JOURNAL OF DEVELOPMENT ECONOMICS AND FINANCE
Vol. 3, No. 1, 2022, pp. 99-120

URL : www.arfjournals.com
https://doi.org/10.46791/jdef.2022.v03i01.05

Nexus between Financial Development and Economic Growth in South-Asian Countries

Md. Tanzeer Alam and Rozina Akter

Assistant Director, Research Department, Bangladesh Bank, Central Bank of Bangladesh.
E-mail: tanzeer.alam@bb.org.bd Correspond to Rozina Akter, Research Department, Bangladesh Bank, Assistant Director, Central Bank of Bangladesh. E-mail: rozina.akter@bb.org.bd

Article History

Received : 09 April 2022
Revised : 29 April 2022
Accepted : 12 May 2022
Published : 03 June 2022

To cite this article

Tanzeer Alam & Rozina Akter (2022). Nexus between Financial Development and Economic Growth in South-Asian Countries. *Journal of Development Economics and Finance,* Vol. 3, No. 1, pp. 99-120.

Abstract: The purpose of the study is to investigate the nexus between financial development and economic growth in south-Asian countries. The study extracts data from WDI for the four south-Asian countries namely Bangladesh, India, Pakistan and Sri Lanka covering time frame 1995-2019. The study uses principal component analysis (PCA) to construct the index of financial development with incorporation of five variables. Then, vector error correction model (VECM) is applied to trace the direction of causality between financial development and economic growth. The study figures out mixed findings in this region in case of direction of relationship. In Bangladesh and India, the study finds the same results that economic growth and financial development influence each other in the short-run in what is called the feedback hypothesis. And, the identical short-run causality is found in case of Pakistan and Sri Lanka where financial development serves as the driving force behind economic growth, recognized as a supply-leading hypothesis. Long run causality between financial development and economic growth is only found in case of India. The policies should be formulated distinctively by country in such a way that more importance should be placed on the specific determinant that induces development.

Keywords: Economic Growth, Financial Development, Vector Error Correction Model and South-Asian Countries

JEL Classification Code: C30, G20 and O40

Introduction

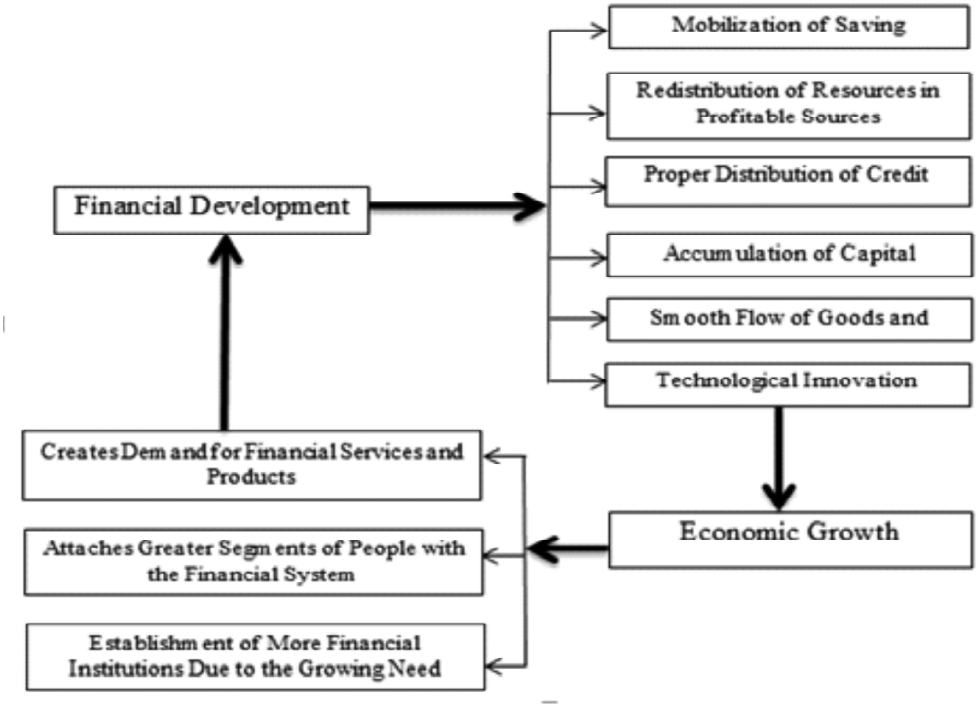
The theoretical as well as practical evidence extracted from several countries apparently proves the alliance of financial development and economic growth (Rahman, 2007).

The evidence indicates that financial development is a pivotal determinant that induces economic growth by making the financial market environment more effectual and dynamic (Beck *et al.* 2011; Levine, 1997). An economy with a fragile financial sector may gradually deviate from the growth rate of the global Production Possibility Frontier (PPF) (Aghion *et al.*, 2005). In the same way, the potentiality of the financial sector is greater when the economy smoothly runs. Hence, the puzzle of the finance-growth nexus arises when financial development is able to push economic growth forward and economic growth is the preferable policy for the country to boost financial development (Odhiambo, 2007). Therefore, the financial sector of a country builds up economic growth by ensuring the mobilization of savings, redistributing resources from sick to profitable ones, ensuring proper distribution of credit, accumulating capital, enabling the smooth flow of goods and services, facilitating trade, and so on (Levine, 2005). In addition, financial development indicators such as broad money (M2) as well as private sector credit signal that there is a positive and significant relationship between financial development and economic growth (Puatwoe and Piabuo, 2017). Conversely, if an economy grows, it creates demand for financial services and products. Thus, they develop an environment to introduce more financial institutions into the economy (Robinson, 1952). Blackburn and Hung (1998) deviate from this view and indicate that there may exist a two-way relationship between financial development and economic growth, such as financial development fastens economic growth in one way and, in another way, economic growth deepens financial development.

Following the importance of the financial development and economic growth relationship, Pattrick (1966) traces four hypotheses, such as the supply-leading hypothesis, demand-following hypothesis, feedback hypothesis, and null hypothesis. Both developed and developing countries experience distinct aftermaths while investigating the relationship between financial development and economic growth. Thus, the nature and direction of the relationship between financial development and economic growth are clearly presented in the following diagram.

The supply-leading hypothesis expresses the unidirectional relationship by indicating that financial development is a prerequisite for economic growth by facilitating savings mobilization, capital accumulation, removing asymmetric information about investment, smoothing the flow of goods and services, proper credit distribution, and so on (King and Levine, 1993). Likewise, the demand-following hypothesis also shows the unidirectionality propounded by Robinson

Figure 1: Finance-growth Nexus



Source: Author's compilation

(1952). Here, the direction of the relationship flows from economic growth to financial development. It implies that if the economy grows, there will be more demand for financial products and services. In addition, financial institutions innovate on new financial products in response to market demand. Blackburn and Hung (1998) propose another hypothesis, the Feedback Hypothesis, which shows a bi-directional relationship. This implies that, on the one hand, financial development is essential for economic growth, and on the other hand, economic growth is a prerequisite for a well-developed financial system. Lastly, the null hypothesis shows that there is no relationship between financial development and economic growth (Shan, 2005). In the above discussion, the finance-growth nexus is clear based on the four hypotheses that present the direction of the relationship between financial development and economic growth.

Objective of the Study

The objective of the study is:

- To investigate the relationship between financial development and economic growth in south-Asian countries

Literature Review

Developing countries are unable to use resources due to financial constraints, and they are unable to reap the full benefits from them due to a lag in the manufacturing process (Aghion *et al.*, 2005). In contrast to the countries whose financial systems are well-structured, there is evidence that their economic growth is more satisfactory compared to third world countries (Demirguc-Kunt and Levine, 2009; Baltagi *et al.*, 2009). That being the case, financial development is a momentous factor in determining long-run economic growth by advancing capital accumulation, proper allocation of resources and technological development (Levine, 2005). Lucas (1988) opposes the theories regarding the relationship between financial development and economic growth, suggesting that there may exist an impartial proposition showing no dependence on each other and functioning independently.

However, in Africa, strict trade barriers and financial hurdles are the dominant factors that are responsible for low economic growth (Beck *et al.*, 2011; Ndulu *et al.*, 2007). Government intervention with subservient monetary sustainability is more beneficial to African countries' financial sectors than autonomous financial sectors (Honahan and Beck, 2008; Ostry *et al.*, 2008; Ncube, 2007). Odhiambo (2007) figures out mixed findings based on three Sub-Saharan African (SSA) countries. The author finds that economic growth is a key requirement for financial development in Kenya and South Africa, which meets the "demand following" hypothesis, whereas in the case of Tanzania, the study explores the "supply leading" hypothesis, which implies that financial development is a key driver of economic growth in this country. Wolde-Rufael (2009) finds "feedback" hypothesis in the case of Kenya when using some proxy variables. On the other hand, Quartey and Prah (2008) find "neutral" hypothesis, indicating that there is no relationship between two variables in the case of Ghana, using some proxy variables.

Ahmed and Wahid (2011) find the long-run equilibrium between financial development and economic growth in the long-run by conducting research on 15 SSA countries, and the study justifies that financial development can enhance the economic performance of these countries. In support of this argument, Gries *et al.* (2009) find a one-way relationship between financial development and economic growth in Benin, Sierra Leone, and South Africa, which meets the "supply leading"

hypothesis, but in the case of Nigeria, the study finds the demand following hypothesis.

By enhancing asset for investment and increasing potency Abu-Bader and Abu-Qarn (2008) determine a one-directional relationship between financial advancement and economic accrual in Egypt. The Egyptian government launched various programs in the year of 1991 to reform the financial sector to impulse savings and investment, which lead to economic growth in the long- run, taking into account the impact of financial services upon capital accumulation.

Furthermore, Pradhan *et al.* (2015) work on Asian countries where the study finds a positive relationship between financial development and economic growth. In the case of East Asia, the study finds a one-way relationship running from economic growth to financial development, which meets the demand following hypothesis. Contrastingly, in the case of South-east Asia, the study finds an inverse relationship running from financial development to economic growth, which meets the supply leading hypothesis. In the cases of West and South Asia, the study finds feedback hypotheses as these two variables are correlated with each other. If it is possible to engage the large population of a country in financial services by increasing their accessibility to these services, the financial sector of that country will definitely expand. And so, it makes it possible to stimulate the domestic savings, which could be used in the form of investment. Deidda (2006) states that when the economy reaches at an optimum or efficient level, the financial sector develops automatically. And if this development is sustainable for the long-run, then the banking system can become more efficient and contribute to enhancing economic growth.

Ahmed *et al.* (2021) find that financial development indicators such as liquid liabilities, money supply, and private credit to the banking sector measured as a percentage of GDP, are driving forces in promoting economic growth in south-Asian countries, including Pakistan, India, Bangladesh, Nepal, and Sri Lanka. Correspondingly, the inspection suggests the three main south-Asian countries, namely, Pakistan, Sri Lanka, and India that the supply-leading hypothesis is validated in these economies since financial development causes economic growth according to Granger sense (Ahmed and Ansari, 1998). Anwar and Cooray (2012) describe how financial development enhances economic growth through direct as well as indirect evidence from south-Asian countries, such as Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka, and Maldives. Conversely, Wu *et al.* (2020) reveal that China, Japan and India sponsor financial development to foster their country's

economic growth following the feedback hypothesis when China maintains a positive supply lead but negative demand follows; for Japan and India, positive feedback manages both supply and demand sides for sustainable economic growth. In addition, Shan (2005) presents some empirical evidence on Asian countries regarding the impact of financial development on economic growth, such as China, Japan, and Korea, which had an ineffective impact of the financial sector on economic growth during their financial crisis.

Based on the preceding discussion and literature, it is clear that financial improvement and economic growth are linked. Some of these studies are country-specific, while others are based on developed economies. There are a few studies which take into account the south-Asian countries together. Therefore, this study contributes to the existing literature by empirically inspecting the relationship between financial development and economic growth in the context of south-Asian economies.

Data and Methodology

Sample Country and Year

This section comprises the description of the variables and the experimental methodology that are applied to achieve the objective. The data is extracted from the dataset of the World Development Indicator (WDI) regarding variables such as financial development and economic growth. The study takes into account four south-Asian countries, namely, Bangladesh, Pakistan, India, and Sri Lanka, along with the time span of 1995–2019.

Description of the Variables

Here, the growth rate of GDP is used as a proxy variable to measure economic growth. And, financial development is the composite index of broad money, domestic credit to the private sector by banks, domestic credit provided by the financial sector, claims on the private sector, and claims on the central government. The explanation of the variables is depicted in Table 1.

Table 1: Description of the Variables

Variable Name	*Unit of Measurement*	*Source*	*Definition*
GDP Growth	%	WDI	The growth rate of Gross Domestic Product (GDP) in the current period

Financial Development Variables

Variable Name	*Unit of Measurement*	*Source*	*Definition*
Broad Money	% of GDP	WDI	The comprehensive process in calculation of money supply
Domestic Credit to Private Sector by Banks	% of GDP	WDI	The transformation of financial resources to private sector by different banks including the central bank
Domestic Credit Provided by Financial Sector	% of GDP	WDI	It refers to the all types of gross credit which are provided to different sectors by financial sector exclusion of the credit to central government
Claims on Private Sector	Annual Growth (% of Broad Money)	WDI	Type of credit expressed in the form of percent of broad money refers to transformation of credit to private sector from financial sector
Claims on Central Government	Annual Growth (% of Broad Money)	WDI	It refers to the loan to central government

Note: WDI (World Development Indicators)

Specification of Model

To determine the relationship between financial development and economic growth, the model has been formed as follows:

$$\text{Growth } (GDP)_{it} = \beta_{0i} + \beta_{1i} CIF_{it} + \mu_{it} \quad (1)$$

$$\mu_{it} = \gamma_i \mu_{it-1} + \varepsilon_{it} \quad (2)$$

Where,

- $i = 1, 2, \ldots\ldots, N$
- $t = 1, 2\ldots\ldots, N$
- Growth (GDP)= Growth rate of GDP in the current period
- CIF= Composite index of financial development
- β_{0i} = Member-specific intercept or fixed-effects
- β_{1i} = Coefficient of CIF

The primary goal of this model is to estimate the value of β_{1i} using appropriate panel tests while also determining the causal relationship between financial development and economic growth. If the value of $\beta 1$ is greater than 0, then it

implies that an increase in the growth of financial development positively influences economic growth.

Unit Root Test

Granger and Newbold (1974) examine that in the case of two non-stationary time series data, while regressing one time series in terms of the other, it produces vague results. So, the justification of stationarity should be traced prior to examining any experimental relationships. The study applies four unit root tests, namely Dickey Fuller (DF), Augmented Dickey Fuller (ADF-Fisher), Phillip Peron (PP), and KPSS (Dutta and Das, 2016) to check the stationarity of the variables.

Panel Co-integration Test

Pradhan *et al.* (2015) describe co-integration as a statistical notion which was introduced by Granger. The co-integration between two series is allowed to determine the long-run equilibrium relationship between them. In the existing literature, there is usage of various panel co-integration tests. But in this study, the author particularly applies the Johansen Co-integration test to find out the co-integration between economic growth and financial development. The coefficient of slope may diverge from country to country by applying a heterogeneous co-integrating factor to the panel countries (Pedroni, 2000). So, he propounds seven different statistics in the co-integration test. He categorizes those panel co-integration statistics into three categories, namely Ordinary Least Square (OLS), Full Modified Ordinary Least Square (FMOLS) and Dynamic Ordinary Least Square (DOLS).

FMOLS and DOLS estimation

Although the co-integrated factors of OLS estimators are radially symmetric, the estimate of OLS estimators is asymptotically biased because of existence of the multicollinearity with disturbance parameters. In the disturbance term, there is a persistence of serial correlation in the panel data (Pedroni, 2001). Besides, the inherent problems of time series data may also appear in the analysis and increase the prevalence of heteroskedasticity (Kao and Chiang, 2001). So, following the importance of accurate and precise estimators, various estimators are propounded by economists concerning with regard to estimating flawless co-integrated factors and solving the problem of OLS estimators. In this study, the authors consider two estimators to solve the problem of OLS estimators, namely "Fully Modified OLS

estimators (FMOLS)" and "Dynamic OLS estimators (DOLS)". Kao and Chiang (2001) states that in both FMOLS and DOLS estimation, there is consistency in the estimates of standard error.

Panel Granger Causality Test

The panel Granger causality test is deployed to determine the causal relationship between economic variables (Cannning and Pedroni, 2008). Here, the study applies this method to determine the causal relationship between economic growth and financial development. The econometric model is given below:

$$\begin{bmatrix}\Delta lnGDP_{it}\\ \Delta lnCIF_{it}\end{bmatrix} = \begin{bmatrix}\dot{\eta}_{1j}\\ \dot{\eta}_{2j}\end{bmatrix} + \sum_{k=1}^{\rho}\begin{bmatrix}\ddot{\alpha}_{11k}(L)\,\beta_{11k}(L)\delta_{11k}(L)\Upsilon_{11k}(L)\\ \ddot{\alpha}_{21k}(L)\,\beta_{21k}(L)\delta_{21k}(L)\Upsilon_{21k}(L)\end{bmatrix}\begin{bmatrix}\Delta lnGDP_{it-k}\\ \Delta lnCIF_{it-k}\end{bmatrix} + \begin{bmatrix}\acute{\omega}1iECT_{1it-1}\\ \acute{\omega}1iECT_{2it-1}\end{bmatrix} + \begin{bmatrix}\varepsilon_{1it}\\ \varepsilon_{2it}\end{bmatrix} \quad (3)$$

Where,

- ρ = Lag lengths of the differenced variables in respective sub equation
- Δ = First difference filter ($\Delta Y_{it} = Y_{it} - Y_{it-1} = \Delta X_{it}\beta + \varepsilon_{it}$)
- i = 1, 2, ... *N* = and *t* = 1, 2, ..., *T*
- ε_j (*j* = 1, 2, 3, 4) is identically and independently distributed for all *i* and *t* with zero conditional mean value and heterogeneous variance

The error correction terms indicate the long-run dynamics between the variables, where the difference between the variables presents the short-run dynamics (Pradhan *et al.*, 2015). To determine the short-run causality existing between the variables, F-statistics and significance of lagged changes in the predictors are used, whereas the long-run Granger causality test is calculated by considering the weight of the t-test of the lagged Error Connection Terms (ECT). The coefficient calculates the quickness of adaptation to the pace of long-run equilibrium. It implies that the greater the value of, , the faster the adjustment with long-run equilibrium will be made.

Descriptive Analysis

Summary Statistics of South-Asian Countries

Table 2 represents the descriptive statistics such as mean, standard deviation, maximum and minimum values based on the respective variables in south-Asian

countries, namely Bangladesh, Pakistan, India, and Sri Lanka. The relationship between financial development and GDP growth among the sample countries is highlighted by this current study, where GDP growth is measured by percent and financial development is constructed from five variables such as broad money, domestic credit to the private sector by banks, domestic credit provided by the financial sector, claims on the private sector, and claims on the central government.

Table 2: Summary Statistics of Economic Growth and Financial Development Index

Variables	*Obs.*	*Mean*	*Std. Dev.*	*Min*	*Max*
Case-1: Bangladesh					
GDP Growth	30	5.77	1.32	2.38	8.15
CIF	30	0.47	0.36	$2.77e^{-07}$	1.00
Case-2: Pakistan					
GDP Growth	30	3.90	1.88	0.53	7.55
CIF	30	0.37	0.23	$2.79e^{-07}$	1.00
Case-3: India					
GDP Growth	30	5.92	3.37	-7.96	8.85
CIF	30	0.52	0.36	$2.97e^{-07}$	1.00
Case-4: Sri Lanka					
GDP Growth	30	4.73	2.81	-3.57	9.14
CIF	30	0.39	0.22	$2.14e^{-07}$	1.00

Source: Author's compilation based on World Bank data (2019)

Note 1: Obs.-observation (1990-2019); std.dev.-standard deviation; min.-minimum; max.-maximum

Note 2: GDP Growth in Annual (%); CIF-Composite Index of Financial development (%)

All five variables are considered a financial development index after carrying out principal component analysis for each sample south-Asian country (See Annex A.1). However, Table 2 summarizes that the mean GDP growth for south-Asian countries, namely Bangladesh, Pakistan, India, and Sri Lanka, is 5.77, 3.90, 5.92, and 4.73, respectively, while the standard deviation varies from 1.32 to 3.37 percent among those countries. On the other hand, the maximum GDP growth values at a specific point in time for all four south-Asian countries are 8.15, 7.55, 8.85, and

9.14, respectively, whereas the minimum GDP growth is positive for Bangladesh and Pakistan, but negative for India and Sri Lanka. Therefore, the overall GDP growth result for India shows that this country suffers from high heteroscedasticity, with the highest minimum and maximum values of GDP growth among the other south-Asian countries. Likewise, the mean value of the Composite Index of Financial Development (CIF) is below average for all the countries considered except India, while the maximum index value is 1. On the other hand, the standard deviation result highlights that Bangladesh and India suffer from higher deviations from their mean values for CIF. Thus, there is lots of scope to enhance the financial development sector in south-Asian countries for further economic improvement.

Mean Verification of Variables through Sample T-test

Table 3 presents the hypothesis testing in relation to GDP growth and all other variables associated with financial development through a paired t-test. In all the relationships, alternative hypotheses have been accepted not only by t-value but also by probability value. If the probability value is equal to or greater than 0.00 and less than or equal to 0.1, alternative hypothesis is accepted in this condition. And if the t-value is greater than 1.64, the alternative hypothesis will be accepted, otherwise the null hypothesis will be considered. Note that the null hypothesis implies that there is no significant mean difference between the two variables. On the other hand, the alternative hypothesis implies that there is a significant mean difference between variables. Thus, in the relationship between GDP and financial indicators, an alternative hypothesis has been accepted for this study.

Table 3: Mean Verification of Variables through Paired T-test

Variables	*t-Value*	*p-Value*	*Decision*
(1) GDP-(2)BM	-37.09	0.00	H_A<0 Accepted
(1) GDP-(2) DCPSB	-21.92	0.00	H_A<0 Accepted
(1) GDP-(2) DCPFS	-26.84	0.00	H_A<0 Accepted
(1) GDP-(2) CPS	-4.26	0.00	H_A<0 Accepted
(1) GDP-(2) CCG	5.92	0.00	H_A>0 Accepted

Note: H_A-alternative hypothesis; p-value-probability value; 0.00<=p-value>=0.1-accept alternative hypothesis; 1.64<=t-Value accept alternative hypothesis; (1) first variable; (2) second variable

Source: Author's compilation based on World Bank data (2019)

Empirical Analysis

Panel Unit Root Test

Several studies reveal that in cases, the series of economic growth and financial development is non-stationary and the outcome of the analysis is spurious if it continues. Hence, before investigating the empirical relationship between the two series, each time series property should be maintained as a stationary feature to conduct empirical analysis. In this study, the panel unit root test is deployed to check the stationary level of data. For this purpose, the study deploys four unit root tests namely, DF, ADF, PP and KPSS. The null hypothesis of the DF, ADF, PP tests assumes that there is a unit root, whereas the null hypothesis of the KPSS test assumes the stationarity of the series if the probability is greater than 0.1. The stationarity is checked in three phases, namely level, first difference, and second difference. The study figures out all the variables stationary in the first difference (See Annex A.2).

Relation between GDP Growth and Financial Development

Table 4 presents the degree of the relationship between financial development and GDP growth. Note that the range of correlation values is between -1 and +1. If the value crosses 0.5, then it shows a highly positive correlation between the variables. If the value is equal to 0.5, then it shows a moderate degree of relationship between the variables. And if it is less than 0.5, it shows a low degree of association between the variables. This is applicable to negative values. Table 4 shows that for the South Asian countries of Bangladesh, Pakistan, India, and Sri Lanka, there is a strong positive correlation between GDP growth and financial development, which is significant at the 1 percent level.

Panel Co-integration Test

Moreover, Table 5 reports the results of the Johansen Co-integration test, and the result of the test confirms the acceptance of the alternative hypothesis, such as that there is co-integration between financial development and economic growth in south-Asian countries. In particular, the estimated maximum eigen value and trace test value along with their responding critical values show that the null hypothesis (r=0) is rejected at 5 percent and 1 percent levels of significance, respectively, under both of the tests. Similarly, at 5 percent and 1 percent levels of significance, the maximum

Table 4: Degree of Relationship between Economic Growth and Financial Development

Variables	*CIF*	*GDP Growth*
Case 1: Bangladesh		
CIF	1.00	
GDP Growth	0.92***	1.00
Case 2: Pakistan		
CIF	1.00	
GDP Growth	0.97***	1.00
Case 3: India		
CIF	1.00	
GDP Growth	0.95***	1.00
Case 4: Sri Lanka		
CIF	1.00	
GDP Growth	0.69***	1.00

Source: Author's compilation based on World Bank data (2019)

Note 1: p-value<=0.01-1% level significant (***); 0.02<=p-value>=0.05-5% level significant (**); 0.06<=p-value>=0.1-10% level significant (*).

Note 2: GDP Growth annual (%) and CIF - Composite Index of Financial Development (%)

eigen and trace tests both find one co-integrating equation. Therefore, this result implies a long-run relationship between financial development and economic growth among south-Asian countries.

Table 5: Johansen Co-integration test

Null Hypothesis	*Alternative hypothesis*	*Test Statistics*	*5 % Critical Value*	*1 % Critical Value*	*Conclusion*
			Maximum Eigen Value Test		
r = 0	r= 1	22.56	17.23	21.38	One co-integrating equation
r ≤ 1	r= 2	8.65	11.59	15.39	
			Trace Test		
r = 0	r= 1	32.49	24.12	29.18	One co-integrating equation
r ≤ 1	r= 2	8.65	11.59	15.39	

Source: Author's compilation based on World Bank data (2019)

Note: Optimal lag length is 3 based on AIC and LR test

Estimation of Long-run Co-integration Parameters

Having established the existence of co-integration between financial development and economic growth, the next step is to dig out the parameters of the long-run co-integration association by FMOLS as well as DOLS analysis.

Table 6: Estimation of Long-run Co-integration Parameters

		FMOLS		*DOLS*	
Dependent Variable	*Independent Variable*	*Coefficient*	*t-Statistic*	*Coefficient*	*t-Statistic*
Case 1: Bangladesh					
GDP Growth	CIF	1.86***	7.56	1.73***	7.02
Case 2: Pakistan					
GDP Growth	CIF	0.67**	2.25	1.80**	2.07
Case 3: India					
GDP Growth	CIF	1.35***	6.67	1.24***	8.44
Case 4: Sri Lanka					
GDP Growth	CIF	1.75***	4.21	1.46**	2.54

Source: Author's compilation based on World Bank data (2019)

Note 1: Rejection of null hypothesis at 1 % and 5 % significance level represented by *** and ** respectively

Note 2: GDP Growth annual (%) and CIF - Composite Index of Financial Development (%)

The estimated outcomes are demonstrated in Table 6. Here, the empirical analysis results of both FMLOS and DOLS show that financial development significantly influences economic growth for the south-Asian countries, namely Bangladesh, Pakistan, India and Sri Lanka. Therefore, financial development has a positive impact on a country's economic growth. For instance, from the FMLOS model, the long-run growth elasticity implies that if financial development increases by 1 percent, then the economic growth will be boosted up by 1.86, 0.67, 1.35 and 1.75 percent respectively for above-mentioned countries, and the result is significant at 1 percent and 5 percent levels. Additionally, the DOLS model presents that a 1 percent increase in financial development pushes economic growth upward by 1.73, 1.80, 1.22 and 1.46 percent respectively and the result is significant at 1 and 5 percent levels.

Granger Causality Test

Having the existence of co-integration, now it is time to verify causality between financial development and economic growth. Here, to identify the causal relation, Granger causality test is applied, by the help of panel vector-error correction model (Equation 3). Table 7 presents the long-run and short-run causal relationship status between the aforementioned variables among the four south-Asian countries. In case of Bangladesh, when CIF considers as dependent variable, the lagged error correction term is statistically significant at 1 percent level.

Table 7: Causality Direction between Economic Growth and Financial Development

Dependent Variables	*Independent Variables*		*Long-run Inference*	*Short-run Inference*
	Δ CIF	*GDP Growth*	ECT_{-1}	
Case 1: Bangladesh				
CIF	-	8.6***	-3.29	GDP Growth=>CIF
GDP Growth	5.76**	-	-2.20	CIF=> GDP Growth
Case 2: Pakistan				
CIF	-	4.19	-1.12	-
GDP Growth	4.10**	-	0.77	CIF=> GDP Growth
Case 3: India				
CIF	-	9.76***	-3.29	GDP Growth=>CIF
GDP Growth	20.2***	-	-2.33*	CIF=> GDP Growth
Case 4: Sri Lanka				
CIF	-	3.94	2.77	-
GDP Growth	3.82*	-	1.88	CIF=> GDP Growth

Source: Author's compilation based on World Bank data (2019)

Note 1: Rejection of null hypothesis at 1%, 5% and 10% significance level represented by *** , ** and * respectively

Note 2: GDP Growth annual (%) and CIF - Composite Index of Financial Development (%); ECT-Error Connection Term

The result states that CIF (financial development index generates from PCA) follows the long-run equilibrium by changing its regressors. Similarly when GDP is dependent variable, GDP tends to coverage its long-run equilibrium path due to change financial development index CIF and the lagged error correction is statistically significant at 5 percent level. In case of Pakistan, financial development index helps GDP (dependent variable) to follow its long-run equilibrium path and the result is significant at 5 percent level. In case of India, both financial development index and

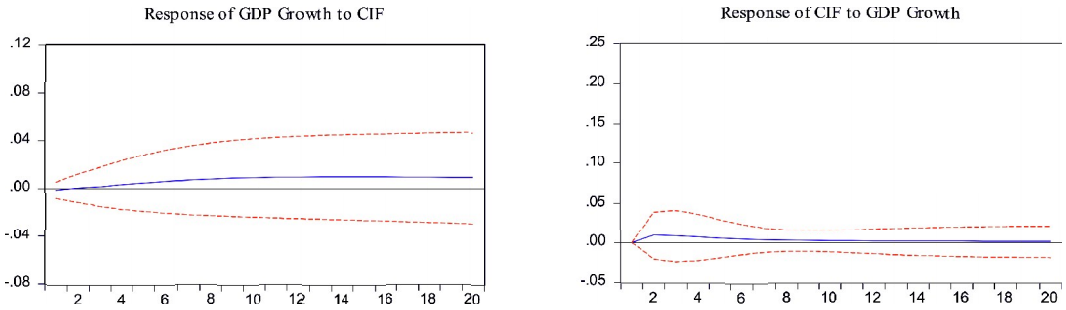
GDP growth helps each other to reach the long-run equilibrium path and the result is statistically significant at 1 percent level respectively based on lagged error correction term. For Sri Lanka, when CIF is considered as regressor then the result implies that GDP growth tends to coverage its long-run equilibrium path with 10 percent level of significance.

Impulse Response Function

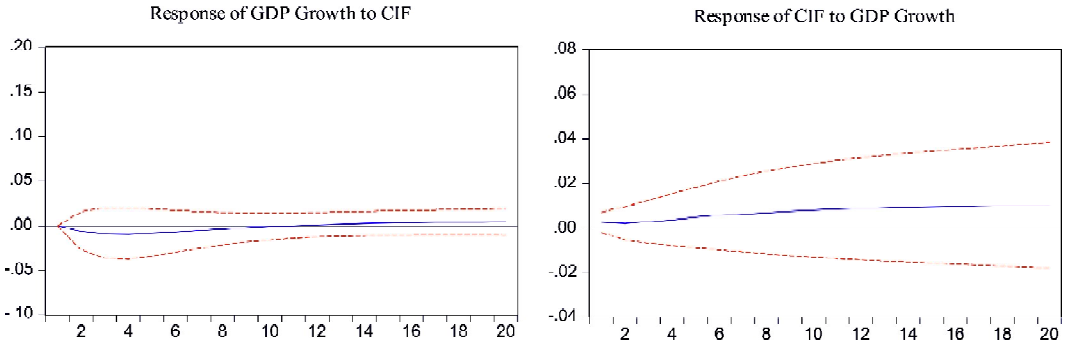
The impulse response is useful tools to present the responsiveness of one variable to the shock or change of another variable. Here, the impulse response function of financial development and economic growth is reported graphically in Figure 2. Variable response is significant if the response does not follow the zero line along with its confidence interval. In case of Bangladesh, the short run response of both financial development and economic growth has significant impact on each other in the very early year of shock. In case of Pakistan, India and Sri Lanka, any shock of financial development positively influences the GDP growth of the respective countries.

Figure 2: Impulse Response Function of South Asian Economies

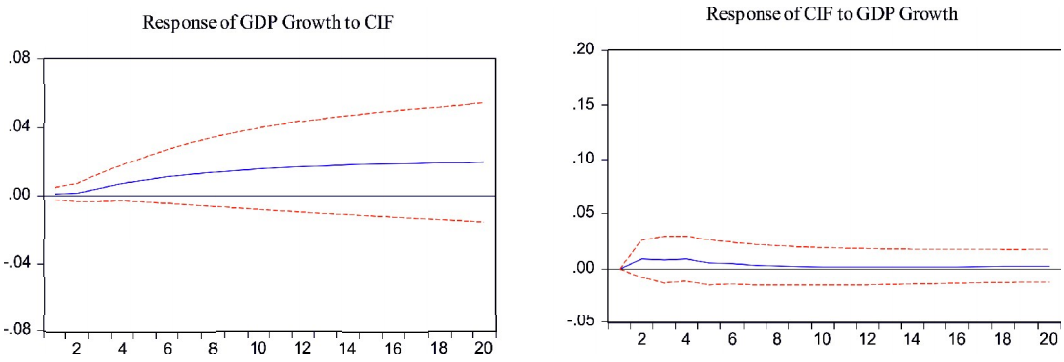
Case 1: Bangladesh



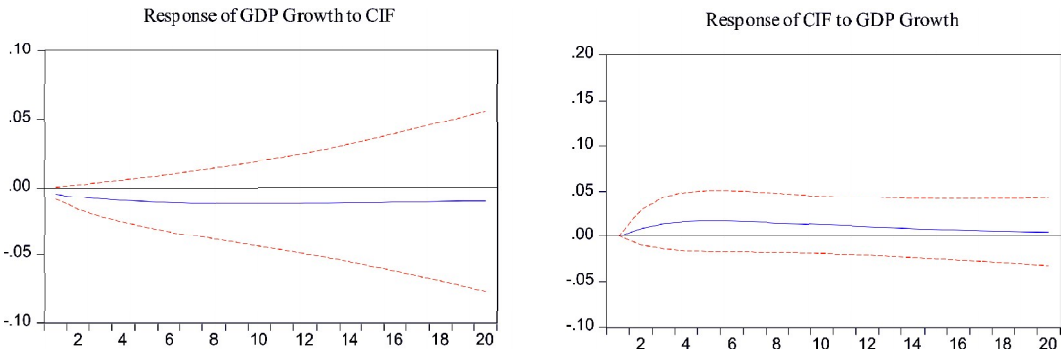
Case 2: Pakistan



Case 3: India



Case 4: Sri Lanka



Note: CII-composite index of ICT indicators; CIF-composite index of financial development; around red dashed area-95% confidence interval

Source: Author's compilation based on World Bank data (2017)

Concluding Remarks

Unveiling the relationship between financial development and economic growth among the south-Asian countries, namely Bangladesh, Pakistan, India, and Sri Lanka, is very crucial for the economic development of those economies. The study investigates the short-run as well as the long-run relationship between financial development and economic growth for south-Asian countries for the time period from 1995 to 2019. It is apparently proved the correlation between the variables but there is a debate about the fact of causal relationship on each other. From the empirical analysis, the authors finds that there is strongly positive correlation in between GDP growth and financial development which is significant at 1 percent level for the south-Asian countries. Secondly, Johansen Co-integration test confirms the

acceptance of the alternative hypothesis such as there is co-integration between financial development and economic growth among those countries. Lastly, the empirical analysis result of both FMLOS and DOLS explores that financial development significantly influences economic growth for the south-Asian countries such as Bangladesh, Pakistan, India and Sri Lanka. In case of Bangladesh and India, CIF and GDP growth influences each other in the short-run and GDP growth tends to coverage its long-run equilibrium path with 10 percent level of significance in India. In case of Pakistan, financial development drives GDP growth in the short-run as well as for Sri Lanka, the short-run causality is found implying that financial development leads to economic growth with 10 percent level of significance. Therefore, the importance of the relationship between the financial development and economic growth cannot be ignored in this present situation. Thus, some recommendations are suggested by the authors of this study presented below:

- Make the financial markets more accessible to a large segment of the population, which will help to increase economic growth.
- Develop the environment of the financial sector such as bank and stock market to make more competitive as well as sustainable.
- Central banks need to adopt a contingency policy for the financial sector that will help the financial market run smoothly.

References

Abu-Bader, S. and Abu-Qarn, A. S. (2008), "Financial Development and Economic Growth: The Egyptian Experience", *Journal of Policy Modeling*, 30(5), 887-898.

Aghion, P., Howitt, P. and Mayer-Foulkes, D. (2005), "The Effect of Financial Development on Convergence: Theory and Evidence", *The Quarterly Journal of Economics*, 120(1), 173-222.

Ahmed, A. D. and Wahid, A. N. (2011), "Financial Structure and Economic Growth Link in African Countries: A Panel Cointegration Analysis", *Journal of Economic Studies*, 38(3), 331-357.

Ahmed, F., Kousar, S., Pervaiz, A., and Shabbir, A. (2021), Do institutional quality and financial development affect sustainable economic growth? Evidence from South Asian countries, Borsa Istanbul Review.

Ahmed, S. M., and Ansari, M. I. (1998), "Financial sector development and economic growth: The South-Asian experience", *Journal of Asian Economics*, 9(3), 503-517.

Anwar, S., and Cooray, A. (2012), "Financial development, political rights, civil liberties and economic growth: Evidence from South Asia", *Economic Modelling*, 29(3), 974-981.

Baltagi, B. H., Demetriades, P. O. and Law, S. H. (2009), "Financial Development and Openness: Evidence from Panel Data", *Journal of Development Economics*, 89(2), 285-296.

Beck, T., Maimbo, S. M., Faye, I. and Triki, T. (2011), Financing Africa: Through the Crisis and Beyond, World bank, Washington, DC.

Blackburn, K. and Hung, V. T. (1998), "A Theory of Growth, Financial Development and Trade", *Economica*, 65(257), 107-124.

Canning, D. and Pedroni, P. (2008), Infrastructure, Long run Economic Growth and Causality.

Deidda, L. G. (2006), "Interaction between Economic and Financial Development", *Journal of Monetary Economics*, 53(2), 233-248.

Demirguc-Kunt, A. and Levine, R. (2009), Finance and Inequality, Research Working Papers, 1(1), 1-52.

Dutta, C. B. and Das, D. K. (2016), Does Disaggregated CO2 Emission Matter for Growth? Evidence from Thirty Countries, Renewable and Sustainable Energy Reviews, 66, 825-833.

Engle, R. F. and Granger, C. W. (1987), "Co-integration and Error Correction: Representation, Estimation, and Testing", *Econometrica: Journal of the Econometric Society*, 251-276.

Granger, C. W. and Newbold, P. (1974), "Spurious Regressions in Econometrics", *Journal of Econometrics*, 2(2), 111-120.

Gries, T., Kraft, M. and Meierrieks, D. (2009), Linkages between Financial Deepening, Trade Openness, and Economic Development: Causality Evidence from Sub-Saharan Africa, World Development, 37(12), 1849-1860.

Honahan, P. and Beck, T. (2008), Finance for All?: Policies and Pitfalls in Expanding Access, World bank Publications.

IMF (2021), Financial Soundness Indicators and the IMF, Available at: *https://www.imf.org/external/np/sta/fsi/eng/fsi.htm* (Accessed on 5 May, 2021).

Kao, C. and Chiang, M. H. (2001), On the Estimation and Inference of ACointegrated Regression in Panel Data, Emerald Group Publishing Limited.

King, R. G. and Levine, R. (1993), "Finance, Entrepreneurship and Growth", *Journal of Monetary Economics*, 32(3), 513-542.

Levine, R. (1997), "Financial Development and Economic Growth: Views and Agenda", *Journal of Economic Literature*, 35(2), 688-726.

Levine, R. (2005), "Finance and Growth: Theory and Evidence", *Handbook of Economic Growth*, 1, 865-934.

Lucas, R. E. (1988), "On the Mechanics of Economic Development", *Journal of Monetary Economics*, 22(1), 3-42.

Ncube, M. (2007), "Financial Services and Economic Development in Africa", *Journal of African Economies*, 16, 13-57.

Ndulu, B. J., Chakraborti, L., Ramachandran, V. and Wolgin, J.(2007), Challenges of African Growth: Opportunities, Constraints, and Strategic Directions, World Bank Publications.

Odhiambo, N. M. (2007). Supply leading Versus Demand following Hypothesis: Empirical Evidence from Three SSA Countries, African Development Review, 19(2), 257-280.

Ostry, M. J. D., Spilimbergo, M. A. and Prati, M. A. (2008), Structural Reforms and Economic Performance in Advanced and Developing Countries*,* International Monetary Fund.

Patrick, H. T. (1966), "Financial Development and Economic Growth in Underdeveloped Countries", *Economic Development and Cultural Change*, 14(2), 174-189.

Pedroni, P. (2000), "Fully Modified OLS for Heterogeneous Cointe-grated Panels", *Advanced in Econometrics,* 15, 93-130.

Pedroni, P. (2001), "Purchasing Power Parity Tests in Cointegrated Panels", *Review of Economics and Statistics*, 83(4), 727-731.

Pradhan, R. P., Arvin, M. B. and Hall, J. H. (2015), "Economic Growth, Development of Telecommunications Infrastructure and Financial Development in Asia, 1991–2012", *The Quarterly Review of Economics and Finance*, 59, 25-38.

Puatwoe, J. T., &Piabuo, S. M. (2017), "Financial sector development and economic growth: evidence from Cameroon", *Financial Innovation*, 3(1), 1-18.

Quartey, P. and Prah, F. (2008), "Financial Development and Economic Growth in Ghana: Is There a Causal Link"? *African Finance Journal*, 10(1), 28-54.

Rahman, M. (2007), Financial development: Economic growth nexus in Bangladesh, Policy Analysis Unit (PAU) Working Paper No. WP, 707.

Robinson, J. (1952), The Rate of Interest and Other Essays, Macmillan, London.

Shan, J. (2005), "Does Financial Development 'Lead Economic Growth? A Vector Auto-regression Appraisal", *Applied Economics*, 37(12), 1353-1367.

WDI (2021),World Development Indicators 2021, World Bank Publications.

Wolde-Rufael, Y. (2009), "Re-examining the Financial Development and Economic Growth Nexus in Kenya", *Economic Modelling*, 26(6), 1140-1146.

Wu, C. F., Huang, S. C., Chang, T., Chiou, C. C., and Hsueh, H. P. (2020), "The nexus of financial development and economic growth across major Asian economies: Evidence from bootstrap ARDL testing and machine learning approach", *Journal of Computational and Applied Mathematics*, 372, 112660.

Annex A

Table A.1: Principal Component Analysis of the Financial Development Related Variables

	Eigen Value	*Proportion Variance*	*Cumulative*
Case 1: Bangladesh			
V1	3.80	0.57	0.57
V2	1.63	0.24	0.81
V3	0.86	0.09	0.90
V4	0.52	0.07	0.97
V5	0.15	0.03	1.00
Case 2: Pakistan			
V1	3.72	0.53	0.53
V2	1.37	0.31	0.84
V3	0.95	0.12	0.96
V4	0.62	0.03	0.99
V5	0.03	0.01	1.00
Case 3: India			
V1	3.77	0.55	0.55
V2	1.08	0.21	0.76
V3	0.99	0.16	0.92
V4	0.93	0.06	0.98
V5	0.11	0.02	1.00
Case 4: Sri Lanka			
V1	3.07	0.48	0.48
V2	2.04	0.36	0.84
V3	0.97	0.09	0.93
V4	0.51	0.06	0.99
V5	0.40	0.01	1.00

Source: Author's compilation based on World Bank data (2019)

Note: V1-V5 indicates five financial development variables

Table A.2: Results from Panel Unit Root Test

	DF		*ADF*		*PP*		*KPSS*		
Variables	*Without Trend*	*With Trend*	*Without Trend*	*With Trend*	*Without Trend*	*With Trend*	*Without Trend*	*With Trend*	*Decision*
Case 1: Bangladesh									
GDP Growth	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
CIF	I(1)	I(1)	I(0)	I(1)	I(0)	I(1)	I(1)	I(1)	I(1)
Case 2: Pakistan									
GDP Growth	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)
CIF I(1)	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)	I(1)	I(1)	
Case 3: India									
GDP Growth	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
CIF I(0)	I(1)	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	
Case 4: Sri Lanka									
GDP Growth	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
CIF I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	

Source: Author's compilation based on World Bank data (2019)

Note 1: Unit root tests are performed on the basis of 5 percent Significance level

Note 2: The null hypothesis of the DF, ADF, PP test has unit root whereas the null hypothesis of KPSS test assumes the stationarity of the series.