The Effect of Financial Innovation on Bank Profitability: Assessing the Role of Country-Level Corporate Governance in Asian Countries

Hussain Abbas[1], Guo Fei[1], Kalsoom Rafique[2] and Shah Abbas[3♣]
[1]School of Accounting, Zhongnan University of Economics and Law, Wuhan, China
[2]School of Foreign Languages, Tianshui Normal University, Tianshui, Gansu, China
[3]School of Economics and Management, China University of Geosciences, Wuhan, China

ABSTRACT

Country-level corporate governance reduces uncertainty, transaction, and search costs and ultimately affects banking performance. In this study, we look at the connections between financial innovation and a bank's ability to make money, as well as the role of corporate governance at the country level. We utilized the data of 88 banks from five South Asian countries over the period 2007–2019. In addition, we used the data from World Bank governance indicators for country-level governance. The results showed that there is a strong and positive link between financial innovations and a bank's profits. This suggests that financial innovation makes banking services better and more efficient, which helps banks make more money. Also, corporate governance at the country level had a positive and important effect on the link between financial innovation and a bank's profits.

♣ Corresponding author: Shah Abbas; School of Economics and Management, China University of Geosciences, Wuhan, China; Email: sabbasnagri@gmail.com

INTRODUCTION

Financial innovation, encompass the concept of new products, new services (e.g., internet banking, online security trading), and new production methods (e.g., electronic record keeping and credit scoring) that reduces cost and risks, and improves transitional lending, and customer satisfaction with financial services (Song et al., 2021). The recent advancements in information and communication technology, mobile communication, and the internet have led to major shifts in the efficiency of financial institutions and the regulatory structure of banking sectors in both developing and developed countries (Zetzsche et al., 2017). Financial innovation in the banking sector allows for the expansion of the financial sector, the generation of profits for investors, and the expansion of economic systems as a whole (Ndako, 2010; Vuong et al., 2014). Therefore, financial innovation is a driving force in the financial sector, allowing for more effective financial intermediation (Johnson & Kwak, 2012), diversification (Nordin et al., 2014), and growth in the range of financial services available to customers (Merton, 1992; Błach, 2011; Silve, 2015). Thus, innovations in the financial world have made it easier for investors to manage their portfolios in a volatile market. So, it speeds up financial development, investors diversify their investments, and makes it easier for them to deal with risk in managing their portfolios in competitive market (Bhatt & Mundial, 1989; Lerner & Tufano, 2017).

Existing research has different views on the effect of financial innovation on bank profitability. Financial innovation (FI) creates both opportunities and risks to the financial sector of the economy. FI increases the chances of a banking crisis (Kim et al., 2013). Studies indicated that the combination of financial innovation and related regulations may be beneficial to the national economy and the global financial system (Hargrave & Van de Ven, 2006; Raffaelli & Glynn, 2015). Policymakers has recognized that financial innovation is way to access the financial services and products such as saving facilities, loans, insurance services, credit and financial education. This will enhance the financial stability and capital mobilization in the domestic economic. Hence, bank profit will be enhanced.

Several countries, particularly in Asian governments have taken initiatives such as bank ownership reforms, technological innovation and regulation reforms, privatization and foreign bank entry etc. Despite

the policy reforms in the banking sector, developments in technology innovations and their implications on the efficiency, financial stability, consumer protection and reliability, financial system still require an all-inclusive response by regulators and supervisors (González Páramo, 2017). However, policyholders are always distended on assessing what regulatory reforms can promote a well-functioning financial institution, especially the developing countries' banking sector. There is no clear-cut evidence about the effect of different financial regulations on the performance of financial institutions (Beck et al., 2006, Jomini, 2011; Triki et al., 2017).

In Asian countries the financial sector is controlled by the banking institutions. Efficient and effective banking has an important effect in expediting economic progress. On the other hand, studies indicate that the collaboration between the regulatory authorities and financial service industry in the developing countries is weak as compared to developed economies, which hamper the innovation in the financial market (Anagnostopoulos & Kabeega 2019). In addition, measuring the profitability of banks has been gain more attention in the corporate finance literature because of vital role of banks as intermediaries. However, over time, particularly, after the global financial crisis there has been more variation in profit of banks in Asian countries as reported in the financial statant of central banks. "This suggests an investigation of the factors responsible for the profitability of banks over time. Very few studies were conducted on the profitability of banking industry in Asian countries (Almaqtari et al., 2022; Chen & Hsu, 2022; Thaker et al., 2022). Thus, this study was conducted to fill this gap by assessing the determinants of profitability of banks and role of country level corporate governance in five Asian countries. The research focused specifically on regulatory quality, political pressure, accountability, and the rule of law in relation to the banking business.

This study contributes to the existing body of literature in several ways. Most importantly, we examined two banking literature perspectives: (1) Based on the survey of literature, this is the first study in Asian countries that investigated the impact of financial innovation on the profitability of banks. (2) very few studies (Almaqtari et al., 2022; Chen Hsu, 2022; Thaker et al., 2022) have examined the subject of country level cooperate governance. Thus, we sought to examine the moderating effect of country-level corporate governance in relation to financial innovation and bank

profitability. Furthermore, the current study includes both firm and country-level factors that affect the bank profitability in Asian countries. We used the dynamic ordinary least square method (DOLS) and the Fully Modified Ordinary Least Square Method (FMOLS). Furthermore, we were able to simultaneously model bank-specific variables and country specific variables. Thus, this study has real-world implications for academics, researchers, and bank managers.

The rest of the paper is organized into following sections; section II presents the literature review on the financial innovation and bank profitability, and role of country level corporate governance. Section III explains the methodology of study including econometric model, construction of variables and data sources, and empirical strategy. Section IV conducts empirical investigation and illustration of obtained results. Finally, section V concludes the overall study with policy recommendations.

LITERATURE REVIEW

Financial Innovation and Bank's Profitability

Financial innovation is a new business model and is related to the information and communication technology in banking and other financial sectors. It includes the use of information and communication technology in the banking sector for opening accounts, client account mandates, transaction and processing, and recording via physical equipment and software linkages from one location to another. The innovation in the financial sector provides something new with the passage of time that reduces costs, reduce risks, provides improved products and services that satisfies consumer demands (Jabbouri et al., 2016). For example, new products include adjustable-rate mortgages and exchange trading funds. Financial services include, online securities trading and internet banking (White & Nteli, 2004) . Financial innovation may help enhance bank performance by increasing market share, expanding product offerings, customizing goods, and better responding to customer demand, all of which contribute to profitability (Aduda & Kingoo, 2012). Financial innovation continues to have an impact on bank operations and profit structures. However, there is a growing body of literature on the relationship between financial innovation and bank's profitability. Studies

suggests that numerous indicators of profitability in the banking industry. For instance, (Petria et al., 2015) investigated the determinants of bank profitability in EU 27 banks over the period 2004-2011. They found that credit and risk, management efficiency and diversification of business, market competition and economic growth influence bank profitability in EU. In the most recent studies, Isayas (2022) investigated the determinates of commercial banks profitability in Ethiopia. The study used the generalized method of moment (GMM) estimation method on the panel of 14 banks covering the time 2008-2019. The study found that the management and accounting system are important elements of bank profitability in Ethiopia.

A number of previous studies have found a favorable and substantial relationship between financial innovation and operating success at the individual's firm level as well as at the country level. For example, Cortez et al. (2015) examined a cross-country comparison of technological firm's innovation and financial profitability. Using firm - level panel data, the study included United States, Japan, Korea, and Taiwan for the years 2002 to 2012. The investigation found a strong correlation among R&D expenditure, intellectual capital, and firm profitability. Syed et al. (2016) investigated the impact of financial innovation on the risk level of the firms as well as the influence of innovation on profitability. Their research revealed a strong positive and significant relationship among both financial innovation and firm's performance. However, there was also a positive and significant effect of financial innovation on risk level, demonstrating that riskier financial institutions likely to be more profitable firms.

Akhisar et al. (2015) examined to see how electronic and online banking services affected their profit margin. The findings indicated that both online banking services as well as the branches of banks to ATMs machines had a considerable impact on bank profits in both advanced and emerging countries. Due to the disparities in the nations' phases of economic development, historical and based on culture structures, and electronic payments infrastructure, certain variables were also found contrasting and exhibited a negative relationship. According to Rubera and Kirca (2017) firms which innovate are better equipped on using their resources accurately and proficiently as compare to less equipped and less innovative firms. Rega (2017) examined the effects of digital investments as well as the number of physical branches on bank profitability in a sample of 38 European banks

from 2013 to 2015. The author demonstrated the existence of a favorable association between digital investment and profitability.

Bloch and Metcalfe (2018) argued that product innovation promote the firms' financial position and its performance. Therefore, financial innovations play a significant and important role in making profits as well as being competitive in the market. Guo et al. (2018) also argued that the ultimate reason for firms to engage in innovation activities is to improve firm performance and success. The study investigated the effect of research and development innovation on the company's overall firm profitability using the R&D expenditure data from Chinese listed manufacturing sectors from 2009 to 2016. Furthermore, Chen et al. (2018) observed the positive influence of research & development R&D was most profound for such company's current strong cash flow in the first accounting year.

In recent studies, Chhaidar et al. (2022) investigated the association between financial technology level and bank profitability in 23 European banks over the time 2010- 2019. Accordingly, banks maintain their profit and competition through innovations in the market. The study asserts that market power can be sustained through technological innovations and strategic shifts. This transition involves the introduction of a diverse range of innovative products, services, and organizational changes. However, with the passage of time these high profits of the financial firms are disintegrating due to replication and competition between the firms in the market which compels the companies and institutions to gain a competitive edge by initiating advanced and digital products and services to succeed in gaining high-pitched profitability. Thus, the banking sector has started to advance the innovation tactics and to improve the risk-taking capabilities with the aim of getting competitive advantage in the market. Wang et al. (2021) also argued that fintech can increase commercial banks' efficiency. This is because fintech encouraged the adoption of more appealing business models, lower operational costs, and enhanced service efficiency, all of which increased bank competitiveness and profitability.

Dong et al. (2020) give evidence that the rise of internet finance has benefited Chinese commercial banks by increasing diversification, profitability, and security while lowering bank liquidity. Furthermore, Cho and Chen (2021) contend that financial technologies in China are viewed

as a technique for increasing banking performance. Similarly, Kou et al. (2021) argued that financial innovation increased European banks' financial performance by increasing their competitive edge. Furthermore, Dadoukis et al. (2021) investigated the impact of information technology deployment during the COVID-19 pandemic on bank performance. They concluded that internet banking/ information technology adoption increased bank soundness during times of crisis.

In the view of above discussion, previous research has mainly focused on the function of banks and considered technological innovation as major driver of bank profitability. The literature shows that large banks implement financial technology very quickly than smaller banks. Furthermore, large banks are safer, more established, and more profitable than small ones, owing to economies of scale. In case of the most developed countries banks the major effect of technological innovation on profitability is greater in small banks than in large because the former can adapt to it more quickly than the latter, which may be slow to respond due to their stable market position and legacy systems requiring significant changes.

Role of Country-Level Corporate Governance

The adaptation of standard and sound governance practices at the firm level and country level macroeconomic governance factor including legal, economic and political factors are important to maximize the stockholder return in banking sector. Country level corporate governance deliver a more competitive environment to the business sector, the effective country- level corporate governance enhances the management of resources, controls risks, enhances corporate accountability, thus, it is key element in working of market discipline and transparency.

Firms take institutional or national level governance considerations into account when deciding how to strategically allocate hazardous and ambiguous initiatives, such as investment in research and innovations (Alam et al., 2019). According to Wu et al. (2016) the institutional framework might encourage innovative activities by offering potency beyond the capabilities of individual firms. Hillier et al. (2011) argue that improved governance guarantees greater credibility and transparency, which then in return makes it simpler to access funding for research and innovation.

These findings suggest that as country-level governance continues to improve, financial sector is becoming more efficient. Hence, country governance improved financial performance, as demonstrated by Gugler et al. (2013). Pindado et al. (2015) also argued that parameters associated with country governance have a considerable impact on how much research and innovation development is valued in the market.

Numerus empirical studies have investigated how different aspects of institutional contexts impact the financial innovation effect on bank profitability. For instance, Hasan et al. (2015) examined innovation and band performance nexus, Hsieh et al. (2013) explored impact of country level institutions on bank regulation and efficiency, Kayalvizhi and Thenmozhi (2018) showed the nexus between accountability, political stability and regulatory quality, and bank efficacy. The findings show that the soundness and standard country governance support to overall banking performance. Thus, a solid regulatory and legal practices, excellent governance, and higher level of protections lead to more banking sector innovation, greater efficacy, and improved financial outcomes (Villarón-Peramato et al., 2018; Olalere et al., 2021) In converse in the absence of regulation common stockholders try to reduce agency problems through their own reasonable standards. It leads to less investment portfolio diversification, constraints on sources of finance and the enhancing of governance structures, possible consequences will be like agency costs factor, which affect less profitable firms relative to organizations across other environments.

Enhanced investor protection, regulatory structures, and institutional quality practices at the national scale, as emphasized by (Hsu et al., 2014), might assist in resolving the agency issue. Pindado et al. (2015), and Chu et al. (2016) also argued that effective governance at the national level promotes research and innovation, and therefore boost firm performance.

Over several years, studies have measured the individual linkage among country level governance, corporate innovation and overall performance. The findings, even though, are still controversial. Knecht (2013) found a negative association among R&D intensity and performance of the firm, Ehie and Olibe (2010) and Gunday et al. (2011) found a significant positive association between innovation and firm performance. Although there is still contention about, how effective innovation and country governance influences firm performance. According to Kaufmann

et al. (2013), unscrupulous government servants indulge in rent-seeking appalling behavior. Azam and Emirullah (2014) examined the dilemma of widespread pervasive corruption in the Asia-Pacific region economies, noting the fact that these countries possess poor governance. Considering anti-corruption measures and effective governance constitute the identical and might could stimulate innovation capabilities.

However, there are few studies which mainly determined the moderating role of country level governance on the association between innovation and firm performance in developed countries. For instance, Hillier et al. (2011) and Pindado et al. (2015) highlighted the importance of the environmental framework, investor protection on innovation-performance nexus in European context. While Xiao (2013) and Chu et al. (2016) focused on investor protection as well as the rule of the law in American and Canadian context. While improved and enhanced governance become increasingly crucial in determining the connection between innovation and firm performance in developing countries, where in general governance framework is weak and the likelihood of bureaucratic confiscation is higher. There is need to implement a good and sound governance legal framework in the protection and safeguard of new innovations, investment decisions, and services. Because availability or lack of good governance and other institutional factors have a significant impact on innovation-profitability nexus.

Moreover, from the review of literature, we came to the conclusion that previous research had paid little attention, particularly, in Asian countries to the role of country-level corporate governance on individual bank profitability. Basiruddin and Ahmed (2019) and Kiymaz et al. (2020) examined the impact of country-level corporate governance on individual banks profitability in Asian countries. Based on the extensive literature survey and best of our knowledge, no research has been examined the interaction between macro level governance and bank profitability across the Asian countries. Although a large number of studies on industrial and developed countries shows firm level corporate governance characteristics such as board and ownership structure effect corporate decision and strategy, and country level- cooperate governance contribute more toward resource allocation. Thus, efficient resource allocation effect positively overall banking performance and flow of new information which is turn reduce the asymmetry risk in the banking sector. On the other hand, given

the brief discussion on literature on impacts of financial innovations, it is evident that both the innovation endeavors have mixed impacts on the bank profitability. However, in all of the studies, the impact of innovations have been measured in a unilateral manner. Thus, the present study was designed to examine the impact of financial innovation and country level-corporate governance on bank profitability in emerging Asian countries.

METHODOLOGY

Data Source

In order to achieve the objective of study, the data on 88 Asian banks were collected from various sources. Most of the bank-level data was collected from the bank's Annual Reports and Bank Focus over the time period 2008-2020. The country level macroeconomic variables and governance data were collected from World Development (WDI) and Worldwide Governance indicators of World Bank database. The countries were selected randomly based on data availability. This study included four countries India, Pakistan, Bangladesh, Nepal and Sri-Lanka. Table 1 shows the data sources and description and measurement of variables used in current study.

Measurement of Variable

Dependent variable

Following prior research that studied the major determinants of bank profitability, this study used one of the most often used indicator of bank profitability (BP), namely return on total assets. Return on "assets assess overall profitability and represents both profit margin and how efficiently the organization uses total assets to produce income (Beck et al., 2016; Lee et al., 2020). It is calculated as net profit after tax divided by total assets. This is probably the most important single ratio in comparing the efficiency and financial performance of banks as it indicates the returns generated from the assets that the firm owns" (Almaqtari et al., 2019). The following formula is used to calculate the ROA;

$$ROA = Net\ profit\ after\ tax/\ Total\ Assets \qquad ..... (1)$$

Independent variable

This study used financial innovation (FIN) as the independent variable. Financial innovation was defined in this research as the combination of allocative efficiency, overcoming agency difficulties, and electronic banking product creation. However, financial innovation measurement is difficult owing to a lack of exact criteria and data availability (Frame & White 2004). Recent research employed three alternative proxies for measuring financial innovation, including (i) R&D expenditures under financial intermediation. (ii) the contribution of off-balance-sheet items to total assets for the firm level studies and (iii) internet banking e.g., number of ATMs for the country level studies. Based on the survey of recent literature, this study used the ratio of off-balance sheet items to total assets as proxy variable for financial innovation suggested by (Beck et al., 2016; Lee et al., 2020).

Moderating variable

The current study used the country level- corporate governance (CCG) index as moderating variable. The country level-corporate governance is related to legislation framework and regulatory mechanisms, and role of state in the economy. The legal rules and mechanism at the country level have a direct impact on corporate governance procedures such as audit performance (Zahra, 2014). In empirical research, the most used indicators are those developed by World Bank (Boţa-Avram et al., 2018). The current study used the sum of WB governance indicators for the country level-corporate governance index. The main benefit of using these indicators is that they contain a large set of aggregate and individual governance indicators for 200 countries, such as political stability and absence of violence, voice and accountability, government effectiveness, regulatory quality, corruption control, and rule of law. Thus, these comprehensive indicators help to retrieve the robust results from aggregate and individual view. It is expected that effective country-level corporate governance will contribute to a more stable business climate and more transparency in the economy, as well as have a favorable impact in bank profitability.

Control variables

This study also employed several "bank-specific and country-level control variables, which according to previous literature also effect bank profitability (Neaime & Gaysset, 2018). In terms of bank-specific control variables, this study used number of employees, total reserves and loans to

assets ratio (LOA) as suggested by (Beck et al., 2016). The country-level control variables include GDP per capita, bank deposits to GDP ratio, and gross domestic savings.

Econometric Model

This study aimed to investigate the effect of financial innovation on bank profitability in 88 Asian banks over the period spanning from 2007-2021. We also investigated the moderator effect of country-level corporate governance on the links between financial innovation and bank profitability. The econometric model for the current study was developed based on the previous research Campanella et al. (2017), Dong et al. (2020) and Wang et al. (2021) on the determinants of bank profitability. The studies proved that IT- investment and financial innovation in banking sector positively contribute to bank performance. Financial innovation can boost the productivity factors of banks, promote most attractive business model, reduce operating cost, improve service efficiency thereby boosting competitiveness. Thus, financial innovation promotes efficiency and diversification, profitability and overall bank performance. Based on the above argument we estimated the following econometric model (2). In addition, to eliminate serial correlation, hetroskadacity, and other regression problems in time series and panel data, the transformation of the equation into natural logarithmic form yields superior results compared to functional form linear equation (Musa, 2019).

$$BPR_{i,j,t} = a_0 + \beta_1\, FIN_{i,j,t} + \beta_2\, X_{i,j,t} + \beta_3\, V_{i,t} + \mu_{i,t} \qquad …………..(2)$$

Where i and t denote country () and time period (t = 2007, 2008……. 2021). j denotes the banks (j = 1, 2……...88) in country i. $BPR_{i,j,t}$ denotes bank profitability, $FIN_{i,t}$ represents financial innovation, $X_{i,j,t}$ represents the bank-specific factors variables (size of bank, number of employees, loans to assets ratio). $V_{i,t}$ shows the country level specific variables (GDP per capita, bank deposits to GDP ratio, and gross domestic savings). $\mu_{i,t}$ is random error term.

$$BPR_{i,j,t} = a_0 + \beta_1 FIN_{i,j,t} + \sum_{K=1}^{6} \alpha_k\, CCG_{it} + \beta_2 X_{i,j,t} + \beta_3 V_{i,t} + \mu_{i,t} ………………..(3)$$

Where CCG_{it} represent the aggregate country level corporate governance index. However, CCG_{it} is the function of

$$CCG_{it} = f(VA,\ PS,\ GE,\ RQ,\ RL,\ CC) \qquad\qquad \text{.......(4)}$$

Where VA is voice and accountability, PA represent political stability, GE is government effectiveness, RQ is regulatory quality, RL is rule of law and CC is control of corruption. Next, we introduced the interaction term variable (*FIN * CCG*) into the equation (3) to check the moderating effect of country-level corporate governance.

$$BPR_{i,j,t} = a_0 + \beta_1 F_1 N_{i,j,t} + \beta_2 (FIN*CCG)_{i,j,t} + \beta_3 X_{i,j,t} + \beta_4 V_{i,t} + \mu_{i,t}\ldots\ldots\ldots$$
$$(5)$$

Where $(FIN * CCG)_{i,j,t}$ denote interaction term and shows the moderating variable- country level corporate governance. The country-level corporate governance is measured by using the World Bank governance indicators. If $\beta_1 > 0$ and $\beta_2 > 0$, then the "financial innovation positively influences bank profitability, and corporate governance favorably affects this relationship. If $\beta_1 > 0$ and $\beta_2 > 0$, then the financial innovation positively influences bank profitability, and country level corporate governance adversely impacts this relationship. If $\beta_2 > 0$ then moderating effect of country level corporate governance and innovation positively influences bank profitability and vice-versa.

Method of Analysis

This study followed the standard econometric approach to achieve the objective of study. Our econometric strategy was based on the testing of stationarity of panel data, panel cointegration test for the long run relationship between study variables. Furthermore, short-run and long-run parameter elasticities were estimated by using the Fully Modified Ordinary Least Square (FMOLS) and Dynamic Ordinary Least Square (DOLS) estimators. These estimation methods are more appropriate when the variables are non-stationary and following the same order of integration (Saikkonen, 1992) and (Stock & Watson 1993). In addition, the granger causality test was performed to check the casual association between variables. The robustness of pre-estimated results has been checked by

eliminating the aggregate sample data into sub-sample dataset i.e., small size banks, medium and large size banks based on the total assets.

Panel Unit Root Test

The methodology for estimating the regression model (2,3, and 5) begins with a panel unit root test. The panel unit root test help to determine order of integration, whether a series are integrated of order I (1) or I (2). In prior empirical investigations for stationarity analysis, Maddala and Wu (1999), Levin et al. (2002), and Im et al. (2003) developed the panel unit root test, which is most frequently used. Furthermore, Pesaran (2007) modified IPS tests to CIPS tests by considering the cross-sectional dependence. The null hypothesis of panel unit root is having unit roots. The null hypothesis is determined using t-statistics. If the series is not stationary at the level (Yi) after the test result, take the series difference (Yt − Yt-1) and then apply the unit root test again. The current study used the CIPS (Pesaran, 2007b) test to check the stationarity of data. The test statistics are expressed as:

$$\widehat{CIPS} = N^{-1} \sum_{i=1}^{n} CADF_i \dots\dots\dots\dots\dots\dots\dots..(6)$$

Where CADF stands for "Cross-Sectionally Augmented Dickey-Fuller."

Panel Cointegration Test

After evaluating the unit root procedure and the stationarity test, the second step is to evaluate the co-integration relationship between the study variables. To do this, we utilized the Westerlund (2005) co-integration test. The advantage of using Westerlund co-integration over other tests in the literature is that it is easy to implement as no correction for temporal data dependence is necessary; it is also robust to cross-sectional dependence and panel heterogeneity (Dogan et al., 2020). The test can also be accommodated by individual-specific constants, short-run dynamics, slope parameters, and trend terms. The test performs better even with small samples (Westerlund, 2005). Co-integration is considered in all or some panels if the test results reject the null hypothesis (no co-integration). Furthermore, we also used

the Pedroni co-integration test to verify the results of Westerlund (2005) co-integration. Pedroni determines whether there is co-integration employing the null hypothesis of no co-integration. To compute the test statistics to examine the null hypothesis, The following was the error correction model for assessing long-run cointegration:

$$\Delta Z_{it} = \acute{\partial}_i d_i + \emptyset_i \left(Z_{i,t-1} + \acute{\delta}_i W_{i,t-1} \right) + \sum_{r=1}^{p} \emptyset_i \, \Delta Z_{i,t-r} +$$

$$\sum_{r=0}^{p} \gamma_{i,j} \, \Delta W_{i,t-r} + \varepsilon_{i,t} \dots . (7)$$

The results of group statistics can be derived with the equation (8) and (9)

$$G_T = \frac{1}{N} \sum_{i-1}^{N} \frac{\emptyset_i}{SE\emptyset_i} \dots \dots . (8)$$

$$G_a = \frac{1}{N} \sum_{i-1}^{N} \frac{T\emptyset_i}{\emptyset_i(1)} \dots \dots (9)$$

The following equation (10) and (11) can be used to calculate the test statistics for panel cointegration.

$$P_T = \frac{\emptyset_i}{SE\emptyset_i} \dots \dots . (10)$$

$$P_a = T\emptyset_i \dots \dots \dots . (11)$$

Fully Modified OLS

For the best estimates of cointegrating equations, (Phillips & Hansen, 1990) presented the Fully Modified Ordinary Least Square (FMOLS) technique. This technique includes kernel estimators of the nuisance parameters and modifies the asymptotic distribution of the OLS estimators. The advantage of the FMOLS method is that establish a cointegrating

relationship, controls the issue of endogeneity and serial correlation (Phillips & Hansen, 1990). The Dynamic Ordinary Least Square (DOLS) framework developed by (Stock & Watson, 1993). The DOLS estimate the influence of endogen (Phillips & Hansen, 1990) us variable on exogenous variable in lags, leads and levels of the explanatory variables. This technique has the benefit of controlling serial correlation, endogeneity, and small sample bias by include the lags of independent variables (Stock & Watson, 1993). The DOLS is estimated using Eq. (12), which is given as;

$$BPR_{i,j,t} = u_i + x_{i,t}\forall_{it} + \sum_{j=-p}^{p} \beta_j \, BPR_{i,j,t-k} + \sum_{j=-q_0}^{q} P_{1j} \, FIN_{i,j,t-k}$$

$$+ \sum_{j=-q_0}^{q} P_{2j} \, CCG_{it-k} + \sum_{j=-q_0}^{q} P_{3j} \, X_{i,j,t-k} + \sum_{j=-q_0}^{q} P_{4j} \, V_{i,t-k}$$

$$+ \, \mu_{i,t} \ldots \ldots \ldots \ldots \ldots (12)$$

Where q and p represent the number of leads/lags. The long run relationship is estimated from the FMOLS is given as;

$$BPR_{i,j,t} = u_i + x_{i,t}\Psi_{it} + v_{it} \ldots \ldots (14)$$
$$x_{i,t} = x_{i,t-1} + e_{it}$$

Where $x_{i,t}$ is the vector of explanatory variables, u_i is intercept term, while e_{it} and v_{it} is error term. However, the estimation of Ψ is expressed as;

$$\widehat{\Psi}_{FMOLS} = \left[\sum_{i=1}^{N} \sum_{t=1}^{T} (x_{it} - \bar{x}_{it}) * (x_{it} \right.$$

$$\left. - \bar{x}_{it}) \right]^{-1}$$

$$* \left[\sum_{i=1}^{N} \left(\sum_{t=1}^{T} (x_{it} - \bar{x}_{it}) * \widehat{BPR}_{i,j,t} - T\hat{\Delta}_{v\emptyset} \right) \right] \ldots \ldots \ldots \ldots (15)$$

RESULTS AND DISCUSSIONS

Table 1 illustrates the descriptive statistics of all variables of study in the form of mean, standard deviation, maximum and minimum. Bank profitability (BPR) had a mean value of 0.654, which specify the earning capacity of banks was 65% annually by utilizing their assets. Financial innovation mean value was 0.625. This value indicates the average financial innovation in banks. The mean value of country-level corporate governance (CCG) index was 7.87. The positive value indicated the overall governance condition was quite better. The sub indicators of country level corporate governance, that is CC, GE, PS, RQ, RL and VA had mean value of -0.280, 6.199, -0.532, 0.780 and 0.881, respectively. The mean values of GE and RQ indicate that government effectiveness and regulatory quality were not favorable in the Asian countries. However, positive values suggest that governance parameters are somewhat in good condition. The loan to asset ratio (LAR) had a mean value of 10.56. The mean value of number of employs was 8.053, which indicated that the banks had an e average of 80 employees. Country level macroeconomic variables, that is, gross domestic saving (GDS) and per capita GDP had mean value of 17.808 and 1601.2 respecify. This indicated that the average gross domestic saving in Asian countries over the sample per was 17% of GDP while the average GDP per capita income was 1601. The next, range values reflect the minimum and maximum value that trend positive to negative. The standard deviation showed the average degree of dispersion from mean values, the table shows overall all deviation in CCG was quite high as compared to other values.

Table 1: Descriptive Statistical Analysis

Variable	Mean	Std. Dev.	Min	Max
Bank profitability (BPR)	0.654	0.172	0.083	2.903
Financial innovation (FIN)	0.625	1.911	0.031	29.946
Country-level corporate governance index (CCG)	7.870	9.738	-7.069	36.388
Control of corruption (CC)	0.822	1.427	-1.340	4.463
Government effectiveness (GE)	-0.280	1.572	-4.044	3.481
Political stability (PS)	6.199	7.526	-2.810	7.373
Regulatory quality (RQ)	-0.532	1.381	-3.033	2.598
Rule of law (RL)	0.780	1.507	-1.388	4.921
Voice and accountability (VA)	0.881	2.712	-4.791	8.246

Number of employs (EMP)	8.053	1.541	3.883	12.484
Loan to asset ratio (LAR)	10.564	2.336	1.213	18.915
Gross domestic saving (GDS)	17.808	9.555	3.822	33.896
Per capita (GDP)	1601.2	986.8	521.7	3854.3

Source: Author calculation

Table 2 represents pairwise correlation statistics and multicollinearity diagnostic test. As shown in column 2, FIN had a positive correlation value of 0.446. This value indicated a positive correlation behavior of financial innovation with bank profitability. The correlation between BPR and CCG was 0.388, which indicated that good governance practices enhanced bank profitability. With regard to control variables outcomes of correlation analysis depict that BPR and EMP (-0.1039) was negative, while LAR (0.2905), GDS (0.3214), and GDP per capita (0.3049) income had a significant positive correlation. However, all these values enhanced the understanding of the proposed relations between the independent, control and dependent variables. As in Table 6, most of the correlation relation values did not exceed 0.70, indicating no multicollinearity problem. Furthermore, the multicollinearity variance inflation factor (VIF) test also signified no multicollinearity issue in among the explanatory variables. The VIF values fell below 10%, which is acceptable for no multicollinearity.

Table 2: Correlation Analysis

Variables	BPR	FIN	CCG	EMP	LAR	GDS	GDP
BPR	1						
FIN	0.4465*	1					
CCG	0.3884*	0.0254*	1				
EMP	-0.1039	0.1294*	-0.3426*	1			
LAR	0.2905*	0.1109*	-0.1974*	-0.0241*	1		
GDS	0.3214*	0.1801*	0.1049*	0.4603*	-0.4085*	1	
GDP	0.3049*	0.0294*	0.3824*	0.2059*	-0.1629*	0.2988*	1
Multicollinearity							
Variance inflation factor (VIF)	2.10	2.66	2.94	2.82	3.70	2.76	
1/VIF		0.48	0.38	0.34	0.35	0.27	0.36

Note: Mean VIF= 1.41, *** p<0.01, ** p<0.05, * p<0.1

Testing for the Existence of Unit Root

The panel unit root tests are used to determine the variables order of integration. This study used the IPS and CIPS panel unit tests. Table 3 provides the panel unit's test results for each variable. Each test was performed for the level and first difference of the variables. The IPS test results are shown in Panel A of Table 4, whereas the CIPS test results are shown in Panel B. The null hypothesis of test statistics is that the variable has a unit root (non-stationary), whereas the alternative hypothesis is that the variable is stationary. The test statistics yield various outcomes regarding the stability of level values of variables. However, both test statistics reject the null hypothesis of a unit root at the level and support the first difference stationary for all variables. In other words, all the variables were integrated of first order I (1). In this situation, previous research shows that a stable long-term relationship between variables may exist if series have integrated I (1). Therefore, in the next step, we will estimate the long-run cointegrating vector between the study variables.

Table 3: Test Results for Panel Unit Root

	IPS unit root test- Level		IPS unit root test- Difference	
Variable	Intercept	Intercept & trend	Intercept	Intercept & trend
BPR	2.3895 (0.9916)	2.5160 (0.9648)	-10.6122*** (0.0000)	-13.3907*** (0.0000)
FIN	2.9892 (0.9447)	-0.8924 (0.1861)	-13.7631*** (0.0000)	-14.7153*** (0.0000)
CCG	16.610 (1.0000)	8.855 (1.0000)	-8.4280*** (0.0000)	-4.8138*** (0.0000)
EMP	15.394 (1.0000)	3.4104 (0.9997)	-7.2831*** (0.0000)	-10.668*** (0.0000)
LAR	10.423 (1.0000)	1.4258 (0.9230)	-9.3888*** (0.0000)	-13.1116*** (0.0000)
GDS	2.2304 (0.8129)	2.9707 (0.9215)	-17.7491*** (0.0000)	-17.729*** (0.0000)
GDP	0.5641 (0.7136)	12.5552 (1.0000)	-5.0423*** (0.0000)	-9.5330*** (0.0000)
	CIPS unit root test- Level		CIPS unit root test- Difference	
BPR	-1.759	-1.763	-2.810***	-3.420***
FIN	-1.918	-1.835	-4.317***	-4.563***
CCG	0.132	1.445	-2.706**	-3.127***
EMP	-1.558	-2.055	-2.638***	-2.939***

LAR	-1.761	-1.861	-2.366***	-2.763***
GDS	-1.648	1.128	-5.328***	-5.140***
GDP	-0.937	-0.784	-2.030**	-2.379***

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

Panel Cointegration Results

In this step, we applied the panel cointegration tests, the cointegration test helps to examine the long-run relationship between variables. This study employed three cointegration tests, as indicated in Table 4. The null hypothesis of the cointegration test posits no existence of cointegration, while the alternative hypothesis suggests the presence of cointegration among the study variables. The panel (a) of Table 5 shows the Westerlund (2007) test statistics, which indicated the existence of cointegration in all three statistics. Thus, we rejected the null hypothesis of no-cointegration among the study variables. The Westerlund (2007) is more appropriate test and considers the cross-section dependency. In addition, panel (b) and (c) also shows the Pedroni (2004) and Kao (1999) cointegration test. The null hypothesis of these tests is that there is no cointegration, and the alternative hypothesis posits the existence of long-run cointegration among study variables in the absence of cross-section dependency. The test statistics rejected the null hypothesis and accepted the alternative hypothesis as shown in Table 4.

Table 4: Cointegration Test Results

	Statistic	p-value
(a) Westerlund (2007)		
Gt	-2.618	0.0781 ***
Ga	-2.732	0.0564 **
Pt	-2.683	0.0508 **
Pa	-3.735	0.0497 **
(b) Pedroni (2004) cointegration		
Modified Phillips-Perron t	3.7899	0.0000***
Phillips-Perron t	-2.5448	0.0000***
Augmented Dickey-Fuller t	-5.7343	0.0000***
(c) Kao Test (1999)		
Modified Dickey-Fuller t	-3.7664	0.0001***
Dickey-Fuller t	-3.8471	0.0001***
Augmented Dickey-Fuller t	-2.1841	0.0145***

Note: Ho: No cointegration, Ha: All panels are cointegrated, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Fully Modified and Dynamic Ordinary OLS Results

After conducting the range of analysis to examine the properties of panel data and existence of cointegration vector among study variables the next step was to deal with long-run estimation of parameters. This study used the panel Fully Modified Ordinary Least Square (FMOLS) and Dynamic Ordinary Least Square (DOLS) with the pooled weighted estimation method. The "panel DOLS estimator values were determined following the assumption of one lag and one lead in the regressor change."

Firm and Country-level Determinants of Bank Profitability

As shown in Table 5, the long-run firm and country level determinants of bank profitability are estimated using the FMOLS and DOLS estimator. Different specifications are designed to estimate the outcomes of both financial innovation and country level- corporate governance. Columns 1 through 4 display the results from the FMOLS technique, whereas columns 5 through 8 display the results from the DOLS estimator. In terms of statistical significance and sign, the FMOLS and DOLS estimators provide comparable findings, although the magnitude of estimated coefficients differs somewhat. The majority of coefficients were statistically significant between 1 and 5 %. Colum 1&5 demonstrates the firm and country level of determinants, whereas Colum 2&5 demonstrates the impact of financial innovation (FINS) on bank profitability, Colum 3&5 demonstrates the impact of country-level corporate governance (CCG) on bank profitability, and Colum 4&8 demonstrates the combined effect of financial innovation and country-level corporate governance (CCG*FIN) on bank profitability. We found a positive relationship between financial innovation (FIN), country-level corporate governance (CCG) and bank profitability (BPR). The FMOLS results indicated that a 1% increase in FIN and CCG increases BPR by 0.056% and 0.022%, respectively, whereas the combined impact of CCG*FIN on BPR is 0.92 % and was statistically significant for all coefficients at 1%. This implies that both financial innovation and country level corporate governance positively contribute to bank profitability. Similarly, the country-level corporate governance played a positive moderating role in relationship between financial innovation and bank profitability. The magnitude of CCG*FIN was high and statistically significant at 1%. Thus, our empirical results support to the recent studies (Saona & Azad, 2018; Basiruddin

& Ahmed, 2019; Kim et al., 2020). The DOLS estimator also produces comparable results, although the magnitude of coefficients is far smaller than FMOLS, with the exception of CCG. Regarding the firm-specific control variables EMP and LAR, the country-specific control variables GDS and GDP per capita had a positive impact on BPR.

Table 5: Firm and Country-level Determinants of Bank Profitability

	Fully Modified OLS				Dynamic OLS			
Variables	1	2	3	4	5	6	7	8
FIN		0.0564 a				0.0544 a		
		(0.0277)				(0.0229)		
CCG			0.0228 a				0.0461 a	
			(0.0113)				(0.0171)	
CCG*FIN				0.9212 a				0.8521 a
				(0.0109)				(0.0133)
EMP	0.2864 a	0.3433 a	-0.0122	-0.0184	0.0336 a	0.0628 a	0.0512 a	0.0337 a
	(0.0394)	(0.0912)	(0.0547)	(0.0569)	(0.0158)	(0.0158)	(0.0216)	(0.0158)
LAR	0.1795 a	0.0372 a	-0.0258 a	-0.0480 a	0.0460 c	0.0858 a	0.0626 b	0.0661 a
	(0.0691)	(0.0126)	(0.0112)	(0.0235)	(0.0240)	(0.0240)	(0.0314)	(0.0240)
GDS	0.0312 a	0.0279 a	0.0265 a	0.0218 c	0.0575 a	0.0576 c	0.0418	0.0775 a
	(0.0116)	(0.0149)	(0.0122)	(0.0122)	(0.0213)	(0.0313)	(0.0331)	(0.0313)
GDP	0.0350 a	0.0314 a	0.0711 a	0.0475 a	0.0811 a	0.0741 a	0.0831 a	0.0811 a
	(0.0155)	(0.0127)	(0.0239)	(0.0214)	(0.0350)	(0.0192)	(0.0276)	(0.0381)
Constant	1.1425	3.8079 a	1.1844 a	1.3355 a	0.8077 a	0.8136 a	0.8280 a	0.8065 a
	(0.7296)	(0.6820)	(0.0715)	(0.6550)	(0.0716)	(0.0718)	(0.0730)	(0.0719)
R2	0.84	0.78	0.54	0.73	0.81	0.58	0.76	0.88
Adjusted R2	0.83	0.77	0.52	0.72	0.79	0.57	0.75	0.87

a, b, c indicates the statistical significance level at 1%, 5% and 10%, respectively

Role of Country-level Corporate Governance and Bank Profitability

Table 6 exemplifies the regression statistics of how country-level corporate governance effect the relationship between financial innovation and bank profitability. We estimated the impact of sub indicators of governance on relationship between financial innovation and bank profitability by using

both FMOLS and DOLS estimators. The FMOLS and DOLS estimator produce similar results in terms of sign and statistical significance but the magnitude of coefficients is quite varied. Column 1&7 shows the combined effect of control of corruption and financial innovation (CC*FIN). The results indicated that a 1% increase in CC*FIN decreases BPR by -0.1166% and -0.2498%, respectively. Our results are more consistent with the study of (Al Maqtari et al., 2020; Almaqtari et al., 2022). The studies indicated that there exists a negative relationship between control of corruption and bank performance. Due to the high level of corruption the business transition increases as a result reducing the value-creating for the firms and other business. Column 2&8 shows the effect of government effectiveness and financial innovation on bank profitability (GE*FIN). The positive and statically significant coefficient of GE*FIN indicated that a 1% increase in GE*FIN increases BPR by 0.3851% and 0.4814%, respectively. Column 3& 9 shows the combined effect of political stability and financial innovation on bank profitability. The results indicated a positive and significant relation between both variables. This implies that political stability contributes positively to BPR. Similarly, the coefficients of rule of law, regulatory quality and voice and accountability are positive and significantly contribute to bank profitability. Our empirical results are more consistent with the study of (Groşanu et al., 2015; Chambers & Munemo, 2017). The studies suggested that transparent and accountable policy, rule of law, voice and accountability are an important determinants of banking performance. More precisely, the indicators of country-level corporate governance play positive role toward the business regulation. Moreover, in line with the study by Chowdhury and Audretsch (2021), corrupt practices tend to favor specific groups, leading to economic distortions both in society and in business. The practices of good corporate governance play a positive role towards banking sector performance (Hung Son et al., 2020).

Robustness Check

Table 7 shows robustness analysis when the sample was segregated into individuals sample countries and used augmented mean group (AMG) estimation method. As, we observed that there were no substantial changes in the estimated model. Focusing on coefficients values, mostly, variables carried a similar relationship as shown in our pre-estimated model. All the variables are significant at 1% and 10%. The magnitude of coefficients

was varied among the countries. The financial innovation and country-level corporate governance had a positive effect on bank profitability. The combined effect of CCG*FIN was greater than individual effect, and this implies that country level corporate governance significantly contributes toward bank profitability. With to the firm specific control variables the number of employees (EMP) was negatively related with bank profitability and statistically significant at the 1% and 5%. LAR was positive and significant with BRP. Similarly, the country level control variables also had similar relations, GDS and GDP per capita income had a positive and significant impact on BPR. Thus, we may conclude that both firm and country level factors contributed to the bank profitability. Financial innovation and country level corporate governance positively contributed to bank profitability.

Table 6: Role of Country-level Corporate Governance and Bank Profitability

	Fully Modified Ordinary Least Square Method						Dynamic Ordinary Least Square Method					
	1	2	3	4	5	6	7	8	9	10	11	12
CC*FIN	-0.1166 a						-0.2498 a					
	(0.0149)						(0.1253)					
GE*FIN		0.3851 a						0.4814 a				
		(0.1719)						(0.1225)				
PS*FIN			0.1639 a						0.1922 c			
			(0.0225)						(0.0114)			
RQ*FIN				0.2495 a						0.2890 a		
				(0.0268)						(0.1380)		
RL*FIN					0.1264 a						0.5130 a	
					(0.0749)						(0.2034)	
VA*FIN						0.3232 a						0.3739 a
						(0.1290)						(0.1853)
EMP	0.0312 a	-0.2835 c	-0.9882 c	-0.8880 a	-0.7881 c	-0.1881	-0.2592	0.2261 a	-0.1727 c	-0.2424	0.1575	-0.1727 b
	(0.0145)	(0.1592)	(0.4900)	(0.4200)	(0.3900)	(0.4900)	(0.6890)	(0.0128)	(0.0861)	(0.6738)	(0.4165)	(0.0861)
LAR	0.4263 a	0.0565 b	0.0866 a	0.0666 a	0.0566 b	0.0466 a	1.4417 a	0.0339 a	0.2029 a	1.4402 a	0.7367 a	0.2030 a
	(0.0197)	(0.0276)	(0.0386)	(0.0286)	(0.0286)	(0.0186)	(0.3659)	(0.0123)	(0.0358)	(0.3568)	(0.2868)	(0.0357)
GDS	0.0292 a	0.0746 a	0.0925 a	0.0625 a	0.0635 a	0.0675 a	0.0326 a	0.0414	0.0227 c	0.0718 c	0.0676 a	0.0527 a
	(0.0146)	(0.0130)	(0.0330)	(0.0130)	(0.0230)	(0.0130)	(0.0176)	(0.0835)	(0.0132)	(0.0372)	(0.0173)	(0.0232)
GDP	0.0423 a	0.0835 a	0.3135 a	0.16235 a	0.2735 a	0.3135 a	0.2729 a	0.0713	0.0434 a	0.0730 a	0.0227 a	0.0234 a
	(0.0171)	(0.0215)	(0.0515)	(0.0615)	(0.0115)	(0.0215)	(0.0121)	(0.0921)	(0.0116)	(0.0321)	(0.0116)	(0.0126)
Constant	0.7609 a	3.1108	3.1454	3.1443	3.1345	3.1448	-4.7731	0.8694 a	4.0162 a	-4.8372	-5.7534	4.0170 a
	(0.1555)	(4.1894)	(4.2040)	(4.2035)	(4.2054)	(4.2037)	(5.7826)	(0.1515)	(1.0960)	(5.6520)	(6.6802)	(1.046)
R2	**0.94**	**0.90**	**0.92**	**0.74**	**0.66**	**0.73**	**0.82**	**0.86**	**0.58**	**0.75**	**0.48**	**0.55**
Adjusted R2	0.93	0.89	0.81	0.71	0.64	0.72	0.80	0.85	0.56	0.73	0.46	0.54

a, b, c indicates the statistical significance level at 1%, 5% and 10%, respectively, standard error values are reported in parenthesis.

Table 7: Robustness Analysis – Cross Country Augmented Mean Group Estimator

	Pakistan			India			Bangladesh			Sri-Lanka			Nepal		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
FIN	0.1176 a (0.0261)			0.1627 a (0.0332)			0.2144 a (0.0162)			0.2189 a (0.0369)			0.2178 a (0.0523)		
CCG		0.2309 a (0.1053)			0.7936 a (0.3151)			0.5690 a (0.2616)			0.3593 a (0.1320)			0.1446 a (0.1398)	
CCG*FIN			0.4361 a (0.0118)			0.7562 c (0.1800)			0.8903 a (0.0758)			0.5119 a (0.0273)			0.6186 a (0.0289)
EMP	-0.1721 a (0.0970)	0.3279 a (0.1376)	-0.1701 a (0.0972)	-0.2915 (0.3771)	0.6714 a (0.2089)	-0.2941 (0.3767)	-0.8196 a (0.1584)	-0.6005 a (0.1487)	0.4041 (0.8097)	-0.0625 a (0.0114)	0.0697 a (0.0277)	0.2545 (0.1803)	-0.1908 (0.4907)	-0.0660 (0.0577)	-0.2449 a (0.6760)
LAR	0.2790 a (0.0507)	0.3627 a (0.1521)	0.2778 a (0.0509)	0.2344 a (0.1156)	0.2537 (0.1566)	0.2333 a (0.1153)	0.2321 a (0.0450)	0.3253 a (0.0608)	0.2410 (0.4855)	0.0529 (0.0762)	0.0836 a (0.1449)	0.9259 a (0.0558)	0.0567 b (0.0393)	0.0168 (0.0292)	0.4405 a (0.1581)
GDS	0.0248 a (0.0123)	0.0316 c (0.0185)	0.0346 a (0.0123)	0.0423 (0.0529)	0.0260 (0.0331)	0.0818 a (0.0429)	0.0477 b (0.0241)	0.0842 a (0.0331)	0.0755 a (0.0329)	0.0618 a (0.0322)	0.0831 b (0.0423)	0.0693 a (0.0215)	0.0534 a (0.0130)	0.0535 a (0.0178)	0.0319 c (0.0173)
GDP	0.0312 a (0.0113)	0.0214 c (0.0126)	0.0282 a (0.0123)	0.0916 a (0.02142)	0.0933 a (0.0512)	0.0781 c (0.0412)	0.0763 a (0.0312)	0.0852 a (0.0411)	0.0611 a (0.0212)	0.0641 b (0.0321)	0.0814 b (0.0411)	0.0810 a (0.0318)	0.0635 a (0.0115)	0.0419 a (0.0212)	0.0730 a (0.0321)
Constant	7.3219 (8.3887)	0.7289 (1.4329)	8.3543 (1.7022)	4.4807 (4.7971)	-2.8880 (7.0562)	4.4857 a (2.8221)	5.1528 a (0.9068)	0.6320 (2.4992)	0.8108 (3.5310)	0.1295 (0.9867)	-1.6842 (4.5608)	7.0901 b (3.7193)	3.1644 (4.2142)	-1.5129 (4.2850)	-4.8284 (5.6710)
No. Banks	24			19			11			11			19		
Observations	312			247			143			143			247		
R2	0.94	0.90	0.92	0.84	0.66	0.83	0.82	0.96	0.88	0.96	0.93	0.86	0.91	0.96	0.98
Adjusted R2	0.93	0.89	0.91	0.83	0.65	0.82	0.81	0.95	0.87	0.95	0.92	0.85	0.66	0.95	0.96

a, b, c indicates the statistical significance level at 1%, 5% and 10%, respectively, standard error values are reported in parenthesis.

CONCLUSION AND POLICY RECOMMENDATIONS

The purpose and basic aim of the research was to explore the relationship between financial innovation, country-level corporate governance, firm specific factors (number of employs & loan to asset ratio) and country level specific factors (gross domestic saving & GDP per capita income, on profitability of 88 banks in five emerging Asian economies, namely, Pakistan, India, Bangladesh, Sri Lanka and Nepal, over the time span 2007-2019. The data for the current study was collected from the Annual reports of the central banks and World Bank development indicators. The current study employed a set of econometric techniques, including panel unit root test, panel cointegration test, FMOLS and DOLS estimators. In addition, the robustness of pre specified model results were checked by using the augmented mean group estimation (AMG) estimator.

Our panel cointegration results confirmed the existence of long-run relationship between financial innovation, country level corporate governance, firms' level and country level specific factors. The FMOLS and DOLS estimator shows strong evidence that financial innovation and country level corporate governance are the main factors determine the profitability of 88 banks in five emerging Asian developing countries. This indicate that the technological transformation of financial services improves bank performance in terms of greater market share, extended product range, customized goods, and better response to client demand, all of which contribute to increased banking industry profitability. Thus, technology plays a key role in the emerging Asian countries. The statistical outcomes from the governance model support the positive and significant effect of good governance on bank profitability. This implies that an effective governance environment in a nation enables management to expand their production operations by making ongoing investments. Furthermore, the sub indicators of governance show that corruption level negatively affects bank profitability, government effectiveness, regulatory quality, voice and accountability, rule of law and political stability in country is positive and significant impact on bank profitability over the sample countries. With regard to macroeconomic variables gross domestic saving and GDP per capita income positively affect the level of bank profitability. Moreover, the empirical results were found robust while distributing whole sample into individual country and used augmented mean group (AMG) estimation method.

Thus, the findings of the study also hold significant ramifications for academics, decision-makers, and investors. It is evident that several developing markets lack strong corporate level governance frameworks. Financial firms may be hindered from engaging riskier investments in innovative new products, research and development as a result of the instability of emerging markets. Broadly speaking, the current investigation has significant policy implications for numerous countries around the globe about the need of governance as well as in business decisions. The rising worlds' policymakers should put more effort towards exercising good governance practices, fighting against the corruption, defending property rights, and guaranteeing rule of law, government effectiveness and voice and accountability. Such governance practices can significantly boost domestic banking industry's expansion and provide good business environment.

This study undoubtedly has some limitations. The data analysis period was limited to 2007-2019 due to the data being unavailable for several years from various countries. The sample of 88 banks from five countries were taken into consideration for this study. For a thorough analysis, future research may update the data and include more banks and countries by considering the firms level variables. Secondly, this study could not consider the potential effect of COVID-19 in the year 2019. The governance practices at firm level and countries level have been changed in respond to the COVID-19. This analysis can therefore be expanded by taking into account the COVID-19 governance policies and firm-level governance factors in order to evaluate the overall effects of various components in regulating the relationship between financial innovation and performance.

Discloser Statement

This study follows all ethical practices during writing. We confirm that this manuscript has not been published elsewhere and is not under consideration in any journal. Ethical approval and consent do not applicable for this study.

Funding

Not applicable

Availability of Data and Materials

The dataset used during the current study are available from corresponding author on reasonable request.

Competing Interest

The authors declare no competing interest

REFERENCES

Aduda, J. and N. Kingoo (2012). "The relationship between electronic banking and financial performance among commercial banks in Kenya." *Journal of finance and investment analysis 1*(3): 99-118.

Akhisar, I., K. B. Tunay and N. Tunay (2015). "The effects of innovations on bank performance: The case of electronic banking services." *Procedia-Social and Behavioral Sciences 195*: 369-375.

Al Maqtari, F. A., N. H. Farhan, H. M. Al-Hattami and A. S. Khalid (2020). "Impact of country-level corporate governance on entrepreneurial conditions." *Cogent Business & Management 7*(1): 1797261.

Alam, A., M. Uddin and H. Yazdifar (2019). "Institutional determinants of R&D investment: Evidence from emerging markets." *Technological Forecasting and Social Change 138*: 34-44.

Almaqtari, F. A., E. A. Al-Homaidi, M. I. Tabash and N. H. Farhan (2019). "The determinants of profitability of Indian commercial banks: A panel data approach." *International Journal of Finance & Economics 24*(1): 168-185.

Almaqtari, F. A., A. Hashid, N. H. Farhan, M. I. Tabash and W. M. Al-ahdal (2022). "An empirical examination of the impact of country-level corporate governance on profitability of Indian banks." *International Journal of Finance & Economics 27*(2): 1912-1932.

Anagnostopoulos, Y. and J. Kabeega (2019). "Insider perspectives on European banking challenges in the post-crisis regulation environment." *Journal of Banking Regulation 20*(2): 136-158.

Azam, M. and C. Emirullah (2014). "The role of governance in economic development: evidence from some selected countries in Asia and the Pacific." *International Journal of Social Economics*.

Basiruddin, R. and H. Ahmed (2019). "Corporate governance and Shariah non-compliant risk in Islamic banks: evidence from Southeast Asia." Corporate Governance: The International Journal of Business in Society.

Beck, T., T. Chen, C. Lin and F. M. Song (2016). "Financial innovation: The bright and the dark sides." *Journal of Banking & Finance 72*: 28-51.

Beck, T., A. Demirgüç-Kunt and R. Levine (2006). "Bank supervision and corruption in lending." *Journal of monetary Economics 53*(8): 2131-2163.

Bhatt, V. V. and B. Mundial (1989). Financial innovation and credit market development, World Bank Washington DC.

Błach, J. (2011). "Financial innovations and their role in the modern financial system-identification and systematization of the problem." e-Finanse: *Financial Internet Quarterly 7*(3): 13-26.

Bloch, H. and S. Metcalfe (2018). "Innovation, creative destruction, and price theory." *Industrial and Corporate Change 27*(1): 1-13.

Boţa-Avram, C., A. Groşanu, P.-R. Răchişan and M. D. Gavriletea (2018). "The bidirectional causality between country-level governance, economic growth and sustainable development: A cross-country data analysis." Sustainability 10(2): 502.

Campanella, F., M. R. Della Peruta, S. Bresciani and L. Dezi (2017). "Quadruple Helix and firms' performance: an empirical verification in Europe." The Journal of Technology Transfer 42(2): 267-284.

Chambers, D. and J. Munemo (2017). "The impact of regulations and institutional quality on entrepreneurship."

Chen, J., W. S. Leung and K. P. Evans (2018). "Female board representation, corporate innovation and firm performance." Journal of Empirical Finance 48: 236-254.

Chen, S.-H. and F.-J. Hsu (2022). "National governance differences and foreign bank performance in Asian countries: The role of bank competition." Computational Economics 59(4): 1283-1333.

Chhaidar, A., M. Abdelhedi and I. Abdelkafi (2022). "The Effect of Financial Technology Investment Level on European Banks' Profitability." Journal of the Knowledge Economy: 1-23.

Cho, T.-Y. and Y.-S. Chen (2021). "The impact of financial technology on China's banking industry: An application of the metafrontier cost Malmquist productivity index." The North American Journal of Economics and Finance 57: 101414.

Chowdhury, F. and D. B. Audretsch (2021). "Do corruption and regulations matter for home country nascent international entrepreneurship?" The Journal of Technology Transfer 46(3): 720-759.

Chu, W.-K., N.-T. Yang and S.-Y. Yang (2016). "Corporate governance'impact on research and development." Journal of Business Research 69(6): 2239-2243.

Cortez, M. A. A., M. I. M. Ikram, T. T. Nguyen and W. P. Pravini (2015). "Innovation and financial performance of electronics companies: a cross-country comparison." Journal of International Business Research 14(1): 166.

Dadoukis, A., M. Fiaschetti and G. Fusi (2021). "IT adoption and bank performance during the Covid-19 pandemic." Economics Letters 204: 109904.

Dong, J., L. Yin, X. Liu, M. Hu, X. Li and L. Liu (2020). "Impact of internet finance on the performance of commercial banks in China." International Review of Financial Analysis 72: 101579.

Ehie, I. C. and K. Olibe (2010). "The effect of R&D investment on firm value: An examination of US manufacturing and service industries." International Journal of Production Economics 128(1): 127-135.

Frame, W. S. and L. J. White (2004). "Empirical studies of financial innovation: lots of talk, little action?" Journal of economic literature 42(1): 116-144.

González Páramo, J. M. (2017). "Financial innovation in the digital age: Challenges for regulation and supervision." Revista de estabilidad financiera. Nº 32 (mayo 2017), p. 9-37.

Groşanu, A., C. Boţa-Avram, P. R. Răchişan, R. Vesselinov and A. Tiron-Tudor (2015). "The influence of country-level governance on business environment and entrepreneurship: A global perspective." Amfiteatru Economic Journal 17(38): 60-75.

Gugler, K., D. C. Mueller, E. Peev and E. Segalla (2013). "Institutional determinants of domestic and foreign subsidiaries' performance." International Review of Law and Economics 34: 88-96.

Gunday, G., G. Ulusoy, K. Kilic and L. Alpkan (2011). "Effects of innovation types on firm performance." International Journal of production economics 133(2): 662-676.

Guo, Y., X. Xia, S. Zhang and D. Zhang (2018). "Environmental regulation, government R&D funding and green technology innovation: Evidence from China provincial data." Sustainability 10(4): 940.

Hargrave, T. J. and A. H. Van de Ven (2006). "A collective action model of institutional innovation." Academy of management review 31(4): 864-888.

Hasan, I., S. Raymar and L. Song (2015). "Effects of corporate and country governance on R&D investment: Evidence from emerging markets." The Singapore Economic Review 60(01): 1550003.

Hillier, D., J. Pindado, V. d. Queiroz and C. d. l. Torre (2011). "The impact of country-level corporate governance on research and development." Journal of International Business Studies 42(1): 76-98.

Hsieh, M. F., P. F. Chen, C. C. Lee and S. J. Yang (2013). "How does diversification impact bank stability? The role of globalization, regulations, and governance environments." Asia-Pacific Journal of Financial Studies 42(5): 813-844.

Hsu, P.-H., X. Tian and Y. Xu (2014). "Financial development and innovation: Cross-country evidence." Journal of financial economics 112(1): 116-135.

Hung Son, T., H. C. Gia Khanh and N. Thanh Liem (2020). "Credit information sharing, corruption and financial development: International evidence." Cogent Business & Management 7(1): 1851856.

Isayas, Y. N. (2022). "Determinants of banks' profitability: Empirical evidence from banks in Ethiopia." Cogent Economics & Finance 10(1): 2031433.

Jabbouri, N. I., R. Siron, I. Zahari and M. Khalid (2016). "Impact of information technology infrastructure on innovation performance: An empirical study on private universities in Iraq." Procedia Economics and Finance 39: 861-869.

Johnson, S. and J. Kwak (2012). "Is financial innovation good for the economy?" Innovation policy and the economy 12(1): 1-16.

Jomini, P. (2011). "Effects of inappropriate financial regulation." European Centre for International Political Economy: Brussels, Belgium: 1-17.

Kao, C. (1999). "Spurious regression and residual-based tests for cointegration in panel data." Journal of econometrics 90(1): 1-44.

Kaufmann, D., A. Kraay and P. Zoido-Lobatón (2013). Governance matters II: updated indicators for 2000-01, World Bank Publications.

Kayalvizhi, P. and M. Thenmozhi (2018). "Does quality of innovation, culture and governance drive FDI?: Evidence from emerging markets." Emerging Markets Review 34: 175-191.

Kim, T., B. Koo and M. Park (2013). "Role of financial regulation and innovation in the financial crisis." Journal of Financial stability 9(4): 662-672.

Kim, W. S., H. Kiymaz and S. Oh (2020). "Do country-level legal, corporate governance, and cultural characteristics influence the relationship between insider ownership and dividend policy?" Pacific-Basin Finance Journal 64: 101457.

Knecht, M. (2013). Diversification, industry dynamism, and economic performance: The impact of dynamic-related diversification on the multi-business firm, Springer Science & Business Media.

Kou, G., Ö. Olgu Akdeniz, H. Dinçer and S. Yüksel (2021). "Fintech investments in European banks: a hybrid IT2 fuzzy multidimensional decision-making approach." Financial Innovation 7(1): 1-28.

Lee, C.-C., C.-W. Wang and S.-J. Ho (2020). "Financial innovation and bank growth: The role of institutional environments." The North American Journal of Economics and Finance 53: 101195.

Lerner, J. and P. Tufano (2017). "Thoughts about Financial Innovation." Achieving Financial Stability: Challenges To Prudential Regulation 61: 261.

Merton, R. C. (1992). "Financial innovation and economic performance." Journal of applied corporate finance 4(4): 12-22.

Musa, K. S. (2019). "Crude oil price and exchange rate on economic growth: ARDL approach." Open Access Library Journal 6(12): 1.

Ndako, U. B. (2010). "Financial Development and Economic Growth: Evidence from Nigeria." IUP Journal of Financial Economics 8(4).

Neaime, S. and I. Gaysset (2018). "Financial inclusion and stability in MENA: Evidence from poverty and inequality." Finance Research Letters 24: 230-237.

Nordin, S. M., S. M. Noor and M. S. bin Md Saad (2014). "Innovation diffusion of new technologies in the Malaysian paddy fertilizer industry." Procedia-Social and Behavioral Sciences 109: 768-778.

Olalere, O. E., M. S. KES, M. A. Islam and S. Rahman (2021). "The Effect of Financial Innovation and Bank Competition on Firm Value: A Comparative Study of Malaysian and Nigerian Banks." The Journal of Asian Finance, Economics and Business 8(6): 245-253.

Pedroni, P. (2004). "Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis." Econometric theory 20(3): 597-625.

Petria, N., B. Capraru and I. Ihnatov (2015). "Determinants of banks' profitability: evidence from EU 27 banking systems." Procedia economics and finance 20: 518-524.

Phillips, P. C. and B. E. Hansen (1990). "Statistical inference in instrumental variables regression with I (1) processes." The Review of Economic Studies 57(1): 99-125.

Pindado, J., V. de Queiroz and C. De la Torre (2015). "How do country-level governance characteristics impact the relationship between R & D and firm value?" R&D Management 45(5): 515-526.

Raffaelli, R. and M. A. Glynn (2015). Institutional Innovation: Novel, Useful. The Oxford Handbook of Creativity, Innovation, and Entrepreneurship, Oxford Library of Psychology: 407-420.

Rega, F. G. (2017). "The bank of the future, the future of banking-An empirical analysis of European banks." Available at SSRN 3071742.

Rubera, G. and A. H. Kirca (2017). "You gotta serve somebody: the effects of firm innovation on customer satisfaction and firm value." Journal of the Academy of Marketing Science 45(5): 741-761.

Saikkonen, P. (1992). "Estimation and testing of cointegrated systems by an autoregressive approximation." Econometric theory 8(1): 1-27.

Saona, P. and M. A. K. Azad (2018). "Bank-and country-based determinants of banks' performance in Asia." Journal of the Asia Pacific Economy 23(3): 428-446.

Silve, F. and A. Plekhanov (2015). "Institutions, innovation and growth: cross-country evidence."

Song, T., J. Cai, T. Chahine and L. Li (2021). "Towards smart cities by Internet of Things (IoT)—a silent revolution in China." Journal of the Knowledge Economy 12(2): 1-17.

Stock, J. H. and M. W. Watson (1993). "A simple estimator of cointegrating vectors in higher order integrated systems." Econometrica: journal of the Econometric Society: 783-820.

Syed, A. M., Z. Riaz and A. Waheed (2016). "Innovation, firm performance and riskiness: Evidence from the leading worldwide innovative firms." International Journal of Innovation Management 20(07): 1650066.

Thaker, K., V. Charles, A. Pant and T. Gherman (2022). "A DEA and random forest regression approach to studying bank efficiency and corporate governance." Journal of the Operational Research Society 73(6): 1258-1277.

Triki, T., I. Kouki, M. B. Dhaou and P. Calice (2017). "Bank regulation and efficiency: What works for Africa?" Research in International Business and Finance 39: 183-205.

Villarón-Peramato, O., I.-M. García-Sánchez and J. Martínez-Ferrero (2018). "Capital structure as a control mechanism of a CSR entrenchment strategy." European Business Review.

Vuong, Q. H., N. K. Napier and D. Samson (2014). "Relationship between innovations, capital expenditures and post-M&A performance: evidence from Vietnam, 2005-2012." The IUP Journal of Business Strategy 11(1): 34-41.

Wang, C., C. Qiao, R. I. Ahmed and D. Kirikkaleli (2021). "Institutional quality, bank finance and technological innovation: a way forward for fourth industrial revolution in BRICS economies." Technological Forecasting and Social Change 163: 120427.

Wang, Y., S. Xiuping and Q. Zhang (2021). "Can fintech improve the efficiency of commercial banks?—An analysis based on big data." Research in international business and finance 55: 101338.

Westerlund, J. (2007). "Testing for error correction in panel data." Oxford Bulletin of Economics and statistics 69(6): 709-748.

White, H. and F. Nteli (2004). "Internet banking in the UK: why are there not more customers?" Journal of Financial Services Marketing 9(1): 49-56.

Wu, J., C. Wang, J. Hong, P. Piperopoulos and S. Zhuo (2016). "Internationalization and innovation performance of emerging market enterprises: The role of host-country institutional development." Journal of World Business 51(2): 251-263.

Xiao, G. (2013). "Legal shareholder protection and corporate R&D investment." Journal of Corporate Finance 23: 240-266.

Zahra, S. A. (2014). "Public and corporate governance and young global entrepreneurial firms." Corporate Governance: An International Review 22(2): 77-83.

Zetzsche, D. A., R. P. Buckley, J. N. Barberis and D. W. Arner (2017). "Regulating a revolution: From regulatory sandboxes to smart regulation." Fordham J. Corp. & Fin. L. 23: 31.