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RESEARCHARTICLE

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Public Sector Supply Chain Sustainability: Strategies for Net Zero Emissions

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Abstract

The primary objective of this project is to construct a comprehensive mathematical model that would enhance the correlation between supply chain management and the achievement of net-zero emissions. This study aims to predict elevated transfer rates within the sector, hence offering valuable information for investors in their stock selection process. Moreover, the research surpasses traditional investment analysis by incorporating the concept of sustainability and the importance of intelligent supply chains in advancing a net-zero emissions economy. The study investigates the potential of smart supply chains to improve sustainability and circularity in publicly listed companies, recognizing the importance of sustainable practices in achieving net zero emissions in the present economic landscape. The analysis examines the influence of cutting-edge technology, effective resource utilization, and conscientious supply chain management on the elevated delivery rates of publicly traded enterprises. Comprehending the correlation between intelligent supply chain practices, sustainability, and a circular economy with net zero emissions enables investors to align their investment strategies with social objectives.

KEYWORDS

Net zero emissions; Environmental sustainability; Mathematical model; State-of-the-art technology; Supply chain management; Societal goals

1 | INTRODUCTION

Sustainability and the circular economy have been increasingly popular in various businesses in recent years. Businesses are showing a growing interest in environmental sustainability (Babiak & Trendafilova, 2011). The article analyzes listed firms' net zero carbon dioxide emissions, circular economy principles, and smart supply networks. The study focuses on the factors that contribute to high delivery rates in securities investing, specifically when the stock delivery rates of listed companies increase. Statistical examination of stock sample data has demonstrated the significance of high delivery rates, typically influenced by robust transfer dividend programs. These regulations frequently lead to stocks performing better than the market before the announcement. Stocks that experience a high number of transfer events before a public announcement have the potential to yield significant profits (Siegel, 2021). Stocks of companies with generous dividend policies tend to outperform the market on the ex-dividend date and before the announcement date, according to Hartzmark & Solomon (2019). Before the announcement, outside investors who purchased stocks saw significant income growth and capital gains (Savor & Wilson, 2016). Therefore, high-delivery events attract a lot of investors as they offer a profitable stock market chance in Türkiye (Gepner et al., 2022). Based on a qualitative study, this paper suggests an empirical model and theoretical framework. To provide focused recommendations, it compiles significant research on the factors influencing net zero CO2 emissions and develops stock forecasting models from Turkish and international sources. The study uses quantitative analysis and logistic regression to create forecasting models. The circular economy is becoming more and more well-liked as a sustainable and green approach to economic growth (Goyal et al., 2021). Unlike the linear economy's "take-make-dispose" strategy, the circular economy encourages continuous usage, recycling, and regeneration of materials and

products to minimize waste and maximize resource efficiency. The circular economy and net zero CO2 emissions depend on smart supply chains (Mishra et al., 2023). Using advanced technology, data analytics, and intelligent systems, a smart supply chain maximizes the movement of materials, information, and resources throughout the supply chain network (Zhao et al., 2020). The research analyzes the high delivery rates of listed corporations using a statistical method. Investors utilize circular economy and sustainability concepts to choose stocks. It identifies the social and environmental sustainability of listed companies using intelligent supplier networks. Researchers analyze the primary factors contributing to elevated delivery rates to assist investors in making informed judgments based on a broader range of factors. This research provides investors with a framework to align their investment strategies with long-term social and environmental objectives, contributing to the development of a more sustainable and circular economy through the integration of sustainability practices and financial performance. The study demonstrates how an intelligent supply chain utilizes state-of-the-art technology, effective resources, and ethical management to achieve net zero CO2 emissions. The paper recommends that investors align their investment strategies with long-term environmental and social objectives to create a more robust and sustainable economic framework that harmonizes responsible investing with financial prosperity. For what reason? Innovative supply chain techniques, sustainability, and circular economy principles are interconnected. Utilizing real-time data, automation, and connectivity enhances stakeholder visibility, transparency, and collaboration in intelligent supply chains. It reduces costs, improves productivity, and minimizes environmental footprint. Effective product lifecycle management is essential for the circular economy. Block chain and RFID tags provide visibility across the product lifetime, from raw material acquisition to disposal. Enhancing visibility aids in locating opportunities for reusing, remanufacturing, and recycling, which in turn prolongs product lifecycles and diminishes waste. Smart supply chains engage in recycling, repairing, and returning things. Businesses may extract value from returned products by optimizing reverse logistics to repair and relaunch them (Ashraf et al., 2019). This reduces inefficiency, increases income, and satisfies clients. The project aims to develop a quantitative securities investment model. The methodology examines all factors influencing the high turnover rates of listed organizations. Identifying these factors assists investors in selecting stocks.

The remainder of the study is as follows: Section 2 describes the literature review, and section 3 explains the research methodology. Section 4 describes the results and discussions of the tables, and Section 5 explains the conclusions of the study.

2. Literature Review

2.1. Environmental Compliance

Companies desire carbon emission transparency from their suppliers for several reasons. These include operational efficiency, strategic planning, and environmental compliance (Villena & Dhanorkar, 2020). When suppliers disclose carbon emissions, investors compare them to those of their rivals. Benchmarking enables investors to assess the environmental impact of their assets and identify opportunities for reducing supply chain costs and risks. Companies and investors minimize carbon emissions costs and risks by using transparent carbon emissions data (Choi & Luo, 2021). Carbon emissions data transparency helps investors choose stocks (Bukhari et al. 2024). Understanding a company's environmental effect helps investors analyze its risks and potential (Ameli et al., 2020). Investors mitigate risks associated with a net-zero carbon economy by increasing the openness of CO2 emissions data. It involves avoiding carbon-intensive businesses or investing in sustainable sectors (Bonsu, 2020). Companies that disclose CO_2 emissions data are industry leaders and comply with environmental laws, credibility and investment appeal (Cheng et al., 2023). The study investigates how supply chain management helps businesses lower their greenhouse gas emissions. It is crucial to use sustainable practices, renewable energy, effective logistics, and suppliers. Fig. 1 explains the environmental risk factors, sustainable practices, and supply chain management.

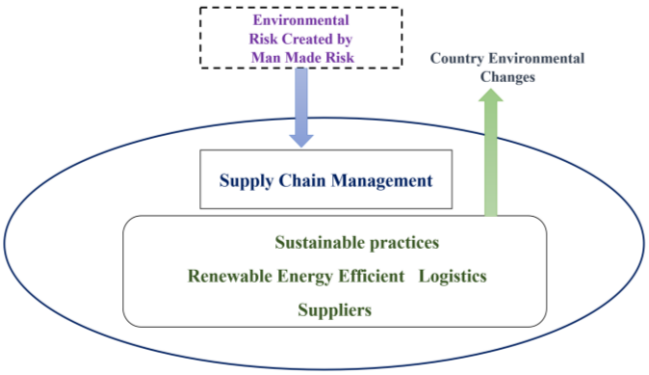

Fig. 1: Represents the environmental compliance and supply chain management framework.

A reliable source of firm-specific CO_2 emission data is essential for stakeholders to assess a firm's environmental impact and make decisions about working with it. Reducing emissions and offsetting them with carbon removal projects are necessary for a net zero emissions economy (Iyer et al., 2021). Through intentional emission reduction and supply chain sustainability, supply change management benefits the environment. According to Dharmayanti et al. (2023),

supply change management ought to take into account sustainability drivers such as social responsibility, environmental concerns, and economic viability. Sustainability and emissions reduction are two performance goals for supply change management (Mangenda et al., 2021). This article investigates how public organizations integrate sustainability drivers and performance predictions with supplier change management to reach net zero emissions. Evaluating these initiatives calls for predictive technology, emission reduction in the supply chain, and sustainable behaviors.

2.2. Net Zero Emissions and Supply Chain Management

Achieving net-zero carbon emissions is an ambitious aim that nations across the world are committing to more and more. The goal is to achieve a net-zero increase in atmospheric carbon dioxide concentration by balancing the emission of carbon dioxide into the atmosphere with its removal. Turkey has stopped adding to global warming by implementing a net-zero carbon policy. The market for acquiring rights to emit greenhouse gases (GHGs) is known as carbon emission trading. Companies and nations are able to exchange emissions permits through the purchase and sale of these rights, usually under a cap-and-trade system (Raufer et al., 2022). Turkey is the world's largest functioning market for greenhouse gas trading; therefore, its involvement in the carbon emission trading scheme might have a big effect. Its participation demonstrates the nation's dedication to combating climate change and lowering its carbon impact internationally (Glavič et al., 2023). Fig. 2 represents the path towards net zero carbon dioxide trading process in supply chain optimization.

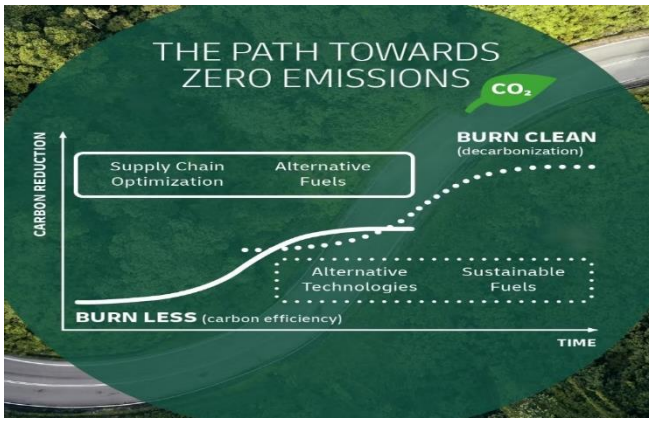

Fig. 2: Represents the framework of the path towards net zero CO_2 emissions.

The s-curve illustrates the typical progression of technology diffusion from its beginning to rapid growth, maturity, and eventual efficiency improvements within a certain industry, and might potentially inform strategies for reducing CO_2 emissions in logistics. The modernize their technology and equipment often aim to achieve net zero CO_2 emissions. Companies must purchase emission allowances from others to compensate for their surplus emissions (Glavic et al., 2023). It encourages businesses to invest in energy-efficient equipment, technology, structural changes, and management strategies. Enhancing energy efficiency and reducing emissions align with the goal of achieving net zero CO_2 emissions (Fernando & Hor, 2017). Turkish businesses aiming for net zero emissions in their supply chain management need to implement strategies to reduce greenhouse gas emissions across the supply chain (Mishra et al., 2023). Turkish enterprises prioritize assessing the carbon impact of their supply chain. The study quantifies and evaluates greenhouse gas emissions across the whole process from raw material extraction to distribution (Yildiz et al., 2019). Turkish businesses partner with suppliers to reduce their carbon emissions. Collaborating on sustainability, sharing best practices, and establishing emission reduction goals might be beneficial (Bouguerra et al., 2021). Turkish enterprises utilize product lifecycle management to develop more environmentally friendly products. Utilize recycled materials, create products with a focus on durability and recyclability, and minimize waste at every stage of their lifecycle (Erdil, 2019). Turkish enterprises enhance the sustainability of their supply networks by utilizing IoT, block chain, and AI technologies. The technologies offer immediate visibility into the supply chain and support decision-making that reduces emissions.

3 MATERIALS AND METHODS

Companies decrease their share capital by transferring shares through a high delivery method. While this strategy may lower share prices and boost investor interest in buying shares, it does not immediately increase share capital. Stakeholders such as management, investors, and shareholders can engage in share trading by considering a company's anticipated growing earnings and total share capital at a specific date (Aglietta & Breton, 2001). Dividend policy impact the distribution of shares. Local enterprises, especially those with a significant delivery volume, prioritize stock dividends, while international corporations typically opt for cash dividends (Buchanan et al., 2014). Annual reports frequently highlight outstanding performance, meeting the expectations of investors.

3.1. Data Collection

The high-delivery dividend policy involves two transfer channels: share delivery and share conversion.

Share delivery refers to the transfer of shares from retained earnings to share capital, while share conversion involves transferring shares from capital reserve to share capital. The probability of high delivery tends to rise alongside the growth rate of net profits. Academics in the business sector disagree on the idea of high delivery. Foreign scholars may define it as "10 shares for every 5 shares held," while domestic scholars may define it as "10 shares for every 3 shares held." Companies listed on these markets tend to prefer the high delivery policy. To make the strategy more appealing to investors, high delivery is often defined as "10 shares for every 10 shares held" or more, rather than the potentially less attractive "10-for-5" strategy. Capital Markets Board of Türkiye (CMB) (https://cmb .gov.tr.com) is the regulatory and supervisory authority in charge of the securities markets in Türkiye has provided definitions for high delivery based on different market segments. In the primary board market, high delivery is defined as "10 shares for every five shares held" or more, while in the junior stock market, it is defined as "10 shares for every eight shares held" or more. In the Borsa Istanbul (https://borsaistanbul.com) high delivery is defined as "10 shares for every 10 shares held" or more. The review aims to determine or outline something related to a certain stock market technique or strategy. The phrase "10 offers for each 10 offers held" refers to a stock profit ratio. For every 10 shares of a certain stock that an investor now owns, they will get an additional 10 shares as a dividend. Fig 3 represents the scope of the study and analysis techniques.

Fig. 3: Represents the current study framework of data analysis techniques.

The study has discussed the circular economy structure and role of supply chain management in circular economy of Türkiye. The circular economy is a sustainable system that aims to minimize waste and maximize resource efficiency by designing products for longevity, reuse, and recycling. It emphasizes reducing consumption, extending product life, and creating closed-loop systems where materials are continuously reused or recycled. This approach also includes sharing economy principles, biomimicry, and digitalization to optimize resource use and reduce environmental impact.

3.1.1. Definition of Variables

The variable described the value of DWS indicates whether or not the high delivery dividend policy (DWS) should be implemented. The paper defines "10 get 10 free" and higher as high delivery and transfer; C is a constant term. The closing price of the stock at the end of the year is one explanatory variable. The total share capital at the end of the fiscal year is the definition of equity. Earnings per share, net profit growth rate, market-to-book ratio, and earnings stock samples from the first three quarters are screened. If the end-of-year closing price is less than l0 lira, low = 1; otherwise, low = 0. The study selects the control variables GVD, PASD, and GWSDW. The reasons are as follows: Accumulation per share, in addition to the sum of undistributed profit per share and capital reserve, is denoted by GVD. The undistributed profit per share is a crucial method for companies to distribute shares, and the capital reserve is a source of funds for companies to increase their share count. The CSRC expressly prohibits companies with insufficient funds in their stock accounts from delivering their share count. In general, the higher the company's forwarding capacity, the greater its cumulative earnings per share. Consequently, there are numerous reasons why GVD is utilized as a control variable. The variable (PASD) indicates whether a share is sub-new, meaning it was disclosed and listed in the current calendar year. This variable is chosen to reflect the performance of the domestic stock market. Many outstanding stocks are listed on the domestic stock exchange, with companies completing successful IPOs typically having promising industry growth prospects. The variable (GWSDW) indicates whether high delivery was utilized in the previous year, using samples from mid-year and end-of-year reports. Investors tend to believe that companies performed well last year will perform much lower this year.

3.2. Theoretical Basis of Dividend Distribution

3.2.1. Optimal Price Interval Theory

The study adheres to the optimum price range hypothesis, which suggests that equities are more liquid at lower prices due to investors being drawn to discounts. Publicly listed companies strive to keep their stock prices stable by distributing dividends to improve liquidity. Dividends appeal to investors looking for consistent earnings, which helps to stabilize stock values and increase their liquidity (Tian et al., 2025).

3.2.2. Equity Expansion Theory

The theory of share capital expansion suggests that

listed companies with smaller share capital often have a greater need to expand their capital base. When these companies issue new shares, they typically have substantial capital reserves. To attract smaller and minority investors to buy these new shares and stimulate stock price growth, the companies often adopt a high-dividend policy (Al-Najjar & Kilincarslan, 2016). The research aims to appeal to investors seeking regular income, as dividends provide a steady return on investment, thereby increasing demand for the company's shares and potentially driving up their price. Fig. 5 illustrates the core strategies of the circular economy, showcasing the various analytical tools and modelling techniques essential for understanding and optimising its implementation.

Fig. 4: Represents the Circular Economy Concepts.

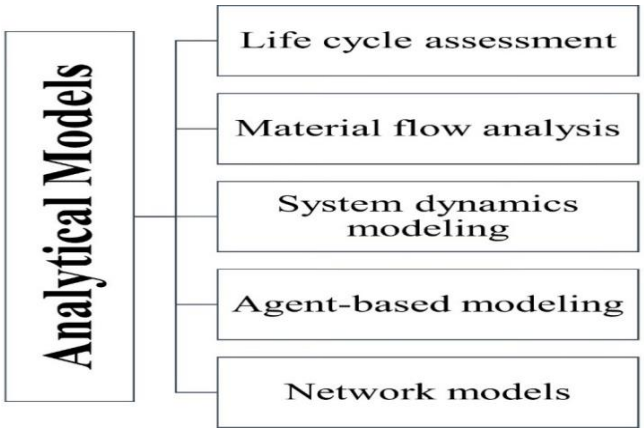

Fig. 5: Core Strategies and Analytical Tools for Circular Economy Implementation.

Among these, Life cycle assessment stands out as a comprehensive technique that evaluates the environmental impacts of a product or service by considering all inputs and outputs across its entire life cycle, including material sourcing, production, use, and end-of-life management. Material flow analysis is another pivotal tool that quantitatively GVD the flow and stocks of materials within a process, across geographical regions' economic activities. System dynamics modeling is a powerful method for simulating the nonlinear behavior of complex systems by incorporating feedback loops. Agent-based modeling is a computational approach that represents systems as collections of autonomous decision-making entities (Ali et al., 2014). The network models are instrumental in representing systems or value chains as nodes connected by links that symbolize material, information. Analyzing the network's topology and centrality helps pinpoint critical intervention points with high impact potential. These analytical tools and modeling techniques play a crucial role in providing insights and supporting decision-making in the implementation of circular economy principles and strategies.

However, companies that made large deliveries last year their stock market value increase this year due to efforts to enhance their value.

The transition involves shifting from linear production and consumption patterns to closed-loop, resource-efficient circulatory flows. The shift aligns with the ideas of the circular economy, which seek to advance sustainable development.

3.2.3. Catering Theory of Dividends

The theory of Dividend Catering examines the distribution of dividends from a behavioral economics perspective (Ben-David, 2010). It is because investors often favor stocks with dividend policies, prompting management to implement such policies to cater to investor preferences. To accommodate investors who prefer companies that do not pay dividends, management will suspend the announcement of a dividend policy (Baker, 2009). Circularity assessments play a crucial role in evaluating the performance and progress of circular initiatives, providing a systematic framework to measure and track the circularity of products, processes (Vinante et al., 2021). Digital tools and infrastructure are essential enablers of circularity, facilitating the efficient exchange of information and resources. The integration of Internet of Things (IoT) sensors further enhances the circular economy by enabling real-time monitoring and optimization of resource flows, waste management, and product lifecycles (Magrini et al., 2021). Fig 6 represents the successful implementation of circular economy principles relies on a range of factors and strategies.

Standardization plays a pivotal role in driving circularity by establishing common guidelines, protocols, and criteria for sustainable product design, recycling processes, and material specifications. It ensures consistency, interoperability, and trust among stakeholders, facilitating the transition to circular practices. Policy and regulation also play a crucial role in creating an enabling environment for circular economy adoption (AlJaber et al., 2023). Government implements supportive policies such as extended

producer responsibility (EPR), eco-design requirements, and tax incentives to encourage companies to adopt circular practices and stimulate innovation. Industry collaboration involves sharing best practices, knowledge, and resources, establishing partnerships, and implementing joint initiatives that address common challenges and create synergies.

Fig. 6: Outlines the tactics for implementing a circular economy.

3.2.4. Information Transmission Theory

According to information transmission theory, investors face a persistent disadvantage due to widespread information asymmetry (Mansour, 2014). The dividend policy is often seen as the primary means through which management communicates positive information about the company to the capital market. When the company's profit index continues to rise, profits increase significantly, and management perceives ample room for future growth, they will implement a dividend policy (Bae et al., 2012). When the company's operating efficiency declines, and its main business income and long-term and short-term profit indicators fail to meet expectations, the dividend policy is usually postponed. Thus, the dividend policy informs shareholders and investors about the company's current operating status and future development prospects, influencing their assessment of the stock's current value and leading to non-stationary fluctuations in the stock price.

3.2.5. Factors Influencing High Delivery Rates: Hypothesis Development

The study explores strategies that listed companies utilize to enhance delivery rates and sustainable operations, focusing on transfer dividend policies and mathematical modeling of smart supply chains. The first section discusses how transfer dividend policies help listed companies maximize efficiency and resource allocation across their supply chain network towards net zero emissions. By strategically reallocating profits between high-performing and underperforming subsidiaries, companies address bottlenecks and balance workloads, ensuring that resources are allocated based on overall network needs rather than local priorities alone. The second section of the study introduces a mathematical model for optimizing innovative supply chain management to net zero emissions. By integrating emerging technologies like artificial intelligence, Internet of Things, cloud computing, and blockchain, companies can enhance the efficiency and sustainability of their operations for net-zero emissions. The model focuses on optimising various aspects of the supply chain, such as inventory management, transportation, and production, to minimise waste and maximise value creation, which are factors of carbon emissions. The study argues that transfer dividend policies and mathematical modelling of smart supply chain management can help listed companies achieve their sustainability goals over the long term by achieving net zero emissions. By promoting internal collaboration and strategic resource allocation, these strategies enable companies to navigate disruptions and deliver value to customers efficiently and sustainably. The optimal price range theory suggests that investors with limited capital tend to avoid high-priced stocks, leading to potential losses for small and minority investors. When stocks issue dividends, the ex-rights push the price down. Increasing stock delivery lowers prices further, creating the perception of a declining stock value, which attracts small investors with limited capital to buy. Hypothesis is proposed as a result.

H_{01}: There is a favorable relationship between high delivery and stock price if listed corporations want to fulfil investor needs by reducing stock prices.

The equity expansion theory posits that when a listed company has a small equity scale, the need for scale expansion becomes more pronounced (Baumol, 1962). The listed companies with small equity scales struggle to attract enough institutional investors in the secondary market, hindering their ability to raise capital. Consequently, these companies tend to maintain large capital reserves for new companies and newly issued shares. To address this issue, companies often adopt a high dividend payout policy to increase the scale of their share capital. Hypothesis 2 is thus proposed based on the premise.

H_{02}: Listed firms generally expand, but high delivery rates negatively impact share capital.

Based on the dividend catering theory, companies tend to offer dividends to attract investors who prefer dividend-paying stocks (Baker & Wurgler, 2004). The market-to-book ratio (M/B) is a key indicator, reflecting the premium investors are willing to pay for shares. In

the current domestic market, there is a trend towards high stock dividends, with cash dividends being less common. This shift towards high stock dividends is a strategic move by listed companies to align with investor preferences. Consequently, hypothesis 3 is formulated as follows.

H_{03}: Listed firms frequently pay substantial dividends to appease significant owners. The market-to-book ratio increases the possibility of such a policy.

In market economies, the separation of ownership and management often leads to information asymmetry, as posited by information transmission theory (Doherty, 1999). The external investors have less insight into a company's operations and growth prospects compared to major shareholders. To assess a company's current performance and future growth potential, shareholders and investors rely on dividend policies, which lead to significant fluctuations in stock prices. The hypothesis is proposed that dividend policies, such as high delivery serve as indicators of a company's favorable operating conditions.

H_{04}: List firms must report operational performance to the stock market. Delivery rates often boost earnings per share.

In terms of transfer channels, a high-delivery dividend policy involves both share delivery, which transfers funds from retained earnings to share capital, and share conversion, which shifts funds from capital reserve to share capital. A higher net profit growth rate is associated with a higher likelihood of a high-delivery policy (Belavina et al., 2017). The study has proposed a hypothesis as follows.

H_{05}: A positive correlation exists between high delivery and the net profit growth index.

3.2.6. Model Construction

The optimal price range theory suggests that stock price plays a pivotal role in high delivery implementation (Hinterhuber, 2004). The information transmission theory posits that business performance indicators like earnings per share and profit growth rate significantly impact high delivery implementation. The dividend catering theory emphasizes the market-to-book ratio as the most influential factor. The equity expansion theory highlights equity as the crucial factor in achieving high delivery. The Logistic model is formulated accordingly:

$$DWS = 1/(1+e\text{-}zt) \quad (1)$$

The regression equation will be written as follows:

$$ZT = C + \beta_1 P\gamma ICE + \beta_2 Equity + \beta_3 Earn + \beta_4 NPG\gamma + \beta_5 TMB + \beta_6 LP + \beta_7 PASD + \beta_8 GWSDW + \beta_9 \alpha PS \quad (2)$$

4 | RESULTS AND DISCUSSIONS

4.1. Descriptive Analysis

Table 1 provides descriptive statistics for key variables influencing high delivery. As of right now, the median share price is 8.87 lira, the median share capital is 175 million shares, the median earnings per share are 2.56 million liras, and the cumulative median per share is 0.12 lira. There is a median book-to-market ratio of 1.78, the average value of sub-new shares is 17%, and the median net profit growth rate is 11.27%. Low-priced equities had an average sub-new share value of 21% in the preceding year, while high-delivery stocks had an average value of 9% in the sub-new share market.

Table 2 presents the study examining the correlation coefficient among various influencing factors. External financial supporters have less insight into a company's operations and growth potential compared to major investors. Investors and financial supporters rely on profit methods to assess an organization’s current performance and future growth prospects, which may significantly impact stock prices. The conjecture posits that profit techniques, such as high conveyance, serve as indicators of an organization’s favorable working conditions, with connection coefficients calculated for each variable.

The analysis reveals that five explanatory variables, stock price, accumulation per share, earnings per share, new stock status, and low-priced stock status, are strongly correlated with high delivery, except for the low-priced stock index, which shows a negative correlation with high delivery. Other variables demonstrate a positive relationship with high delivery. The correlation between the remaining five variables is not statistically significant; however, they are still incorporated into the econometric model.

4.2. Logistic Regression Analysis

Table 3 presents the logistic regression analysis estimated results of the model. When exploring the factors affecting the likelihood of high delivery,

Table 1: The descriptive statistics of study variables

Variable Symbol	Sample size	Maximum	Minimum Value	Mean Value	Mid-Value	Standard Deviation
PRICE	5320	428.04	0.53	24.27	6.37	24.53
EQUATIY	5320	1920.19	0.26	23.82	4.26	192.7
EARN	5320	17.44	-29.19	0.92	3.86	3.86
GVD	5320	6.76	-6.62	0.19	0.26	0.29
PASD	5320	274266.2	-28620.4	65.67	31.48	1904
BTMB	5320	1926.19	-62920.6	0.29	2.54	149.87
CSRC	5320	1.0002	0.00001	0.26	0	0.18
GWSDW	5320	1.0005	0.0001	0.08	0	0.62
FS	5320	1.0002	0.00003	0.42	2	0.27

Table 2: Represents the results of correlation analysis among variables

	HGS	PRICE	APS	EARN	GVD	PASD	BTMB	CSRC	GWSDW	FS
HGS	1									
PRICE	0.418	1								
APS	0.414	0.662	1							
EARN	0.241	0.662	0.631	1						
GVD	0.314	0.414	0.462	0.262	1					
PASD	-0.312	-0.637	-0.493	-0.416	-0.202	1				
BTMB	0.002	0.037	0.002	0.079	-0.006	-0.031	1			
CSRC	-0.026	-0.046	-0.02	0.026	0.002	0.042	0.001	1		
GWSDW	0.006	0.024	0.024	0.006	0.004	-0.031	0.002	0.002	1	
FS	0.093	0.079	0.041	0.372	-0.062	-0.079	-0.002	-0.031	0.006	1

descriptive statistical analysis provides an initial, albeit subjective, understanding. EViews 6.0 software is employed for time-cycling training. However, to delve deeper, it's crucial to conduct further analysis on each factor. Utilizing binary variables for logistic regression can enhance the analysis. The quantitative model, akin to equation 2, includes a time dummy variable. The study uses stock sample data from five years and incorporates four-time dummy variables. Initially, a simple regression is conducted, followed by the gradual addition of new variables.

The analysis reveals several key findings. Firstly, the price index shows significance at a 1% confidence level, with a positive coefficient. This suggests that as the stock price increases, the likelihood of a high bargain also rises, supporting the optimal price range theory. Secondly, the (FS) index is significant with a negative coefficient, indicating that companies tend to avoid high delivery when stock prices are low, contrary to the equity catering theory's predictions (Polk & Sapienza, 2008). The equity index is statistically significant with a negative coefficient, indicating that larger equity scales are associated with a lower likelihood of high delivery, supporting the equity expansion theory. Domestic companies, which place a premium on equity scale, find it easier to secure bank financing with a larger proportion of equity (Modigliani & Perotti, 2000). However, the (*BTMB*) index's insignificance makes it challenging to demonstrate the dividend catering theory. Similarly, the (*EARN*) and (*HGYT*) indicators are insignificant, suggesting that a company's operating status does not impact high delivery predictions. This indicates that listed companies prioritise high delivery rates, rather than reflecting investors' dividend motivations or providing accurate information about their operating performance. While it is relatively straightforward to screen variables related to the optimal price range theory and equity expansion theory, obtaining information on dividend catering range and performance development poses challenges (Biswas et al., 2022). Additionally, the (*GVD*) index is significant and positive, suggesting that accumulation per share is a key factor for high delivery. The new index is also substantial and positive, indicating a high likelihood of high delivery for newly issued shares. Similarly, the (*GWSDW*) index is significant and positive, suggesting that companies that implemented high delivery last year are likely to continue doing so this year. While variables like price, equity, and (*FS*) enhance model reliability, optimizing (BTMB) and profit variables like earnings and (HGYT) is less straightforward.

4.3. Sample Fitting and Inspection

Using the coefficients assessed from 2018 to 2023 and the available data, the probability of high delivery for sample companies was calculated. Table 4 represents the probabilities, which were then ranked from highest to lowest and compared to the test samples. Among the 60 stocks with the highest probability, the likelihood of high delivery was 81%, while among the top 105 stocks, it was 74%. These figures exceed the general forecast level, indicating that the model's fitting effect is significant. It is necessary to perform out-of-sample prediction to obtain more objective data. The following are the steps of the research process: The evaluation coefficient is computed using the base period data from 2018, and the explanatory variable sample in 2019 is utilized to estimate the likelihood of high delivery in 2017 and compared to the actual sample data. The coefficient of evaluation is computed using samples from 2018 to 2019. Using the evaluation coefficient and the explanatory variable samples in 2021, the probability of high delivery in 2021 is predicted and compared with the actual sample data. The forecast is analogically depicted in Table 4.

A considerable portion of the 2023 sample results is evident. The top 25 stocks with the highest probability of high delivery represent 86% of the sample, while the top 55 stocks account for 80%. Furthermore, the accuracy of forecasts from 2019 to 2022 is notably high. Despite the average probability across all stock samples being only 13.4%, the proportion of high delivery among the top 30 stocks ranges from 53% to 71%, indicating higher accuracy in forecasting.

4.4. Portfolio Reaction

The portfolio's composition is determined using a sample test. A portfolio comprising the top 25 stocks with the highest probability of high delivery is constructed

Table 3: Represents the expected results of matters affecting efficient delivery

Details	Coefficient				
Constant term	−3.65***	−3.48***	−3.48***	−3.50***	−3.00***
PRICE	0.03***	0.03***	0.03***	0.03***	0.03***
APS		−0.03***	−0.03***	−0.03***	−0.02***
EARN			4.5E−05	4.5E−05	1.4E−05
GVD				−0.122	−0.27
PASD				1.3E−06	−4E−07
BTMB					−1.28***
CSRC	0.25***	0.26***	0.26***	0.27***	0.25***
GWSDW	0.83***	0.72***	0.72***	0.70***	0.63***
FS	0.79***	0.79***	0.79***	0.79***	0.71***
T_1	0.26	0.16*	0.16*	−0.29*	0.11
T_2	0.40***	0.39***	0.39***	0.40***	0.33***
T_3	−0.07	−0.09	−0.09	−0.06	−0.38***
T_4	0.12	0.13	0.13	0.14	0.09
Mc Fadden R^2	0.21518	0.2128	0.1897	0.2147	0.1823

Note: p. value < 0.01.

Table 4: Represents the findings of sample test

Stock with the highest probability	Fitting situation (%)	Samples (%)			
		2020	2021	2022	2023
Top 20	66.5	65	50	65	86
Top 30	67	71	53	57	87
Top 50	59.5	64	44	50	80
Top 100	52	56	36	40	76

and compared to the stock market indexes of Borsa İstanbul "https://borsaistanbul.com". The analysis of stock samples from 2019 to 2023 reveals that the portfolio's returns significantly exceed market returns. Based on the model test results, this paper calculates the return of the stock portfolio tested by the samples, as presented in Table 5.

Table 5: Represents the probability distribution of portfolio in capital market in percentage.

Top 25 stocks	2020	2021	2022	2023
High delivery probability	65	48	52	74
Beyond the market probability	91	69	83	84
Beyond the market income	27	45	27	9

Based on the analysis of sample data, investors show the highest interest in the dividend policy of high delivery between the end of July and the announcement of the dividend policy. The interest is primarily driven by the consecutive release of the company's annual reports in early April, which includes data on significant factors used to analyze and predict the likelihood of high delivery. Following the announcement of the high delivery dividend policy, capital market expectations have been met, and excess earnings per share have been transferred.

4.5. Mathematical Modelling of Smart Supply Chains

This section presents a mathematical model to determine how a listed company can maximize sustainable delivery performance by transitioning to an AI-powered "smart supply chain." Advanced technologies now enable the modelling of supply chain operations with unprecedented insight into processes, resource flows, and behaviours (Reyes et al., 2023). Mathematical techniques offer objective ways to quantitatively analyze such complex dynamic systems and identify optimal configurations and control strategies (Schaal et al., 2007). The supply chain is depicted as a directed graph with nodes representing facilities and edges indicating material flows between them. Demand and lead time uncertainty are captured using probabilistic functions derived from historic sales data. Inventory levels, transportation modes, and production schedules are considered as state variables, while procurement and distribution decisions serve as control inputs. The "learnt" policy integrates real-time demand signals and inventory positions to autonomously coordinate workflow across the networked entities in the supply chain system. Advanced predictive analytics tools powered by the model enable proactive scenario planning and reactive recovery against disruptions, sustaining high delivery service levels crucial for a listed company's success. Blockchain, IoT, and cloud computing form the integrated digital backbone that embraces people, systems, and assets across the extended boundaries of smart supply chains (MacCarthy & Ivanov, 2022). Continuous enhancement of mathematical models using ever-growing operational data refines policies, enhancing responsiveness to constant change. This systematic, data-driven transformation enables supply chain visibility and responsiveness far surpassing what traditional human-centric planning and piecemeal automation can achieve, ultimately driving sustainable competitive advantage and shareholder value.

4.6. Sustainability through Transfer Dividend Policies

The previous sections have outlined strategies for listed companies to achieve sustainability goals by focusing on high and consistent product/service delivery

over the long term. Transfer dividend policies can optimize internal resource allocation to improve network efficiency in response to customer demands. Mathematical modeling of smart supply chains, supported by AI/analytics on a shared digital infrastructure, can enhance resilience against disruptions. Implementing these strategies together addresses systemic challenges that hinder sustainability, such as sub-optimal local unit performance and lack of end-to-end coordination. The integrated approach transforms the supply chain into a cohesive, high-performing system optimized for continual value delivery. Customers receive quality products when needed at competitive costs, and the supply chain proactively plans for environmental regulations and societal responsibilities (Klassen & Vereecke, 2012). The transition to sustainability requires reimagining value creation and business models across supply chains. Circular economy principles, when combined with analytical modeling and AI/ML methods optimize operations and inform strategic decision-making for sustainability. The study explores how these approaches has applied, providing an overview of circular economy concepts, advanced analytical models for assessing circularity, and AI/ML methods for powering smart circular systems and economies. Various circular economy assessment frameworks are available to measure economic and environmental benefits across value chains, such as the Circular Economy Toolkit developed by the Ellen MacArthur Foundation (Kulakovskaya et al., 2023), which uses metrics like product lifetime extension, recoverability, and recycled content usage.

4.7. AI/ML Methods for Powering Smart Circular Systems

Emerging technologies are revolutionizing analytical capabilities and decision-making processes, especially in the context of circular optimization. Artificial intelligence (AI) plays a crucial role by leveraging vast amounts of data to extract valuable insights, while machine learning (ML) continuously refines models. When combined with the Internet of Things (IoT), these tools create intelligent systems that can adapt to changing conditions. Computer vision and natural language processing further enhance these systems by automating the extraction of information from various unstructured data sources, such as manuals, catalogs, and websites, to map out closed-loop processes. Predictive analytics, powered by ML algorithms, can forecast the remaining useful life of products based on sensor data, enabling optimized maintenance, repair, and reuse strategies to reduce premature disposal. Reinforcement learning agents are used to optimize multi-objective functions, coordinating decentralized decisions across complex circular systems involving reverse logistics and reuse/remanufacturing networks. These agents balance economic and environmental priorities in real-time. Simulation and gaming platforms facilitate participatory scenario development, aligning diverse stakeholder perspectives to drive broader adoption of circular practices. Blockchain technology ensures the integrity of circularity tracking, providing tamper-proof records of components/materials exchanges across supply network participants. This enhances supply chain visibility, accountability, and trust, crucial for scaling collaborative closed-loop paradigms. The circular economy concept aims to move away from the traditional linear model of resource consumption by implementing strategies that promote sustainability and closed-loop systems. By extending the lifespan of products, keeping materials within closed-loop systems, and recovering and regenerating materials at the end of their service life, the circular economy minimizes waste generation. It promotes a regenerative approach to economic activity.

4.8. Analytical Models for Assessing Circularity

Advanced quantitative modeling techniques offer data-driven approaches to comprehend and enhance operation systems for circularity. Life cycle assessment (LCA) evaluates overall environmental impacts by tracking all inputs/outputs throughout the entire lifespan of a product or service. When coupled with system dynamics modeling, LCA can pinpoint critical stages and suggest circular design enhancements by incorporating socioeconomic elements. Material flow analysis visually represents quantities and movements of materials/components within a specific value chain over time. These representations help in strategizing where to focus efforts to close material loops, considering factors like importance and losses. Agent-based modeling predicts the effects of alternative circular scenarios by simulating the behaviors of independent entities (individuals, organizations) and their interactions within socio-technical systems. Network models depict systems as interconnected nodes (e.g., facilities, producers, consumers) with links representing material/information exchanges. Centrality metrics assess the influence and significance of each entity within the network, identifying key intervention points to maximize circular material flows. Hybrid LCA-material flow-network models offer a comprehensive view of circularity performance across various scales.

4.9. Pathways towards Large-Scale Circular Transition

Widespread digitalization now enables circular principles and analytical/AI approaches to drive systemic change on a large scale, extending beyond individual firms or industries. National or regional

"circularity dashboards" could consolidate circularity assessments across sectors to pinpoint priority areas for policy support or incentives based on their impacts. Industry-specific simulation platforms help standardize terminologies, metrics, and monitoring across global value chains. Public-private innovation partnerships develop shared digital infrastructures, expertise, and applications to assist small and medium enterprises (SMEs) in adopting circular techniques, such as open-access modeling tools, IoT devices, and marketplaces for exchanging secondary materials. Crowdsourcing challenges and hackathons encourage grassroots innovations that promote circular technologies. Government procurement practices that prioritize refurbished or remanufactured goods stimulate circular businesses and markets. Thoughtful integration of circularity criteria into industry regulations and trade standards reinforces systemic drivers for changes in global production and consumption patterns in the long run. With ongoing advancements in analytical capabilities and the proliferation of intelligent circular systems, achieving a truly sustainable global economy may become feasible.

5. Conclusions and Recommendations

This evaluation considers the elements that impact and predict high delivery rates in listed companies. Companies are more likely to deliver products and services promptly when their stock price is high and less likely when it is low. An optimal cost range hypothesis has been formulated. When a company's stock price is too low, the board is hesitant to implement strategies that ensure significant returns. Furthermore, the theory that food contributes to profit may not be relevant in our current situation. Minority financial supporters are likely to invest in lower-priced stocks if earnings show potential. Consequently, the management of these companies may choose to improve distribution performance to increase stock market value potentially. A hypothesis of value extension is established when public businesses have relatively little share capital. The interest in expanding business size is substantially higher due to lower initial capitalization. When stock liquidity is low, corporate securities can significantly impact investors' costs, making it challenging for companies with limited share capital to attract institutional investors with sufficient capital, hindering the growth of their funding sources. Furthermore, high conveyance is an excellent option for adding value. Organizations with lesser share capital, better stock valuation, and higher income per share are likely to increase their equity capital. Most public firms meeting these criteria are mostly newly listed companies offering new shares. Despite the organization's high profit per share, its value is low; therefore, the theory of value expansion is partially applicable due to the requirement for capital market support. The organization's management opted for premium delivery options for listed companies that had high delivery rates in the previous year due to the numerous exceptional offers in the secondary market. As a result, the net profit index increased rapidly, and the market book value was relatively high. The business has been publicly traded for an extended period, and the number of shares available for trading and the rate of total profit growth have reached a particular threshold. To enhance the organization's value and communicate a positive message to the market, the supply chain management will focus on achieving high delivery efficiency to reach net zero emissions. This also supports the theories of earnings management and information sharing for supply chain management in achieving net-zero emissions. Sustainability offers opportunities and responsibilities for large corporations with complicated global supply chains in a context of national net-zero emissions. Key tactics that include profit optimization techniques and numerical modelling are crucial for achieving sustainable competitive advantage by delivering high levels of supply chain value. Utilizing modern scientific abilities allows for exact organization, resulting in much-improved outcomes compared to traditional methods of organizing to achieve net-zero emissions. As countries adopt sustainable shared prosperity, established companies using integrated intelligent services will spearhead the exploration of unconventional innovations for investors and society alike. Advancements in large-scale circular models offer significant opportunities to tackle sustainability issues by enhancing resource efficiency, reducing emissions, and promoting economic growth while ensuring environmental protection towards achieving net-zero emissions.

5.1. Future Suggestions

Future research may use these frameworks to quantify scenarios involving industrial supply chains. Critical behavioral and market sensitivity analyses reinforce. Cooperation among regulators enhances socioeconomic well-being, and standardizing non-financial reporting promotes transparency. Intelligent technologies and sophisticated analytical modelling optimize complex processes and shift consumer and business attitudes. With coordinated multistakeholder initiatives, innovative circular economy concepts based on data-driven decision-making may help separate prosperity from finite resource consumption globally.

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