

# A Dynamic Estimation of Board Efficiency Index and Financial Performance: Evidence from China

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**To Link this Article:** <http://dx.doi.org/10.6007/IJARAFMS/v14-i3/22266> DOI:10.6007/IJARAFMS/v14-i3/22266

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**Published Online:** 31 August 2024

## **Abstract**

This study aims to evaluate the impact of the Board Efficiency Index on the financial performance of listed companies in China, from both market-based and residual income perspectives. The sample consists of 6,130 observations from 1,226 firms listed on the Shanghai Stock Exchange over the period from 2018 to 2022. The System Generalized Method of Moments (GMM) is employed to address endogeneity issues, and its effectiveness is compared with Fixed Effects and Two-Stage Least Squares (2SLS) regression models. The findings indicate that the Board Efficiency Index positively influences financial performance, suggesting that management should recognize the importance of improving board efficiency. By optimizing board structure, enhancing decision-making efficiency, and strengthening oversight capabilities, firms can achieve better governance outcomes and improve overall market performance and value. This provides empirical support for emerging markets like China. This study also focuses on comparing market value (Tobin's Q) and residual income (Economic Value-Added Rate) to explore the impact of the Board Efficiency Index. The results show that, within the dynamic interplay of corporate governance structures and financial

performance, the Board Efficiency Index consistently has a positive effect on financial performance.

**Keywords:** Corporate Governance, Board Efficiency Index, SYS-GMM.

## Introduction

Research on boards of directors has been extensively conducted worldwide, and the relationship between board characteristics and financial performance has reached a plateau in terms of new developments. However, companies in emerging economies like China are often undervalued in financial markets due to weak governance. Improvements in corporate governance can enhance investor confidence in companies from emerging economies and increase their access to capital. The Chinese government initiated corporate reforms in 2003, followed by new reforms in 2013 and 2015, which continue to this day. These reforms have heightened investor interest in corporate investments and managerial attention to corporate governance. A substantial body of research indicates that board governance in China is continually improving and plays a crucial role in the financial performance of companies (Amadi *et al.*, 2023; Brahma *et al.*, 2023; Chen, 2015; Lu and Cao, 2018; Luo, 2023; Wang *et al.*, 2019).

Agency theory emphasizes the importance of board governance. Previous literature highlights that agency theory focuses on internal corporate governance, with board governance and improvements being pivotal for the development of corporate performance (Coles *et al.*, 2008; García-Ramos and Díaz, 2021; Horváth and Spirollari, 2012; Kiel and Nicholson, 2003; O'Connell and Cramer, 2010; Yasser *et al.*, 2017). In emerging economies, board governance is even more critical, determining whether a company can develop stably and efficiently. As the largest developing economy, China has experienced rapid economic growth, with corporate development being a significant component.

Despite extensive research globally on the relationship between board characteristics and financial performance (Jermias and Gani, 2014; Lu and Cao, 2018; Mishra and Kapil, 2018; Pucheta-Martínez and Gallego-Álvarez, 2020), there has been relatively limited systematic investigation into board efficiency. Board efficiency refers to the effectiveness of board operations measured by integrating board characteristics into a composite index. Researching efficiency indices can comprehensively analyze the impact of boards on financial performance. Notably, China as a developing country, the legal framework for corporate governance requires improvement (Lu and Cao, 2018). In addition, the number of loss enterprises has risen from 73 in 2013 to 317 in 2022 in the Shanghai Stock exchange. After the reform, many companies have struggled to adapt to the new environment, and Chinese-listed companies need help in improving their performance. Plenty of studies emphasize the pivotal role of the board of directors as a significant factor influencing corporate financial performance (Christensen *et al.*, 2010; Coles *et al.*, 2008; Wang *et al.*, 2018). Scholars anticipate that an exemplary board will enhance corporate governance efficiency, thereby elevating financial performance.

The significance of this article is that China, as an emerging market, has an imperfect corporate governance structure. Studying the board efficiency index is an important way to improve corporate governance, so as to improve corporate financial performance. For

enterprise managers, the board efficiency index is undoubtedly a more comprehensive way to measure the board characteristics, which can enable the enterprise to comprehensively optimize the board structure and make the enterprise develop better. For shareholders, the use of the Economic Value-Added Rate (EVAR) can directly reflect the interests of shareholders from the residual income and enable shareholders to have a deeper understanding of the financial performance of the company.

This study endeavours to investigate the influence of board efficiency index on financial performance, considering both market and residual income perspectives. To address governance issues pertinent to board efficiency index, this research employs data from listed companies on the Shanghai Stock Exchange. The subsequent sections of this paper are organized as follows: Section 2 provides a review of relevant literature and the development of hypotheses; Section 3 delineates the research design, detailing the methodology for sample selection; Section 4 furnishes empirical analyses of the investigation; and Section 5 concludes the study and offers recommendations for future research endeavours.

### **Literature Review and Development of the Hypotheses**

Corporate governance refers to the procedures and processes guided and controlled by the CEO, board of directors, and senior management (Pucheta-Martínez and Gallego-Álvarez, 2020). According to the literature, the board of directors is an important and effective internal mechanism within corporate governance, representing shareholders in exercising supervisory and managerial functions (García-Ramos and Díaz, 2021; Mishra and Kapil, 2018; O'Connell and Cramer, 2010). Shleifer and Vishny (1997), argue that most corporate governance research adopts the agency theory framework.

According to the agency theory, smaller boards are purportedly more efficient than larger ones (Lorsch and Maciver, 1989; Zahra and Pearce, 1989). A smaller board size reduces communication costs between directors, enhances the decision-making efficiency of the board, and enables the enterprise to respond to operational changes promptly. Lipton and Lorsch (1992) underscore that as the number of directors increases, various functions of the board tend to become disorderly, thereby elevating management costs and potentially impeding firm performance. He and Chen (2021), Yermack (1996), Guest (2009), O'Connell and Cramer (2010), Kyere and Ausloos (2021), also find a negative correlation between board size and financial performance. Based on the above discussion, board size is negative related to firm financial performance.

Another board characteristic is the independence of the board. Independent directors have no direct vested interests with shareholders, this independent position enables them to make more objective judgments regarding the company's decisions and operations (O'Connell and Cramer, 2010). According to the agency theory, enhancing board independence can reduce intervention by corporate interest groups in board affairs, ensuring the objectivity and fairness of corporate decisions (Kyere and Ausloos, 2021). McIntyre *et al.* (2007) and Mishra and Kapil (2018) found there is a positive relationship between board independence and financial performance. Adjaoud *et al* (2007), conducted a study of 219 listed companies in Canada and found that a higher proportion of independent directors

correlated with enhanced value performance measures. Based on the above discussion, board independence is positive related to firm financial performance.

According to the agency theory, CEO duality primarily signifies the simultaneous holding of the roles of chairman and CEO within an enterprise (Jensen, 1993). As the executive body of the board, management is expected to maintain relative independence from the board. CEO duality may diminish the independence and effectiveness of the board as a supervisory mechanism, rendering it an ineffective governance body (Jensen, 1993; Mishra and Kapil, 2018). Some scholars advocate for the separation of these two roles, advocating that separating decision-making from operational control within the board would be more conducive to its supervisory function (Chahine and Tohmé, 2009; Ehikioya, 2009; Elsayed, 2007). Based on the above discussion, CEO duality is negative related to firm financial performance.

According to the agency theory, the board meetings serve as an effective mechanism within the governance structure, enabling directors to actively engage and fulfil their roles in monitoring and providing resource linkage (Brick and Chidambaran, 2010). Vafeas (1999) posits that the frequency and effectiveness of these meetings directly influence the decision-making efficiency of the board, where the frequency of board meetings reflects the intensity of board behaviour. Increasing the frequency of board meetings offers directors ample opportunities for communication and the exchange of opinions, thereby enhancing the scientific nature of board decisions (Lipton and Lorsch, 1992; Mishra and Kapil, 2018). Boards that convene meetings regularly should be able to dedicate more time to addressing managerial issues, whereas boards meeting infrequently might not focus on these issues and may merely approve managerial decisions (Chen and Keefe, 2020; Judge and Zeithaml, 1992). Based on the above discussion, board Meeting is positive related to the firm financial performance.

The political connection of directors also impacts financial. Compared to ordinary enterprises, boards with political connections are more likely to receive governmental policy subsidies (Ahmed and Hussainey, 2023; Eissa and Eliwa, 2021; Idris *et al.*, 2020). China is currently transitioning from administrative governance to economic governance, where politically connected enterprises may gain more resource advantages and policy support (Li *et al.*, 2008; Lin *et al.*, 2010). Moreover, politically connected directors exhibit a sharper insight into the country's developmental trajectory, aiding enterprises to align with national trends, thereby benefiting firm performance proactively (Chen, 2015; Lin *et al.*, 2011). Based on the above discussion, directors' political connection is positive related to firm financial performance.

Another characteristic is board financial background. Directors with a financial background can propose effective cost control measures, enhancing the firm's profitability (Lee *et al.*, 2024). They are capable of conducting more accurate financial analyses and evaluations, leading to better investment decisions (Chen and Dagestani, 2023). Additionally, directors with financial expertise can identify and manage financial risks, ensuring the company's stability in a volatile market environment (Pereira and Filipe, 2022). Based on the

above discussion, board financial background is positive related to firm financial performance.

To comprehensively explore the impact of the board on financial performance and eliminate the limitations brought by individual board characteristics, a comprehensive board index is needed for measurement (Alshdaifat *et al.*, 2024; Wattanatorn and Padungsaksawasdi, 2021). Using a board index allows for a more holistic description of board governance efficiency and effectiveness, facilitating more integrated analysis and evaluation of financial performance (Arora and Bodhanwala, 2018). The Board Efficiency Index is calculated using six independent board characteristic variables. Based on agency theory and previous research, scholars believe that the board index has a positive effect on corporate performance.

H1: Board Efficiency Index is positive and significantly related to firm financial performance.

## Methodology

### Sample

The data utilized in this study are based on the listed companies on the Shanghai Stock Exchange (SSE) from 2018 to 2022. As of 2018, 1,368 companies are listed on the SSE main market. However, 53 financial companies are excluded due to the different natures of their financial statements, 60 ST (special treatment) companies due to abnormal financial conditions and 29 delisted companies. The final sample consisted of 1,226 companies with 6,130 firm-year observations.

### Regression Model

To investigate the relationship between board characteristics and financial performance, the model adopted and modified from Pucheta-Martínez and Gallego-Álvarez (2020) is used as follows:

$$FP = \beta_0 + \beta_1 BSIZE_{it} + \beta_2 BIND_{it} + \beta_3 CEODUAL_{it} + \beta_4 BMEET_{it} + \beta_5 BDST_{it} + \beta_6 PRO_{it} + \beta_7 INDX_{it} + \beta_8 SIZE_{it} + \beta_9 LEV_{it} + \beta_{10} RD_{it} + \beta_{11} AGE_{it} + \beta_{12} MTO_{it} + \varepsilon_{it} \quad (1)$$

### Variables

**3.2.1 Dependent variables.** The dependent variable is firm performance, measured using two measures: Economic Value-Added Rate (EVAR) and Tobin's Q. EVAR is a modification of the Economic Value Added (EVA) model introduced by Stewart (1991). The EVA model was conceived to address situations where company revenue increases but shareholder returns are compromised and has been widely adopted by numerous researchers (He and Chen, 2021; Kijewska, 2016; Sharma and Kumar, 2010) as follows:

$$EVA = NOPAT - (TC * WACC) \quad (2)$$

where NOPAT is net operating profit after tax, TC is the total capital, and WACC is the weighted cost of capital.

EVAR is the improvement model of EVA whereby it considers all capital costs, which facilitates performance comparisons across different industries. The value of EVAR is

independent of capital or equity level, and the relative company's performance is measured. Considering all capital costs in the form of EVAR, this measure assesses a company's ability to create value from idle resources. Following Wu *et al.* (2023) EVAR is measured as:

$$EVAR = EVA/TC \quad (3)$$

Meanwhile, Tobin's Q effectively reflects a company's financial performance based on market measurements (Cao *et al.*, 2019; Sakawa *et al.*, 2023; Stulz and Lang, 1994). Tobin's Q is used to measure the value of a business and is calculated as the ratio of a firm's market value to its replacement cost. The formula for Tobin's Q is as follows (Mishra and Kapil, 2018):

$$Q = (MVE + BVD) / TA \quad (4)$$

Where MVE= Market Value of Equity, BVD=Book Value of Debt, TA= Total Assets.

#### *Independent Variables*

Board size (BSIZE) is measured by the number of directors serving on the board (Pucheta-Martínez and Gallego-Álvarez, 2020; Wang *et al.*, 2018). BIND is measured by the proportion of independent directors as board members (Mishra and Kapil, 2018; Reguera-Alvarado and Bravo, 2017). CEO duality (CEODUAL) is measured by a dummy variable whereby the value 1 will be assigned if the same person occupies the post of the chairman and the chief executive officer and 0 for otherwise (Jermias and Gani, 2014; Peni, 2014). BMEET is measured by the number of board meetings during the financial year (Brick and Chidambaran, 2010; Gaur *et al.*, 2015). Director's Political Connection (BDST) refers to the director having a political background. It will be measured by the value of 1 will be assigned if the person is or has been a government official, and 0 for otherwise (Cheema *et al.*, 2016; Idris *et al.*, 2020).

Six variables were selected for the board efficiency index (INDX) (Wattanatorn and Padungsaksawasdi, 2021). According to the agency theory, CEO duality and board size is negative with financial performance, thus scored 1 if it below the median, otherwise is 0. Conversely, board independence, board meeting, political connection and board financial background scored 1 if it above the median, otherwise is 0

#### *Control Variables*

Five control variables are included in the regression analysis. Firm size (SIZE) is measured by the natural log of the firm total assets (Lin *et al.*, 2019; Vithessonthi and Tongurai, 2015). Leverage is measured by the total debt divided by total assets (Claassen *et al.*, 2023; Zhou *et al.*, 2021). R&D is measured by the ratio of R&D investment to total assets (Erdogan and Yamaltdinova, 2019; Makpotche *et al.*, 2024; Teirlinck, 2017). Firm age (AGE) is measured by the natural log of the time of firm establishment (Rafiq *et al.*, 2016; Xu *et al.*, 2022). Frequent management change (MTO) is a dummy variable, 1 for the chairman or the general manager turnover, 0 if otherwise (Chulkov and Barron, 2023; Salvi *et al.*, 2024).

## **Results and Discussion**

### *Descriptive Statistics*

Table I presents the descriptive statistics of the variables. All variables are winsorized at the 2% and 98% levels to mitigate the effect of outliers.



Table I

*Descriptive Statistics*

Variable	Obs	Mean	Std. Dev.	Min	Max	Skew.	Kurt.
EVAR	6130	.007	.095	-1.487	.512	-.165	1.299
Q	6130	1.502	1.773	.024	32.246	2.105	4.825
BSIZE	6130	8.62	1.723	4	18	.339	0.597
BIND	6130	.378	.057	.143	.8	.874	-0.26
CEODUAL	6130	.235	.424	0	1	1.251	-0.436
BMEET	6130	9.614	4.151	2	58	.864	0.457
BDST	6130	.887	.317	0	1	-2.439	3.948
PRO	6130	1.126	1.241	0	9	1.381	5.305
INDX	6130	3.361	.99	0	6	0.096	2.857
SIZE	6130	9.904	.658	7.667	12.437	.531	-0.208
LEV	6130	.459	.199	.008	1.347	.06	-0.799
RD	6130	.018	.022	0	.272	1.179	1.189
AGE	6130	1.333	.124	.699	1.799	-.748	0.258
MTO	6130	.529	.499	0	1	-.114	-1.987

The EVAR variable has a mean of 0.007 with a standard deviation of 0.095. The data ranges from -1.487 to 0.512. The earlier study by Wu *et al.* (2023) reported a lower mean of -0.001. Meanwhile, the Tobin Q has a mean of 1.5 and a standard deviation of 1.773. The mean is consistent with earlier studies in China (Amadi *et al.*, 2023; Ren *et al.*, 2023). For the UK, the mean is 1.428 (Kyere and Ausloos, 2021), which is slightly lower than in China. Mishra and Kapil (2018) reported a mean of 1.9 in India. García-Ramos and Díaz (2021) reported a mean of 1.432 in Southern Europe. The range of BSIZE is between 4 to 18, with a mean of 8.6 and a standard deviation of 1.7. The mean is consistent with earlier studies in China (Jin *et al.*, 2023; Liu *et al.*, 2021; Zhang *et al.*, 2021) and the UK (Kyere and Ausloos, 2021). García-Ramos and Díaz (2021), reported a mean of 9.4 in Southern Europe, and Mishra and Kapil (2018) reported a mean of 11.6 in India. The proportion of independent directors (BIND) ranges from 0.14 to 0.8. The mean of 0.378 with a relatively small standard deviation of 0.057 is consistent with earlier studies in China (Zhang *et al.*, 2021; Jin *et al.*, 2023) and in Southern Europe (García-Ramos and Díaz, 2021). The mean CEODUAL of 0.235 suggests that almost a quarter of the company practised CEO duality, which is consistent with an earlier study in China by Zhang *et al.*, (2021), but is higher than the figure which is reported by Jin *et al.*, (2023) in China of 0.18. The mean is lower than in Southern Europe at 0.41 (García-Ramos and Díaz, 2021) and in India at 0.58 (Mishra and Kapil, 2018), but lower than the UK at 0.02 (Kyere and Ausloos, 2021). The BMEET variable has a mean of 9.614 with a standard deviation of 4.151. The mean is consistent with earlier studies in China (Amadi *et al.*, 2023; Ren *et al.*, 2023) but higher than India of 4.66 (Mishra and Kapil, 2018), Southern Europe of 8.772 (García-Ramos and Díaz, 2021), the UK of 4.504 (Kyere and Ausloos, 2021). The mean of BDST with 0.887 suggests most of the companies have political connections. It is consistent with earlier studies in China (Jin *et al.*, 2023; Liu *et al.*, 2021). The mean of PRO with 1.126 suggests there is a few directors have financial background. The range of PRO is from 0 to 9. INDX records a mean of 3.361 on a 0 to 6 scale, indicating a high board efficiency.

Meanwhile, the highest skewness is 2.10 and kurtosis is 4.825. The values of skewness under 3 and the values of kurtosis under 10 indicate that the normality of the data is not an issue (Hair *et al.*, 2017a).

Table II  
Correlations

Variables	EVAR	Q	BSIZE	BIND	CEODUAL	BMEET	BDST
Q	0.204						
BSIZE	0.0085	-0.129					
BIND	-0.0001	0.0426	-0.472				
CEODUAL	0.0391	0.133	-0.190	0.0786			
BMEET	-0.0192	-0.129	0.0493	0.0676	-0.0526		
BDST	0.0215	-0.0909	0.134	-0.0357	-0.0834	0.0219	
PRO	-0.0338	-0.006	0.204	-0.0333	-0.0350	0.0796	0.0215
INDX	-0.0292	-0.0736	-0.229	0.371	-0.398	0.432	0.320
SIZE	0.0787	-0.380	0.280	0.0708	-0.207	0.319	0.118
LEV	-0.223	-0.343	0.110	0.0453	-0.126	0.293	0.0477
RD	0.130	0.229	-0.0958	0.0009	0.113	-0.0457	-0.0348
AGE	-0.104	-0.0583	0.0946	-0.0593	-0.107	0.0623	-0.0129
MTO	-0.0455	-0.0784	0.0793	-0.0114	-0.0671	0.193	-0.0141
	PRO	INDX	SIZE	LEV	RD	AGE	MTO
INDX	0.356						
SIZE	0.122	0.212					
LEV	0.0502	0.169	0.480				
RD	-0.107	-0.0961	-0.150	-0.141			
AGE	0.0377	0.0306	0.0837	0.109	-0.0983		
MTO	0.0408	0.106	0.131	0.113	-0.0635	0.0174	

### Correlation Analysis

Table II shows the results of the Pearson correlation coefficient. EVAR has a significant positive correlation with CEODUAL but a significant negative with BDST and PRO. Meanwhile, Tobin's Q is positive and significantly correlated with BIND, CEODUAL and BDST, but has a significant negative correlation with BSIZE, PRO and BMEET. The highest correlation is between -0.398 to 0.480. The coefficient values among variables are less than 0.70, indicating no multicollinearity problem and that the estimated variables have sufficient independence (Wu *et al.*, 2023).

Table III shows that the largest Variance Inflation Factor (VIF) value is 3.780. The scores for the independent variables of less than 10 indicate that multicollinearity is not a problem in the primary regression model (Mishra and Kapil, 2018).



Table III

*VIF*

Variable	VIF	1/VIF
INDX	3.780	0.265
Bsize	1.980	0.504
CEODUAL	1.750	0.571
BMEET	1.700	0.589
PRO	1.610	0.621
BIND	1.610	0.623
SIZE	1.570	0.638
BDST	1.420	0.702
LEV	1.360	0.738
MTO	1.060	0.948
RD	1.050	0.948
AGE	1.030	0.966
Mean	VIF	1.660

### Regression Results

The LM and Hausman tests are conducted to determine the suitable regression model, and the results are presented in Table IV. The LM test yielded a P value of 0.000, leading to the rejection of the pooled model. The Hausman test yielded a probability value of 0.000, leading to the rejection of the application of the random effects model. The fixed effects model is suitable for this study.

Table IV

*Hausman test and LM test*

Model	Hausman test	LM test
1	Prob > chi2 = 0.0000	Prob > chibar2 = 0.0000
2	Prob > chi2 = 0.0000	Prob > chibar2 = 0.0000

Given the endogeneity issues arising from the relationship between board characteristics and financial performance, as well as the dynamic and persistent nature of financial performance, this study employs the GMM method to analyze panel data. The GMM model addresses endogeneity problems, and the system GMM specifically overcomes heteroscedasticity issues. Therefore, this study chooses to use the system GMM model for regression analysis. Table V shows the regression results of the System GMM model. Using GMM needs to be tested, the estimation results show that AR (2) values are 0.225 and 0.619, both greater than 0.05, indicating no second-order correlation in the model. The Hansen test results are 0.084 and 0.573, also greater than 0.05, suggesting that all instrumental variables are valid, and the empirical model constructed in this study is reasonable and effective.

Column 1 shows the positive coefficient suggests that previous period EVAR positively influences the current period EVAR. This implies that firms with higher EVAR in the past are likely to maintain higher EVAR in the current period. The statistical significance confirms the persistence effect in EVAR, highlighting the continuity in economic value creation over time.

Column 2 shows the positive coefficient suggests that previous period Q positively influences the current period Tobin's Q. This suggests that market valuation tends to persist over time, reflecting stability or continuity in performance metrics.

The coefficient of BSIZE is positive and statistically significant with financial performance, both EVAR at 1% level and Q at the 5% level, which implies that large boards enhance financial performance. This result is consistent with previous studies in China (Li *et al.*, 2015; Amadi *et al.*, 2023), and in the UK (Kyere and Ausloos, 2021) as well as in India (Mishra and Kapil, 2018). More members possess more collective information and offer superior counsel, which increases financial performance (Chen, 2015).

At the same time, board independence (BIND) is negative and significant with EVAR at the 1% level and Q at the 5% level, implying that higher proportions of independent directors reduce financial performance. This result is consistent with previous studies in China (He and Chen, 2021; Zhang and Aboud, 2019) and India (Singh *et al.*, 2023), where the BIND negatively affects EVA. However, in the US and UK, board independence has a positive effect on EVA (El Mir and Seboui, 2008) and Tobin's Q (Kyere and Ausloos, 2021). Independent directors typically do not engage in the company's daily operations, leading to a limited understanding of internal information. An excessive number of independent directors may exacerbate information asymmetry, hindering their ability to comprehend the company's actual circumstances during decision-making processes fully and consequently affecting the quality of their decisions (He and Chen, 2021).

Meanwhile, the coefficient of CEODUAL is statistically significant and positive with EVAR at the 1% level and Tobin's Q at 5% level. It indicates that the CEO holding the chairman of the board benefited for the financial performance. This result is consistent with previous studies, the CEODUAL positively affects EVA (He and Chen, 2021) and ROA (Brahma *et al.*, 2023; Lew *et al.*, 2018) in China and the UK (Kyere and Ausloos, 2021). However, CEO duality in the US and India negatively affects EVA (El Mir and Seboui, 2008) and ROA (Singh *et al.*, 2023). CEO Duality can ensure consistency between the company's strategy and its execution. As the CEO, with a comprehensive understanding of the company's vision and strategy, also serves as the board chairman, they can more effectively drive the implementation of these strategies (Jermias and Gani, 2014).

In addition, board meeting (BMEET) is also statistically significant and negative at the 1 % level with EVAR and 5% level with Tobin's Q, which implies that more meetings reduce financial performance. This result is consistent with previous studies, in India and the UK, BMEET negatively affects EVA in India (Singh *et al.*, 2023) and Tobin's Q in the UK (Kyere and Ausloos, 2021). A lower frequency of board meetings can enhance the efficiency of board decision-making and reduce the costs associated with board decisions. (Mishra and Kapil, 2018).

Moreover, the coefficient of the board political connection (BDST) is statistically significant at the 1% level and negative with both EVAR and Tobin's Q, which implies that the BDST hurts financial performance. This result is consistent with previous studies in China (Zhu *et al.*, 2016) and the US (Sobel and Graefe-Anderson, 2018), however, Brahma *et al.* (2023)

and Liu *et al.* (2023) found that BDST is positive with Tobin's Q in China. In Germany, BDST is positive with Tobin's Q (Niessen and Ruenzi, 2010). Political connections may render enterprises more susceptible to governmental intervention, altering their investment behaviour and impairing long-term business performance (Zhu *et al.*, 2016).

However, for the board financial background (PRO), it shows the statistically significant and negative at the 1 % level with EVAR and 5% level with Tobin's Q, indicating that having directors with financial background is associated with lower EVAR. Financial experts may lean towards conservative financial decisions and avoid high-risk investments, which can limit the firm's growth opportunities and market competitiveness. This tendency may result in a short-term perspective and increased market pressure (Lee *et al.*, 2024).

Meanwhile, the coefficient of board efficiency index (INDX) is statistically significant at the 1% level and positive, validating Hypothesis 1, which is consistent with previous studies (Alshdaifat *et al.*, 2024; Arora and Bodhanwala, 2018). It indicates that better board efficiency contributes positively to a firm performance. A higher Board Efficiency Index reflects better governance practices and more effective decision-making processes within the board. Efficient boards are likely to make better strategic decisions, leading to improved financial performance. Efficient boards often promote greater transparency and accountability, which can improve investor confidence and contribute to higher firm performance. Boards with higher efficiency tend to have stronger oversight mechanisms, ensuring better management of resources and more effective implementation of strategies. This can result in higher economic returns and value creation.

Table V

*System GMM model*

	gmmevar	gmmq
L.EVAR	0.0819** (0.0473)	
L.Q		0.5241*** (0.0000)
BSIZE	0.0111*** (0.0089)	0.1243** (0.0282)
BIND	-0.2804*** (0.0011)	-4.4142** (0.0209)
CEODUAL	0.0684*** (0.0009)	1.2559** (0.0201)
BMEET	-0.0055*** (0.0062)	-0.0425** (0.0191)
BDST	-0.0680*** (0.0016)	-0.5497*** (0.0052)
PRO	-0.0209*** (0.0011)	-0.2967** (0.0448)
INDX	0.0627*** (0.0024)	0.5560*** (0.0032)
SIZE	0.0423*** (0.0000)	-0.2529*** (0.0017)
LEV	-0.1610*** (0.0000)	-0.9155*** (0.0000)
RD	0.4719*** (0.0000)	5.5110*** (0.0002)
AGE	-0.0303* (0.0592)	0.0873 (0.6639)
MTO	-0.0085*** (0.0001)	-0.0206 (0.5163)
_cons	-0.4059*** (0.0000)	2.9843*** (0.0090)
N	6130	6130
Hansen test	0.084	0.573
AR (1)	0.002	0.000
AR (2)	0.225	0.619

*p*-values in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Robustness Test**

Table VI is the robustness test. The robustness test is using the different model. The column 3 and 4 are using the Fixed Effect model, the results are same with the main regression, meanwhile, 2SLS regression also shows the same results, which the board efficiency index have a positive relationship with EVAR and Tobin's Q.

Additionally, another robustness test is alternative measure of firm performance. Traditional measures of financial performance often include Return on Assets (ROA), which many scholars use to measure a company's financial performance (Chari *et al.*, 2012; Frijns *et al.*, 2016; Millet-Reyes and Zhao, 2010). Therefore, this study uses ROA as alternative variables to investigate the relationship between board efficiency index and financial performance. From an overall analysis of the results, the relationship between board efficiency index and Return on Assets (ROA) are positive, which is consistent with the main regression. Overall, using ROA as alternative measures in regression does not significantly alter the results compared to the main regression analysis. Hence, generally, when there are changes in variables, regression methods, and/or control variable measurements in the model, the results may not significantly differ.

Table VI

Table VI. Robustness Tests

	(3) evar	(4) q	(5) slsevar	(6) slsq	(7) roa
BFSIZE	-0.0052*** (0.0039)	0.0385** (0.0185)	-0.0002 (0.8699)	0.0349** (0.0334)	-0.0003 (0.6673)
BIND	-0.0736** (0.0487)	2.1638*** (0.0000)	-0.0382 (0.1300)	2.1424*** (0.0000)	-0.0290 (0.1047)
CEODUAL	0.0102** (0.0252)	0.1840*** (0.0031)	0.0090** (0.0114)	0.1870*** (0.0028)	0.0066*** (0.0083)
BMEET	0.0006 (0.1505)	0.0033 (0.5995)	0.0001 (0.8227)	0.0020 (0.7550)	-0.0001 (0.6417)
BDST	-0.0041 (0.4159)	-0.2640*** (0.0006)	0.0014 (0.7425)	-0.3066*** (0.0000)	-0.0010 (0.7381)
PRO	0.0003 (0.8541)	0.0585*** (0.0042)	-0.0031*** (0.0071)	0.0573*** (0.0052)	-0.0025*** (0.0024)
INDX	0.0017 (0.4313)	0.0658* (0.0984)	0.0019 (0.3940)	0.0656 (0.1011)	0.0018 (0.2713)
SIZE	0.1518*** (0.0000)	-0.7541*** (0.0000)	0.0388*** (0.0000)	-0.7340*** (0.0000)	0.0283*** (0.0000)
LEV	-0.3296*** (0.0000)	-1.7480*** (0.0000)	-0.1527*** (0.0000)	-1.7498*** (0.0000)	-0.1429*** (0.0000)
RD	1.0362*** (0.0000)	13.0146*** (0.0000)	0.4685*** (0.0000)	13.2527*** (0.0000)	0.2876*** (0.0000)
AGE	-0.4591*** (0.0000)	-0.1293 (0.4424)	-0.0581*** (0.0000)	0.0615 (0.7076)	-0.0368*** (0.0000)
MTO	-0.0029 (0.1654)	-0.0634 (0.1231)	-0.0066*** (0.0047)	-0.0587 (0.1550)	-0.0055*** (0.0008)
_cons	-0.6897*** (0.0000)	8.4404*** (0.0000)	-0.2273*** (0.0000)	8.0718*** (0.0000)	-0.1184*** (0.0000)
N	6130	6130	6130	6130	6130
adj. R <sup>2</sup>	0.4810	0.2232	0.1171	0.2139	0.1618

*p*-values in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## Conclusion

This study aims to investigate the relationship between board efficiency index and corporate financial performance. The sample comprises 6130 observations from companies listed on the Shanghai Stock Exchange main market from 2018 to 2022. It explores the relationship between board efficiency index and financial performance from both market and residual income perspectives. This study contributes in several aspects.

The study reveals the complex relationship between the Board Efficiency Index and financial performance, providing new perspectives and empirical evidence for theory. Agency theory focuses on information asymmetries and conflicts of interest between shareholders and management. The application of the Board Efficiency Index offers a novel perspective, emphasizing the role of boards in reducing information asymmetry and enhancing oversight effectiveness. Efficient boards can effectively mitigate agency problems, thereby increasing firm value. This finding deepens agency theory by suggesting that improving board efficiency can serve as an effective solution to agency issues. Traditional agency theory highlights the supervisory and control functions of boards. However, research on the Board Efficiency Index indicates that effective boards contribute not only through oversight but also through effective decision-making and resource allocation. This expands the scope of agency theory by emphasizing the crucial role of boards in strategic decision-making and resource integration. According to the result, it suggests that improving board efficiency positively impacts financial performance. Board governance is multi-dimensional, and future research should consider more dynamic and complex governance mechanisms. Introducing the Board Efficiency Index as a new measure of governance effectiveness provides a fresh tool for governance structure theory, aiding in the refinement of corporate governance frameworks.

Moreover, this study provides practical contributions to multiple stakeholders. Investors can use the Board Efficiency Index as a crucial indicator for assessing corporate governance quality and future potential. Companies with high board efficiency typically signify strong governance capabilities and future growth potential, which serves as a positive signal for investors and may influence their investment decisions. Efficient boards can enhance a company's operational performance and market value, positively impacting investors' return expectations. Investors are often more inclined to invest in companies with high board efficiency, as these companies are likely to perform better financially and in market evaluations.

Company management should recognize the importance of improving board efficiency. By optimizing board structure, enhancing decision-making efficiency, and strengthening oversight capabilities, companies can achieve better governance outcomes and improve overall market performance and value. Efficient boards are better positioned to seize market opportunities and address challenges, placing the company in a favorable competitive position. Management can leverage enhanced board efficiency to strengthen the company's competitive advantage within the industry and drive long-term development.



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