematic patterns in risk exposure across ESG levels and should not be taken as proof of causality or direct policy guidance.

6. Conclusion

This study analyzes how firms' ESG performance relates to their exposure to systematic market risk in the Chinese A-share market. Treating ESG as a firm characteristic, we examine how cross-sectional differences in ESG profiles are associated with firm-year CAPM beta, a standard measure of systematic risk exposure. Based on a broad sample of Chinese listed firms, we find a robust association between ESG performance and systematic risk exposure.

Our baseline results show that firms with stronger ESG performance are associated with lower exposure to aggregate market risk. This relationship remains robust after controlling for firm size and year fixed effects, is present across firms of different sizes, and reflects a composite ESG effect driven primarily by environmental and governance dimensions rather than by any single component.

Importantly, the findings of this study should be interpreted as descriptive rather than causal. The analysis focuses on cross-sectional characterization and does not attempt to identify the causal impact of ESG performance on risk exposure. Moreover, data limitations constrain the incorporation of a full set of time-varying firm-level controls. Despite these limitations, the findings reveal clear cross-sectional patterns in the relation between ESG characteristics and market risk exposure in an emerging market context.

Appendix A. Sample Evolution and Early Exploratory Results

In the early stage of this project, we conducted a set of exploratory analyses using a substantially smaller pilot sample to validate the data pipeline and estimation procedures. Based on this pilot sample (approximately 1,700 firm–year observations), the baseline cross-sectional regression of firm-year CAPM beta on ESG performance yielded a positive and statistically significant coefficient on the ESG score, controlling for firm size and year fixed effects, with standard errors clustered at the firm level.

Additional exploratory analyses based on the same pilot

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sample indicated that this positive association was primarily concentrated among large firms, while the relationship was not statistically significant in the small-firm subsample. A joint regression including the environmental (E), social (S), and governance (G) sub-dimensions suggested that the coefficients were similar in sign but individually insignificant, providing no evidence of a single dominant ESG dimension at this stage. Simple binned visualizations were consistent with the positive cross-sectional association observed in the regressions.

As the project progressed, the data construction and cleaning procedures were substantially refined. In particular, the sample coverage was expanded, identifier mapping across ESG records and return data was standardized, and the construction and alignment of key variables-including rolling-window beta estimates and firm size-were harmonized across the full sample. Following these refinements, the baseline results converged to the negative association between ESG performance and systematic risk exposure reported in the main text.

We include these early pilot results in the appendix to transparently show how the analysis evolved. Due to the exploratory nature of the pilot sample and the absence of a fully reproducible codebase for that stage, these early results are not treated as part of the evidential basis for the paper's conclusions.

Table A1. Baseline Regression Results: Pilot Sample vs. Full Sample

Notes: The finalized sample reported here reflects the largest sample available at the current stage of the project and does not represent the full universe of A-share listed firms. Panel A reports results from the early pilot sample, while Panel B reports results from the finalized sample used in the current analysis. This table compares baseline cross-sectional regressions estimated on the early pilot sample and the finalized sample used in the current analysis. All specifications control for firm size and year fixed effects. Standard errors are clustered at the firm level.

Sample	N (firm–year)	Firms	ESG Coefficient	Std. Error	p-value
Pilot sample (early test)	1,753	≈200	+0.0044		0.0056
Current final sample (now)	8,260	1,002	-0.0065	0.001	<0.001

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