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# Research on the Correlation between ESG Performance and Economic Value Added

**Jing Huang*, Guiqian Li*, Zhishu Li**
School of International Business, Jilin International Studies University, Changchun, Jilin, China
*Corresponding Authors. Jing Huang, Guiqian Li

***Abstract:***

With the ESG investment theory gradually gaining public attention and recognition, the relationship between ESG performance and enterprise profitability deserves further exploration. This paper empirically analyses the impact effect between ESG performance and Economic Value Added(EVA), by using A-share listed companies from 2012 to 2019 as the research object. The research results show that ESG performance can significantly improve Economic Value Added. Through further analysis, it was found that: (i) all three dimensions of ESG can significantly increase Economic Value Added. (ii) ESG performance remains highly significant in increasing Economic Value Added for firms in high-carbon emission industries.

***Keywords****: ESG performance, Economic value added, High-carbon emission industries.*

## I. INTRODUCTION

The establishment of the Beijing Stock Exchange on 3rd September 2021 marked the further improvement and maturity of China's capital market. Nowadays, buying shares has become one of the most popular investment options for the public. Therefore, as one of the investment concepts that have gained public attention and recognition in recent years, the relationship between ESG investment and Economic Value Added deserves further exploration.

Based on the above, this paper conducts the empirical research. The innovations of this paper are mainly in three aspects: ①It is demonstrated that there is a positive effect between ESG performance and Economic Value Added and that ESG and its three dimensions can significantly increase Economic Value Added. ②By further analysis, it is found that the positive effect between ESG performance and Economic Value Added in high-carbon emission industries is still significant. ③The empirical research provides investors with a theoretical basis for judging Economic Value Added through ESG performance.

The research process and research contributions are described in detail later: the second part is the literature review, the third part is the research design, the fourth part is the empirical research and the final part is the conclusions.

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## II. LITERATURE REVIEW

There has been a considerable amount of research on the relationship between ESG performance and enterprise profitability.Gunnar Friede et al. (2015) synthesised over 2,200 published papers on the relationship between ESG performance and company financial performance between 1970 and 2015 and noted that approximately 90% of these studies found a non-negative relationship between ESG performance and company financial performance. Furthermore, the positive effect of ESG performance on a company's financial performance is stable from time to time.[1] Meanwhile, Caterina De Lucia, Pasquale Pazienza and Mark Bartlett (2020) also argue that favourable ESG performance leads to the better financial performance of a company.[2] Moreover, Changjiang Zhang et al. (2021) also believe that good ESG performance can improve market performance and financial performance. They also believe that investors' ESG literacy should be cultivated and listed companies should be guided to transform to ESG strategies.[3]

However, it is worth noting that the aforementioned literature has used indicators such as return on assets or return on equity as a proxy for measuring enterprise profitability. Although traditional financial performance measures such as return on assets and return on equity are informative, they are susceptible to accrual earnings management practices, which in turn affect the quality of accounting information and lead to some deviations in the empirical results. Therefore, Zixian Ren et al. (2021) propose to use Economic Value Added as a proxy for measuring enterprise profitability to study the relationship between ESG performance and enterprise profitability. Nevertheless, the sample size of their research was only 228 and there may be a problem of sample selection bias.[4]

Consequently, this paper extends the sample size and conducts the empirical research on the relationship between ESG performance and Economic Value Added based on the above literature review.

## III. EMPIRICAL DESIGN

Based on the analysis of the literature review, ESG performance is positively correlated with enterprise financial performance. From this, the following hypotheses are proposed in this paper.

H0: ESG performance is negatively correlated with Economic Value Added. In other words, the worse the ESG performance, the lower the Economic Value Added.

H1: ESG performance is positively correlated with Economic Value Added. In other words, the better the ESG performance, the higher the Economic Value Added.

### 3.1 Sample

In this paper, data of listed companies from 2012 to 2019 (data from the CSMAR database and the WIND database) were selected for analysis. The sample was screened according to the following criteria: ①excluding ST and PT companies; ②excluding the financial sector samples; ③excluding

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listed companies with incomplete data research and abnormal data during the sample period, resulting in 524 sample companies with a total sample size of 4,192.

3.2 Variables

Predicted variable: Economic Value Added(EVA), referring to Laiqiang Feng et al, 2017, TingRong Yang and Huiping Ding, 2017 and Pengjie Na et al, 2017.[5]~[7]

Explanatory variable: ESG performance (ESG), referenced to Hui Lyu et al. (2021) quantitatively assessed using the Bloomberg ESG score as the explanatory variable and taking the natural logarithm to measure the ESG performance of the company. The higher the natural logarithm, the better the ESG performance of the company.[8] The Bloomberg ESG score is based on publicly disclosed data such as company annual filings, CSR reports, corporate websites, questionnaires and media reports, and scores each aspect of ESG performance.

Control variables: Referring to (Dayu Huang and Huobao Xie, 2021; Ball and Shivakumar, 2005; Sugata Roychowdhury, 2003), the following variables were controlled for ①Accrual Earnings Management (AEM); ②Real Earnings Management (REM); ③Leverage (LEV); ④Firm age (AGE); ⑤Listed age (LA); ⑥Nature of ownership (SOE).[9]~[11] Also, this paper conducts dummy variables to control for year and industry: ①Year (YEAR); ②Industry (IND).

3.3 Variables description and models

**TABLE I. Variables description**

| TYPE OF VARIABLE | VARIABLE NAME | DESCRIPTION |
|---|---|---|
| PREDICTED | EVA | $Model(1)EVA/Share\ Capital$ |
| EXPLANATORY | ESG | $Ln_{ESG\ Score}$ |
| CONTROL | AEM | $ACC_{i,t}$ |
| CONTROL | REM | $TREM_{it}$ |
| CONTROL | LEV | $Liabilities/Assets$ |
| CONTROL | FA | $Ln_{Firm\ age}$ |
| CONTROL | LA | Listed age is greater than 3 years=1, else=0 |

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| | | |
|---|---|---|
| CONTROL | SOE | First major shareholder is state-owned=1, else=0 |
| DUMMY | YEAR | |
| DUMMY | IND | |

The following is the equation and description of Economic Value Added (1).

NOPAT=Operating profit-Income tax expense + [Interest expense(Non-financial institution) + Assets impairment loss + Development expenditure] * (1 - Corporate income tax rate) + Increase of deferred income tax liabilities – Increase of deferred income tax assets (1a)

Total capital=Total owners' equity + Provision for impairment of assets-Provision for impairment of project in progress – Net amount of project in progress + Deferred income tax liabilities-Deferred income tax assets + Short-term borrowing + Trading financial liabilities + Non-current liabilities due within one year + Long-term borrowing+ Bonds payable + Long-term payable (1b)

WACC=Cost of bond * (1 - Corporate income tax rate) * (Debt capital / Total capital) + Cost of equity capital * (Equity capital / Total capital) (1c)

Cost of equity capital=Risk-free interest rate + Risk factor * Market risk premium (1d)

Wherein: cost of debt capital uses one-year bank lending rate, with risk-free interest rate adopting one-year deposit rate of bank, and risk factor using BETA of 250-trading-day circulation market value-weighted for stocks in Shanghai and Shenzhen markets; considering the high volatility of China stock markets, the market risk premium shall be 4% in the calculation.

The following is the equation and description of the Accrual Earnings Management AEM model (2).

$$ACC_{i,t} = \alpha_0 + \alpha_1 CFO_{i,t-1} + \alpha_2 CFO_{i,t} + \alpha_3 CFO_{i,t+1} + \alpha_4 DCFO_{i,t} + \alpha_5 DCFO_{i,t} \times CFO_{i,t} + \varepsilon \quad (2)$$

$ACC_{i,t}$ is equal operating profit minus net cash flow from operating activities. $CFO_{i,t-1}$, $CFO_{i,t}$ and $CFO_{i,t+1}$ denote net cash flow from operating activities of i company for periods t-1, t and t+1 respectively. $DCFO_{i,t}$ takes 1 when $CFO_t - CFO_{t-1} < 0$, otherwise takes 0. $\varepsilon$ is the regression residual, the larger the absolute value of the residual, the larger the degree of Accrual Earnings Management of the company. Also in order to eliminate the scale effect, divided by the total assets at the end of period t-1, and in the calculation has excluded the sample size of less than 10 after the industry classification

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and the relevant data missing samples.

The following is the equation and description of the Real Earnings Management AEM model (3).

$$\frac{CFO_{it}}{A_{it-1}} = \alpha_0 + \alpha_1 \frac{1}{A_{it-1}} + \alpha_2 \frac{REV_{it}}{A_{it-1}} + \alpha_3 \frac{\Delta REV_{it}}{A_{it-1}} + \epsilon_{it} \quad (3a)$$

$$\frac{PROD_{it}}{A_{it-1}} = \beta_0 + \beta_1 \frac{1}{A_{it-1}} + \beta_2 \frac{REV_{it}}{A_{it-1}} + \beta_3 \frac{\Delta REV_{it}}{A_{it-1}} + \beta_4 \frac{\Delta REV_{it-1}}{A_{it-1}} \epsilon_{it} \quad (3b)$$

$$\frac{DISEXP_{it}}{A_{it-1}} = \gamma_0 + \gamma_1 \frac{1}{A_{it-1}} + \gamma_2 \frac{REV_{it-1}}{A_{it-1}} + \epsilon_{it} \quad (3c)$$

$$TREM_{it} = \ （-1）A\_CFO_{it} + A\_PROD_{it} + (-1)A\_DISEXP_{it} \quad (3d)$$

$CFO_{it}$ represents the net cash flow from operations of i enterprise in year t. $PROD_{it}$ represents the cost of production of i enterprise in year t, which is equal to the sum of operating costs and inventory changes of the enterprise in the period. $DISEXP_{it}$ represents the manipulative expenses of i enterprise in year t, which is equal to the sum of selling and administrative expenses of the enterprise. $REV_{it}$ represents the operating income of i enterprise in year t. $\Delta REV_{it}$ represents the change in operating income of i enterprise in year t. $\Delta REV_{it-1}$ represents the change in operating income of i enterprise in year t-1. $A_{it-1}$ is used to eliminate the scale effect by using the total assets at the end of period t-1 to eliminate the scale effect. $A\_CFO_{it}$ represents the abnormal cash flow from operating activities of i enterprise in year t. $A\_PROD_{it}$ represents the abnormal production costs of i enterprise in year t. $A\_DISEXP_{it}$ represents the abnormal expenses of i enterprise in year t.

The model is calculated by regressing by industry and year, obtaining the residuals of each model regression and then calculating them according to the formula, i.e. the outliers of each indicator. The higher the absolute value of the indicator, the higher the degree of true surplus management. Samples with a sample size of less than 10 after industry classification and those with missing relevant data have been excluded from the calculation.

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## IV. EMPIRICAL RESEARCH

This paper uses STATA16 software for statistical processing. For the sake of excluding outliers from interfering with the empirical results, this paper has shrunk the tails of continuous variables at 0~1% and 99%~100% of their distributions and performed variance inflation factor (VIF) diagnostics on all explanatory and control variables entering the model. The results show that the maximum value of VIF is 1.150 and the mean value is 1.100, so there is no multicollinearity problem.

4.1 Descriptive statistics and matrix of correlations

Table 2 provides descriptive statistics for the variables involved in the research. The explanatory variable(EVA) is concluded to be normally distributed by drawing a histogram.

**TABLE II. Descriptive statistics**

| VARIABLES | OBSERVATION | MEAN | Std. Dev. | MIN | MAX |
|---|---|---|---|---|---|
| EVA | 4192 | 0.204 | 0.578 | -1.240 | 2.599 |
| ESG | 4192 | 3.037 | 0.278 | 2.374 | 3.798 |
| AEM | 4192 | 0.003 | 0.047 | -0.133 | 0.135 |
| REM | 4192 | -0.020 | 0.192 | -0.666 | 0.513 |
| LEV | 4192 | 0.505 | 0.195 | 0.081 | 0.866 |
| FA | 4192 | 2.692 | 0.406 | 1.386 | 3.296 |
| SOE | 4192 | 0.161 | 0.368 | 0 | 1 |
| LA | 4192 | 0.603 | 0.489 | 0 | 1 |

Table 3 shows the correlation analysis between the variables, indicating the interconnections and effects that exist. As can be seen through the significance, both the Pearson correlation test and the Spearman correlation test indicate that ESG performance is significantly positively correlated with EVA at the 1% level. The Pearson test also indicates that the correlation coefficients are all less than 0.7, providing strong evidence that there is no significant multicollinearity between the variables.

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**TABLE III. Matrix of correlations**

| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| (1) EVA | 1 | 0.090 *** | 0.434 *** | -0.323 *** | -0.111 *** | 0.003 | 0.027 * | -0.067 *** |
| (2) ESG | 0.105 *** | 1 | -0.041 *** | 0.024 | 0.040 *** | 0.119 *** | -0.085 *** | 0.174 *** |
| (3) AEM | 0.427 *** | -0.044 *** | 1 | -0.063 *** | -0.254 *** | -0.016 | -0.020 | -0.054 *** |
| (4) REM | -0.293 *** | 0.031 ** | -0.085 *** | 1 | 0.214 *** | 0.146 *** | -0.071 *** | 0.154 *** |
| (5) LEV | -0.124 *** | 0.057 *** | -0.252 *** | 0.231 *** | 1 | 0.127 *** | -0.049 *** | 0.160 *** |
| (6) FA | 0.027* | 0.127 *** | -0.058 *** | 0.166 *** | 0.165 *** | 1 | -0.097 *** | 0.185 *** |
| (7) SOE | 0.022 | -0.093 *** | -0.010 | -0.078 *** | -0.051 *** | -0.115 *** | 1 | -0.235 *** |
| (8) LA | -0.034 ** | 0.178 *** | -0.060 *** | 0.179 *** | 0.158 *** | 0.199 *** | -0.235 *** | 1 |

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Note: *, ** and *** indicate significant at the 10%, 5% and 1% levels respectively; Pearson test in the bottom left corner and Spearman test in the top right corner.

4.2 Linear regression models

For the sake of checking whether ESG performance has a significant positive impact on EVA. This paper uses a multiple linear regression model to measure it referring to (Cheng Lu and Weijuan Zou, 2015) for the F-test to screen the OLS mixed regression model, the Fixed-effects model and the Random-effects model.[12] The F-test result does not reject the OLS mixed regression model, so the Hausman test is not necessary for the research.

Thus, the OLS mixed regression model would be used in the empirical research and the model settings are shown in equations (a).

$$Y = \alpha_0 + \alpha_1 ESG + \alpha_2 Control + \alpha_3 YEAR + \alpha_4 IND + \mu \quad (a)$$

$Y$ represents the predicted variable EVA for the selected sample. $\alpha_0$ represents the intercept terms. $\alpha_1$ is the regression coefficients of the explanatory variables $ESG$. $Control$ represents the control variables selected for this paper. $YEAR$ and $IND$ are the dummy variables year and industry respectively. $\mu$ is the random disturbance terms.

4.3 Linear regressions results

Table 4 represents the linear regression results. Regression models OLS (a), FE and RE show the significance between ESG performance and EVA. As can be seen from Table 4, ESG performance has a significant positive effect on EVA. In addition, the regression results of the FE and RE models can be used as a reference. Thus, the previous hypothesis H1 is verified.

**TABLE IV. ESG and AEM linear regression results**

| | **OLS MODEL(a)** | **FE MODEL** | **RE MODEL** |
|---|---|---|---|
| VARIABLES | EVA | | |
| ESG | 0.166***(0.032) | 0.166***(0.046) | 0.166***(0.046) |
| AEM | 5.169***(0.192) | 5.169***(0.252) | 5.169***(0.252) |

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| | | | |
|---|---|---|---|
| REM | -0.791***(0.047) | -0..791***(0.030) | -0.791***(0.030) |
| LEV | 0.280***(0.050) | 0.280***(0.070) | 0.280***(0.070) |
| FM | -0.010(0.023) | -0.010(0.011) | -0.010(0.011) |
| SOE | 0.001(0.021) | 0.001(0.016) | 0.001(0.016) |
| LA | 0.033*(0.018) | 0.033**(0.011) | 0.033***(0.011) |
| YEAR | CONTROL | CONTROL | CONTROL |
| IND | CONTROL | CONTROL | CONTROL |
| CONSTANT | -0.701***(0.112) | -0.609***(0.169) | -0.701***(0.165) |
| N | 4192 | 4192 | 4192 |
| $R^2$ | 0.394 | 0.378 | 0.394 |

Note (the same below) : *, ** and *** indicate significant at the 10%, 5% and 1% levels respectively; Standard Error of Mean between brackets.

4.4 Heterogeneity analysis

For the sake of further exploring the impact of three different dimensions of ESG performance on listed companies in terms of environmental, social and corporate governance, this paper conducts a sub-sample regression of ESG environmental performance, social performance and corporate governance performance.

At the same time, with global warming, Carbon neutrality, Carbon peaking and many other environmental issues receiving widespread attention from all walks of life, this paper refers to Jie Yang et al, 2020, which classifies 13 industries such as Chemical Industry, Iron and Steel Industry and Paper Industry as high-carbon emission industries group[13] to further study high-carbon emission industries and conduct regression analysis on the data.

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**TABLE V. Sub-sample linear regression results**

| VARIABLES | EVA | | | |
|---|---|---|---|---|
| | ENVIRONMENTAL | SOCIAL | GOVERNANCE | ESG HIGH-CARBON INDUSTRIES |
| COEFFICIENT | 0.026**(0.010) | 0.062***(0.015) | 0.311***(0.075) | 0.157***(0.049) |
| CONTROL | CONTROL | CONTROL | CONTROL | CONTROL |
| YEAR | CONTROL | CONTROL | CONTROL | CONTROL |
| IND | CONTROL | CONTROL | CONTROL | CONTROL |
| CONSTANT | -0.289***(0.082) | -0.446***(0.090) | -1.398***(0.276) | -0.597***(0.157) |
| N | 4192 | 4192 | 4192 | 1592 |
| $R^2$ | 0.390 | 0.391 | 0.391 | 0.446 |

The regression results in the three different dimensions of ESG performance show that the environmental, social and corporate governance dimensions all have a significant positive effect on EVA. Further, the reason why the regression result between the environmental performance of ESG and EVA is just significant at the 5% level, slightly lower than the regression result for the social performance of ESG and corporate governance performance of ESG which are significant at the 1% level, is most likely due to spending the cost of implementing carbon emission reduction and environmental governance activities by companies. This leads to a fallback in EVA during the transition to environmental friendliness.

Meanwhile, the regression results for the high-carbon emission industries group show that the regression results are highly significant at the 1% level which demonstrates that the positive effect of ESG performance and EVA is also informative in the high-carbon industries.

4.5 Robustness tests

4.5.1 Substitution of the predicted variable

For the sake of testing the robustness, this paper referred to Lijun Chen and Yanxi Li, 2022 to

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replace the predicted variable EVA with Total Asset EVA Ratio(EVA/ASSETS), Net Asset EVA Ratio (EVA/EQUITY) and Return on Equity(ROE).[14] As can be seen from the regression results in Table 6, the positive effect of ESG performance on EVA remains significant which indicates that the regression results are robust.

**TABLE VI. Robustness test(substitution of the predicted variable)**

| VARIABLES | EVA/ASSETS | EVA/EQUITY | ROE |
|---|---|---|---|
| ESG | 0.004**(0.002) | 0.016***(0.004) | 0.027***(0.004) |
| AEM | 0.463***(0.014) | 0.909***(0.028) | 1.000***(0.031) |
| REM | -0.083***(0.003) | -0.149***(0.006) | -0.139***(0.006) |
| LEV | 0.010***(0.004) | 0.047***(0.008) | 0.033***(0.008) |
| FM | -0.004**(0.001) | -0.006**(0.003) | -0.001(0.003) |
| SOE | -0.002(0.001) | -0.001(0.003) | -0.001(0.003) |
| LE | -0.002(0.001) | -0.008***(0.003) | -0.009***(0.003) |
| YEAR | CONTROL | CONTROL | CONTROL |
| IND | CONTROL | CONTROL | CONTROL |
| CONSTANT | -0.009(0.010) | -0.056***(0.019) | -0.025(0.016) |
| N | 4192 | 4192 | 4192 |
| $R^2$ | 0.560 | 0.476 | 0.490 |

4.5.2 Controlling the individuals

For the sake of further verifying the robustness, this paper further controls individuals. As can be seen from the regression results in Table 7, the regression results are still highly significant after further controlling for individuals, further indicating that the regression result is robust. Thus, hypothesis H1 is verified.

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**TABLE VII. Robustness test(controlling the individuals)**

| VARIABLES | EVA |
|---|---|
| ESG | 0.142***(0.047) |
| AEM | 3.349***(0.201) |
| REM | -0.631***(0.054) |
| LEV | -0.180*(0.109) |
| FM | -0.134*(0.071) |
| SOE | -0.006(0.022) |
| LE | -0.065(0.039) |
| YEAR | CONTROL |
| IND | CONTROL |
| INDIVIDUAL | CONTROL |
| CONSTANT | -0.109(0.221) |
| N | 4192 |
| $R^2$ | 0.722 |

4.6 Endogeneity test

Two-way causality may lead to endogeneity problems. To avoid the above, this paper refers to Jinglin Li et al, 2021 to further treat the predicted variables with a one-year lag.[15] Table 8 shows the results of the one-period lag regression. The regression result shows that the effect effects between ESG performance and EVA remain significant and well ESG performance can enhance the figure for EVA.

**TABLE VIII. One-year lagged regression results**

| VARIABLES | EVA |
|---|---|
| ESG | 0.109***(0.028) |
| AEM | 5.182***(0.192) |

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| | |
|---|---|
| REM | -0.795***(0.047) |
| LEV | 0.289***(0.050) |
| FM | -0.011(0.023) |
| SOE | -0.001(0.021) |
| LE | 0.038**(0.018) |
| YEAR | CONTROL |
| IND | CONTROL |
| CONSTANT | -0.547***(0.106) |
| N | 4192 |
| $R^2$ | 0.391 |

## V. CONCLUSIONS

This paper uses the data of a sample of A-share listed companies selected from 2012 to 2019 as the research sample to analyse the impact effect between ESG performance and EVA through empirical research, proving that ESG performance is significantly and positively related to EVA and well ESG performance can enhance the figure for EVA. Also, the different three dimensions of ESG performance, Environmental performance, Social performance and Cooperate governance performance are significantly and positively related to EVA as well. Meanwhile, the research also revealed that ESG performance remains highly significant in increasing the figure for EVA of companies in high-carbon emission industries.

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