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Corporate Governance, Corporate Investment, Corporate Social Responsibility and Firm Efficiency; A Comparative Study of Developing and Developed Economies

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Abstract

Firm efficiency plays an essential role in the survival of an organization because when a firm becomes inefficient, it suffers losses and probably faces dissolution. The study investigated the relationship between corporate governance, corporate investment, corporate social responsibility, and firm efficiency in developing (Pakistan) and developed (USA) economies. The sample size of the study consists of 13 years of data from 2009 to 2021 of 200 non-financial firms from each developing and developed economy. To find accurate figures of firm efficiency, the study has employed the Data Envelopment Analysis (DEA) model. The research has used Principal Component Analysis (PCA) to construct a corporate governance index for each economy based on various corporate governance variables. The study has applied various statistical tools like descriptive statistic, correlation analysis, diagnostic tests such as heteroskedasticity, multicollinearity, stationarity, and endogeneity test, etc., panel regression and mediation analysis through feasible generalized least square (FGLS) and dynamic generalized method of moments (GMM) models to find and examine the relationships among variables. The theoretical framework is based on agency theory. The findings indicated that corporate governance, corporate investment, and corporate social responsibility have direct and significant relationships with firm efficiency in developing and developed

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economies. The findings of the study are consistent with prior studies and recommended that both owners and managers should try to mitigate agency conflicts in an organization, ensure investment in positive NPV and valuable projects, and utilize firm's resources in an effective way to achieve goals. It also suggested that owners and managers should consider and focus on social activities for communities and create awareness to attract stakeholders and improve firm performance and efficiency. The findings of the study are helpful for investors, academic researchers, regulators, and business practitioners who are interested in understanding the association between corporate governance, corporate investment, corporate social responsibility, and firm efficiency.

Keywords: Corporate Governance, Corporate Investment, Corporate Social Responsibility, Firm Efficiency, Data Envelopment Analysis, FGLS, GMM

Introduction

Firm assessment is a crucial task for economists, research scholars, and business professionals to enhance its overall performance and efficiency. One of the critical methods employed for this assessment is measuring the efficiency of the firm, as suggested by Ilona and Evelina (2013). This technique helps to gauge the effectiveness and efficiency of the organization, thereby enabling stakeholders to make informed decisions and take appropriate actions. Today professionals in the fields of economics, finance, and business research are often met with a diverse range of obstacles and concerns as they evaluate the performance and efficiency of various companies. These challenges can span from keeping up with technological developments and managing earnings to navigating a global marketplace, exploring innovative investment strategies, addressing information imbalances, responding to social issues, and adapting to ever-changing economic circumstances.

According to llona and Evelina (2013), there exists a positive association between the value creation of a firm and its efficiency. This suggests that firms

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with higher efficiency are more likely to generate greater value for their stakeholders, while those with lower efficiency may struggle to do so. This finding underscores the importance of optimizing operational efficiency as a means of enhancing overall business performance and maximizing returns for investors.

Efficiency is a crucial factor in the success of any business, as it involves utilizing company resources effectively. Many organizations utilize and create innovative tools and techniques to address new challenges and improve efficiency within the organization., Low (2000) provided a definition of efficiency, which is the degree of association between the inputs and outputs. This association indicates how effective the process is in converting inputs into outputs, thereby achieving the desired outcomes. In other words, efficiency measures how well resources are utilized to achieve a given objective. Understanding efficiency is crucial for businesses and organizations to optimize their operations and minimize waste. In general terms, Efficiency pertains to the ability of an organization to effectively utilize its resources (inputs) to achieve its desired goals (outputs), as stated by Ilona and Evelina (2013).

Many factors can affect a firm's performance and efficiency. Yet, managers struggle with finding an accurate way to measure performance due to financial challenges (Omrani & Keshavarz, 2013). For financial experts and researchers, accurately measuring a company's efficiency can be quite daunting because organizations may employ a mix of tangible and intangible resources to attain their objectives. Both tangible and intangible resources play a crucial role in an organization's success, making it essential to consider them when measuring efficiency. Various methods have been used in literature to assess the performance of companies, including Return on Assets (ROA), Return on Equity (ROE), Tobin q, operating profit, and other efficiency measures. According to Pinprayong and Siengthai (2012), various tools can be used to measure a

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company's ability to generate operating revenues from its assets. Feng (2000) has highlighted the use of financial ratios for evaluating the performance of airlines. Meanwhile, the cost efficiency of several Hong Kong-based banks was evaluated by Kawn (2006) using the Stochastic Frontier Approach (SFA). The Data Envelopment Analysis (DEA) model is a practical non-parametric method that combines various inputs and outputs to assess and provide a single measure of an organization's efficiency.

The DEA model is particularly helpful in determining how well resources are allocated across different practices. However, it's important to note that a high level of firm efficiency doesn't necessarily translate to a top market position or exceptional performance. Because even if resources are used effectively, they may not be optimized (Kumar and Galati,2010). Previous studies have evaluated various industries, including banks, hospitals, universities, military operations, and industrial firms, for their efficiency using DEA. According to Yue (1992), the DEA approach can accept multiple inputs and outputs and provides a single indicator of efficiency. Moreover, shipping firms' operating efficiency can also be measured using DEA as a powerful performance measurement tool, as explained by Cheng and Feng (2005).

According to Abroche, Aguenaou, and Iraqi (2013), the DEA method evaluates a group of peer firms known as the Decision-Making Unit (DMU). So, the DEA model is a valuable tool for measuring the efficiency of an organization. However, it's essential to remember that efficiency doesn't always translate to top market position or exceptional performance. Nonetheless, DEA has been used successfully in various industries, including shipping, to measure operating efficiency and determine how well resources are allocated. The performance and efficiency of a company are strongly linked to its governance and ownership structure, as all stakeholders have a vested interest in the company's success (Omrani and Keshavarz, 2013). Making strategic decisions can be challenging

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due to the agency problem, which arises from the different interests of management and ownership. This problem becomes particularly apparent when managers invest in various projects that can significantly impact the company's performance and efficiency. The main issue is how managers can balance the interests of shareholders and other stakeholders to operate the company in the best way possible, ultimately increasing its value and achieving maximum efficiency.

Therefore, management aims to establish effective corporate governance to improve efficiency. A research study that utilized agency theory also incorporated stewardship theory, pecking order theory, signaling theory, stakeholder theory, and legitimacy theory to explore the relationships among variables. Inconsistencies in the company's efficiency often arise from a lack of information, leading to management issues and agency conflicts (Charnes et al., 1978). Efficient cost control and management of company expenditures by management can lead to increased productivity, according to Kozmetsky and Phillip (1994).

Over the last decade, the importance of effective corporate governance has become increasingly evident to companies. Good corporate governance can reduce conflicts between managers and shareholders, suppliers and managers, and other stakeholders, ultimately leading to better output growth. In previous years, corporate governance has received much attention due to the financial failures of companies like WorldCom, Maxwell Group, and Enron. This issue calls for solutions to be found. Firms must create an internal system of corporate governance through a variety of laws when the government fails to safeguard investors and other interests. Corporate governance describes the procedures lenders use to guarantee a profit on their investments. The protection of the interests of all firm stakeholders is the main goal of corporate governance. As it affects how a corporation is controlled, ownership structure is important to

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corporate governance. Different ownership structures have produced conflicting outcomes on how efficiently businesses operate. The entrenchment hypothesis suggests that managerial ownership decreases firm performance and efficiency, while the monitoring hypothesis suggests that block holder's ownership increases firm performance and efficiency.

The first Corporate Governance Code was adopted by Pakistan's Securities and Exchange Commission (SECP) in March 2002 to govern the nation's corporate sector. The study aims to examine how corporate governance affects a company's efficiency. Investing is a critical element that can impact a business's effectiveness. To increase a firm's value, it should invest in projects that generate positive net present value and use its resources efficiently. Shliefer and Vishny (1986) presented the monitoring hypothesis, which suggested that block holders' ownership can enhance a company's performance and efficiency by monitoring and controlling management activities and conflicts. The entrenchment hypothesis presented by Morck, Shleifer, and Vishny (1988) suggested that managerial ownership can decrease a company's performance and efficiency. Managers with high authority may prioritize their personal benefits over other stakeholders' interests, leading to earning management. Such practices can create information asymmetry and influence a company's efficiency. Nevertheless, some companies can effectively exploit investment opportunities and generate positive signals in the market, thus reducing information asymmetry and enhancing their efficiency.

Corporate social responsibility is another vital factor that affects a firm's efficiency. Businesses devote substantial resources to social projects to attract stakeholders, protect the environment, and build a positive image in the market. By investing in long-term social responsibility projects, firms generate positive signals in the market that reduce information asymmetry and ultimately enhance their efficiency. Previous research has investigated some aspects of firm

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efficiency, including corporate governance, investment, and social responsibility components -but none have previously checked the overall effect of these factors using the data envelopment analysis measuring tool. The study aimed to fill this gap by examining the relationships between corporate governance, investment, social responsibility, and firm efficiency in Pakistan and the USA. The research is unique and adds vital contributions to the literature.

In contrast to developing economies with poorer governance systems, this strategy is more effective in developed economies with good governance (Claessens & Yurtoglu, 2013; Dharwadkar, George & Brandes, 2000).

Although prior research has indicated that good corporate governance can boost a company's efficiency, other research has produced contradictory findings regarding the connections between ownership structure, capital investment, social responsibility, and firm efficiency. The research study has made significant contributions to the current literature in two crucial ways. It has thoroughly investigated the impact of corporate governance, corporate investment, and corporate social responsibility on firm efficiency. The study has provided invaluable insights into the intricate dynamics between these factors and their influence on firm efficiency.

The problem of agency conflicts arises when the interests of both the principal and the agent conflict, causing a misalignment of goals, as per Jensen and Meckling's (1979) theory. Managers may act in their own interests while preparing financial reports, which can lead to a lack of alignment with the principal's interests, according to Davis, Schoorman, and Donaldson (1997). Agency theory explains various phenomena among different parties, such as principals, agents, financiers, suppliers, creditors, investors, customers, and competitors. Eisenhardt (1989) explained that agency theory governs the relationship between stakeholders, including employees, managers, shareholders, and bondholders. The theory is based on a contractual agreement between

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principals and agents, whether written or not, outlining the expected behavior of managers as agents. Although principals anticipated managers acting in their best interests, the agency theory assumes that agents put their own interests first (Hill & Jones, 1992).

The agency problem was defined by Jensen and Meckling (1979) as a conflict of interest between the principal and the agent, both of whom are utility maximizers. Managers often possess more information about a company's future performance than other stakeholders (Watts & Zimmerman, 1990). Anuar Sarun (2016) argued that corporate governance does not have a significant impact on firm efficiency and needs further research to examine the relationships. Mahrani and Soewarno (2018) examined the effects of corporate governance and CSR on firm performance and reported that these relationships should be explored on larger sample size and across other sectors. Latif (2018) investigated the connection between corporate governance and firm value with the mediating role of earning quality and recommended the use of other proxies of corporate governance in future studies. Additionally, they suggested that firm value could be measured by other proxies, such as firm efficiency, to validate such relationships and test such relationships in developed economies.

Stakeholders face numerous challenges in finding accurate figures for firm efficiency and identifying the factors that affect it. Some studies suggested that poor management results in irregularities in company efficiency, while others argued that solid managerial skills and the ability to manage costs can enhance company productivity. The level of ownership concentration can also significantly influence company performance. Some studies show that it can lead to better supervision and assessment of operations. In contrast, others indicated that it could result in personal gain for managers at the expense of the company and minority shareholders. Corporate investment not only enhances profits but also plays a crucial role in firm growth and country development. The pecking-

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order theory contends that corporations prioritize using retained earnings to fund investments due to information asymmetry. When internal financing is insufficient, they look outside, first to debt and then to equity, for funding. This sequence is explained by conflicts between the company and the financiers as well as different financing expenses. Due to adverse selection, businesses favor internal financing sources over external ones.

They choose debt when external financing is required since information costs are lower. Equity is regarded as the final option. Using existing internal funds is less costly than new equity and debt financing. Each financing source demands a higher return of capital if the exposure to risk is greater. Therefore, companies prefer retained earnings financing to debt, short-term debt to long-term debt, and debt to equity. Making selections about capital investments can lower information risk and improve earning quality, which will ultimately increase business efficiency. According to Jensen and Meckli (1976), an agency relationship is a contract in which one party (the principal) appoints another party (the agent) to carry out a service on their behalf and delegates certain decision-making authority to the agent. If both parties aim to maximize their own benefit, the agent may not always act in the principal's best interest; instead, the agent's actions focus on achieving their personal goals, creating agency conflicts. Because of the disparity in goals, the principal must pay agency expenses to pay someone to watch the agent's behavior. By optimizing revenues and cash flows, senior management seeks to benefit the owners (shareholders). The costs associated with running an agency will increase as the requirement to oversee managers grows.

Pinegar and Wilbricht (1989) reported that raising the debt level can help partially resolve the principal-agent issue without significantly raising agency expenses. Lubatkin and Chatterjee (1994) asserted that managers can become

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more effective by ensuring that they return excess cash flows to shareholders rather than investing in initiatives with a negative net present value (NPV).

As debt levels rise, shareholders and lenders are forced to participate in the governance of the company. To better serve shareholders, managers who cannot pay debt commitments are replaced by more effective ones. Therefore, higher debt levels are better for shareholders since debt may be utilized to keep an eye on managers. High levels of debt can lead to a conflict of interest between shareholders and the debt holders in an organization. Debt holders want the company to make enough money and create enough cash flow to pay off the debt, while shareholders want management to invest in projects that will bring in more money and boost bottom-line profitability.

However, higher levels of risk could result from shareholders' expectations for greater profits. To stop shareholders from pressuring management to undertake imprudent investments, debt holders may impose limits. Managers who are motivated to amass wealth may overinvest, spending free firm cash flows on capital expenditures without considering optimizing shareholder returns. Jensen (1989) asserted that top managers with access to free cash flows may decide to invest them in initiatives with negative net present value rather than distribute them to shareholders, particularly if management performance and compensation are predicated on the business growth rate. According to proponents of the free cash flow hypothesis, businesses with subpar investments should use their free cash flows to avoid projects with a negative NPV. Firms in Pakistan and other underdeveloped countries do not realize the significance of Corporate Social Responsibility (CSR). Firms face numerous issues related to their employees, insufficient awareness programs, health concerns, environmental problems, and more. By implementing CSR, companies can improve their financial performance and achieve employee and customer loyalty and satisfaction. Creating a positive image with stakeholders

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and society is possible for companies through corporate social responsibility. The importance of corporate social responsibility has become significant for social development in society.

The two hypotheses used in this study are used to assess the relationship between a company's social responsibility and overall performance. The Stakeholder hypothesis is the first, and it contends that a company's primary goal is to satisfy the requirements of those who are impacted by its decisions. For a corporation to survive and evolve, this notion emphasizes how crucial it is to win over stakeholders. Since it relates to issues like management responsibility and financial success, which are essential to individuals involved in the company's operations, it is especially pertinent to the study. The legitimacy hypothesis contends that both a company's operations and those of the community in which it works can have an impact on one another, When a company's ideals align with those of society and the environment, legitimacy can be attained. Companies can raise earnings, improve organizational effectiveness, and acquire credibility from society by being transparent about their CSR activities and ultimately increasing firm efficiency.

The framework for the study's research theory is displayed in the figure below.

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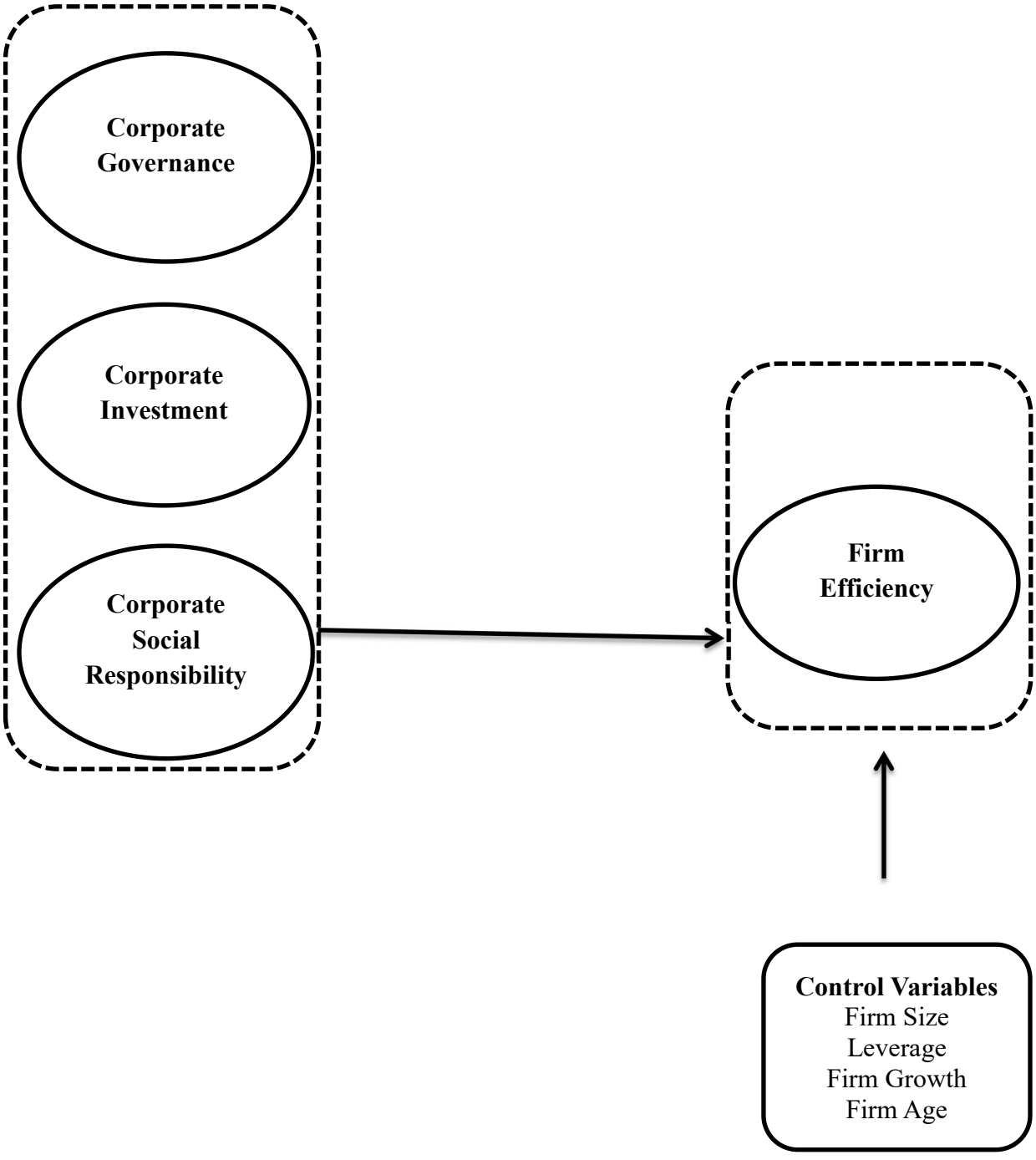
Theoretical Framework



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The study contributes the potential for agency conflicts among various stakeholders that can decrease firm efficiency. The study suggested that corporate governance, corporate investment, and social responsibility play a significant role in firm efficiency in developing and developed economies. The study may be useful to academics and research scholars, and its findings have significant implications for business practitioners, companies' stakeholders, and academic researchers in Pakistan and the US. Some research studies indicated that companies with good corporate governance, significant capital expenditure, and high levels of social activity tend to perform well. This research work contributed to the body of knowledge by analyzing firm efficiency using the constant return to scale (CRS) model of Data Envelopment Analysis.

The study concluded that the overall efficiency of a firm reflects how effectively an organization utilizes inputs to produce maximum outputs. In various sectors, researchers have employed Data Envelopment Analysis (DEA) models to assess organizational efficiency, which is a commonly used and helpful approach. This research examined the impact of corporate governance, corporate investment, and corporate social responsibility on firm efficiency in Pakistan (a developing economy) and the US (a developed economy). Prior research has delved into the association between a company's technical efficiency, its ownership structure, corporate governance, corporate investment, and corporate social responsibility, utilizing various performance measurement tools. Hence, it is crucial to scrutinize the efficiency score provided by the DEA efficiency model (CRS) to identify the most accurate efficiency score that can elucidate the association between corporate governance, corporate investment, corporate social responsibility, and firm efficiency.

The study is divided into several sections, Chapter 01, covers an introduction, chapter 02, presents a survey of the literature review, chapter 03,

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deliberated research methodology, chapter 04, discusses results and discussions, and chapter 05 describes the overall conclusion and findings of the study.

Literature Review

In both developing (Pakistan) and developed (the United States of America) economies, extensive research has been done on the topics of corporate governance, ownership structure, and business efficiency. The literature available on these topics has been thoroughly examined, including the various measuring tools implemented to establish their interconnections. The primary goal of organizations is to maximize their value, and management formulates strategies to utilize resources and attain objectives efficiently. Efficiency is defined as the ratio of output to input, and organizations strive to minimize input while maximizing output by adopting innovative methods and techniques. Firm efficiency is a critical component in achieving the goals of an organization, and the strategic decisions made by the organization play a significant role in determining it. Investments, financing, dividend policies, assets management, and merger and acquisition decisions are all examples of these decisions that have a direct or indirect impact on the firm's efficiency and overall success.

Firm Efficiency

The success of a business hinges on its ability to be efficient. Management strives to use its resources effectively to achieve organizational goals. Efficiency can be defined as the ratio between output and input. Firms aim to produce output by using inputs, which is known as firm efficiency. Assessing how well an organization is performing requires measuring different types of efficiencies. Technical efficiency, pure technical efficiency, scale efficiency, profit efficiency, X-efficiency, productive efficiency, cost efficiency, and other approaches have all been used over time by scholars and business experts. Each of these approaches has advantages and disadvantages of its own. Some academics employ Stochastic Frontier Analysis (SFA), a parametric method, to assess firm efficiency.

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Other academics gauge efficiency using data-envelopment analysis or financial ratios. A linear programming tool called the DEA (Data Envelopment Analysis) approach evaluates the effectiveness of businesses (Decision-Making Units) compared to one another. It is a nonparametric approach that was developed by Charnes, Cooper, and Rhodes (1978) and assesses a firm's inputs and outputs to estimate its efficiency. Allocative efficiency and technical efficiency are the two subcategories of efficiency. The ability of a company to select the ideal combination of inputs to get the required number of outputs is the focus of allocative efficiency.

On the other side, technical efficiency measures a company's ability to produce the maximum amount of output with a specific level of input. Charnes, Cooper, and Rhodes (1978) expanded Farrell's (1957) work by adding multiple inputs and outputs to the model. They recommended using the Constant Return to Scale Model, also known as the CCR model, to optimize technical efficiency from a fixed level of inputs. However, high efficiency can also be achieved by decreasing inputs. Banker, Charnes, and Cooper (1984) developed the Variable Return to Scale Model, or BCC Model, to optimize output while minimizing inputs. The extended model further divides technical efficiency into scale efficiency (SE) and pure technical efficiency (PTE). DEA is a widely used method in various organizations with different goals. It has been used in courts, air force maintenance units, hospitals, schools, railways, transportation sectors, airlines, banks, retail productivity, and the shipping industry.

This approach has also been used to investigate concerns with corporate governance and ownership structure, as well as how they affect business performance. DEA is a widely utilized technique to gauge performance across a range of sectors and countries. Morita and Avkiran (2009) found that selecting the right input and output variables is crucial in determining a company's efficiency. They conducted a factor analysis to identify the appropriate variables

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for the assessment. Therefore, to accomplish the research objectives, DEA must carefully select the inputs and outputs. Efficiency has been assessed in earlier research using various input and output factors.

Lin, Liu, and Chu (2005) used total assets and total stockholder equity as inputs and total revenue and net profit before tax as outputs to assess the efficiency of Taiwan's shipping sector. Liu, Lin, and Fang (2009) used FEDI transactions and earnings as outputs and personnel costs and business promotion as inputs to evaluate the efficiency of banks. Nikoomaram, Mohammadi, and Mahmoodi (2010) used operating expenses and owner's equity as inputs and operating cash flows and net earnings as outputs to evaluate the efficiency of metal industry companies listed on the Tehran Stock Exchange Corporation. Abrache, Aguenaou, Alaoui, and Iraqi (2013) reported that selecting inputs and outputs is crucial to the success of the DEA approach. The relative efficiency of non-financial companies listed on the Casablanca stock exchange was assessed using five inputs—total assets, total liabilities, cost of goods sold, general administrative costs, and net holding plant property and equipment—and five outputs—return on assets, return on equity, gross sales revenue, income before taxes, and net income.

Previous studies have shown that some companies experience a decrease in their financial performance, which is measured by their net income before taxes. However, the Data Envelopment Analysis method can't process negative values and needs all values to be positive to provide accurate results. To solve this problem, a translation procedure introduced by Ali and Seiford (1990) was used in this study. The procedure involves converting all negative values, including the largest negative value among the variables, into positive values. Additionally, a constant value of one was added to the negative value series of all firms in the sample. A similar technique was used in a study by Bowlin and Renner (2008) to convert negative values into positive values for analysis using

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DEA. The objective of the study, which considered the overall efficiency of the organization, was to assess the technical efficiency of non-financial firms in Pakistan and the US. This was accomplished by considering three input variables, total assets, total shareholder equity, and total liabilities, as well as three output variables, total revenue, net profit before interest and tax, and net income.

Corporate Governance and Firm Efficiency

Corporate governance is the umbrella term for the set of policies that direct and regulate an organization's operations. The Organization for Economic Cooperation and Development (1999) defined corporate governance as the process of assigning duties and privileges to various parties and establishing guidelines and protocols for decision-making. To develop objectives, aims, and monitor activities to attain target goals, a suitable structure is established. The value of corporate governance is found in its capacity to address agency issues and guarantee an organization's expansion. In situations where a country's legal framework falls short of adequately preserving shareholders' interests, investors may create an internal corporate governance system within a corporation to protect themselves through incentive structures and suitable ownership arrangements. Evaluation of corporate governance concerns in transition nations can benefit from research on business ownership structures. Zheka's (2005) demonstrated that creating efficient corporate governance is essential for organizations that seek to attain efficiency.

Kuznetsov and Muravyev (2001) examined how corporate governance and ownership arrangements impact firm performance. Government involvement might be required when businesses don't have internal corporate governance. The incentives for managers and a company's financial performance in transitional economies are both impacted by ownership structure, which has a substantial impact on corporate governance. In developing nations like Pakistan, where family members frequently control, own, and hold top managerial

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positions, Shah (2009) emphasized the need to address corporate governance difficulties. This might cause agency issues. Researchers have employed various techniques in prior studies to assess corporate governance appropriately. To create successful corporate governance, various criteria have been applied. Black (2002) used eight different strategies, including transparency and disclosure, asset stripping and transfer pricing, dilution through share issues or restructuring/merger, bans on foreign ownership, register risk, management attitude toward shareholders, and insolvency.

There was a precise weight given to each component. Klapper and Love (2002), on the other hand, employed a total of 57 questions with YES/NO responses, divided into seven categories, including social awareness, independence, accountability, justice, transparency, responsibility, and discipline. Except for the first group, which received a weight of 0.10, each group was given a weight of 0.15. Corporate governance greatly affects the effectiveness and performance of organizations. Corporate governance that is effective can assist businesses in efficiently and effectively achieving their organizational goals, such as wealth maximization. A board's size is an important consideration when talking about the connection between corporate governance and firm efficiency. As each director may prioritize their interests, a larger board may waste resources and be less effective, which could result in disagreements and disputes between the board members.

Yermack (1996) claimed that a firm's performance may be significantly impacted by the size of its board of directors. Eisenberg, Sundgren, and Wells (1998) found that larger boards were linked to worse performance in both Finland and a sample of 491 US corporations over a seven-year period (1984 to 1991). Hutchinson and Gul (2003), a board of directors that is independent and competent can lower agency costs and increase a company's value. They are essential for distributing resources wisely, and if they are made up of impartial

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specialists, they can boost a company's productivity and value. Fama (1980) emphasized that non-executive directors oversee a company's operations while standing in for the interests of outside shareholders. A company's executive board structure is crucial for increasing productivity. Several studies in Pakistan have examined the link between board composition and business success. Ibrahim, Rehman, and Raoof (2010), Yasser, Entebang, and Mansor (2011), and Khan and Awan (2012) all discovered a positive relationship between board independence and performance.

Bhagat and Black (2002) and Bhagat and Bolton (2008), showed a negative association between board independence and performance. It is unclear whether there is a connection between board makeup and organizational performance because of the contradictory findings. Alam (2013) stated that a communication gap between the CEO and independent board members may exist between the company's strategic decisions and their participation. However, the business can become more effective if independent board members are heavily involved in strategic choices. As a result, it is anticipated that board independence and company efficiency are directly related. The ownership structure of an organization, which can vary widely, affects how it is managed. Governments, families, foreign investors, financial organizations, and private individuals can all exercise control. Numerous theories have been conducted to explain why ownership structures differ throughout nations, according to significant research on the subject. For instance, Baraca (1994) discovered that over 90% of manufacturing businesses in Italy are managed and controlled by a single person or family.

Major owners possess 85% of public firms in Germany and France, according to Franks and Mayers (1995, 1997), but in the US, many corporations have multiple stockholders. According to Landreth (1992) and Prowse (1992), many corporations in Japan and England have a large number of stockholders.

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Shliefer and Vishny (1986), block holders, or individuals with a sizable ownership position, can enhance firm performance by using their knowledge and skills to oversee and control the management's operations. However, Johsen et al. (2000) noted that when minority shareholders become managers themselves, concentrated ownership can lead to significant agency issues. According to Laporta (1999, 2002), ownership concentration can lead to serious agency issues in nations with insufficient shareholder legal protection. Considering that majority shareholders may have different interests and goals than minority shareholders, Morck (2000) stressed the significance of ownership concentration. The effectiveness and performance of businesses can be affected by many ownership aspects.

Zheka (2005) discovered that while government ownership might not have a detrimental effect, foreign ownership generally tends to increase efficiency. To evaluate the specific impacts of different ownership structures on business efficiency, more research is necessary. Additionally, Ariff and Luccan (2008) found that domestic private banks in emerging nations are less effective than foreign banks. Battcharya, Lovell, and Sahey (1997) reported that state-owned banks in India are more effective than both domestic and overseas commercial banks. Omrana, Bolbol and Fatheldin (2008) discovered that the ownership structure had little effect on the performance of Arab firms. Gugler, Mueller, and Yurtoglu (2008) found that institutional ownership improves company performance in the United States whereas insider ownership has a beneficial impact on firm wealth. King and Santor (2008) stated that high control harms corporate performance.

Cespedes, Gonzalez and Molina (2010) found a direct relationship between ownership concentration and company leverage. Li, Arosa, Iturralde, and Maseda (2010) found that the management abilities of the family managing the business have a significant impact on the success of family-owned

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concentrated enterprises. Chen and Yu (2011) found that diversification had little impact on long-term performance but can enhance short-term performance. Gumus and Celikkol (2011) reported that DEA methodology and ratio analysis were contrasted for analyzing corporate performance, and it was found that both approaches are consistent when evaluating liquidity and profitability.

Wahla, Shah, and Hussain (2012) stated that managers who are also business owners might negatively affect a company's performance in Pakistan. Ownership concentration, which is defined as the control of the company by a small number of people who make important decisions, did not provide any notable findings in the same study. When ownership is concentrated, owners are better able to track development and devote funds to boost productivity and performance. Distributed ownership, however, can result in subpar performance since people might not participate actively in management and control. Claessens and Djankov (1999), and McConnell and Servaes (1990) reported that there is a direct relationship between concentrated ownership and organizational performance, including labor productivity and business profitability.

Kuznetsov and Muravyev (2001) also discovered a positive association between ownership concentration and technical efficiency for Russian non-financial privatized firms, while Nguyen (2011) proposed that ownership concentration might improve corporate performance. Using the top 5 shareholder proxies for ownership concentration, Chen and Dickinson found a negative correlation between ownership concentration and firm performance. Demsetz and Lehn (1985) found a negative correlation between ownership concentration and the market value of the company.

Ongore (2011) discovered a strong adverse association between ownership concentration and corporate performance. The efficiency of a corporation and its ownership concentration are related, according to the literature. Financial institutions including banks, insurance companies, and other financial firms are

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considered to have institutional ownership. These institutions often have low risk tolerance levels; therefore, they tend to shy away from hazardous or uncertain ideas that could raise a company's worth. This cautious approach could limit how a corporation uses its resources. The value or performance of enterprises and institutional ownership have been found to be negatively correlated in studies from Japan, Finland, and France. However, studies conducted in Sweden and the United States have found an association between institutional ownership and corporate performance that is favorable. Performance and institutional ownership have been linked in numerous studies, including those by McConnell and Servaes (1990), Smith (1996), Del Guercio and Hawkins (1999), and Bjuggren, Eklund, and Wiberg (2007). Faccio and Lasfer (2000) and Duggal and Millar (1999) found no evidence of a connection between institutional ownership and firm performance. Nevertheless, institutional ownership is seen to enhance corporate productivity.

Gender diversity in the workplace has attracted more attention and inquiry in recent years. A varied workforce, especially in terms of gender, may have a positive effect on organizational outcomes. Smith and Smith (2018) have shown that teams with various genders make better decisions than teams with only one gender. Diverse teams bring a wide range of viewpoints, experiences, and cognitive capacities to the table. Organizations with gender diversity are more likely to demonstrate high levels of creativity and invention (Herring (2009). since diverse teams frequently produce a larger variety of ideas and solutions, which enhances innovation. Rock and Grant (2016) demonstrated that gender-diverse teams are more adept at adjusting to changes and resolving issues, which results in increased employee engagement and reduced turnover rates. Companies can improve their performance by developing a positive reputation to attract top personnel, increase consumer loyalty, and build stronger connections with stakeholders. Adams and Ferreira (2009) argued that superior

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governance and decision-making practices are seen when women are fairly represented on a company's board. The thorough meta-analysis by Carter et al. (2017) provided more evidence for the benefits of gender diversity on boards by showing a direct relationship between gender diversity and higher innovation, successful strategic decision-making, and improved financial performance. A company's reputation and impression among stakeholders might improve when different genders are represented on the board.

Erhardt et al. (2003) found that in Fortune 500 businesses, organizations with more women on their boards were seen as being more socially responsible and having a higher reputation. Customers, investors, and the public may be more inclined to trust and support a company because of this favorable reputation among stakeholders. A gender-diverse board has been shown to improve corporate governance and risk management procedures. For instance, Singh et al. (2016) studied Indian companies and found an association between boards with greater gender diversity and lower levels of risky behavior. This shows that diverse boards consider a larger range of risks and make more educated choices regarding risk management, which ultimately helps to improve firm performance. Aggarwal, Erel, Stulz, and Williamson (2022) investigated the impact of staggered boards, a corporate governance element, on firm value and efficiency and discovered that companies with staggered boards had lower firm values and less operational efficiency, highlighting how crucial sound corporate governance is to the success of businesses. The impact of corporate governance practices on business efficiency, such as board independence and CEO-chair separation, has been studied recently.

De Andres & Vallelado (2021) stated that the effectiveness of these procedures was found to be positively impacted on bank efficiency and demonstrating the significance of good corporate governance in raising business performance. Boubaker and Gounopoulos (2020) found that effective corporate

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governance practices had a positive impact on bank efficiency. Goergen & Manjon (2019) examined the effect of corporate governance on the adoption of blockchain technology and firm efficiency and demonstrated that effective corporate governance procedures enhance the use of blockchain technology, resulting in increased operational effectiveness and improved firm performance. By concentrating on Indian manufacturing companies, Sharma & Hiranandani (2019) discovered that effective corporate governance measures, such as board independence and CEO-chair separation, are favorably associated with firm efficiency. This demonstrates the significance of good corporate governance in enhancing business performance. Based on past research studies, it is expected that there will be a positive association between corporate governance and firm efficiency across various industries, regions, and economies. A hypothesis was formulated based on the above literature.

Hypothesis 01: Corporate governance has a direct and significant association with firm efficiency.

Corporate Investment and Firm Efficiency

The relationship between a company's investment in long-term assets, like buildings, machinery, and equipment, and its efficiency is complex and ever-changing. Capital expenditure is a critical factor in enhancing a company's productivity and operational efficiency. Investing in new technologies, equipment, or infrastructure can streamline production processes, automate tasks, and boost overall efficiency. Bloom et al. (2012) discovered that higher levels of capital investment were linked to higher levels of productivity and efficiency in manufacturing firms. Capital expenditure often leads to technological advancements and innovation. By purchasing new technologies or investing in research and development, firms can improve their products, processes, and services, resulting in increased efficiency. Peters and Wagner (2014) found that companies that invested more in R&D and capital expenditure

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had higher levels of innovation, which positively influenced their efficiency. Capital expenditure enables companies to expand their production capacity, leading to economies of scale. By investing in new facilities or machinery, companies can increase their output and lower their average costs per unit, improving overall efficiency.

Mankiw et al. (1992) emphasized the importance of economies of scale in improving company performance and efficiency. Capital expenditure is closely connected to long-term profitability and competitiveness. By strategically investing in their physical assets, companies can gain a competitive advantage, improve their market position, and achieve sustained profitability. Chong et al. (2018), stated that allocating funds towards investments can prove to be advantageous for an organization in terms of amplifying its earnings and enhancing its operational efficacy. Though capital expenditure is often linked with improved firm efficiency, it is crucial to consider the financial constraints that some firms may face. Limited internal resources or difficulty accessing external financing may impact their ability to invest in capital expenditure. In such cases, firms may need to prioritize investments based on their financial capabilities.

Rajan and Zingales (1998) explored the association between financial constraints and investment decisions. Meanwhile, Barlev and Haddad (2003) have discovered that an increase in capital investment can have a positive impact on a company's efficiency. This is because it allows for the acquisition of advanced technology, improved production processes, and increased capacity utilization. It is important to effectively allocate capital to productive assets, as this can result in cost savings, streamlined operations, reduced downtime, and an overall improvement in efficiency. Capital expenditure often involves investments in research and development (R&D) and the adoption of new technologies, which can lead to innovation and technological advancements that

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further improve a company's efficiency. In fact, Chen et al. (2017) found that there is a positive relationship between R&D intensity (a measure of capital expenditure on R&D) and firm efficiency. Companies that invest in R&D tend to develop new products, processes, or services that enhance their competitive advantage and operational efficiency. Ultimately, capital expenditure helps firms expand their productive capacity and optimize asset utilization, leading to improved efficiency.

Hadhri et al. (2020) focused on the manufacturing sector and its connection between capital expenditure and firm efficiency. The results showed that a rise in capital investment has a positive impact on capacity expansion and asset utilization efficiency. Effective use of capital-intensive assets such as machinery and equipment can significantly improve overall firm efficiency. Capital expenditure plays a crucial role in a firm's long-term competitiveness and sustainable growth. In a study by Cao and Qiu (2018) on state-owned enterprises (SOEs) in China, it was found that higher capital expenditure has a positive impact on firm efficiency and contributes to long-term growth. This is due to the ability of SOEs to upgrade their technological capabilities, improve product quality, and remain competitive in the market. Chen et al. (2021) discovered that increased capital investment has a positive effect on firm efficiency, leading to improved financial performance. This potential for increased sales, market share, and profitability is a result of productive capital investments.

Brynjolfsson and Hitt (2000) found that investing in capital-intensive technologies can lead to higher productivity levels and efficiency gains across various industries. Increased capital investment allows firms to produce more goods or services with the same or fewer resources, resulting in improved efficiency. Fare et al. (2005) conducted research on the manufacturing sector and found that firms investing in capital equipment and technology tend to exhibit

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higher technical efficiency. Firms can improve their overall efficiency by utilizing advanced technologies to automate processes, reduce waste, and streamline operations.

According to a study by Sheng et al. (2017) on Chinese manufacturing firms, capital investment has a positive correlation with efficiency. This suggests that better resource allocation resulting from increased capital investment can lead to improved overall efficiency. By investing in the right assets, firms can optimize resource allocation and utilization, ultimately enhancing efficiency. A study conducted by Chen et al. (2019) on Chinese listed companies also found a positive relationship between capital investment and higher profitability, which contributes to overall firm efficiency. Meanwhile, Choung et al. (2020) discovered that firms that invest more in capital assets tend to achieve higher growth rates and exhibit better overall performance. Hence, strategic capital investments can improve a firm's capabilities, expand into new markets, and strengthen their competitive position, ultimately contributing to improved efficiency.

Baum, Ongena & Schafer (2021) conducted a study on the impact of corporate investment on firm efficiency in family firms, and their findings were quite insightful. They discovered that increased levels of investment resulted in greater efficiency gains, indicating a positive correlation between the two. This observation was further corroborated by Arouri, Lahiani & Nguyen (2020), who explored the relationship between corporate investment and firm efficiency. Their research indicated that higher levels of investment contributed to improved operational performance, which is a critical factor in enhancing overall firm performance. Matousek & Nguyen (2019) also looked into the impact of corporate investment on firm efficiency, but their focus was on transition economies. They suggested that firms investing more in physical and intangible assets tend to achieve higher levels of efficiency, indicating the positive impact of corporate investment on firm performance. This is particularly important for

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firms operating in transition economies, where the competitive landscape can be quite challenging. Braga-Alves, García-Feijoo, & Rezende (2018) studied the relationship between corporate investment and firm value and found a positive correlation.

Their research showed that firms that invest more in tangible and intangible assets tend to have higher market valuations, indicating a positive relationship between corporate investment and firm value. This observation underscores the critical role that investment plays in enhancing overall firm performance. Al-Mawali & Reddy's (2018) study focused on the oil and gas industry and found that effective investment strategies positively influence firm value. This observation highlights the importance of higher levels of investment in enhancing firm performance, particularly in the context of the oil and gas industry, where effective investment strategies can be the difference between success and failure.

The current research study indicates a relationship between corporate investment and firm efficiency, which leads to the formation of the following hypothesis.

Hypothesis 02: Corporate investment has a significant association with firm efficiency.

Corporate Social Responsibility and Firm Efficiency

There is a growing trend in the business world to delve into the connection between a company's social responsibility and its overall efficiency. Companies are recognizing the importance of giving back to society and taking actions that demonstrate their commitment to ethical and sustainable practices. The idea is that by being socially responsible, companies can not only make a positive impact on the world but also improve their bottom line and reputation in the long run. As a result, many organizations are now prioritizing their corporate social responsibility initiatives and integrating them into their business strategies.

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Social responsibility refers to a company's dedication to acting in a socially and environmentally responsible way. Meanwhile, firm efficiency measures how well a company can use its resources to produce outputs. Companies that prioritize social responsibility often have a good reputation and positive perception from stakeholders, which can lead to better efficiency.

McWilliams and Siegel (2001), companies that participated in corporate social responsibility (CSR) initiatives were perceived more favorably by stakeholders. When a company is perceived positively in terms of social responsibility, it can have a number of benefits. This includes increased customer loyalty, improved relationships with suppliers, and better access to resources, which can all contribute to greater efficiency within the organization. Additionally, socially responsible companies often enjoy higher levels of employee engagement, which can further improve efficiency. A study by Turker (2009) examined the link between CSR and employee outcomes, revealing that CSR activities can lead to increased employee satisfaction, commitment, and motivation. Engaged employees are more likely to be productive, committed to their work, and contribute to overall firm efficiency. Socially responsible firms tend to adopt proactive risk management practices, which can result in cost savings and improved efficiency.

Eccles et al. (2011) demonstrated that firms with strong CSR performance were better equipped to identify and manage risks effectively. By implementing sustainable practices, reducing environmental impacts, and maintaining ethical standards, firms can avoid potential financial and reputational risks, leading to improved efficiency. Companies that participate in social activities often show increased levels of innovation, which can help with long-term competitiveness and efficiency. In a study by Lin et al. (2016), it was discovered that businesses with strong commitments to CSR tended to have higher levels of innovation. Companies that prioritize innovation are better equipped to adapt to changes in

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the market, identify new opportunities, and improve operational efficiency. Implementing social responsibility into business practices can lead to higher levels of customer loyalty, which can positively affect market performance and efficiency.

Sen and Bhattacharya (2006) demonstrated how CSR initiatives can increase client satisfaction and loyalty, resulting in repeat business, favorable word-of-mouth advertising, and increasing market share—all of which are beneficial to the efficiency of the firm. Research has indicated that socially responsible companies tend to have a positive reputation, engage employees, adopt effective risk management strategies, drive innovation, and benefit from customer loyalty. These factors all contribute to improved efficiency and long-term competitiveness. Zhu et al. (2020) analyzed a large sample of Chinese companies and found that businesses with higher levels of CSR involvement had better operational efficiency. Integrating social responsibility into business strategies can create mutually beneficial outcomes for both society and the company. Through sustainable practices, waste reduction, and optimized resource utilization, businesses can save costs and improve overall efficiency. Implementing CSR initiatives can have a positive impact on employee productivity and engagement, which in turn improves overall firm efficiency.

A study conducted by Chen et al. (2018) showed that CSR engagement was positively linked to employee productivity. When employees are engaged and feel connected to a company's social responsibility initiatives, they are more motivated, committed, and productive, all of which contribute to firm efficiency. CSR practices can also contribute to better risk management and financial performance, which ultimately leads to improved firm efficiency. According to a meta-analysis by Orlitzky et al. (2003), there is a positive correlation between CSR and financial performance. This suggests that effective CSR engagement can mitigate risks associated with environmental, social, and governance factors,

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resulting in improved financial outcomes and organizational efficiency. Numerous studies have explored the relationship between CSR and firm efficiency, including those that specifically focus on Islamic banks and Chinese firms. Chen, Yao & Ye (2021) discovered that firms with higher levels of CSR engagement tend to demonstrate higher efficiency levels, indicating the positive impact of CSR on firm efficiency. A recent study conducted by Ahmad & Yousaf (2020) revealed that businesses that prioritize social responsibility tend to experience better operational performance. The study found that there is a strong connection between engagement in corporate social responsibility (CSR) and firm efficiency. This suggests that firms that actively engage in CSR practices tend to achieve better overall performance.

Herzig & Schaltegger (2019) examined the correlation between CSR, business models, organizational structures, and efficiency. The researchers found that firms with CSR-focused business models and decentralized organizational structures tend to be more efficient. This highlights the importance of aligning CSR practices with organizational design, as this can significantly improve firm efficiency. Mohd Ghazali & Weetman (2018) explored the link between CSR and firm financial performance while also examining the role of productivity. The study revealed that CSR engagement has a positive impact on productivity, which in turn leads to improved financial performance and enhanced firm efficiency. This suggests that CSR can play a critical role in driving overall firm efficiency. Zagonov & Baranov (2018) looked at the connection between CSR and company efficiency and discovered that organizations that actively engage in CSR efforts typically exhibit higher levels of efficiency. This demonstrates how CSR has a positive impact on operational success. When considered collectively, these studies offer strong support for the beneficial influence of CSR on firm efficiency across a range of sectors and regions.

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They also contend that CSR and business performance are positively correlated in both developing and developed countries, highlighting the significance of CSR as a key factor in determining total firm efficiency.

Hypothesis 03: Firm efficiency is significantly linked to corporate social responsibility.

Data and Research Methods

The study discussed various aspects of the research methodology, including the population and sample size, type of data and data collection, methodology, measurement of variables and econometric models used in the study. It explained how the methodology is chosen and defined and statistical techniques utilized to achieve the study objectives. Additionally, the research examined the data collection and analysis process, including the econometric model specifications, estimation techniques, and data validation. Finally, the study provided an in-depth elucidation of the diagnostic tests and panel data regression models used to accomplish the research objectives and investigated the relationships among variables.

Population and Sample Size

This research study conducted a thorough analysis of non-financial companies currently listed on the stock exchanges of Pakistan and the United States of America. The study aimed to include all non-financial firms listed on the stock exchanges of both economies and selected a large sample size of 200 companies based on data availability. The study covered a timeframe of 13 years, from 2009 to 2021. Financial companies were excluded from the sample due to their different regulatory environments, profit and capital structures, and accounting methods. Additionally, companies with incomplete corporate governance or insufficient data were also excluded from the sample, as were most firms with negative equity due to financial distress. The selected sample included

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companies from various sectors in both developing and developed economies, providing a comprehensive view of the business landscape in both countries.

Data Collection and Type of Data

The data of Pakistani firms required for the measurement of various variables used in this study has been obtained from the Data Stream, Eikon, and annual financial statements of the firms published in each year. while the data for necessary variables from selected US companies has been gathered from the Wharton Research Data Services (WRDS) database. For this study, a combination of cross-sectional and time series data was used to create a panel data set sample. The input and output variables needed to calculate firm efficiency were also obtained from these sources. The DEA model was implemented to determine the firm efficiency variable, while the PCA method was used to generate corporate governance indices for both economies. Various methods, including DEA, descriptive statistics, correlation analysis, panel regression models, mediation models, FGLS, and dynamic GMM, were used to analyze the relationships between the variables in the study.

The DEAP software has used for measuring firm technical efficiency and Stata software has used to perform regression and mediation analyses and investigate the relationships of the study.

Measurement of Variables

Measurement of Firm Efficiency

Researchers have used various methods to measure a company's efficiency accurately. These techniques include financial ratios, analytical hierarchal processes, and data envelopment analysis. In transition contexts, technical efficiency is particularly useful for two reasons, as observed by Zheka (2005). Firstly, market rigidity often prevents companies from having freely traded shares. Secondly, technical efficiency can predict the effect of corporate

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governance on firm value and identify governance issues, mainly when resources are not used efficiently.

Data Envelopment Analysis (DEA)

Data Envelopment Analysis (DEA) is a well-liked technique for measuring efficiency. Charnes, Cooper, and Rhodes (1978) are credited with developing this technique, which is based on the constant return to scale model. The model of a variable return to scale was later added by Banker, Cooper, and Charnes (1984), who further developed the idea. The primary distinction between the two models is the free variable Uo.A company's different inputs and outputs can be combined using DEA to create a single measure that indicates the efficiency between that DMU's inputs and outputs. This is referred to as a decision-making unit (DMU). In essence, DEA enables a thorough assessment of an organization's entire performance regarding its unique mix of inputs and outputs.

Assumptions of DEA

This study employed DEA annually to avoid short-term fluctuations that can cause data noise. DEA relies on following certain assumptions,

- All values must be positive because DEA cannot run on negative values.
- There must be absence of noise in the data set.

Previous research has utilized the Data Envelopment Analysis (DEA) method to measure the efficiency of both financial and non-financial companies. The main objective of this study was to utilize the DEA technical efficiency constant return to scale (CCR) model, which is a popular and widely used approach, to evaluate the annual efficiency of each company from 2009 to 2021. The DEA CCR model determines the overall efficiency of a company by selecting input and output parameter weights that increase each unit's efficiency score, with an efficiency score of one on the scale indicating that the company is fully efficient. The efficiency scores range from 0 to 1, with lower scores indicating lower efficiency levels. Therefore, this model provides a comprehensive and reliable measure of a

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company's efficiency and can be used to identify areas where improvements can be made. The ability of a company to produce the highest possible output with a given input is known as "technical efficiency". To maximize technical efficiency using a specific set of inputs, the Constant Return to Scale Model, also known as the CCR (1978) model, can be used. This study measures the technical efficiency of non-financial firms in both developed and developing economies by using three input variables (total assets, total shareholder's equity, and total liabilities) and three output variables (total revenue, net profit before interest tax, and net income). This measurement represents the overall efficiency of firms.

Constant Return to Scale Model

The first mathematical equation was introduced by Charnes et al. (1978) and is as follows:

$$\max ho = \frac{\sum_{i=1}^{s} UrYrO}{\sum_{i=1}^{m} ViXiO}$$

Subject to:

$$\max ho = \frac{\sum_{i=1}^{s} UrYrj}{\sum_{i=1}^{m} ViXij} \leq 1; \ \ j = 1,,,,n.$$

Ur, Vi > 0, r =1,,,,,s, i =1,,,,,, m

Where,

Ho=	Efficiency score of DMU (Firm) 0
J=	Decision making unit (DMU)
Yr=	The output r values
Xi=	The input i values
Ur=	Weights of the output r
Vi=	Weights of the input i
s and r=	Numbers of outputs
m=	Number of inputs
n=	Number of DMUs
ho=	DMU under assessment.

Measurement of Corporate Governance Index

For measuring corporate governance index, the study has used principal component analysis. For measuring corporate governance variables, different researchers used different proxies in the above literature section. Whestphal and

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Zajac (1995), Eisenberg, Sundgren and Wells (1998), Khan and Awan (2002), Ammann, Oesch et al. (2011), Shah (2009), Dar et al. (2011) and Khan (2014) used various proxies and measured Board Size, Gender Diversity, Independence of Board, Institutional Ownership and Ownership Concentration. The research study has considered the above studies and developed corporate governance indices comprised of Board Size, Gender Diversity, Independence of Board, Institutional Ownership and Ownership Concentration for both economies. Utilizing a regression function, a meticulous and all-encompassing corporate governance index has been crafted. This index is built upon the foundation of previous research and considers a multitude of crucial factors, including board size, board independence, gender diversity, institutional ownership, and ownership concentration. The objective of this endeavor is to establish a dependable and consistent set of measures for evaluating corporate governance.

CGI=f (BS, BI, GD, IO, OC)

Board Size Measurement

The method used to determine the size of the board involved calculating the total number of directors through the natural logarithm, which was previously reported by Alam (2013) and Khan (2014).

Measurement of Board Independence

For measuring board independence variables, different researchers used different proxies in the literature. This study followed the proxy of the board independence variable used by Alam (2013) and Khan (2014). To evaluate the level of Board Independence, one can calculate the proportion of non-executive directors compared to the total number of individuals who serve on the board.

Measurement of Gender Diversity

The board's gender diversity level was evaluated through a calculation of the ratio between female and male directors, according to a study conducted by Mirza and Andalleb (2012).

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Measurement of Institutional Ownership

Institutional ownership can be measured and stated if financial institutions held and owned at least 5% of the shares firm (Alam, 2013) and (Khan, 2014).

Measurement of Ownership Concentration

According to Mangena, Priego & Manzaneque (2020), block ownership refers to the power held by block-holders who possess a minimum of 5% of a company's shares, except for the bank with a dual role. The study examines previous research on block ownership and monitoring by analyzing the degree of block ownership and block-holder dispersion, as found in Tribo et al. (2007), Konijn et al. (2011), and Basu et al. (2016). To gauge block ownership, the study employs three constructs: (i) the complete ownership by the top three blocks (Top3 blocks), (ii) the separate share of the first, second, and third most significant block-holders (Block 1, Block 2, and Block 3), and (iii) the dispersion of block holders evaluated by the number of blocks and the Herfindahl index of equity stakes. The study computes the scaled Herfindahl index, as Konijn et al. (2011) did, utilizing the entire ownership of the three largest block-holders.

To calculate the Herfindahl index, the study used the following formula: [(% of Block 1)^2 + (% of Block 2)^2 + (% of Block 3)^2] / (% of Block 1 + % of Block 2 + % of Block 3). This formula is used to determine the level of dispersion of block-holders in a firm. A lower Herfindahl index or a higher number of blocks indicates a greater dispersion of block-holders (Konijn et al., 2011).

Measurement of Corporate Investment

Change in fixed assets has been used as proxy for corporate investment in the research study.

Measurement of Corporate Social Responsibility

Different studies have used different proxies for measurement of corporate social responsibilities; However, the study has been used the ratio of CSR to total assets

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for measurement of CSR activities. While CSR activities represents donations by firms.

Measurement of Control Variables

Measurement of Firm Size

The study determined the size of a firm by measuring its total assets and taking the natural logarithm.

Measurement of Leverage

To measure a firm's leverage, the ratio of a firm's debt to its total equity is calculated.

Measurement of Firm Growth

The study has utilized a ratio to assess a company's expansion, which involves subtracting the sales from the preceding year from the sales for the current year and then dividing the result by the sales from the previous year.

Measurement of Firm Age

To determine the age of a firm, the number of years since its establishment is measured by taking the logarithm.

Table I shows the measurement of variables used in past studies.

Table I: Measurement of Variables

Variable Name	Category	Measurement	References
EFF	DV	Technical Efficiency calculated through DEA-CCR (1978) model.	Zheka, (2005) & Khan (2014)
CGI	IV	CGI constructed through PCA.	Tarverdi, et. Al (2019) & Khan (2020)
CI	IV	CI measured by change in fixed assets.	Kim, et. Al. (2021)
CSR	IV	Ratio of CSR to total assets while CSR refered to donations by a firm in a specific year.	Ramzan, (2021) & Sarwar (2022)

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FZ	CV	FZ measured by natural log of total assets.	Kim, et. Al. (2021) & Ramzan (2021)
LEV	CV	LEV measured by debt-to-equity ratio.	Kim, et. Al. (2021) & Ramzan (2021)
FG	CV	FG measured by subtracting previous year sales from current sales and divided by previous sales.	Coad, et. Al. (2016)
FA	CV	FA is measured by the number of years since the firm's establishment by taking the logarithm.	Coad, et. Al. (2016), Rafiq et.al. (2016) & Ramzan (2021)

Note: DV= Dependent variable, IV= Independent variable, MV= Mediating variable, CV= Control variable.

Expected Sign of Variables with Firm Efficiency

Based on extensive research literature, the study reported expected signs of various variables with firm efficiency.

Table II: Expected Sign of Variables with Firm Efficiency

S.No	**Variable's Name**	**Category of Variable**	**Expected Sign**
1.	Corporate Governance	IV	**+**
2.	Corporate Investment	IV	**+**
3.	Corporate Social Responsibility	IV	**+**
6.	Firm Size	CV	**-**
7.	Leverage	CV	**-**
8.	Firm Growth	CV	**+**
9.	Firm Age	CV	**+**

Note: DV= Dependent variable, IV= Independent variable, MV= Mediating variable, CV= Control variable.

Panel Regression Models

The following panel regression models were used in order to investigate the relationships among variables.

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Equation:

$$EFF\,\text{it} = \alpha + \beta 1(CGI)\,\text{it} + \beta 2(CI)\,\text{it} + \beta 3(CSR)\,\text{it} + \beta 4(FZ)\text{it} + \beta 5(LEV)\text{it} + \beta 6(FG)\text{it} + \beta 7(FA)\text{it} + \mu\,\text{it} \ldots\ldots 01$$

Where;

EFF = Efficiency of ith firm at time t.

α = Constant term in the equation.

β = Coefficient of independent variables.

CGI = The value of the Corporate Governance Index for the ith firm at time t.

CI = Corporate Investment value of ith firm at time t.

CSR = Corporate Social Responsibility value of ith firm at time t.

FZ= Firm Size value of ith firm at time t.

LEV= Leverage value of ith firm at time t.

FG= Firm Growth value of ith firm at time t.

FA= Firm Age value of ith firm at time t.

μ = The error term for the ith firm at time t of the equation.

Diagnostic Tests

The following diagnostic tests have been applied in order to examine and identify various issues in the data set and find out their best possible solution in an appropriate way.

1.1.1. Heteroskedasticity Tests

1.1.2. Panel Unit Root Test:

1.1.3. Multicollinearity Test:

1.1.4. Endogeneity Test:

Econometric Model Specification

The study comprehensively explained the statistical process used to assess the factors that impact firm efficiency in both developing and developed economies. In order to accurately analyze each economy, it is important to determine the

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appropriate econometric model based on factors such as sample selection, data characteristics, variable definition and measurement, and statistical processes used for analysis. This study used econometric models to test hypotheses formed in chapter 2 described in detail.

The objectives of this research are to highlight the impact of corporate governance, corporate investment, corporate social responsibility on firm efficiency. The econometric relationship is shown below in the following equations:

$EFF_{i,t} = \beta_0 + \beta_1 X_{i,t} + \beta_2 Z_{i,t} + \varepsilon_{i,t}$ 02

Where,

$EFF_{i,t}$ denotes the firm's efficiency, which is dependent variable in the study, β_0 is an intercept, i is the cross-section which is a company, t is a time which is the year, X denotes the independent variables like corporate governance, corporate investment and corporate social responsibility, denotes control variables of the study that is firm size, leverage, firm growth, and age of the firm. $\varepsilon_{i,t}$ denotes the zero-mean disturbance term. The above equation (02) denotes the static for the regression model.

The study has used equation (02) for estimation with simple ordinary least squares, and there may be several mathematical problems raised. To identify any issues in the data, diagnostic tests are conducted. The panel unit root analysis shows that corporate investment is stationary at first difference in Pakistan data, while all other variables are stationary at the level for both Pakistan and US economies. The Breusch-Pagan/Cook-Weisberg Test confirms the presence of heteroskedasticity in Pakistani data while there is no heteroskedasticity issue in US data. To check for endogeneity issues, the Durbin chi Square and Wu-Hausman tests are used on both the Pakistani and US data sets. The results show endogeneity issues in the US data, but not in the Pakistan data. Additionally, the significance of the lagged value of EFFi,t indicates autocorrelation issues in the

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US data. Consequently, the Dynamic Generalized Method of Moment (GMM) is best for US data, while the Feasible Generalized Least Square (FGLS) model is preferred for Pakistan data.

Feasible Generalized Least Squares (FGLS)

The Feasible Generalized Least Squares (FGLS) model is an enhanced version of the Generalized Least Squares (GLS) model, which is specifically designed to account for heteroscedasticity and serial correlation in the error term. In contrast to the traditional GLS model, FGLS takes into consideration the variance-covariance structure of the error term while estimating the model parameters. This advanced technique results in more accurate and reliable statistical analysis, making it an essential tool for researchers and analysts in various fields.

The FGLS model can be represented by the following equation:

$EFF_{i,t} = X\beta + \varepsilon_{i,t}$ 03

Where;

$EFF_{i,t}$ is the dependent variable vector,

X is the matrix of independent variables,

β is the vector of coefficients to be estimated, and

$\varepsilon_{i,t}$ is the vector of error terms.

When conducting data analysis, it is crucial to take into account the variance-covariance structure of the error term $\varepsilon_{i,t}$. This structure can be established through theoretical or empirical approaches. By incorporating this structure, the FGLS estimator can produce more dependable and efficient estimates in scenarios where heteroscedasticity and serial correlation exist. The FGLS estimator consists of two significant steps.

In order to better understand the variability and correlations within the error term, one method is to use a preliminary estimation technique such as the Cochrane-Orcutt or feasible GLS estimation. These techniques can assist in detecting and correcting any possible errors or discrepancies in the data,

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resulting in a more precise and trustworthy analysis. To accurately estimate the coefficients β using the FGLS estimator, the study needs to use the estimated variance-covariance structure. This ensures that the results are valid and reliable.

Dynamic Generalized Method of Movement (GMM)

The study has used Manuel Arellano and Stephen Bond (1991) GMM approach for the US data, to proceed further. The use of Dynamic GMM resolves the problem of endogeneity from equation () and transforms the equation as follows.

$$\Delta EFF_{i,t} = \alpha \Delta EFF_{i,t-1}\beta_0 + \beta_2 \Delta X'_{i,t} + \Delta\varepsilon \quad \ldots\ldots 04$$

To investigate the association between corporate governance, corporate investment, corporate social responsibility, earning quality, information asymmetry, and firm efficiency, the study has employed dynamic panel estimation techniques. The study focuses on firm efficiency, and Equations 05 and 06 lays out the general models that the study employed to achieve the research objective and includes control variables. Following Manuel Arellano's (1991) suggestion, the study has used the first-differenced lagged dependent variable as an instrument to avoid the biased one-step method. Instead, Frank Windmeijer (2005) recommends the use of two-step robust standard errors as they are more efficient and consistent than a simple two or one-step approach. By utilizing these methods, the study can accurately analyze the relationship between these variables and better understand the underlying dynamics at play.

$$EFF_{i,t} = \beta_0 + \beta_1 EFF_{i,t-1} + \beta_2 CGI_{i,t} + \beta_3 CI_{i,t} + \beta_4 CSR_{i,t} + \beta_5 EQ_{i,t} + \beta_6 FZ_{i,t} + \beta_7 LEV_{i,t} + \beta_8 FG_{i,t} + \beta_9 FA_{i,t} + \varepsilon_{i,t} \quad \ldots\ldots 05$$

$$EFF_{i,t} = \beta_0 + \beta_1 EFF_{i,t-1} + \beta_2 CGI_{i,t} + \beta_3 CI_{i,t} + \beta_4 CSR_{i,t} + \beta_5 IA_{i,t} + \beta_6 FZ_{i,t} + \beta_7 LEV_{i,t} + \beta_8 FG_{i,t} + \beta_9 FA_{i,t} + \varepsilon_{i,t} \quad \ldots\ldots 06$$

Results and Discussions

This chapter of the research study is concerned with the empirical findings of various statistical and econometric tools used to investigate and test the

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hypotheses and accomplish the study's goals. As was already indicated, the data set employed in this study is what is referred to as a panel data set because it combines time series data (spanning 13 years) with cross sections data (covering 200 enterprises). And the sample data contains the developing economy (Pakistan) and the developed economy (USA). Firstly, the data was carefully rinsed and screened for any underlying issues, such as mean values, standard deviation, missing values, and outliers, and the issues associated with the data set in order to refine the data for analysis.

Secondly, the firm efficiency has been calculated using Data Envelopment Analysis, while corporate governance indices for Pakistan and the US have been created using Principal Component Analysis (PCA). Thirdly, the data was screened for any underlying issues such as stationarity, heteroskedasticity, multicollinearity, endogeneity etc.; this was essential for ensuring the accuracy and reliability of the results obtained and the selection of correctly specified models for analysis. Subsequently, other various panel data techniques such as descriptive statistic, correlation analysis, diagnostics tests, regression analysis based on the above tests, Feasible Generalized Least Square (FGLS), and Generalized Method of movement (GMM) analysis have been applied to investigate the relationship among variables and achieve the study objectives. This section reported and discussed the results of various statistical tools on Pakistani data as well as on US data separately.

Results and Discussions of Developing Economy (Pakistan)

The study has employed various statistical techniques like DEA, PCA, descriptive statistic, Pearson correlation, FGLS on Pakistani data and reported results below.

Descriptive Analysis of Variables used for Efficiency

In order to comprehend and characterize the nature of the data for analysis, a descriptive analysis has been conducted. Descriptive statistics provide the mean,

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standard deviation, minimum and maximum values of each series in a data set. Additionally, it also includes the total number of observations. Table III reveals three output variables (Total Revenue, Earning Before Interest and Tax and Net Income) and three input variables (Total Assets, Total Liability and Total Equity) for the measurement of firm efficiency. The tables show mean, standard deviation, minimum, maximum and category of total revenue, EBIT, NI, TA, TL and TE, and number of observations.

Table III: Descriptive Summary of Inputs and Outputs Variables (Rupees in Thousands)

Variable Name	Category	Mean	Std. Dev.	Min	Max
Total Revenue	Output	24152.792	77631.731	159.547	1204247.375
EBIT	Output	3180.205	11715.559	-31772.23	178291.951
Net Income	Output	1720.322	8237.603	-56036.73	123914.550
Total Assets	Input	27339.557	74812.111	31.923	955993.814
Total Liabilities	Input	15935.189	48887.966	4.670	700337.120
Total Equity	Input	11404.368	45074.599	-414780.4	769644.045
Number of Observations: 2600					

Note: EBIT refers to earnings before interest and tax.

Principal Components (PCA)

To develop a series that contains the maximum possible features of corporate governance, the corporate governance index was built using the regression function shown below. The study considers and incorporates board size, board independence, gender diversity, institutional ownership, and ownership concentration to construct the corporate governance index (CGI), which was based on prior research.

CGI=f (BS, BI, GD, IO, OC)

By running PCA, the study has been obtained the following coefficients for corporate governance index.

CGI = 0.2604(BS)+ 0.2036(BI)+ 0.1986(GD)+ 0.1854(IO)+ 0.1519(OC)

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Descriptive Summary of Variables for Analysis

Using a descriptive analysis, it was possible to comprehend the variables that were used in the analysis. The dataset's mean, standard deviation, minimum and maximum values for each variable are displayed in Table IV along with the overall number of observations. The standard deviation of EFF is 0.1052, and the mean value is 0.9075, indicating that non-financial firms in Pakistan are generally 90.75% efficient. Efficiency values range from 0.154 to 1. The CGI mean value is 2.3709 and standard deviation is 1.0001 indicate that average firms in the data set have good corporate governance mechanism. The CGI values lies between -3.9567 and 5.5570. The mean value of CI is 259.5020 and standard deviation is 389.1231 reveals that average investment rate is 259.50 in Pakistani firms. The CI values lies between -0.9999 to 19413.16. The average value of CSR is 0.0017 and standard deviation is 0.0084 shows that Pakistani firms on average spends 0.17% on corporate social activities of their revenue.

The CSR values range from 0 to 0.2673. The mean value of FZ is 15.7292, standard deviation is 1.6074 and the series range from 10.3711 to 20.6782. the average value of LEV is 0.5824 and standard deviation is 0.3127 represents that average firms having 0.5824 debt ratio in the data set of Pakistan. The LEV series range from 0.0043 to 3.9970. the mean value of FG is 0.3692 and standard deviation is 7.6669 indicate that the series highly volatile and average growth rate is 36.92% of Pakistani sample data. The FG values lie between -0.9830 and 323.1718. FA's minimum and highest values are 0.1056 and 2.2068, respectively, with a standard deviation of 0.2386 and an average value of 1.5257. In the sample of Pakistani data set, there are a total of 2600 observations.

Table IV: Descriptive Summary of Variables (Pakistan)

Variable Name	Mean	Std.Dev.	Min	Max
EFF	0.9075	0.1052	0.154	1

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CGI	2.3709	1.0001	-3.9567	5.5570
CI	259.5020	389.1231	-0.9999	19413.16
CSR	0.0017	0.0084	0	0.2623
FZ	15.7292	1.6074	10.3711	20.6782
LEV	0.5824	0.3127	0.0043	3.9970
FG	0.3692	7.6669	-0.9830	323.1718
FA	1.5257	0.2386	0.1056	2.2068
Number of Observations: 2600				

Correlations Analysis

Prior to estimating and performing regression analysis, correlation analysis is one of the essential statistical tools that researchers typically employ to investigate and determine the strength and directions among variables. The correlation coefficient is a number that represents how strongly two variables are correlated. Its values fall between -1 and +1, with a coefficient of +1 denoting a perfect positive correlation, a coefficient of -1 denoting a perfect negative correlation, and a coefficient of 0 denoting no correlation between the variables (Orth, Robins, & Widaman, 2012).

The study has used Pearson correlation matrix to examine the correlation analysis among variables. Table V depicts the correlation analysis of efficiency with other variables in the context of Pakistan, the corporate governance value is 0.1971 which means that corporate governance has a direct and significant correlation with firm efficiency at 5 % significance level. When a firm improves the quality of corporate governance, it can lead to increase firm efficiency. Corporate Investment has a value 0.0070 which indicates a positive and significant correlation with firm efficiency at 10% significance level. It suggested that firm investment can increase its efficiency. The corporate social

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responsibility value is 0.0206 indicates a direct and significant correlation with firm efficiency on 10% significance level. It means that those firms who spend money on social activities can increase their efficiency. Firm Size value is -0.06633 which indicates a negative and significant correlation with firm efficiency at 5% significance level. It refers to when a firm increases its size, it cannot properly utilize its resources and leads to a decrease in its efficiency.

Leverage value is -0.0781 represent that leverage has an inverse and significant correlation with firm efficiency at 5% significance level. It means that firms who increase its debt ratio can decrease its efficiency. Firm growth value is 0.0204 depicts a positive but insignificant correlation with firm efficiency. Firm age value is -0.0848 indicates an indirect and significant correlation with firm efficiency at 5% significance level. It means that with the passage of time, firm efficiency can be decreased.

Table V: Correlation Analysis of Variables (Pakistan)

	EFF	CGI	CI	CSR	FZ	LEV	FG	FA
EFF	1.0000							
CGI	0.1971**	1.0000						
CI	0.0070***	0.0086	1.0000					
CSR	0.0206***	0.0143	-0.0049	1.0000				
FZ	-0.6633**	0.3291***	0.0171	-0.0962**	1.0000			
LEV	-0.0781**	-0.0408***	-0.0226	0.1304***	-0.1334***	1.0000		
FG	0.0204	0.0211	0.5327*	-	-	0.0405*	1.0000	

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				0.0073**	0.0182**	**		
FA	-0.0848**	0.1673*	-0.0072	-0.0240	0.1290***	-0.1217**	-0.0268**	1.0000

Note: The significance levels of 1%, 5%, and 10% are indicated by the symbols *, **, and ***, respectively.

Panel Data Regression Analysis

The study used an appropriate regression model to investigate the relationship between the independent and dependent variables. Usually researchers use Ordinary Least Square (OLS) to investigate the relationships among variables. But before going to apply regression model, the study has applied some important diagnostic tests to check that the data set has fulfilled the basic assumptions of OLS or not. The results of some diagnostic tests are given below.

Diagnostic Tests

The study has performed the following diagnostic tests to investigate various issues in Pakistani data set.

Heteroskedasticity Test

To use OLS, it is necessary for the error term's variance to be constant. If homoscedasticity is present, OLS can be used. However, if heteroskedasticity occurs (meaning that error term's variance is not constant), other models must be applied instead of OLS. A frequent test for spotting heteroskedasticity in a dataset is the Breusch-Pagan/Cook-Weisberg test. The Breusch-Pagan/Cook-Weisberg Test was employed in this analysis to identify heteroskedasticity, and the results are listed below. The results in Table VI indicate that the p-value (0.000) is significant. This indicates that the null hypothesis according to which the error term's variance is constant, has been disproved. Instead, the alternative hypothesis was approved, proving that the data do indeed contain heteroskedasticity. The study also examined this issue by analyzing the residual plot (see Residual Graph I) and obtained the same result. Regression analysis

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frequently makes use of the concept of "robustness" to control the problem of heteroskedasticity in a dataset and produce reliable results.

Ho: Error Term has a constant variance.

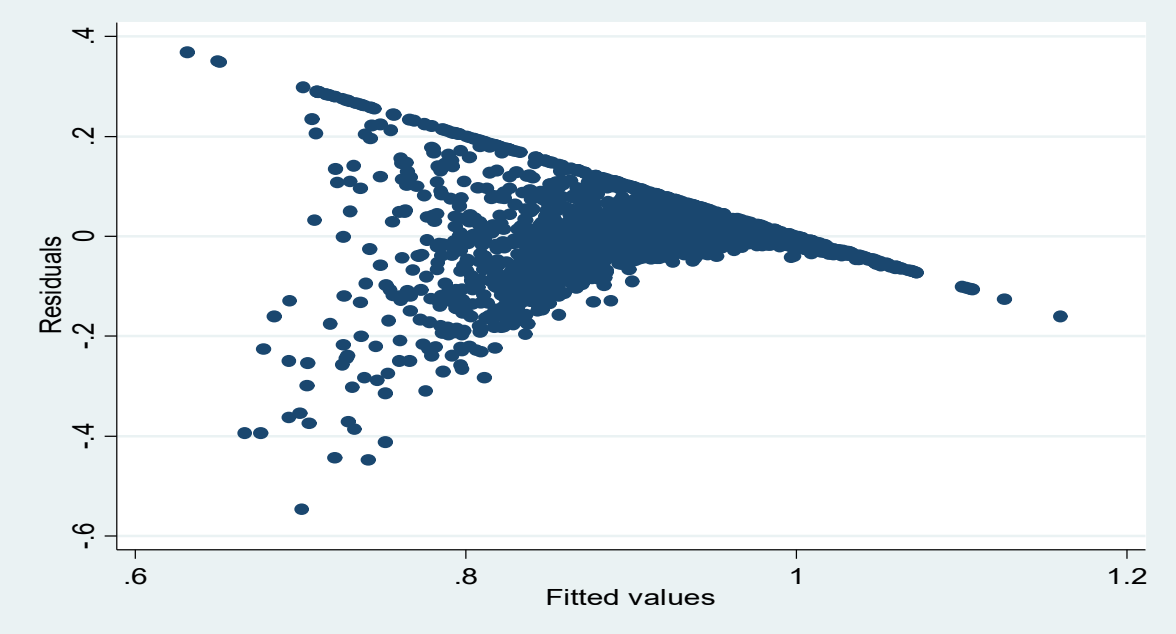
H1: Variance of Error Term is not constant.

Table VI: Heteroskedasticity Breusch-Pagan / Cook-Weisberg Test

Variable	**Fitted value EFF**
Chi (2)	2957.09
Prob.Chi2	0.000

Check through Residual Plot

Figure: II Residual Graph I (Pakistan)



Panel Unit Root Analysis

The second assumption checked by this study is to find the unit root in all variable's series. For employing OLS, all variables must be stationary at the level. But if any variable is not stationary at level, then the study will make them stationary and run the regression analysis. To check the unit root in series, the study employed the Levin-lin-chu Test to test the unit root in each variable series;

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the following results found by running the test on each variable separately. Table VII shows that EFF, CGI, CSR, FZ, LEV, FG and FA variables are stationery at level while CI became stationery at first difference. So, the study has used the first difference of CI as variable in a regression and mediation analysis.

Ho: Panels contain unit roots.

H1: Panels are stationery.

Table VII: Levin-lin-chu Test for Stationarity (Pakistan)

Variable Name	p-value at level	p-value at 1st diff	Stationery
EFF	0.0000	----	I (0)
CGI	0.0000	----	I (0)
CI	0.9999	0.0000	I (1)
CSR	0.0000	----	I (0)
FZ	0.0000	----	I (0)
LEV	0.0000	----	I (0)
FG	0.0000	----	I (0)
FA	0.0000	----	I (0)

Multicollinearity Analysis

The next important assumption is to check multicollinearity issues in independent variables before running the regression. The study checks the correlation among independent variables because if independent variables strongly correlated with others, it would give biased results. The study has used Variance Inflation Factor (VIF) and Collinearity Tests to find multicollinearity issues among variables. The following results were found by running the VIF test. Table VIII depicts that CGI VIF value is 1.15 and /VIF value is 0.8717, indicating that there is no multicollinearity issue with CGI. The VIF value of CI is 1.44 and 1/VIF value is 0.6926, suggesting that there is no multicollinearity issue with CI. The CSR VIF and 1/VIF values are 1.03 and 0.9702 respectively representing that

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there is no multicollinearity issue with CSR. FZ VIF and 1/VIF values are 1.17 and 0.8568, respectively suggested no multicollinearity issue with FZ. LEV VIF and 1/VIF values are 1.33 and 0.7521, respectively report no multicollinearity issue with LEV. FG VIF and 1/VIF values are 1.41 and 0.7116 respectively indicate no multicollinearity issue with FG. FA VIF value is 1.05 and 1/VIF value is 0.9541 suggests that there is no multicollinearity issue with FA. So, the study has used all variables in analysis because there is no multicollinearity issue in data set.

Table VIII: Variance Inflation Factor and Collinearity Tests for Multicollinearity

Variable Name	**VIF**	**1/VIF**
CGI	1.15	0.8717
CI	1.44	0.6926
CSR	1.03	0.9702
FZ	1.17	0.8568
LEV	1.33	0.7521
FG	1.41	0.7116
FA	1.05	0.9541
Mean VIF:	**1.22**	

Note: The rule of thumb is that if the VIF value is greater than 5 and 1/VIF value is less than 0.2, then there will be a multicollinearity issue in a data set. So, the above results suggest that there is no multicollinearity issue in the Pakistani data set.

Endogeneity Test

Another important assumption to run OLS is to test for endogeneity issues in the data set. Strong correlations between the independent variables and the error term can cause endogeneity problems. When there is an endogeneity issue in a data set and runs OLS, it will give biased results and estimation. So, if the study found an endogeneity issue in a data set, it cannot run OLS on data, and the

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study will apply some other models like the Generalized Method of movement (GMM). GMM is one of the best models to control endogeneity issues and produce results. Table IX reported the following test of endogeneity results. The p-value is greater than 0.05, suggesting that there is no endogeneity issue in a data set.

Ho: Variables are exogenous.

H1: Variables are endogenous.

Table IX: Test of Endogeneity

Variable	Statistics	p-value
Durbin (score) Chi (2) 3	1.74395	0.6272
Wu-Hausman F (3, 2389)	0.579072	0.6288

Feasible Generalized Least Square (FGLS)

The study has applied various regression assumptions to investigate and refine the data for regression analysis. The diagnostic tests suggest that there are heteroskedasticity and autocorrelation issues while no endogeneity issue in the data set of Pakistan. To control heteroskedasticity and autocorrelation issues, some researchers used and recommended that Feasible Generalized Least Square (FGLS) is a better model to estimate the results. On the basis of above diagnostic tests, the study applied Feasible Generalized Least Square (FGLS) to interpret the relationships among variables in the context of Pakistan. After employed various diagnostic tests, the study employed cross-sectional time-series FGLS regression model to control the heteroskedasticity and autocorrelation issues and investigate the relationships among variables.

Table X depicts the relationship of corporate governance, corporate investment, corporate social responsibility with firm efficiency. Table X shows that the model Wald chi value is 45.02 and p-value 0.000 indicates that the model is correctly specified. The first objective of the study was to determine how

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corporate governance affects firm efficiency. As a result, the coefficient of CGI is 0.0013, and p-vale (0.030) suggests that CGI has a positive significant association with firm efficiency at the 5% significance level, supporting the study's first hypothesis in Pakistan. According to this interpretation, if CGI rises by one-unit, firm efficiency will rise by 0.0013 units at a 1% significance level while all other factors stay the same. The study confirms the findings of agency theory that corporate governance decreases agency conflicts which increase firm efficiency. The findings consistent with the prior studies of (Zheka,2005; Khan, 2014; Rock and Grant, 2016; Carter et al., 2017; Goergen & Manjon, 2019; Sharma & Hiranandani, 2019; Boubaker & Gounopoulos, 2020; De Andres & Vallelado, 2021).

The study's second objective was to investigate the impact of corporate investment and capital expenditure on firm efficiency. The findings indicated that, at the 5% level of significance, there is a direct and significant relationship between corporate investment and firm efficiency, with a D.CI coefficient value of 0.0005 and a p-value of 0.044 at a 5% level of significance. Statistically it can be noted that a 1% increase in corporate investment will result 0.0005% gain in firm efficiency, with the rest of the conditions remaining the same. It suggested that firm's investments can directly enhance its efficiency as it proved the second hypothesis of the study in Pakistan and findings of the study parallel to the findings of (Barlev and Haddad, 2003; Fare et al., 2005; Chen et al., 2017; Sheng et al., 2017; Chong et al., 2018; Cao and Qiu, 2018; Hadhri et al., 2020; Chen et al., 2021). The third objective was to examine how corporate social responsibility impacts firm efficiency. The findings demonstrate that the Coefficient value of CSR is 4.4148 and the p-value (0.032) suggests that corporate social responsibility has a significant and positive correlation with firm efficiency at a 5% significance level.

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This implies that, in Pakistan, all other things being equal, a one-unit increase in social activities will result in a 4.4148 unit increase in firm efficiency at a 5% significance level. It's approved the third hypothesis of the study and confirmed the findings of the studies (Orlitzky et al, 2003; Lin et al., 2016; Chen et al., 2018; Zagonov & Baranov, 2018; Herzig & Schaltegger, 2019; Ahmad & Yousaf, 2020; Zhu et al., 2020; Chen, Yao & Ye, 2021). The control variable FZ coefficient value is -0.0644 and p-value (0.000) states that firm size has an indirect and significant association with firm efficiency at 1 % significant level. Its suggest that firm efficiency can decrease when firm increases its size and vice-versa in Pakistan. The coefficient value of LEV is -0.1604 and p-value (0.001) reported that leverage has an inverse and significant relationship with firm efficiency at 1% significant level.

It suggests that those firms who taking high debt can reduce its efficiency in Pakistan because of high uncertainty and instability in Pakistani economy. FG coefficient value is 0.0036 and p-value (0.068) describes that firm growth has a direct and insignificant association with firm efficiency. The coefficient of FA is -0.0863 and p-value (0.354) suggests that firm age has an indirect and insignificant relationship with firm efficiency. The research indicates that in Pakistan, there is a positive association between corporate governance, corporate investment, corporate social responsibility, and firm efficiency.

Table X: Cross-Sectional Time-Series FGLS Model for Analysis (Pakistan)

Dependent Variable	Independent Variables	Coefficients	z-value	p-value
EFF	Constant	2.2089	7.59	0.000
	CGI	0.0013	2.18	0.030

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	D.CI	0.0005	2.01	0.044
	CSR	4.4148	2.14	0.032
	FZ	-0.0644	-3.84	0.000
	LEV	-0.1604	-3.41	0.001
	FG	0.0036	1.82	0.068
	FA	-0.0863	-0.93	0.354
Wald Chi 2 (7):		45.02		
Prob>Chi2:		0.000		

Results and Discussions of Developed Economy (USA)

The research study has applied several statistical and panel data statistical techniques like DEA, PCA, descriptive statistic, correlation analysis, diagnostics tests such as panel unit root, heteroscedasticity, endogeneity test etc., regression analysis on the basis of Generalized Method of movement (GMM) analysis in order to investigate the relationship between corporate governance, corporate investment, corporate social responsibility and firm efficiency in the context of the developed economy (United States of America). The results of these techniques are given below.

Descriptive Analysis of Variables used for Efficiency

The descriptive analysis has been performed in order to understand and describe the nature of data for analysis in the context of the US. A descriptive statistic displays the mean, standard deviation, minimum, and maximum values for each series, along with the total number of observations in a dataset. Table XII reported three output variables (Total Revenue, Earning Before Interest and Tax and Net Income) and three input variables (Total Assets, Total Liability and Total Equity) for the measurement of firm efficiency. The tables further show mean, standard deviation, minimum, maximum, and category of total revenue, EBIT, NI, TA, TL and TE, and a number of observations.

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Table XII: Descriptive Summary of Inputs and Outputs Variables ($ in Thousands)

Variable Name	Category	Mean	Std. Dev.	Min	Max
Total Revenue	Output	11510.27	1134.918	9993.166	1321597
EBIT	Output	3379.106	6592.128	-28387	108949
Net Income	Output	2237.129	5360.089	-23119	94680
Total Assets	Input	34006.38	53675.07	328.962	551669
Total Liabilities	Input	21316.61	33354.31	136.515	367767
Total Equity	Input	12689.77	23148.20	-18075	201934
Number of Observations: 2600					

Note: EBIT refers to earnings before interest and tax.

Principal Component Analysis (PCA)

To develop a series that encompasses the most features of corporate governance, the regression function was used to create the corporate governance index for the US. To construct the corporate governance index (CGI) for the US economy, the study draws on earlier research and considers the following factors such as board size, board independence, gender diversity, institutional ownership, and ownership concentration.

CGI= f (BS, BI, GD, IO, OC)

By running PCA, the study has been obtained the following coefficients for corporate governance index.

CGI = 0.3338(BS)+ 0.3041(BI)+ 0.2000(GD)+ 0.0932(IO)+ 0.0688(OC)

Descriptive Summary of Variables for Analysis

The study performed descriptive analysis on variables to understand the nature of variables used in this study in the context of the US. Table XIII depicts mean, standard deviation, minimum, maximum values of each variable, and total number of observations in a US data set. The mean value of EFF is 0.6937, standard deviation is 0.2020, which shows that data sample of US average non-financial firms are 69.37% efficient. The value of efficiency lies between 0.0850 to

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1. The CGI mean value is 5.0067 and standard deviation is 1.0001 indicates that average firms in the US data set have good corporate governance mechanism. The CGI values lies between -0.4735 and 9.4278. The mean value of CI is 0.0004 and standard deviation is 0.0038 reports that average investment rate is also very low in US firms. The CI values lies between 0 to 0.1688. The average value of CSR is 0.0037 and standard deviation is 0.0240 shows that US firms on average spend 0.37% on corporate social activities of their revenue.

The CSR values range from 0 to 0.2891. The mean value of FZ is 9.6962, standard deviation is 1.2236 and the series range from 5.7959 to 13.2207. The average value of LEV is 0.6153 and standard deviation is 0.1978 represents that average firms having 0.6153 debt ratio in the data set of US. The LEV series ranges from 0 to 1.8037. The mean value of FG is 0.0106 and standard deviation is 0.1146 indicates that average growth rate is 1.06% of US firms. The FG values lie between -0.2259 and 0.2354. The average value of FA is 2.7468, standard deviation is 0.8759, minimum value is 0.6990 and maximum value is 3.3056. The total number of observations are 2600 in the sample of US data set.

Table XIII: Descriptive Summary of Variables (US)

Variable Name	Mean	Std.Dev.	Min	Max
EFF	0.6937	0.2020	0.0850	1
CGI	5.0067	1.0001	-0.4735	9.4278
CI	0.0004	0.0038	0	0.1688
CSR	0.0037	0.0240	0	0.2891
FZ	9.6962	1.2236	5.7959	13.2207
LEV	0.6153	0.1978	0	1.8037
FG	0.0106	0.1146	-0.2259	0.2354
FA	2.7468	0.8759	0.6990	3.3056

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Number of Observations: 2600

Correlation Analysis

The study has used correlation analysis to investigate and identify the strength and directions among variables before estimation and regression analysis on US data set. Table XIV describes the correlation analysis of efficiency with other variables in the context of US. The corporate governance index value is 0.0871 which means that corporate governance has a direct and significant correlation with firm efficiency at 5 % significance level. When a firm improves the quality of corporate governance, it can lead to increase firm efficiency. Corporate Investment has a value 0.1222 which indicates a positive and significant correlation with firm efficiency at 10% significance level. It suggested that firm investment can increase its efficiency. The corporate social responsibility value is 0.1698 and shows a direct and significant correlation with firm efficiency on 10% significance level. It means that those firms who spend money on social activities can increase their efficiency.

Firm Size value is -0.8991 which shows a negative and significant correlation with firm efficiency at 5% significance level. It refers to when a firm increases its size, it cannot properly utilize its resources and leads to decrease in its efficiency. Leverage value is 0.1328 representing that leverage has a direct and significant correlation with firm efficiency at 10% significance level. It means that firms who increase its debt ratio can increase its efficiency. Firm growth value is 0.0040 depicts a positive but insignificant correlation with firm efficiency. Firm age value is -0.2517 indicates an indirect and significant correlation with firm efficiency at 5% significance level.

Table XIV: Correlation Analysis of Variables (US)

	EFF	CGI	CI	CSR	FZ	LEV	FG	FA
EFF	1.000							

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CGI	0.0871***	1.000						
CI	0.1222***	0.0300	1.000					
CSR	0.1698***	0.0254	-0.0152	1.000				
FZ	-0.8991***	0.0936***	0.1805***	0.1720**	1.000			
LEV	0.1328***	-0.0234	0.1098***	-0.0381***	0.1391**	1.000		
FG	0.0040	0.0116	0.0116	-0.0085	-0.0365***	-0.0365***	1.000	
FA	-0.2517***	0.0896***	-0.0896***	-0.0442**	0.1030**	0.1030**	-0.0055	1.000

Note: *, **, *** represent 1%, 5% and 10% significance level respectively.

Panel Data Regression Analysis

The research investigated the relationship corporate governance, corporate investment, corporate social responsibility, and firm efficiency in developed economy (US data set) by employing a suitable regression model. Before going to apply regression model, the study has applied some important diagnostic tests to check that the data set has fulfilled the basic assumptions of OLS or not. The results of some diagnostic tests are given below.

Diagnostic Tests

The research study has applied the following diagnostic tests to find out various issues in the US data set.

Heteroskedasticity Test

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The variance of the error term must be constant, which is one of the fundamental presumptions for using OLS. The study can employ OLS if homoscedasticity exists. OLS cannot be used in the study if there is a problem with heteroskedasticity; alternative models must be used instead. The Breusch-Pagan/Cook-Weisberg Test is a frequently used test to identify heteroskedasticity in a dataset. The Breusch-Pagan/Cook-Weisberg Test was employed in this study to identify heteroskedasticity. The results of Table-XV show that the p-value (0.505) is insignificant. Thus, the null hypothesis of the test does not reject, which indicates that the variance of the error term is constant. This means there is no issue of heteroskedasticity in the US dataset. The study also checked for heteroskedasticity issues using a residual plot (see Residual Graph II), which produced the same result.

Ho: Error Term variance is constant.

Ho: Error Term variance is not constant.

Table XV: Heteroskedasticity Breusch-Pagan / Cook- Weisberg Test

Variable	**Fitted Values of EFF**
Chi2 (1)	0.44
Prob>chi2	0.5050

Check through Residual Plot

Figure: III Residual Graph II (US)

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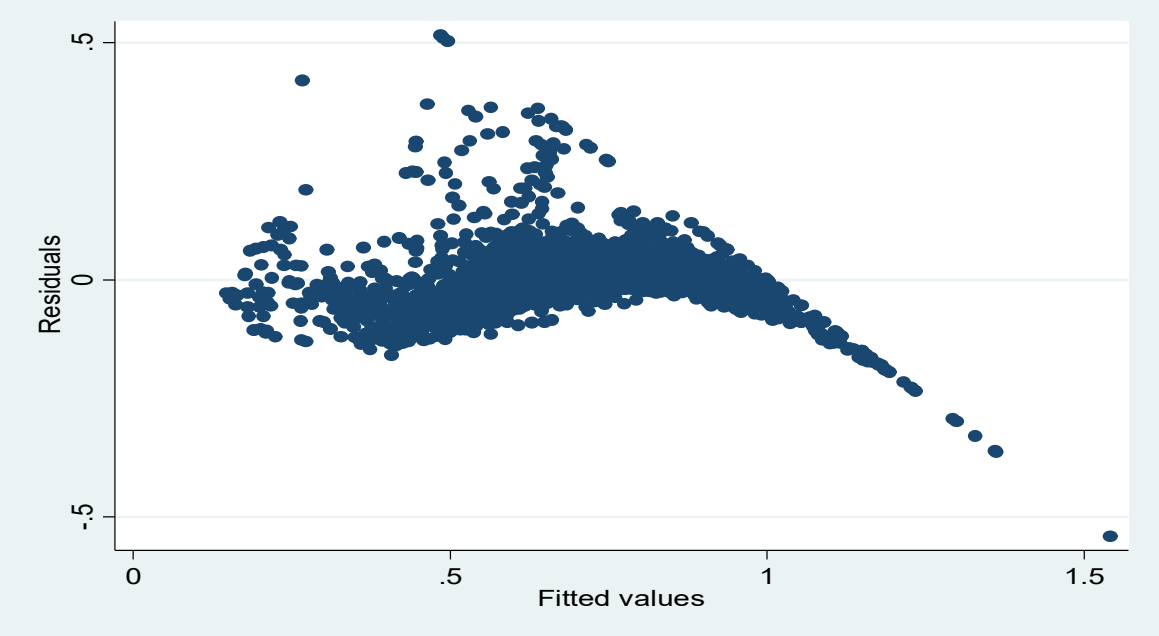

Panel Unit Root Analysis

The other assumption is checking unit root in all variable's series of US data set in order to get stationarity of series. For employing OLS, all variables must be stationary at level. But if any variable is not stationary at level, then the study will make them stationary and then run the regression analysis. To check the unit root in series, the study employed Levin-lin-chu Test to test the unit root in each variable series, the following results found by running the test on each variable separately. Table XVI shows that all variables EFF, CGI, CI, CSR, FZ, LEV, FG and FA are stationary at a level. So, the study can use OLS for regression analysis.

Ho: Panels contain unit roots.

H1: Panels are stationery.

Table XVI: Levin-lin-chu Test for Stationarity (US)

Variable Name	p-value at level	p-value at 1st diff	Stationery
EFF	0.0000	----	I (0)
CGI	0.0000	----	I (0)
CI	0.0000	----	I (0)

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CSR	0.0000	----	I (0)
FZ	0.0000	----	I (0)
LEV	0.0000	----	I (0)
FG	0.0000	----	I (0)
FA	0.0000	----	I (0)

Multicollinearity Analysis

Before performing the regression, the study used the Variance Inflation Factor (VIF) test to look for issues with multicollinearity in the independent variables in the US data. The study has employed Variance Inflation Factor (VIF) and Collinearity Tests to find multicollinearity issues among independent variables. The following results were found by running the VIF test. Table XVII portrays that CGI VIF value is 1.03 and 1/VIF value is 0.9707 indicates that there is no multicollinearity issue with CGI. The VIF value of CI is 1.07 and 1/VIF value is 0.9308 suggests no multicollinearity issue with CI. The CSR VIF and 1/VIF values are 1.05 and 0.9541 respectively represents that there is no multicollinearity issue with CSR. FZ VIF and 1/VIF values are 1.25 and 0.7985 respectively recommends no multicollinearity issue with FZ. LEV VIF and 1/VIF values are 1.08 and 0.9274 respectively reports no multicollinearity issue with LEV. FG VIF and 1/VIF values are 1.00 and 0.9977 respectively indicates no multicollinearity issue with FG. FA VIF value is 1.15 and 1/VIF value is 0.8713 suggests that there is no multicollinearity issue with FA. So, the study has used all variables in regression analysis because there is no multicollinearity issue in data set.

Table XVII: Variance Inflation Factor and Collinearity Tests for Multicollinearity

Variable Name	**VIF**		**1/VIF**
CGI	1.03		0.9707

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CI	1.07		0.9308
CSR	1.05		0.9541
FZ	1.25		0.798583
LEV	1.08		0.927441
FG	1.00		0.997750
FA	1.15		0.871362
Mean VIF:	**1.08**		

Note: *The rule of thumb is that if VIF value is greater than 5 and 1/VIF value is less than 0.2 then there will be a multicollinearity issue in the data set. So the above results suggest that there is no multicollinearity issue in the US data set.*

Endogeneity Test

The study has applied Durbin and Wu-Hausman tests examine endogeneity issues in a data set. Endogeneity issues arise when there is a strong correlation between independent variables and error term. When there is an endogeneity issue in a data set and runs OLS, it will give biased results and estimation. So, if the study found endogeneity issue in a data set, it cannot run OLS on data and the study will apply some other models like Generalized Method of movement (GMM). GMM is one of the best models to control endogeneity issues and gives better results. Table XVIII reports results of endogeneity tests. The p-value is (0.000) which is less than 0.05 suggests that there is an endogeneity issue in US data set. So, the study has applied GMM model to estimate the results.

Ho: Variables are exogenous.

H1: Variables are endogenous.

Table XVIII: Test of Endogeneity

Variable	**Statistics**	**p-value**
Durbin (score) Chi (2) 3	32.1972	0.000
Wu-Hausman F (3, 2389)	10.8285	0.000

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Dynamic Generalized Method of Movement (GMM)

The study has applied various regression assumptions tests in order to investigate and refine the data for regression and mediation analysis in the US. The diagnostic tests suggested that there is an endogeneity issue in the data set of US. To control endogeneity issue, some researchers used and recommended that Arellano-Bond Dynamic GMM is a better model to estimate the results.

The Arellano-Bond estimator is particularly suitable when dealing with unobserved individual-specific effects, serial correlation, and endogenous repressors. It extends the difference-in-differences approach by using lagged levels of the dependent variable as instruments to control endogeneity. The basic idea behind the Arellano-Bond estimator is to exploit the orthogonality between the first-differenced errors and lagged levels of the dependent variable as instruments. This helps to address the problem of endogeneity and generate reliable and accurate estimates.

Based on the above diagnostic tests, the study applied Dynamic Generalized Method of Movement (GMM) model to interpret the relationships among variables in US data set. Table XIX depicts the relationship of corporate governance, corporate investment, corporate social responsibility with firm efficiency. Table XIX shows that the model Wald chi value is 7524.84 and p-value 0.000 indicated that the model is correctly specified. As, GMM takes its first lag of dependent variables as an independent variable. The coefficient value of L1.EFF is 0.1795 and p-vale (0.000) suggested that lag value of efficiency has a positive significant association with firm efficiency at 1% significance level, which showed GMM is an appropriate estimation model for the data set of US. Coefficient of Intercept is 1.4240 and p-vale (0.000).

First objective of this study was to check the impact of corporate governance on firm efficiency, so the coefficient of CGI is 0.0002 and p-vale (0.000) reports that CGI has a direct and significant association with firm efficiency at

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1% significance level which confirmed the first hypothesis of the study in US. It can be interpreted that if CGI increased by one unit, it would bring 0.0002 units increase in firm efficiency at 01 percent significance level, other conditions remain constant. The study confirms the findings of agency theory that corporate governance decreases agency conflicts which increase firm efficiency in USA. It means that good corporate governance can improve firm efficiency in developed economies. The findings are consistent with the prior studies of (Zheka,2005; Khan, 2014; Rock and Grant, 2016; Carter et al., 2017; Goergen & Manjon, 2019; Sharma & Hiranandani, 2019; Boubaker & Gounopoulos, 2020; De Andres & Vallelado, 2021). Second objective of the study was to assess the influence of corporate investment/ capital expenditure on firm efficiency, the results show that CI having coefficient value is 0.1155 and p-value (0.009) reported that corporate investment has a direct and significant relationship with firm efficiency at 1% significance level.

Statistically, it can be noted that one unit increase in corporate investment will result in 0.1155 units increase in firm efficiency at a 1% significance level, ceteris paribus in the US. It suggested that firm's investments can directly enhance its efficiency as it proved the second hypothesis in the context of US and findings of the study parallel to the findings of (Barlev and Haddad, 2003; Fare et al., 2005; Chen et al., 2017; Sheng et al., 2017; Chong et al., 2018; Cao and Qiu, 2018; Hadhri et al., 2020; Chen et al., 2021). The third objective of this research was to check the impact of corporate social responsibility on firm efficiency. The value of the CSR coefficient is 0.4647, and the p-value of 0.000 suggests a positive and significant relationship between corporate social responsibility and firm efficiency at a 1% significance level. This means that in the US, an increase in corporate social activities by one unit is associated with an increase of 0.4647 units in firm efficiency, all other things being equal. It's confirmed the theoretical findings and approved the third

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hypothesis of the study. It indicates that those firms who spend a lot on social activities and welfare projects can improve its efficiency. The findings of research found similar to the studies of (Orlitzky et al, 2003; Lin et al., 2016; Chen et al., 2018; Zagonov & Baranov, 2018; Herzig & Schaltegger, 2019; Ahmad & Yousaf, 2020; Zhu et al., 2020; Chen, Yao & Ye, 2021).

The control variable FZ coefficient value is -0.1592 and p-value (0.000) stated that firm size has an indirect and significant association with firm efficiency at 1 % significant level in US. It's suggested that firm efficiency can be decreased when firm increases its size and vice versa. Coefficient value of LEV is 0.1712 and p-value (0.000) reported that leverage has a direct and significant relationship with firm efficiency at 1% significant level in the context of USA. It suggested that those firms who taking high debt can improve its efficiency by utilizing amount in worthy projects. FG coefficient value is 0.0251 and p-value (0.000) described that firm growth has a direct and significant association with firm efficiency in US. The coefficient of FA is 0.2107 and p-value (0.000) suggested that firm age has a direct and significant relationship with firm efficiency. The study showed that there is a direct relationship exists between corporate governance, corporate investment, corporate social responsibility, and firm efficiency in the context of USA.

Table XIX: Arellano-Bond Dynamic Panel Data GMM Model for Analysis

Dependent Variable	Independent Variables	Coefficients	z-value	p-value
EFF	L1.EFF	0.1795	7.64	0.000
	Constant	1.4240	17.42	0.000
	CGI	0.0002	4.14	0.000
	CI	0.1155	2.59	0.009
	CSR	0.4647	3.75	0.000
	FZ	-0.1592	-42.85	0.000

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	LEV	0.1712	17.32	0.000
	FG	0.0251	5.73	0.000
	FA	0.2107	7.33	0.000
Wald Chi 2 (8):		7524.84		
Prob>Chi2:		0.000		

Comparative Analysis with Respect to Research Methods and Model Specifications

The aim of the investigation was to examine the connections between corporate governance, corporate investment, corporate social responsibility, and company efficiency in both developing (Pakistan) and developed (US) economies. The study analyzed the comparative analysis of developing and developed economies. Various statistical and panel data tools employed separately on each economy and discussed the results. Results of the diagnostic tests stated that heteroskedasticity exists in Pakistani data while US data free from this issue. All the variables were stationery at level in both economies except corporate investment which became stationery at first level in Pakistani data. Endogeneity issue found in US data set while Pakistani data set was free from this issue. Based on various tests, feasible generalized least square (FGLS) was applied in Pakistani context while generalized method of movement (GMM) was applied in the context of USA.

Comparative Analysis of Developing (PAK) and Developed (US) Economies

The study examined the impact of corporate governance, corporate investment, and corporate social responsibility on firm efficiency in both developed and developing economies. The first phase of the study focused on each economy separately, and it found that all three factors had a significant and positive effect on firm efficiency. The study's findings showed that corporate governance can reduce agency conflicts and improve firm performance, while corporate

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investment ensures that resources are utilized effectively in worthy projects, leading to improved efficiency. Corporate social activities also generate positive information in the market and attract stakeholders, which can increase firm performance and efficiency. Past studies have supported these claims (Shleifer & Vishny, 1997). The study also found that effective corporate governance mechanisms, such as board size, board independence, gender diversity, institutional ownership, and ownership concentration, can reduce agency conflicts, address asymmetric information, and improve firm performance and efficiency. Overall, the study highlights the importance of corporate governance, corporate investment, and corporate social responsibility in enhancing firm efficiency in both developing and developed economies.

Summary of Comparative Analysis of Developing and Developed Economies

After analyzing non-financial firms in both developed (USA) and developing (Pakistan) economies, it has been concluded that corporate governance, corporate investment, corporate social responsibility all play a significant role in improving organization efficiency. In both economies, corporate governance, corporate investment, and corporate social responsibility have a direct and positive impact on firm efficiency, with similar results. It is important to note that the USA has already established well-functioning systems, while Pakistan can learn from their economy and implement their systems to safeguard stakeholders. To enhance firm efficiency and increase their chances of success, Pakistani companies should prioritize spending on social activities and diversification.

Conclusion and Policy Implications

This research aimed to study the effects of corporate governance, investment, and social responsibility on firm efficiency in both developing (Pakistan) and developed (USA) economies. The efficiency score of each firm was calculated for each year using the Data Envelopment Analysis (DEA) methodology. Principal Component Analysis (PCA) was utilized to develop corporate governance

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indices for both economies. Other statistical tools like descriptive statistics, correlation analysis, regression analysis through FGLS, and dynamic GMM models have been used to investigate the relationships and achieve study objectives. The study concluded, based on theoretical and empirical findings, that corporate governance has a direct and significant impact on firm efficiency in both developing and developed economies. It stated that if the country did not provide strong mechanism for corporate governance, then firms should have developed a good corporate governance mechanism in order to safeguard the rights of all stakeholders and improve firm efficiency.

The results of various studies conducted by Zheka (2005), Khan (2014), Rock and Grant (2016), Carter et al. (2017), Goergen & Manjon (2019), Sharma & Hiranandani (2019), Boubaker & Gounopoulos (2020), and De Andres & Vallelado (2021) Studies consistently demonstrate that corporate investment has a positive effect on firm efficiency, regardless of whether the economy is developed or developing. These findings highlight the importance for both owners and managers to minimize agency conflicts within the organization, invest in projects that have a positive net present value, and make optimal use of the firm's resources to attain their objectives. Previous studies by Barlev and Haddad (2003), Fare et al. (2005), Chen et al. (2017), Sheng et al. (2017), Chong et al. (2018), Cao and Qiu (2018), Hadhri et al. (2020), and Chen et al. (2021) have yielded similar results. These studies also indicate that there is a positive and significant connection between corporate social responsibility and firm efficiency in both developed and developing economies.

It is recommended that owners and managers prioritize social activities within communities to raise awareness and attract stakeholders, thus improving firm performance and efficiency. These results are similar to prior studies by Orlitzky et al. (2003), Lin et al. (2016), Chen et al. (2018), Zagonov & Baranov (2018), Herzig & Schaltegger (2019), Ahmad & Yousaf (2020), Zhu et al. (2020),

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and Chen, Yao & Ye (2021). Additionally, USA has already undergone the consequences of their experiments and have established well-functioning systems, while Pakistan can learn from US economy and implement the system to safeguards stakeholders and improve firm efficiency. Spending on social activities and Diversification are crucial for Pakistani companies to enhance firm efficiency and increase their chances of success.

Policy Implications and Recommendations

This research study has significant implications and recommendations for various parties, including firms, investors, managers, regulators, policymakers, researchers, and other stakeholders. Good corporate governance can enhance firm efficiency and minimize agency conflicts, ultimately resulting in better performance. The study suggests that corporate governance is crucial in enhancing firm efficiency because owners can monitor and evaluate projects' progress and operations, ensuring that all resources are used efficiently to improve the firm's performance.

Policy Implications and Recommendations for Companies

The association between corporate governance, corporate investment, corporate social responsibility (CSR), and firm efficiency has significant implications for companies. Understanding these implications can help companies make informed decisions and develop appropriate strategies. Some key implications and recommendations are given below:

Implications

- By implementing effective corporate governance practices, firms can increase their efficiency through transparent decision-making, reducing agency conflicts, and aligning the interests of management with those of shareholders.

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- Making strategic and effective investments in a corporation can lead to improved efficiency by boosting productivity, innovation, and competitiveness.
- Incorporating corporate social responsibility (CSR) initiatives into a business's operations can have a positive effect on its efficiency by improving its reputation, brand value, and relationships with stakeholders.
- By integrating corporate governance, corporate investment, and CSR, a holistic approach can be adopted to create synergies that enhance firm efficiency.

Recommendations

- Establishing strong corporate governance frameworks, such as independent boards of directors, effective internal control systems, and transparent disclosure mechanisms, should be a priority for companies. This can lead to better decision-making processes, promote accountability, and ultimately improve firm efficiency.
- It is advisable for companies to have a well-structured approach to investment decisions. This includes conducting a thorough analysis of costs and benefits, assessing risks, and considering long-term sustainability. It is best to prioritize investments that align with their core competencies, strategic goals, and have the potential to generate sustainable returns.
- It is important for companies to integrate practices that promote corporate social responsibility (CSR) into their overall business strategy. This involves aligning CSR initiatives with their core values and business model, identifying significant issues, establishing measurable targets, and frequently reporting on CSR performance. By following these steps, companies can improve their reputation, appeal to customers, inspire

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employees, and cultivate stronger relationships with stakeholders. Ultimately, this will lead to enhanced firm efficiency.

- To achieve sustainable growth and enhance firm efficiency, companies should adopt an integrated approach to decision-making. This approach involves considering the interplay between corporate governance, corporate investment, and CSR. The company should establish mechanisms to assess the social and environmental impact of investment decisions, incorporate stakeholder perspectives into governance processes, and align CSR initiatives with the company's investment strategy. By leveraging these synergies, companies can achieve their goals while also considering the impact on their stakeholders and the environment.

Policy Implications and Recommendations for Regulators and Policymakers

The relationship between corporate governance, corporate investment, corporate social responsibility (CSR), and firm efficiency has significant implications for regulators and policymakers. These implications can assist in creating and implementing effective regulations and policies. Several crucial implications and recommendations are provided below.

Implications

- To enhance firm efficiency, it is necessary to establish a strong regulatory framework for corporate governance that ensures transparency, accountability, and protection for shareholders.
- Encouraging corporate investment by implementing supportive regulations has the potential to boost economic growth, improve the effectiveness of companies, and attract more investment capital.
- Policymakers acknowledge the significance of corporate social responsibility (CSR) in attaining sustainable development objectives and establishing socially responsible businesses. By regulating CSR practices,

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companies can be prompted to incorporate social and environmental factors into their operations, resulting in improved firm effectiveness.

- Collaboration and knowledge sharing among stakeholders is essential for promoting corporate governance, investment, CSR, and firm efficiency. Regulators and policymakers have a crucial role to play in facilitating this process.

Recommendations

- It is important for regulators to create and enforce proper corporate governance standards that demand companies to follow best practices. This involves making it mandatory for companies to have independent boards of directors, guaranteeing sufficient disclosure and transparency, and implementing measures to tackle conflicts of interest. Consistent supervision and enforcement of these standards are necessary to ensure a fair and effective business environment.
- To encourage investment and capital formation, policy makers should create a favorable environment. This can be achieved by simplifying regulatory procedures, offering tax benefits for long-term investments, promoting financing accessibility, and ensuring fairness and transparency in capital markets. Such a climate can motivate companies to make productive investments, leading to improved firm efficiency.
- Companies should be required by regulators to disclose their Corporate Social Responsibility (CSR) activities and their impact. This disclosure should include information on environmental sustainability, social impact, diversity and inclusion, and ethical business practices. To ensure consistency and comparability of CSR reporting, it is important to establish reporting standards based on international frameworks like the Global Reporting Initiative (GRI) or Sustainability Accounting Standards

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Board (SASB). Such standards would enable stakeholders to assess and reward responsible business practices.

- It is important for regulators to create a space for companies, investors, civil society organizations, and academia to communicate and work together. This will allow for the sharing of successful strategies, inspire innovation, and highlight new trends and risks. Furthermore, policymakers should invest in research and development focused on corporate governance, investment, corporate social responsibility, and company efficiency. By doing so, policies can be made based on solid evidence.

Policy Implications and Recommendations for Researcher and Academician

The association between corporate governance, corporate investment, corporate social responsibility (CSR), and firm efficiency presents researchers with various opportunities and areas of focus. These implications can guide researchers in exploring and contributing to the existing body of knowledge. Some important implications and recommendations are given below:

Implications

- The relationship between corporate governance, corporate investment, CSR, and firm efficiency is complex and multifaceted, offering several research avenues.
- Research in this domain requires a combination of quantitative and qualitative approaches to capture the multidimensional nature of corporate governance, corporate investment, CSR, and firm efficiency.
- Conducting rigorous research in this area relies on access to high-quality data on corporate governance practices, investment decisions, CSR activities, and firm performance.
- Research in this field should generate insights that are relevant to practitioners, policymakers, and other stakeholders.

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- Given the growing emphasis on sustainability and responsible business practices, researchers should consider the long-term implications of corporate governance, corporate investment, CSR, and firm efficiency.

Recommendations

- Researchers should investigate the specific mechanisms through which corporate governance practices impact corporate investment decisions, the relationship between CSR initiatives and firm efficiency, and how these factors interact to influence overall corporate performance. Additionally, exploring the role of different stakeholders, the impact of regulatory frameworks, and the effectiveness of various governance mechanisms can provide valuable insights.
- Researchers should adopt a mixed-methods approach, combining econometric analyses, financial modeling, case studies, and surveys. This interdisciplinary approach can provide a comprehensive understanding of the relationships and facilitate a more nuanced exploration of the underlying mechanisms. Researchers should also consider longitudinal studies to capture the dynamic nature of these relationships over time.
- Researchers should collaborate with industry organizations, regulatory bodies, and academic institutions to access comprehensive datasets. They should also leverage emerging technologies, such as natural language processing and machine learning, to analyze unstructured data, such as corporate reports, sustainability disclosures, and news articles. Moreover, efforts to standardize data collection and reporting practices across industries can enhance comparability and enable more robust analyses.
- Researchers should aim to bridge the gap between theory and practice by conducting research that addresses real-world challenges and provides actionable recommendations. They should actively engage with industry professionals, policymakers, and NGOs to understand their needs and

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collaboratively identify research questions. Disseminating research findings through academic journals, policy briefs, conferences, and workshops can ensure broader awareness and impact.

- Researchers should explore the relationship between these factors and long-term sustainability outcomes, including environmental stewardship, social impact, and ethical considerations. Understanding how sustainable practices can contribute to firm efficiency and long-term value creation is crucial for both academic research and practical implementation.

Limitations of the study

The study has identified corporate governance, corporate investment and corporate social responsibility as crucial factors that affect firm efficiency in both developing and developed economies. However, the study has some limitations with its findings. Researchers often struggle to find and gather trustworthy and comprehensive data. As a result, this study only examines 200 non-financial companies from each economy over a 13-year period (2009-2021), which may lessen the significance of the findings. It's essential to keep in mind that a shortage of data, a small sample size, and a narrow time frame can impede the accuracy and thoroughness of research results. The research focused solely on non-financial companies in both economies and did not include financial firms in the sample size. The study focused on firms whose data is available, as not all firms have their data included in databases like Eikon and Data Stream.

Future Directions

After conducting a thorough examination and study, it is common to discover new questions. As a result, the study has provided valuable suggestions for future researchers. These suggestions can expand the scope of the study and address any gaps in the current research. Some potential directions for future research include that research study could look at the long-term effects of corporate governance, investment, and corporate social responsibility on a

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company's efficiency and investigate how these factors affect efficiency over a prolonged period and assess their ability to improve efficiency sustainably. Further analysis could explore the impact of various factors on the connections between corporate governance, corporate investment, corporate social responsibility, and firm efficiency. Factors such as firm size, industry characteristics, macroeconomic variables, and regulatory measures may moderate the strength and direction of these relationships. It is essential to consider these specific factors when examining the interplay between these critical components of a company's efficiency.

To further investigate the association between corporate governance, corporate investment, corporate social responsibility, and firm efficiency in different economies, future research should aim to use a larger sample size. This would provide more comprehensive insights across both developing and developed countries. Researchers can compare the effects of corporate governance, corporate investment, and corporate social responsibility on firm efficiency in different countries, considering institutional and cultural contexts. By analyzing these relationships in diverse settings, they can determine if the associations remain consistent and explore country-specific factors that may influence the outcomes. The aim of recommending future research is to enhance comprehension of the links between corporate governance, corporate investment, corporate social responsibility, and firm efficiency. By focusing on these research directions, researchers can add to the current knowledge base both theoretically and empirically, inform investors and policymakers, and offer practical insights for enhancing the financial stability and efficiency of firms.

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Appendix I: List of Abbreviations

DEA	Data Envelopment Analysis
TE	Technical Efficiency
CCR	Constant Return to scale model
OLS	Ordinary Least Square
PSE	Pakistan Stock Exchange
SECP	Security and Exchange Commission of Pakistan
SFA	Stochastic Frontier Analysis
DMU	Decision Making Unit (Company)
FGLS	Feasible Generalized Least Square
GMM	Generalized Method of Movement

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CGI	Corporate Governance Index
CI	Corporate Investment
CSR	Corporate Social Responsibility
EFF	Efficiency
FE	Firm Efficiency
CAXP	Capital Expenditure
DV	Dependent Variable
IV	Independent Variable
MV	Mediating Variable
CV	Control Variable
FZ	Firm Size
LEV	Firm Leverage
FG	Firm Growth
FA	Firm Age