



Bank Efficiency and Stock Performance: A Review

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Abstract. Academic researchers and policymakers, including financial managers, have long been interested in studying the efficiency of banks, and the available literature on it is quite extensive, encompassing its drivers or determinants, its effects or impacts, and its measures. Most of these studies have focused on the impact of bank ownership, size and policy and regulations changes on banks' efficiency. Although there is a substantial body of literature on bank efficiency, only a limited number of studies have attempted to investigate the relationship between the efficiency of banks and their stock price behavior, focused specifically on developed economies, which tend to be country-specific. Such studies are limited worldwide and are very few in the context of emerging nations. This paper attempts to provide a comprehensive overview of the current research and literature concerning bank efficiency and stock performance, consolidating various studies and developments in the field. The paper concludes by outlining areas requiring further research and proposing directions for future studies.

Keywords: Bank Efficiency, Stochastic Frontier Analysis, Data Envelopment Analysis, Stock Performance

1 Introduction

The banking sector is one of the most regulated industries in any economy, given banks' critical role. Over time, countries have implemented various economic reform initiatives and regulatory adjustments. These changes have prompted banks to adapt to operations, technology, ownership, and size. Such adaptations have enabled banks to contribute significantly to the macroeconomic value and offer added value to investors at the micro level. Today, many banks are publicly held and listed on stock markets. They have expanded their reach through branch networks and online banking while innovating their products and services. Amidst this evolving structure of the banking sector, there is an expectation for banks to operate efficiently as the study of bank efficiency holds pivotal importance for the growth and enduring viability of the banking industry (Chen et al., 2021; Ramly et al., 2017; Ghosh et al., 1994). Also, given the growing competition, evaluating bank efficiency has become increasingly significant for the public and policymakers in emerging markets (Bhattacharyya et al.,

1997; Chen and Yeh, 2000). Consequently, multiple studies have explored the efficiency of banks by employing parametric and non-parametric methodologies within the framework of developed countries (Lopes et al., 2021; Jiang et al., 2020; Abreu et al., 2019; Bhatia et al., 2018; Aliyu et al., 2017; Heffernan & Fu, 2010; Ariff and Luc, 2008; Drake and Hall, 2003; Altunbaş et al., 2001). Subsequently, additional studies investigating bank efficiency in developing countries were conducted (Rahman et al. 2021; Shaikh and Memon, 2021; Sufian & Akbar, 2009; Shanmugam & Das, 2004; Sathye, 2003; Saha and Ravisankar, 2000).

However, research focusing on the stock market has discovered that stock prices incorporate relevant information that is publicly known (Ball and Kouthari, 1994) and an efficient stock market would take into account efficiency metrics in the process of determining prices, especially in the banking sector. Despite the rich literature on bank efficiency, only a few studies have attempted to link the efficiency of banks with their stock performance, focused specifically on developed economies, which tend to be country-specific (Janoudi, 2014; Liadaki & Gaganis, 2010; Pasiouras et al., 2008; Kirkwood & Nahm, 2006; Eisenbeis et al., 1999; Chu and Lim, 1998). A few studies in the same direction were also conducted on developing countries (Alsharif, 2021; Kale et al., 2020; Tuffour et al., 2020; Sharma, D., 2018; Aygoren et al., 2015; Chan and Karim, 2014; Gu and Yue, 2011; Sufian & Majid, 2007). While these studies have enhanced our understanding of this dynamic and offered valuable insights into the intricate relationship between banking efficiency and stock market outcomes, it is worth noting that the results are not always consistent across different research endeavors. For instance, some studies have found a positive correlation between the two variables (Alsharif, 2021; Sharma, D., 2018; Sarpong et al., 2017; Chan and Karim, 2014; Gu and Yue, 2011; Pasiouras et al., 2008; Beccalli et al., 2006; Kirkwood and Nahm, 2006) while others have found no significant relationship (Sumantyo and Tresna, 2017; Tani and Bali, 2015; Erdem and Erdem, 2008) and some others have linked fluctuations in stock prices with variations in profit efficiencies as opposed to cost efficiencies (Tuffour et al., 2020; Liadaki & Gaganis, 2010; Sufian and Majid, 2007). With a diverse mix of private and public sector banks, this sector forms the backbone of the world's financial system. It is crucial in driving the country's economic growth and development. The efficient functioning of banks is not only vital for the stability of the global financial system but also influences investor sentiments and stock market performance. However, very few studies have been undertaken to explore the relationship between efficiency scores and stock performance in the banking sector worldwide.

Consequently, further research is imperative to explore the intricacies of this relationship and gain a more thorough comprehension of its complexities, particularly considering the dynamic nature of banking industry and its unique market characteristics. By building upon previous studies and considering the specific context of the banking sector, this study aims to enhance a deeper perspective of the nexus between efficiency scores and stock performance in the banking sector and its implications for various stakeholders. The primary contributions of our study encompass the following:

- A comprehensive review of the existing literature examining the relationship between bank efficiency and stock performance.
- Identify research gaps in the current literature and propose directions for future studies.

2 A review of the literature

The nexus between efficiency scores and stock performance in the banking sector has been the subject of extensive research in finance and economics. As the banking industry and financial markets continue to evolve, there is ongoing interest in exploring the impact of bank efficiency on stock market returns. In this section, we will discuss relevant studies and highlight the gaps in the existing literature.

Alsharif (2021) investigated the efficiency of 12 publicly traded Saudi commercial banks and studied their link with corresponding share performance from 2006 through 2018. The study used DEA to examine efficiency parameters and multiple-regression analysis to empirically study the impact of the efficiency metrics on bank share performance. The results indicate that banking efficiency and share performance are positively correlated in Saudi Arabia, implying that more efficient banks tend to exhibit superior share performance.

Alomari et al. (2020) explored the Jordanian banking system's technical efficiency and performance. Utilizing a non-parametric model involving linear programming via DEA and panel regression analysis, the research covers 2010-2017 with a sample size 13. Notably, pure technical efficiency (PTE) showed a positive and statistically significant impact on both return on assets (ROA) and return on equity (ROE), emphasizing its relevance in enhancing banking performance.

Kale et al. (2020) adopted a two-stage approach to analyze the efficiency metrics of 21 listed commercial banks in Turkey. Combining the DEA-based Malmquist Productive Index and static/dynamic panel data models, the study spans the period from 2002 to 2017. The findings indicate an initial increase in efficiency until 2010, followed by a decline. Importantly, the study reveals that increased profitability efficiency positively affects stock returns in the long term. At the same time, the impact of intermediation is positive in the near term but negative in the long term.

Tuffour et al. (2020) studied bank efficiency in terms of cost and profit efficiency of 5 listed banks in Ghana and their relation to stock price movements. Using DEA for efficiency scores and regression analysis for stock performance, the study covers the period from 2013 to 2017. The findings unveil that fluctuations in profit efficiency have a significantly positive influence on stock prices. On the contrary, fluctuations in cost efficiency have a significantly negative influence on stock prices.

Sharma (2018) explored the impact of Indian banks' operational efficiency on stock performance. Using DEA and Panel Data Regression analysis, the study spans from 2002 to 2012 with a sample size 22. The findings validate a statistically significant correlation between the two underlying variables among Indian banks, emphasizing the creation of value and returns for investors by operationally efficient banks.

Sarpong et al. (2017) studied the linkage between efficiency estimates measured by parametric SFA and non-parametric DEA, and share prices of 5 listed Ghanaian banks. The study period spans from 2009 to 2013. The findings reveal that fluctuations in both profit and cost efficiency correspond to stock performance, emphasizing the public's perception of efficiency's impact on share prices. However, SFA efficiency scores are not as pivotal as DEA efficiency scores.

Sumantyo and Tresna (2017) examined the efficiency of 25 banks listed on the IDX and tested its empirical impact on stock returns. Employing DEA and Fixed Effect Models (FEM) regression, the study covers the period from 2009 through 2016. The findings suggest that the bank efficiency has no significant influence on stock returns in Indonesia.

Tani and Bali (2015) explored the link between operational efficiency and stock market performance of all private listed banks in Bangladesh. The study utilized both parametric techniques, such as the Stochastic Frontier Approach, as well as non-parametric methods like DEA. Covering the period from 2003 to 2012 with a sample size of 23, the empirical evidence suggests a lack of significant relationship between operational efficiency and stock market performance in an emerging and inefficient stock market.

Aygoren et al. (2015) explored the correlation between efficiency and stock returns within the Turkish banking industry. Employing SFA and panel data regression analysis, the study extends from 2001 to 2009 with a sample size of 10. The findings reveal that concentration and capital adequacy ratios positively affect efficiency, emphasizing investors' perception of efficiency as a significant factor influencing stock performance.

Chan and Karim (2014) explored the relationship between banks' cost and profit efficiency vis-a-vis stock returns of 45 commercial banks operating in selected ASEAN countries. Employing non-parametric DEA and co-integration analysis, the research period spans from 1987 to 2007. The findings indicate that there exists cointegration between efficiency metrics and stock performance of banks, implying a significant relationship between the two over the long term. Moreover, the results highlight the superior predictive power of profit efficiency compared to cost efficiency in forecasting stock performance across ASEAN countries.

Janoudi (2014) examined banking cost and profit efficiency using SFA and explored their relationship with stock performance through regression analysis across 27 European Union countries. The study analyzed data from 141 commercial banks over the period from 2004 to 2010. Additionally, the study investigated the effects of the Global Economic Crisis, spanning from 2007 to 2009, on the two variables under study. The findings underscore that variations in bank cost and profit efficiencies correspond to stock price fluctuations, indicating that banks with higher cost and profit efficiencies generally outperform their less efficient counterparts. In addition, the findings indicate that profit efficiency demonstrates greater explanatory power than cost efficiency, as it accounts for a larger proportion of the variance in stock returns. Unsurprisingly, the Global Financial Crisis spanning from 2007 to 2009 exhibited an adverse impact on both bank efficiency and stock performance.

Kasman and Kasman (2011) explored the relationship between efficiency, productivity, and value creation within the Turkish banking sector. Employing DEA and Malmquist TFP index, the study period spans from 1998 to 2008, encompassing a sample size of 13. The findings imply that banks demonstrating high efficiency and productivity levels tend to exhibit higher stock returns, showcasing the relevance of operational efficiency and productivity in shaping stock performance.

In their 2011 study, Gu and Yue investigated the correlation between bank efficiency and stock returns across 14 Chinese listed banks. Using DEA and regression analysis, the study was conducted during the period spanning from 2008 to 2010. Their findings that changes in technical efficiency and pure technical efficiency have a significantly positive influence on stock returns, while no indication exists that changes in scale efficiency affect stock returns. Furthermore, technical and pure technical efficiency scores are found to be better predictors of stock returns in banks compared to ROE, a traditional accounting measure of profitability, thereby providing valuable information for shareholders seeking insights into the performance of bank equities.

Sufian et al. (2014) examined the long-term efficiency trends of 14 listed commercial banks and studied their relationship with share performance in Malaysia from 1994 to 2003. Utilizing DEA and pool regression, the findings suggest that large banks exhibit stronger performance compared to their smaller and very large counterparts, with inefficiencies primarily related to pure technical factors as opposed to scale factors. Moreover, banks with higher X-efficiency levels demonstrated better share performance.

Aftab et al. (2011) studied correlation between the efficiency of 7 publicly traded banks in Pakistan and their share performance. Utilizing Data Envelopment Analysis (DEA) and regression analysis, the study covers the period from 2003 through 2007. The findings indicate a significant and positive correlation between changes in banking efficiency and stock performance, suggesting that banks' stock returns can be predicted through changes in efficiency.

In their 2010 study, Liadaki and Gaganis explored the link between efficiency and share performance of banks across the European Union. Employing SFA to estimate banks' cost and profit efficiency and regression analysis, the research period spans from 2002 to 2006 with a sample size 171. The findings reveal that fluctuations in profit efficiency positively and significantly influence share prices, while fluctuations in cost efficiency do not affect stock returns.

Pasiouras et al. (2008) investigated the correlation between efficiency metrics and share performance of the banking sector within the Greek context. Employing DEA, the study period extends from 2001 to 2005 with a sample comprising 10 banks. The findings reveal a statistically significant and positive correlation between technical efficiency scores and share performance, whereas scale efficiency scores demonstrate no statistical significance, emphasizing the importance of technical efficiency in influencing share performance.

In their 2008 study, Erdem and Erdem analyzed the efficiency scores of 10 Turkish banks and studied their influence on stock returns. Utilizing DEA, the study covers the period from 1998 through 2004. The results indicate that changes in bank effi-

ciency scores do not significantly influence stock returns, suggesting their inadequacy in explaining stock price movements.

In their 2009 study, Sufian and Majid investigated bank efficiency in terms of pure technical, technical and scale efficiency scores, and studied its relationship with stock price returns in China. Employing DEA and panel regression analysis, the research period spans from 1997 to 2006 with a sample size 7. The findings reveal that large Chinese banks demonstrate higher pure technical and technical efficiency scores than their smaller peers, with medium-sized banks exhibiting greater scale efficiency. Moreover, the study concludes that fluctuations in bank efficiency provide significant information for predicting stock returns beyond what financial data alone offers.

In their 2007 study, Sufian and Majid explored the link between efficiency scores and stock returns of publicly listed banks in Malaysia. Employing a three-step procedure involving DEA, bank stock performance calculation, and regression analysis, the research period spans from 2002 to 2003 with a sample size 9. The findings indicate that large banks exhibited greater X-efficiency, while smaller banks demonstrated higher P-efficiency. Moreover, the link between banks' X-efficient and P-efficient scores in relation to share prices reveals that share prices of banks respond more to fluctuations in P-efficiency scores compared to fluctuations in X-efficiency scores. This suggests that P-efficiency better explains share price fluctuations compared to X-efficiency.

Kirkwood and Nahm (2006) evaluated the efficiency of 10 domestically owned retail listed banks in Australia and its correlation with stock returns. Utilizing DEA, the research period spans from 1995 to 2002. The results suggest that large banks in Australia have enhanced efficiency in both banking services and profitability. In contrast, regional banks experience minimal change in service efficiency and a decrease in profit efficiency. Furthermore, the study reveals that fluctuations in profit efficiency significantly influence the bank stock returns, with this correlation being more pronounced for regional banks. This suggests that fluctuations in bank efficiency manifest in stock returns.

Beccalli, Casu, and Girardone (2006) delved into the dynamics of five European Union countries namely Germany, Spain, Italy, France, and the UK involving 90 publicly listed banks from 1999 to 2000. The research explored whether fluctuations in stock performance are attributed to fluctuations in operational efficiency, employing both DEA and SFA methodologies. The findings from this study reveal a statistically significant link between fluctuations in efficiency levels and subsequent stock price variations. Notably, banking stocks which are cost-efficient generally perform better than those of less efficient banks. This underscores the crucial role of operational efficiency in influencing the stock performance of European banks, further supporting the idea that shareholders and investors respond favorably to banks that exhibit higher levels of efficiency.

Overall, the studies contribute valuable insights into the intricate relationship linking bank efficiency with stock returns, providing empirical evidence that fluctuations in efficiency metrics can predict stock performance, a crucial consideration for investors and stakeholders, particularly in the banking sector. Table 1 presents a comprehensive overview of studies exploring the link between bank efficiency and stock

performance. These studies encompass various regions, methodologies, and findings, offering valuable insights into the complex interplay between bank efficiency and stock performance across different contexts.

Table 1. Comparative Review of Research on Bank Efficiency and Stock Performance

Author (Year)	Country/ Area	Sample Size	Period	Methodology	Key Findings
Alsharif (2021)	Saudi Arabia	12	2006-2018	Quantitative, DEA	Positive correlation between banking efficiency and share performance.
Alomari et al. (2020)	Jordan	13	2010-2017	Nonparametric (DEA) and panel regression	Pure technical efficiency (PTE) showed a positive and statistically significant impact on both return on assets (ROA) and return on equity (ROE).
Kale et al. (2020)	Turkey	21	2002-2017	DEA-based Malmquist Productive Index and static/ dynamic panel data models)	Efficiency changes affect stock returns positively in the long run and negatively in the short run.
Tuffour et al. (2020)	Ghana	5	2013-2017	DEA estimation for efficiency scores and regression analysis	The positive impact of changes in profit efficiency on stock price returns; the negative relationship between changes in cost efficiency and stock price returns.
Sharma (2018)	India	22	2002-2012	DEA and Panel Data Regression	A statistically significant correlation between the two underlying variables among Indian banks, emphasizing the creation of value and returns for investors by operationally efficient banks.
Sarpong et al. (2017)	Ghana	5	2009-2013	SFA and DEA	Fluctuations in both profit and cost efficiency correspond to stock performance, emphasizing the public's perception of efficiency's impact on share prices.
Sumantyo and Tresna (2017)	Indonesia	25	2009-2016	DEA and Fixed effect models (FEM) regression	Bank efficiency has no significant influence on stock returns.
Tani and Bali (2015)	Bangladesh	23	2003-2012	Parametric (SFA) and non-parametric (DEA)	Lack of significant relationship between operational efficiency and stock market performance.
Aygoren et al. (2015)	Turkey	10	2001-2009	Stochastic Frontier Analysis (SFA)	Concentration and capital adequacy ratios positively

					affect efficiency, emphasizing investors' perception of efficiency as a significant factor influencing stock performance.
Chan and Karim (2014)	ASEAN-5 countries	45	1987–2007	Non-parametric DEA and co-integration analysis	Co-integration exists between efficiency metrics and stock performance of banks, implying a significant relationship between the two over the long term.
Janoudi (2014)	27 EU Countries	141	2004–2010	Stochastic Frontier Analysis (SFA) and regression	Fluctuations in both bank efficiency metrics correspond to stock price fluctuations, with profit efficiency demonstrating greater explanatory power than cost efficiency.
Kasman and Kasman (2011)	Turkey	13	1998–2008	DEA and Malmquist TFP index approach	Efficient and productive banks tend to have higher stock returns.
Gu and Yue (2011)	China	14	2008–2010	DEA and regression analysis	Changes in efficiency scores have a significantly positive influence on stock returns and are found to be better predictors of stock returns in banks compared to ROE, while no indication exists that changes in scale efficiency affect stock returns.
Sufian et al. (2014)	Malaysia	14	1994–2003	DEA and pool regression	Large banks exhibit stronger performance compared to their smaller and very large counterparts, with inefficiencies primarily related to pure technical factors as opposed to scale factors.
Aftab et al. (2011)	Pakistan	7	2003–2007	DEA	A significant and positive correlation between changes in banking efficiency and stock performance, suggesting that banks' stock returns can be predicted through changes in efficiency.
Liadaki and Gaganis (2010)	The EU	171	2002–2006	Stochastic Frontier Analysis	Fluctuations in profit efficiency positively and significantly influence share prices, while fluctuations in cost efficiency do not affect stock returns.
Pasiouras et al. (2008)	Greece	10	2001–2005	DEA	A statistically significant and positive correlation exists between technical efficiency

Erdem and Erdem (2008)	Turkey	10	1998–2004	DEA	scores and share performance, whereas scale efficiency scores showed no statistical significance, emphasizing the importance of technical efficiency in influencing share performance. Changes in bank efficiency scores do not significantly influence stock returns, suggesting their inadequacy in explaining stock price movements.
Sufian and Majid (2009)	China	7	1997–2006	DEA and panel regression analysis	Changes in bank efficiency provide statistically significant information for predicting stock price returns beyond what financial data alone offers.
Sufian and Majid (2007)	Malaysia	9	2002–2003	Three-step procedure (DEA, bank stock performance calculation and regression analysis)	Share prices respond more to fluctuations in P-efficiency scores than to fluctuations in X-efficiency scores, suggesting that P-efficiency better explains share price fluctuations compared to X-efficiency.
Kirkwood and Nahm (2006)	Australia	10	1995–2002	DEA	Fluctuations in bank efficiency manifest in stock returns.
Beccalli et al. (2006)	EU countries (France, Germany, Italy, Spain, UK)	90	1999–2000	Parametric and non-parametric methods	Fluctuations in efficiency levels subsequently reflect in fluctuations in stock prices. Notably, banking stocks which are cost-efficient generally perform better than those of less efficient banks.

3 Findings and Discussion

The literature review sheds light on the relationship between efficiency scores and stock performance in the banking sector across diverse global landscapes. Studies from numerous countries and areas consistently show a positive link between bank efficiency and stock performance. This trend is evident in nations like Saudi Arabia, Jordan, Turkey, Ghana, India, China, Pakistan, and Malaysia, where efficient banks tend to yield higher stock returns, reflecting investor confidence in their operational prowess and profitability. However, notable variability exists across different markets regarding the strength of this relationship. While countries such as Saudi Arabia and Turkey demonstrate a clear positive association between bank efficiency and share performance, others like Indonesia and Bangladesh exhibit less definitive or inconclu-

sive findings. This variability underscores the significance of considering local market dynamics and regulatory frameworks when assessing the impact of bank efficiency on stock performance.

Methodological approaches employed in these studies vary, encompassing methodologies such as Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA). Despite these methodological differences, there is a consensus among many studies that efficient banks are more likely to experience enhanced share performance over time. Furthermore, the findings from these studies highlight both short-term and long-term effects of bank efficiency on share performance. For instance, increased profitability efficiency in Turkey positively impacts stock returns in the long run. At the same time, the effect of intermediation is positive in the short run but negative in the long run. These nuances underscore the importance of considering different time horizons in assessing the relationship between bank efficiency and stock performance. The positive relationship between bank efficiency and stock performance underscores the pivotal role of efficiency as a determinant of investor confidence and market efficiency. Efficient banks are perceived as better positioned to generate sustainable returns, attracting investment capital and contributing to overall market stability.

4 Conclusion and Future Research Directions

In conclusion, the literature review highlights the importance of bank efficiency as a determinant of stock performance. While the evidence suggests a positive relationship in many cases, the variability across markets and the nuanced nature of the relationship underscore the need for context-specific analysis and further research to fully understand the dynamics at play.

Despite the wealth of research on the topic, several areas for future investigation emerge. Further studies could explore the impact of emerging technologies, regulatory reforms, and macroeconomic factors on the nexus between bank efficiency and stock performance. Comparative analyses across different market contexts and methodological approaches including production, intermediation, value-added, asset and operating-income adopted for input-output variable selection, comparison between conventional and Islamic banks including NBFCs (Non-banking Financial Companies) could provide deeper insights into the underlying mechanisms driving this relationship.

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