



AI-Enabled Financial Planning, ESG Risk Disclosure, and Firm Value: A Synthetic Panel Data Simulation Approach

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ABSTRACT

This study aims to replicate a panel data investigation of the connection between ESG risk disclosure and AI financial planning, investment efficiency and firm value. The study has a balanced firm-year sample of 300 firms for 5 years, making a total of 1,500 observations. The main explanatory variable is AI-enabled financial planning, dependent variable is firm value, mediating mechanism is investment efficiency, and moderating factor is ESG risk disclosure. Descriptive statistics, correlation analysis, multicollinearity test and regression models with industry and year effects are used for the analysis. The results suggest that Firm value is positively and significantly impacted by the application of AI in financial planning. Firm value is also positively associated with ESG risk disclosure and with efficiency in investment. Investment efficiency mediates the effect of AI-enabled financial planning on firm value. This implies that AI-based financial systems create value by improving the efficiency of capital allocation. But ESG disclosure does not significantly moderate the relationship between AI planning and firm value. The study adds to the finance and planning literature by bringing together digital financial planning, ESG disclosure and investment efficiency in a single value creation framework.

Keywords: AI-enabled financial planning; ESG risk disclosure; firm value; investment efficiency; synthetic panel data; Tobin's Q; corporate finance.

1. Introduction

AI has emerged as a significant strategic factor in contemporary financial management, revolutionising firms' approach to forecasting, budgeting, risk management, investment planning, and performance evaluation. In data-rich environments, organisations are no longer limited to traditional accounting-based projections or managerial judgement in financial planning. Rather, they are utilising artificial intelligence, business intelligence and big data analytics to enhance the speed of decision making, the accuracy of forecasting and the quality of resource allocation (Chen et al., 2012; Mikalef & Gupta, 2021; Wamba et al., 2017). This change is consistent with a broader shift to a digital business strategy where sophisticated analytics and intelligence systems are embedded within an organization's core decision-making processes (Bharadwaj et al., 2013; Lucas et al., 2013).

AI has recently been shown to generate business value in various ways, including improving organizational capabilities, innovation outcomes, and the performance of a business (Enholm et al., 2022; Haefner et al., 2021; Mikalef & Gupta, 2021). AI and machine learning are also gaining traction in the financial sector for pattern recognition, predictive analysis, portfolio and risk management, and the quality of financial decisions (Goodell et al., 2021). At the firm level, AI has also been associated with firm growth and product innovation, as AI adoption could enhance the operational and strategic performance of firms (Babina et al., 2024). However, despite growing interest in AI-driven business transformation, the specific role of AI-enabled financial planning in improving firm value remains insufficiently examined, particularly when combined with ESG disclosure and investment efficiency.

The financial planning ability within the firm and the ability of the firm to inform non-financial risks and sustainability-related information to investors and stakeholders affects the firm's value. Reporting of ESG risk is gaining importance for corporate transparency as it reduces information asymmetry, signals responsible governance and enhances investor confidence. Prior studies have demonstrated a link between corporate sustainability practices and ESG performance with organizational performance and financial results (Eccles et al., 2014; Friede et al., 2015). Environmental, social, and governance (ESG) disclosure can be a useful instrument that promotes financial planning and strategic decision-making as businesses come under increasing demand to reveal ESG-related risks.

Investment efficiency may be a factor affecting the relationship between AI in financial planning and corporate value. A good financial plan should enhance capital allocation by minimizing the over investment of capital, under investment of capital and the inefficient utilization of financial resources. AI-driven systems can enhance this by incorporating vast amounts of financial and non-financial data, detect patterns in risk, and make better investment decisions. Research on business intelligence and business analytics has proposed that the value can be created using more business intelligence and knowledge in the decision-making process, in order to enhance the managerial insight and responsiveness in the process of operations (Chen et al., 2012; Wamba et al., 2017). Therefore, firms with more AI-savvy financial planning can increase their firm value, at the very least by allocating capital more effectively.

While the application of AI in business strategy, innovation, analytics, and organizational performance (Borges et al., 2021; Dwivedi et al., 2021; Enholm et al., 2022) have been explored in previous studies, there has been limited research on an integrated framework that connects AI-driven financial planning, ESG disclosure, investment efficiency, and firm value. Existing studies tend to focus on one of these themes separately (as a digital capability, as a sustainability mechanism, and as a performance driver, respectively). This generates the research question about whether the use of AI in financial planning will positively impact firm value directly and indirectly via investment efficiency, and whether the relationship will be strengthened by increased disclosure of ESG.

By building and evaluating a financial model based on simulations of firm-level panel data, this study seeks to close this gap. The study takes into consideration the AI associated with financial planning as the primary explanatory variable, the firm value as the dependent variable, the investment efficiency as a mediating mechanism, and ESG risk disclosure as a moderating variable. The paper is a contribution to the fields of digital finance, corporate sustainability, investment efficiency, and firm valuation in that it ties together these variables in a single empirical model. The aims of this study are:

- To examine the effect of AI-enabled financial planning on firm value.
- To evaluate whether ESG risk disclosure has a positive association with firm value.
- To investigate whether investment efficiency improves firm value.

- To investigate if the relationship between AI-enabled financial planning and firm value is mediated by investment efficiency
- To determine whether the relationship between AI-enabled financial planning and business value is moderated by ESG risk disclosure.
- To provide a structured simulation-based framework for analyzing how AI-driven financial planning, sustainability disclosure, and investment efficiency jointly contribute to corporate value creation.

The study is expected to make theoretical and practical contributions. It combines AI capabilities, ESG disclosure and investment efficiency into one, which enriches digital finance and corporate valuation research, in theory. It almost stresses the importance of AI powered financial planning as a strategic tool to improve financial decision making and firm value. The results can be used to inform managers, investors and policymakers about the potential of smart financial systems and transparent ESG practices to enable value-based business planning.

2. Literature Review and Hypothesis Development

The literature on finance and accounting has thoroughly examined the relationship between the firm's value, the effectiveness of investments, the quality of financial decisions, and the disclosure of ESG. Previous research has shown that firms create value not only through profitability and growth, but also through the quality of information they provide for capital allocation, risk management and external stakeholder assessment. In this context, AI-enabled financial planning can be seen as a sophisticated decision support mechanism to enhance forecasting, budgeting, liquidity planning and investment allocation . Although the present study is centered on AI-enabled financial planning, its theoretical underpinning is strongly linked to the broader literature on financial reporting quality, investment efficiency, risk disclosure, and value creation.

Information quality is a major factor in increasing investment efficiency, according to a major body of research. Biddle and Hilary (2006) suggested that better accounting quality enhances capital investment, as it helps to lower information asymmetry and to allocate capital more efficiently. Taking this line of reasoning further, Biddle et al. (2009) reported a relationship between financial reporting quality and reduced underinvestment and overinvestment, which

suggests that a better environment of information results in more efficient investments. Likewise, Chen et al. (2011) found that financial reporting quality contributes to investment efficiency of private companies in emerging markets. The studies imply that the higher the information-processing capacity of the firm, the more likely the firm will allocate resources efficiently. Similarly, AI can assist in financial planning by enhancing the precision, speed, and depth of financial choices.

Agency issues, earnings management and free cash flow are all associated with investment inefficiency. High free cash flows can lead to overinvestment, as indicated by Richardson (2006) especially in the presence of weak monitoring mechanisms. McNichols and Stubben (2008) also determined that earnings management can affect the investment decision making and cause a firm to invest above or below the optimal amount. Gomariz and Ballesta (2014) also related the quality of accounting reports and debt maturity with the efficiency of investment, stating that the financing structures and the quality of information are interrelated and can affect the investment behavior. The findings demonstrate that one way the caliber of financial planning might affect the firm's worth is through investment efficiency. Thus, companies with AI-powered financial planning systems might be better equipped to minimize sub-optimal investment practices and increase value creation.

Based on this reasoning, the first and third hypotheses are proposed:

H1: AI-enabled financial planning has a positive effect on firm value.

H3: Investment efficiency has a positive effect on firm value.

The literature highlights the connection between financial performance and valuation and sustainability disclosure, commonly known as CSR or corporate social responsibility. Cheng et al. (2014) concluded that the firms with high corporate social responsibility performance enjoy better access to financing and thus, responsible corporate behaviour can alleviate financing constraints. Dhaliwal et al. (2011) demonstrated that voluntary disclosure in general and CSR reporting in particular, is linked to a lower cost of equity capital. The same is true for El Ghouli et al. (2011) who concluded that "corporate social responsibility lowers the cost of capital," indicating that investors would be prepared to pay more for companies with a higher perceived risk with more robust CSR efforts. Further causal evidence that CSR can have positive effects on

financial performance was provided by Flammer (2015). The results corroborate the argument that disclosure of ESG data may enhance firm value by increasing transparency, decreasing information asymmetry, and increasing investor confidence.

Fatemi et al. (2018) looked at the link between ESG performance, disclosure and firm value. In addition, they discovered that the relationship between ESG strengths and business value is impacted by transparency, and that ESG concerns can lead to a drop in firm value, as can ESG strengths. This closely relates to the current investigation because ESG risk disclosure may not only directly impact the value of the company but may also influence how investors evaluate AI-enabled financial planning. When firms combine advanced financial planning systems with transparent ESG disclosure, investors may perceive lower uncertainty and stronger governance quality.

Thus, the second and fifth hypotheses are proposed:

H2: ESG risk disclosure has a positive effect on firm value.

H5: ESG risk disclosure positively moderates the relationship between AI-enabled financial planning and firm value.

The theoretical importance of the mediation of investment efficiency is also important. Previous research demonstrates that higher information quality leads to better capital allocation and lesser investment distortions (Biddle & Hilary, 2006; Biddle et al., 2009; Chen et al., 2011). Given that AI-driven financial planning can enhance the quality of information processing and decision-making, it is reasonable to believe that this will lead to an improvement in firm value, at least in part by making better investments. In other words, AI can help firms allocate capital more effectively and thus indirectly to firm value.

Thus, the fourth hypothesis is postulated:

H4: Investment efficiency mediates the relationship between AI-enabled financial planning and firm value.

Combined, the literature indicates that value creation can be understood in the context of the relationships between the quality of financial planning, investment efficiency, ESG transparency and capital-market perceptions. Our contributions extend previous research by combining these

mechanisms in one model that examines AI-based financial planning as a strategic financial capability on company value in relation to investment efficiency and disclosure of environmental, social, and governance (ESG) risks.

3. Conceptual Framework

The conceptual framework of this study provides a theoretical perspective on the relationship among the use of AI in financial planning, ESG risk disclosure, investment efficiency, and business value. It is assumed that companies that use AI-powered financial planning systems are more likely to enhance the precision of their financial forecasts, optimize capital allocation, mitigate financial uncertainties, and reinforce strategic decision-making. These changes are anticipated to raise the company's worth, by using financial resources more efficiently and managing risk better.

AI-enabled financial planning is positioned as the main independent variable in the framework. It refers to the application of tools based on artificial intelligence and analytical systems in financial forecasting, budgeting, investment planning, liquidity management, capital allocation, and risk assessment. Firms with higher AI-enabled financial planning capability are expected to make faster and more accurate financial decisions. Such firms may also be better able to identify investment opportunities, predict financial risks, and allocate resources toward value-generating activities.

The study's dependent variable is the business value. Tobin's Q is used to calculate the firm's market-based valuation. A higher firm value indicates more investor confidence, better expected future performance and more efficient use of corporate assets. In this framework, firm value is affected by AI-enabled financial planning, ESG risk disclosure, investment efficiency and firm-level control variables.

We introduce investment efficiency as a mediating variable. The framework assumes that AI-enabled financial planning does not affect firm value only through a direct effect. Rather, some of its effect is through improved investment efficiency. AI-based systems can help improve capital budgeting, mitigate overinvestment and underinvestment problems, and better match financial resources with strategic investment needs. Thus, we expect firms with stronger AI

enabled financial planning to have higher investment efficiency which, in turn, will lead to higher firm value.

One mitigating variable is the disclosure of ESG risks. The degree to which businesses inform stakeholders about environmental, social, and governance-related risks and practices is reflected in ESG risk disclosure. Investor trust can be increased, information asymmetry can be reduced, and transparency can be improved with good ESG reporting. According to this approach, it is expected that ESG disclosure will strengthen the connection between AI financial planning and corporate value. This suggests that when businesses additionally demonstrate a better degree of ESG disclosure quality, the beneficial impact of financial planning with AI on company value may be more noticeable.

In addition, the framework also contains strict control variables on a firm level: firm age, industry impacts, year effects, firm size, leverage, profitability, and liquidity. These variables are included because firm value may be influenced by financial structure, operational maturity, profitability conditions, sector-specific characteristics, and time-based changes. Controlling for these factors allows the study to more accurately estimate the connection between corporate value and financial planning made possible by AI.

The proposed conceptual framework is therefore based on three key relationships. First, we predict a positive direct effect of AI-enabled financial planning on firm value. Second, investment efficiency is expected to act as a mediator between AI-enabled financial planning and firm value. Third, we anticipate that the association between AI-enabled financial planning and business value will be moderated by disclosure of ESG risk. Overall, these linkages create a holistic viewpoint for understanding the potential impact of AI-driven financial planning on business value within a finance-management context.

Conceptual Model:

AI-Enabled Financial Planning → Firm Value

AI-Enabled Financial Planning → Investment Efficiency → Firm Value

AI-Enabled Financial Planning × ESG Risk Disclosure → Firm Value

Control variables include things like firm size, leverage, profitability, liquidity, firm age, industry effects, and year effects.

4. Research Methodology

4.1 Research Design

This study investigates the connection between AI-based financial planning techniques using a quantitative research methodology based on simulation, ESG risk disclosure and company value, and investment efficiency. The study is set up as a firm level panel analysis where the study includes observations on several firms over a particular period. This approach is appropriate as the study is designed to analyze both longitudinal (over time) and cross-sectional (between enterprises) differences in financial planning outcomes.

The study is explanatory, aimed at answering the question of whether the use of AI in financial planning leads to an increase in the value of the firm and if there is any mediation effect between investment efficiency and the disclosure of environmental, social and governance (ESG) risks. The research design is based on an empirical logic that tests direct effects of the financial planning competitiveness created by AI on value of the business while considering investment efficiency as a mediator variable and ESG risks disclosure as a moderator variable. This study's methodology makes it possible to examine the conditions and mechanism of the relationship between business value and AI-based financial planning.

4.2 Data Design and Variable Measurement

The study employs a balanced firm-year panel data set of 300 firms for five years, resulting in 1,500 observations. The dataset is synthetically generated for simulation-based analysis and is not based on real firm-level data. It was constructed to represent the variations that would theoretically be possible across manufacturing, services, finance, technology and retail firms.

The dependent variable is firm value, as assessed by Tobin's Q. An indicator of AI application in financial planning functions as the principal independent variable, encompassing budgeting, forecasting, risk assessment, capital allocation, and financial decision-making. ESG risk disclosure is measured by an ESG disclosure score. Investment efficiency captures the firm's ability to efficiently utilize financial resources and prevent under- or overinvestment.

The study additionally accounts for various control factors to mitigate omitted variable bias. The logarithm of total assets is used to measure firm size; the debt-to-assets ratio is used to measure leverage; return on assets is used to measure profitability; and the current ratio is used to measure liquidity., and firm age by organizational maturity. To control for sector-specific differences and time-specific variations, industry and year effects are included.

4.3 Model Specification

The empirical analysis is carried out by a series of regression models to test the direct, mediating and moderating relationships among the study variables. The baseline model evaluates how AI-enhanced financial planning directly affects the value of businesses, while accounting for firm-specific financial attributes, industry influences, and temporal effects. The baseline model is given as:

Model 1: Baseline Model

$$\text{Firm Value} = \beta_0 + \beta_1 \text{AI Planning} + \beta_2 \text{Firm Size} + \beta_3 \text{Leverage} + \beta_4 \text{Profitability} + \beta_5 \text{Liquidity} + \beta_6 \text{Firm Age} + \text{Industry Effects} + \text{Year Effects} + \varepsilon$$

The second model extends the baseline specification by including ESG risk disclosure and investment efficiency. This model examines whether ESG disclosure and investment efficiency explain additional variation in firm value beyond AI-enabled financial planning and the control variables.

Model 2: Full Model

$$\text{Firm Value} = \beta_0 + \beta_1 \text{AI Planning} + \beta_2 \text{ESG Disclosure} + \beta_3 \text{Investment Efficiency} + \beta_4 \text{Firm Size} + \beta_5 \text{Leverage} + \beta_6 \text{Profitability} + \beta_7 \text{Liquidity} + \beta_8 \text{Firm Age} + \text{Industry Effects} + \text{Year Effects} + \varepsilon$$

The third model incorporates an interaction term between AI-enabled financial planning and ESG risk disclosure to investigate the moderating effect of ESG disclosure. This specification tests whether the relationship between AI-enabled financial planning and firm value becomes stronger or weaker at different levels of ESG disclosure.

Model 3: Moderation Model

$$\text{Firm Value} = \beta_0 + \beta_1 \text{AI Planning} + \beta_2 \text{ESG Disclosure} + \beta_3 \text{Investment Efficiency} + \beta_4 \text{AI Planning} \times \text{ESG Disclosure} + \beta_5 \text{Firm Size} + \beta_6 \text{Leverage} + \beta_7 \text{Profitability} + \beta_8 \text{Liquidity} + \beta_9 \text{Firm Age} + \text{Industry Effects} + \text{Year Effects} + \varepsilon$$

The two-step Regression analysis is utilized to evaluate the mediating impact of investment efficiency. First, we regress investment efficiency on AI-enabled financial planning and the control variables. Second, we regress firm value on AI-enabled financial planning and investment efficiency. If investment efficiency is significantly impacted by AI-enabled financial planning and company value is significantly impacted by investment efficiency, then investment efficiency can be seen as a transmission mechanism through which AI-enabled financial planning contributes to firm value.

4.4 Estimation Technique

The study uses ordinary least squares regression with industry and year effects . Strong standard errors are employed to account for possible heteroskedasticity and to strengthen statistical inference . Continuous variables are standardized before estimation to improve comparability and interpretability of coefficients.

The analysis uses a sequential estimation approach. The distribution of the research variables was summed up using descriptive statistics. Second, correlation analysis investigates the initial association of AI-enabled financial planning, ESG disclosure, investment efficiency, firm value and control variables. Third, the variance inflation factor analysis is used to assess multicollinearity. Finally, baseline, full, mediation, and moderation models are estimated to test the hypotheses proposed.

The baseline model assesses how AI-enabled financial planning directly affects business value. The full model considers the impact of AI planning, ESG disclosure, and the efficiency of investments. The mediation model examines if the impact of AI planning on firm value is mediated by investment efficiency, and the moderation model investigates whether ESG disclosure affects the strength of the relationship between AI planning and firm value.

As the dataset is created for simulation based financial analysis, the results are considered as model-based evidence as opposed to evidence gained from real firms. This design allows for the testing of theoretically motivated relationships between AI enabled financial planning and ESG disclosure, investment efficiency and firm value.

5. Results

5.1 Descriptive Profile of the Study Variables

Distribution and central tendency of the main variables included in the study were summarized using descriptive statistics. The data set has 1,500 firm-year observations, as indicated in Table 1. The mean value is 87.801 and the standard deviation is 10.252, which means there is moderate variation between firm value and years and between firms. The mean score of AI-enabled financial planning is 58.231, indicating that the simulated companies exhibit varying stages of AI integration in financial planning. The mean values of the ESG risk disclosure and investment efficiency are 65.691 and 0.624, respectively, indicating a relatively moderate level of investment allocation efficiency in the simulated data set.

Table 1. Descriptive Statistics of Study Variables

Variable	N	Mean	Std. Dev.	Min	Median	Max
Firm value	1500	87.801	10.252	57.430	87.620	119.510
AI-enabled financial planning	1500	58.231	18.063	1.300	57.375	100.000
ESG risk disclosure	1500	65.691	16.114	13.790	65.870	100.000
Investment efficiency	1500	0.624	0.116	0.292	0.623	0.980
Firm size	1500	13.902	1.108	10.116	13.960	16.556
Leverage	1500	0.457	0.149	0.057	0.454	0.893
Profitability	1500	0.115	0.054	-0.037	0.116	0.278
Liquidity	1500	1.580	0.480	0.500	1.602	3.299
Firm age	1500	39.690	20.241	3.000	38.000	79.000

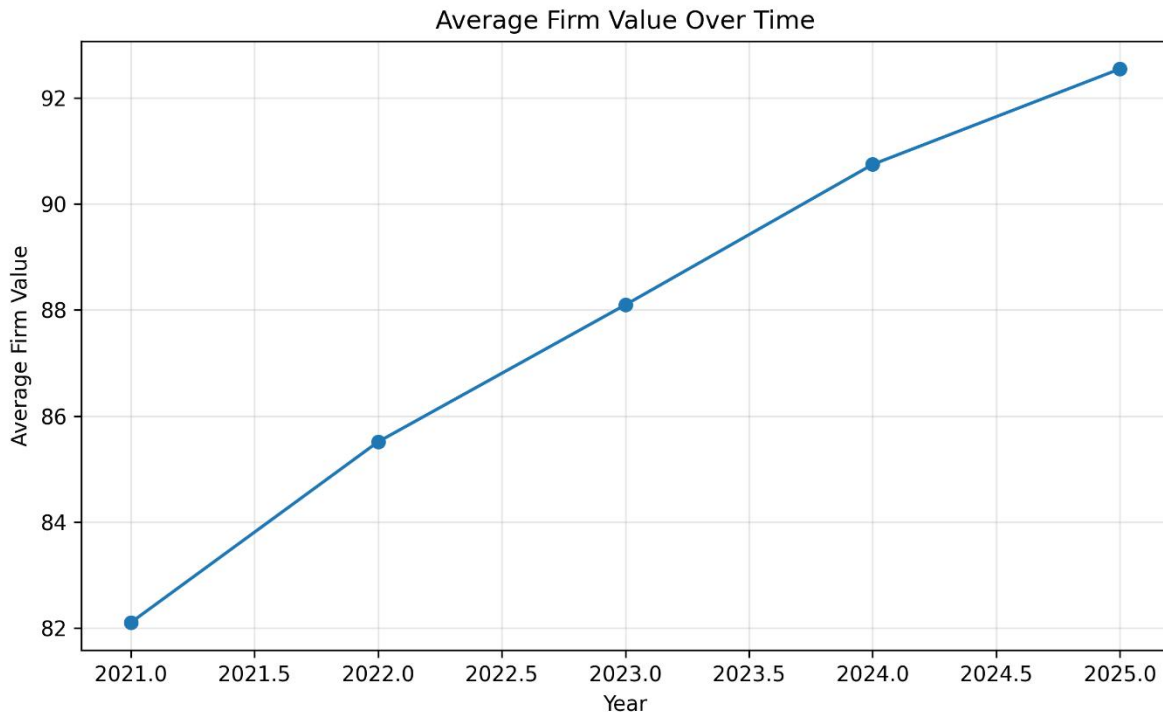


Figure 1. Average Firm Value Over Time

As seen in figure 1, there is a continuous upwards trend in the average firm value from 2021 to 2025. In 2021, the average firm value is around 82.1 but rises to 92.5 in 2025. This result indicates a steady rise in the value of the simulated companies in the period under study. The rising trend supports the assumption that improvements in financial planning capability, ESG disclosure, and investment efficiency may be associated with higher firm value over time.

5.2 Correlation Analysis and Multicollinearity Diagnostics

The preliminary correlations between the main study variables were examined using correlation analysis, before estimating the regression models. As shown in Table 2, firm value is strongly and positively correlated with investment efficiency ($r = 0.803$) and AI-enabled financial planning ($r = 0.746$). This indicates that firms with higher AI-based financial planning capability and stronger investment efficiency tend to report higher firm value. ESG risk disclosure is also positively correlated with firm value ($r = 0.460$), suggesting that stronger ESG disclosure is associated with higher corporate valuation. Profitability shows a strong positive correlation with firm value ($r = 0.696$), while leverage is negatively correlated with firm value ($r = -0.281$).

Table 2. Correlation Matrix

Variable	FV	AIFP	ESGD	IE	FS	LEV	PROF	LIQ	AGE
Firm value (FV)	1.000								
AI-enabled financial planning (AIFP)	0.746	1.000							
ESG disclosure (ESGD)	0.460	0.198	1.000						
Investment efficiency (IE)	0.803	0.720	0.324	1.000					
Firm size (FS)	0.194	0.090	0.118	0.078	1.000				
Leverage (LEV)	- 0.281	- 0.101	0.115	- 0.370	0.032	1.000			
Profitability (PROF)	0.696	0.520	0.313	0.757	0.104	- 0.251	1.000		
Liquidity (LIQ)	0.111	0.045	0.043	0.124	0.090	- 0.232	0.096	1.000	
Firm age (AGE)	0.109	0.059	0.056	0.098	0.087	- 0.060	0.105	0.032	1.000

The results of variance inflation factor were shown in Table 3 . Every VIF number is less than the standard value of 5. This suggests that multicollinearity in the regression is not a significant issue models. The highest value of VIF is 4.423, which is the investment efficiency, and it is still in the acceptable range. Thus, the explanatory variables are appropriate to be used in the regression models.

Table 3. Variance Inflation Factor Test

Variable	VIF
AI-enabled financial planning	2.278
ESG risk disclosure	1.248
Investment efficiency	4.423
Firm size	1.038
Leverage	1.419
Profitability	2.394
Liquidity	1.072
Firm age	1.020

5.3 Graphical Illustration of Bivariate Relationships

The bivariate correlations between company value and the three main explanatory factors were visually examined using graphic analysis. Figures 2, 3 and 4 show the comparison of firm value with AI enabled financial planning, ESG risk disclosure and investment efficiency. These plots serve as a visual aid to the correlation and regression results, by illustrating whether the main explanatory variables follow the expected positive relationship with firm value.

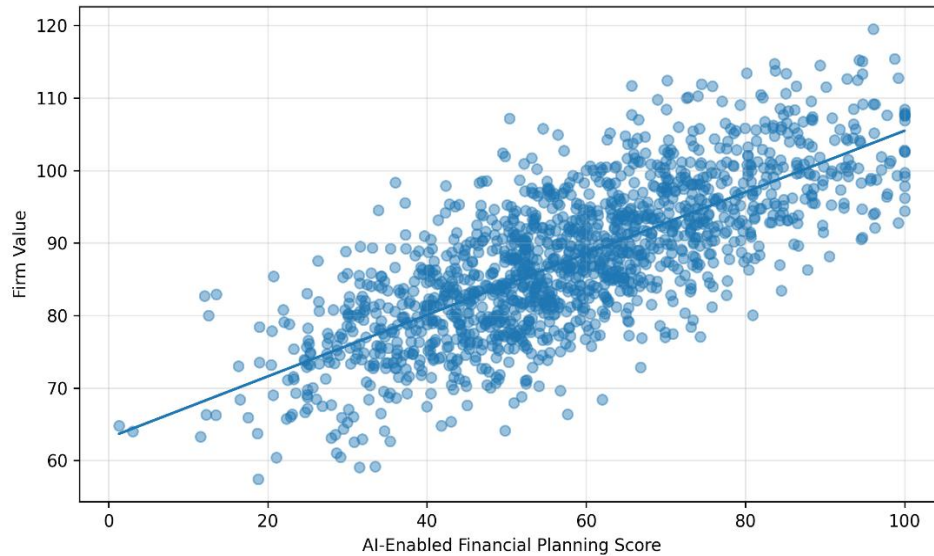


Figure 2. Relationship Between AI-Enabled Financial Planning and Firm Value

Figure 2 shows a clear positive relationship between AI-enabled financial planning and firm value. The trend line fitted is an upwards line, which means that AI planning score is positively associated with firm value scores. This visual pattern aligns with the anticipated theoretical connection between AI-driven financial planning and enhanced prediction, resource allocation, and strategic financial choices, which in turn could translate to increased valuation.

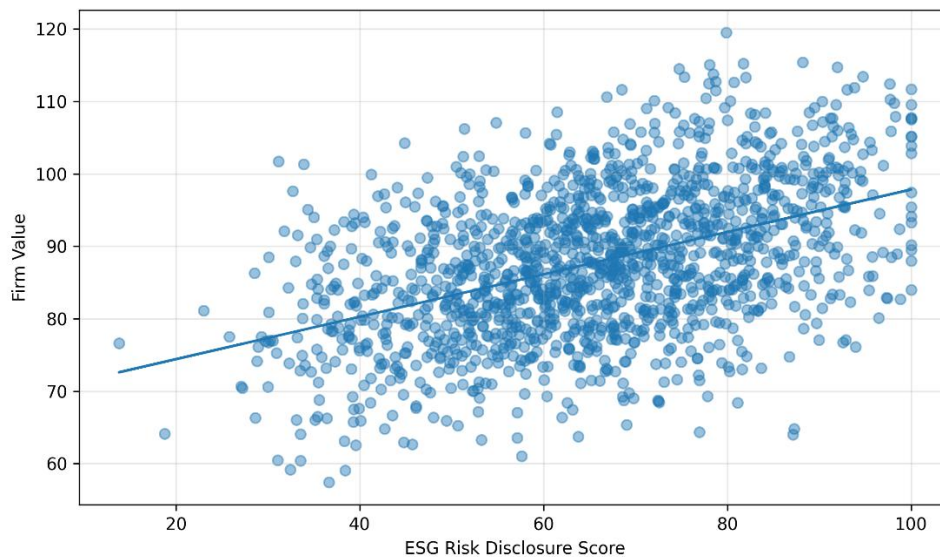


Figure 3. Relationship Between ESG Risk Disclosure and Firm Value

The relationship between risk disclosure in ESG and firm value is positive but comparatively weak, as Figure 3 illustrates. The upward slope of the line suggests that companies with greater ESG disclosures typically have higher firm values. The scatter is larger, however, than the one in the AI planning relationship, suggesting that ESG disclosure can influence firm value but it can be in conjunction with other financial and strategic determinants.

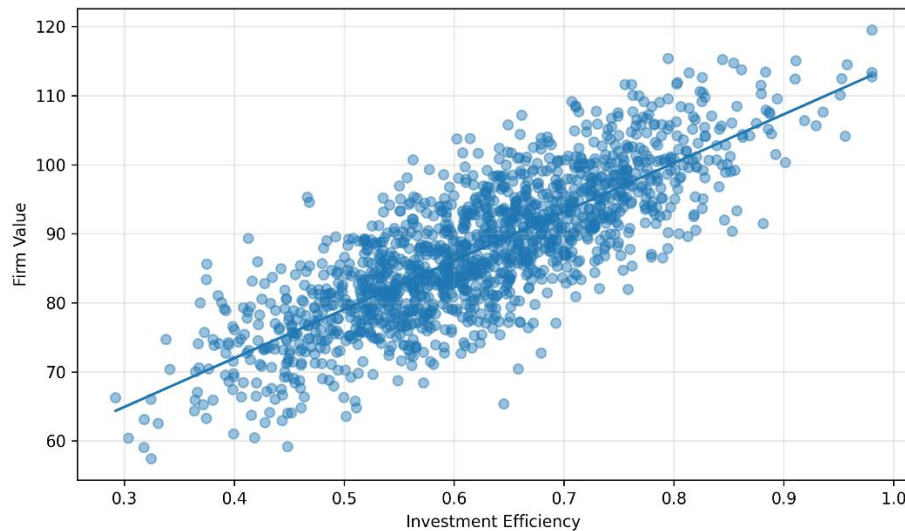


Figure 4. Relationship Between Investment Efficiency and Firm Value

Investment efficiency and firm value have a strong positive link, according to Figure 4's findings. The fitted line's high slope value suggests that a firm's worth increases with increased investment efficiency. The mediating logic for the study is that AI-driven financial planning could lead to a higher firm value due to a better allocation of financial resources in the firm.

5.4 Regression Results

The regression results for the three models (baseline, full and moderation) are presented in Table 4. In model 1, we focus on the immediate impact of financial planning enabled by AI on the firm value. After controlling for various characteristics, temporal effects, and industry influences, the coefficient for AI financial planning remains positive and statistically significant ($\beta = 0.4831$, $p < 0.001$), indicating a robust positive correlation with company value.

Model 2 includes ESG risk disclosure and investment efficiency as a baseline model. Despite the regression of ESG disclosure and investment efficiency, AI planning is statistically significant (β

= 0.3979, $p < 0.001$) and positive, suggesting that AI planning still has a positive effect on firm value post controlling for ESG disclosure and investment efficiency. The positive and substantial connection ($\beta = 0.2502$, $p < 0.001$) between ESG risk disclosure and firm value underscores that the transparency of ESG risks correlates positively with firm value. The investment efficiency is both positive and significant ($\beta = 0.1847$, $p < 0.001$), suggesting that the effective allocation of investment is a crucial determinant of the firm's value.

The firm size and leverage variables are significant and positively and negatively impact firm value, respectively ($\beta = 0.0801$ and 0.1389 , both with $p < 0.001$). Profitability is positive and significant ($\beta = 0.1988$, $p < 0.001$) and is a good indicator of the fact that more profitable firms are more valuable. The age of firm does not provide a significant explanation of the results in the full model, nor is liquidity in the main model statistically significant.

To evaluate the moderating influence of ESG disclosure, Model 3 incorporates and analyzes the interaction term between ESG disclosure and AI-enabled financial planning. The interaction coefficient ($\beta = 0.0044$, $p = 0.6934$) is positive but not statistically significant. This implies that the ESG disclosure in the simulated data set neither strengthens nor weakens the relationship between AI-driven FP and business value.

Table 4. Regression Results

Variable	Model 1 Coef.	Model 1 p-value	Model 2 Coef.	Model 2 p-value	Model 3 Coef.	Model 3 p-value
AI-enabled financial planning	0.4831	0.0000	0.3979	0.0000	0.3976	0.0000
ESG risk disclosure	—	—	0.2502	0.0000	0.2503	0.0000
Investment efficiency	—	—	0.1847	0.0000	0.1846	0.0000
AI planning $\times$ ESG disclosure	—	—	—	—	0.0044	0.6934

Firm size	0.0854	0.0000	0.0801	0.0000	0.0802	0.0000
Leverage	-0.1362	0.0000	-0.1389	0.0000	-0.1392	0.0000
Profitability	0.3812	0.0000	0.1988	0.0000	0.1987	0.0000
Liquidity	0.0051	0.7170	-0.0122	0.3155	-0.0124	0.3107
Firm age	0.0166	0.2002	0.0071	0.5330	0.0069	0.5431

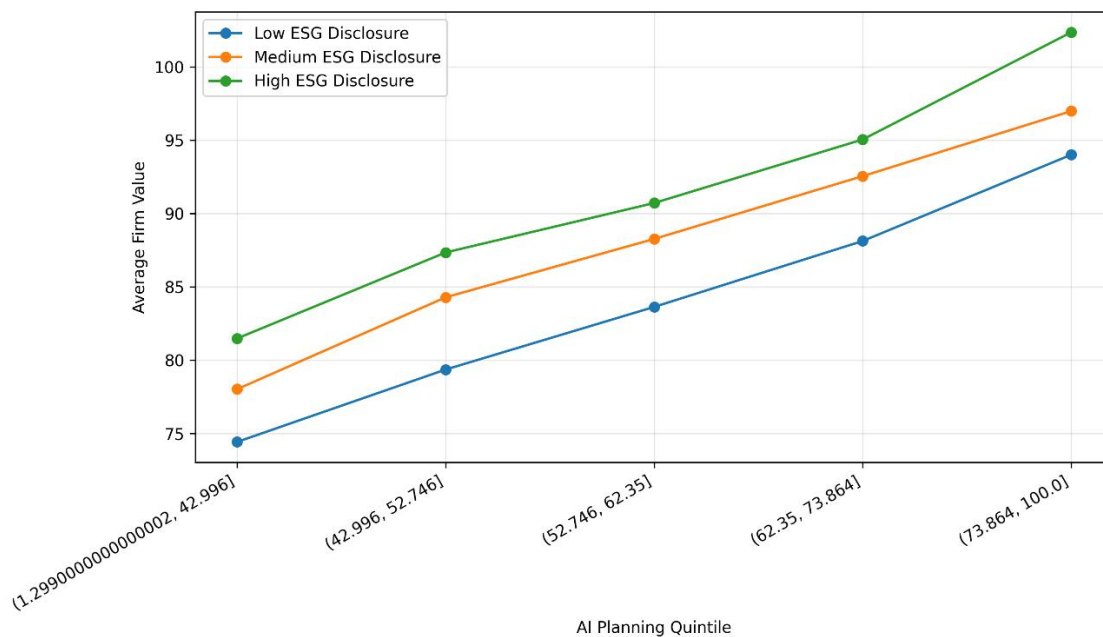


Figure 5. Moderating Role of ESG Disclosure

Figure 5 compares the average firm value in AI planning quintiles for low, medium, and high ESG disclosure groups to illustrate the moderation pattern. The figure shows a positive relation between the average firm value and the level of ESG disclosure of firms at all the AI planning levels. However, the lines are broadly parallel indicating that ESG disclosure increases the valuation level but does not considerably change the strength of the AI planning–firm value relation. This graphical evidence is in line with the regression result that the interaction term is statistically insignificant.

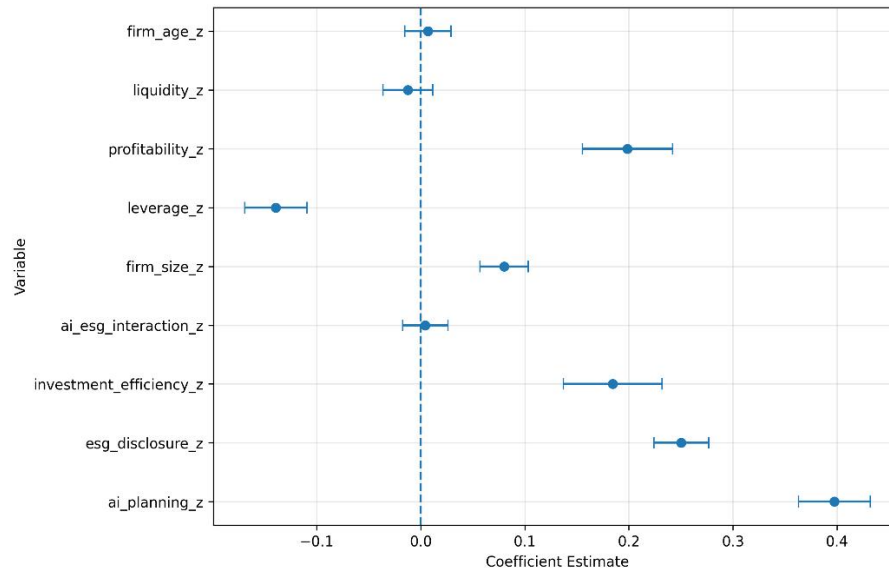


Figure 6. Coefficient Plot for the Full Moderation Model

Figure 6 shows the standardized coefficient estimates of the full moderation model. The biggest positive coefficient is for AI-enabled financial planning, followed by ESG disclosure, profitability, investment efficiency and firm size. The leverage results show a negative coefficient, the higher the debt intensity, the lower the value of the firm. The confidence interval of the AI–ESG interaction contains zero, which means the moderating effect is not statistically significant.

5.5 Hypothesis Testing Summary

Table 5 summarizes the results of the hypothesis testing. H1 is substantiated as AI-driven financial planning exerts a statistically significant and positive influence on corporate value. The hypothesis is supported, as the impact of ESG risk disclosure on firm value is both positive and statistically significant. The efficacy of investments exhibits a positive and statistically significant correlation with business worth; H3 is likewise corroborated. H4 is supported, and the estimated indirect effect via investment efficiency is positive, which implies that investment efficiency is a transmission channel between AI-enabled financial planning and firm value. H5 is not supported because the interaction of AI-enabled financial planning with ESG risk disclosure is not statistically significant.

Table 5. Hypothesis Testing Summary

Hypothesis	Statement	Effect / Coefficient	p-value	Decision
H1	AI-enabled financial planning positively affects firm value.	0.3979	0.0000	Supported
H2	ESG risk disclosure positively affects firm value.	0.2502	0.0000	Supported
H3	Investment efficiency positively affects firm value.	0.1847	0.0000	Supported
H4	Investment efficiency mediates the relationship between AI planning and firm value.	0.1319	—	Supported
H5	ESG disclosure moderates the relationship between AI planning and firm value.	0.0044	0.6934	Not supported

The findings indicate that in general, financial planning through AI, ESG risk disclosure, and investment efficiency are positively related to firm value. AI-enabled financial planning shows the highest explanatory effect, suggesting that AI-based financial decision systems are likely to be key in enhancing corporate valuations. Another key mechanism by which AI planning aids in value creation is investment efficiency. The moderating effect of ESG disclosure is not supported, however, indicating that ESG disclosure has more of a direct value-enhancing effect rather than having a direct effect on the relationship between the AI planning and the firm value.

6. Discussion

The results of this study confirm the hypothesis that there is a positive relationship between the use of AI in financial planning and firm value. For all three models (baseline, full, and moderate), the regression analysis shows a favorable and statistically significant relationship between AI

financial planning and the criterion. This suggests that companies possessing superior AI-driven financial planning capabilities are more certain to attain elevated value results. The result is consistent with the broader view that data-driven and intelligent decision systems improve organizational performance by enhancing forecasting accuracy, decision speed, and resource allocation quality.

Further, the efficiency of investment significantly and positively affects the value of business. It therefore becomes crucial for a corporation to allocate its capital in the best possible way and generate better valuations. This aligns with the research on investment efficiency, indicating that enhanced information quality typically diminishes investment distortions and enhances capital allocation decisions. Biddle and Hilary (2006) show that higher accounting quality improves firm-level capital investment. Biddle et al. (2009) demonstrate that there is a link between financial reporting quality and underinvestment and overinvestment. In this study, we believe we can extend this by positing that AI-driven financial planning can serve a similar purpose in enhancing the quality of decision-making and streamlining efficient investment practices.

This is corroborated by the mediation outcome. The positive indirect effect from investment efficiency suggests that AI-based financial planning has a direct positive effect on the firm value, which is mediated by investment efficiency. The result is both theoretically significant, offering insights into the potential value creation process of AI-powered financial systems, and practically relevant, as it suggests avenues for leveraging artificial intelligence to streamline financial processes. The impact of the paper implies that AI shouldn't be viewed as a blanket technological addition, but rather a tool that can enhance the quality of financial planning and enable companies to prevent wasting capital on ineffective investments. This also supports Richardson's argument (2006) that inefficient investment, particularly overinvestment, can decrease the value of the firm if firms are not able to allocate the free cash flow efficiently.

ESG risk disclosure was also found to have a positive and significant effect on firm value. This suggests that firms with stronger ESG disclosure are likely to be valued more highly, possibly because transparent ESG reporting reduces information asymmetry, improves stakeholder confidence, and signals stronger governance quality. This result is consistent with Dhaliwal et al. (2011), who showed that voluntary nonfinancial disclosure can reduce the cost of equity capital,

and with Fatemi et al. (2018), who found that ESG disclosure plays an important role in the relationship between ESG performance and firm value.

There was no proof that ESG disclosure had a moderating effect. ESG disclosure exerted a beneficial direct influence on business value. However, the interaction between AI-enabled financial planning and ESG disclosure was favorable but not statistically significant. The result implies that ESG disclosure can independently enhance firm value, but it did not significantly reinforce the effect of AI-enabled financial planning on firm value in the simulated panel model. One explanation is that AI-powered financial planning and ESG disclosure work through different value-creation routes. AI planning may mainly improve internal decision efficiency, while ESG disclosure may affect external stakeholder perceptions and transparency. Therefore, both variables are contributing to firm value, but the interaction of the two may not be enough to have a significant moderating effect.

There are some limitations to this study. First, the analysis is based on synthetic rather than real firm level observations. While synthetic data can be used to test theoretical relationships in a controlled setting, the results should be considered as evidence from simulations rather than direct empirical evidence from real firms. The proposed framework needs to be validated with real data of listed companies from financial data bases, ESG rating agencies or annual reports in future research. Second, the study measures AI-enabled financial planning with an index-based variable. This is appropriate for simulation, but actual AI implementation is multidimensional and may differ across forecasting, budgeting, risk management, investment planning and liquidity management functions. Future research could build richer measures of AI capabilities from survey data, text analysis of annual reports, or disclosures on technology adoption.

Third, the study uses Tobin's Q as the main proxy of firm value. In future work, the model can be extended by incorporating alternative performance measures such as return on assets, market to book ratio, stock returns or enterprise value. Fourth, the ESG variable is used as an overall disclosure score. To determine which has the biggest influence on business value, future studies could look at the environmental, social, and governance aspects independently. Finally, future research can extend the model by adding the corporate governance quality, digital transformation intensity, financial constraints, firm risk and industry competition as additional explanatory

factors . Cross-country studies can also examine whether the value effect of AI-enabled financial planning is different between developed and emerging economies.

7. Conclusion

This study concludes that AI-enabled financial planning is a significant driver of firm value within the simulated panel data framework. The findings show that firms with stronger AI-based financial planning capabilities achieve higher firm value, indicating that intelligent forecasting, budgeting, risk assessment, and capital allocation systems can improve financial decision-making and corporate valuation. ESG risk disclosure positively and significantly influences corporate value, indicating that transparency in sustainability and governance-related information bolsters investor trust and fosters value creation. Investment efficiency is identified as an important mechanism through which AI-enabled financial planning contributes to firm value. The mediation result indicates that AI improves firm value partly by supporting more efficient investment allocation. Nevertheless, there is no statistical evidence for the moderating role of ESG disclosure, which indicates that ESG disclosure is an independent value-enhancing factor rather than an enhancer of the AI planning–firm value relation. Overall, by integrating AI-enabled financial planning, this study adds to the literature on finance and planning, ESG disclosure, investment efficiency, and firm value into one analytical framework. This study can be extended in future research by using real firm-level data, looking at differences across sectors, comparing developed and emerging economies, and considering additional factors such as corporate governance quality, financial constraints, the intensity of digital transformation, and firm risk. To look into how ESG disclosure affects business value in many ways, future studies may additionally divide it into its environmental, social, and governance components.

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