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Does growth of nonperforming loan ratio have a temporal impact on private credit growth in Bangladesh economy?

N.M. Ashikuzzaman
Economics Department, North South University, Dhaka, Bangladesh

Abstract

Purpose – This paper addresses the question "Does the growth of nonperforming loan ratio (GNPL) have a temporal impact on private credit growth (PCG)?" for the Bangladesh banking industry during and after the global financial crisis of 2008.

Design/methodology/approach – It employs the autoregressive distributed lag (ARDL) model to examine the temporal equilibrium relationship and causality between PCG and GNPL.

Findings – The results of ARDL bound tests confirm the existence of a single cointegrating vector and temporal equilibrium relationship between variables of interest. According to the error correction mechanism (ECM), there is unidirectional causality from GNPL to PCG in the long run and short run. In the long run, higher GNPL curtails PCG since bankers use the nonperforming loan ratio as a signal and indicator of credit risk in their loan decision-making. In the short run, GNPL positively impacts PCG. It may be because banks go through a rigorous process before declaring a loan as nonperforming that takes time. At the same time, bankers' loan decisions may also be guided by the banks myopic concern of reputation in the short run.

Practical implications – The paper recommends policy prescriptions for the bank risk management, regulatory bodies and the legal authorities. The lending policy of banks should consider the legacy of bad assets. The efficiency of the legal system can also aid in effectively implementing the regulatory guidelines.

Originality/value – The paper inaugurates a bivariate cointegration analysis between PCG and GNPL in the literature. It has utilized quarterly aggregate data in the context of a developing economy like Bangladesh.

Keywords Growth of nonperforming loan ratio, Growth of private credit, Long-run equilibrium relationship, Auto regressive distributed lag model

Paper type Research paper

1. Introduction

Nonperforming loans neither fall in the regular loans category nor interest income earned on loans. These are loans for which borrowers default to make scheduled payments for a stipulated period. Usually, when borrowers fail to make regular payments for 90 days or more, the loan is classified as a nonperforming loan. The duration for not making regular payments by borrowers may range from 90 days to 180 days to various industries and loan types. Nevertheless, nonperforming loans represent the quality of loan assets and credit risk exposure of banks. On the other hand, loan growth is a percentage increase of the loan assets

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after deducting the allowances for loan losses over time. Loan growth can be resulted from increasing lending activities either to the existing customers or to the new customers or both.

Nonperforming loans and loan growth are two key indicators for a bank. These two variables are closely related to each other. Nonperforming loans' exposure can impair banks' capacity for supplying more loans. The impact of nonperforming loans on private credit growth (PCG) can be channelled and explained by the change in capital structure, profit and loss accounting and financing cost of banks (Accornero *et al.*, 2017). In the future, banks may experience surging nonperforming loans if loan growth or PCG in the present results from lowering the credit constraints or standards (Jin *et al.*, 2019). PCG emanating from supply-side shock can deteriorate the loan quality to increase nonperforming loans that may not happen in the case of demand-side shock or productivity shock (Keeton, 1999). For example, banks can charge higher interest rates and impose more stringent credit constraints if private borrowers demand more loans. In this situation, PCG does not adversely affect the loan quality to raise nonperforming loans. However, if banks intend to shift the supply of loans for market expansion while keeping demand unchanged, they need to lower the interests or lessen the credit constraints that can deteriorate the loan quality.

Contemporary literature utilizes regression analysis assuming the given causality to assess the impact of one variable on another. It does not observe to explicitly undertake a formal causality test and temporal equilibrium relationship between nonperforming loans and PCG. In this regard, four possibilities are plausible in the long run and short run:

(1) Nonperforming loans may cause PCG or

(2) PCG may cause nonperforming loans or

(3) There may exist a feedback relationship between these two variables or

(4) There may not exist any causal relationship between them.

Considering this literature gap, the paper aims to examine the temporal causality and equilibrium relationship between the growth of the ratio of gross nonperforming loans to total loans (GNPL) and PCG. GNPL and PCG are flow variables with having more variability that can capture more information (Accornero *et al.*, 2017). Change in these variables in response to an exogenous shock can help gauge the temporal equilibrium relationship and direction of causality. While almost all studies in current discourses utilize bank-level micro data for empirical investigation, this study upholds national-level aggregate data of Bangladesh economy during and after the global financial crisis of 2008. The following graph illustrates the time trend for GNPL and PCG of Bangladesh economy (see Figure 1).

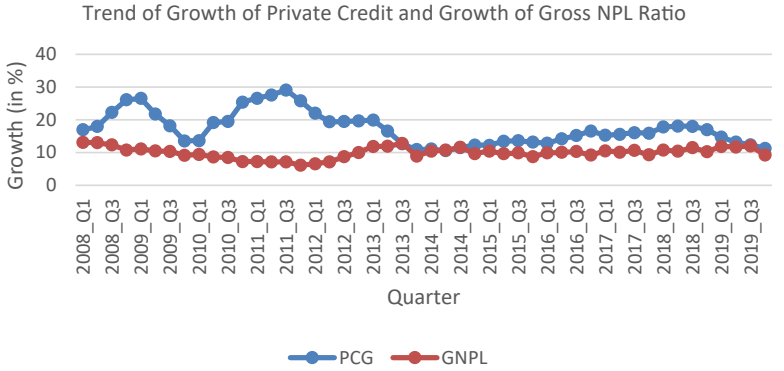

Figure 1.
Time trend of GNPL and PCG

From the above graph, we observe the fluctuations of variables from 2008 to 2019. It highlights relative instability in the banking sector of Bangladesh. The maximum GNPL was 13.15% when the global financial crisis began. Then, it sharply declined to its decade minimum of 6.12% in the fourth quarter of 2011 and jumped to 12.79% in 2013. However, from 2014 to 2019, GNPL was relatively stable and ranged from 9% to 10%. At the same time, PCG was maximum in the third quarter of 2011 and reported to 29.1%. Then, it rapidly turned to its lowest of 10.09% in the fourth quarter of 2013. Overall, during the study period (from 2008 to 2019), GNPL and PCG followed a declining trend.

The visual inspection of the graph of two variables may indicate having a common trend between them. The preliminary analysis also shows a negative correlation between PCG and GNPL (−0.4184). It means that if one variable increases by one unit, then the other variable declines by 0.4184 and vice versa. These two observations lead us to suspect the possibility of existing a negative long-run equilibrium relationship between PCG and GNPL. However, neither the visual inspection nor the correlation can infer the causal direction and equilibrium relationship. Therefore, this paper adheres to the cointegration methodology and employs the autoregressive distributed lag (ARDL) bounds testing approach for assessing the long-run equilibrium relationship between GNPL and PCG in the Bangladesh economy. It also utilizes an error correction mechanism (ECM) for getting information about the adjustment process, the direction of the long-run and short-run causality and fluctuations of variables in the short run. The paper also renders policy recommendations for the banking industry of Bangladesh according to the findings obtained.

The paper is organized as follows: the next section discusses relevant theoretical link and empirical evidence. Then, it presents data and methodology followed by results and discussions. Finally, the paper ends with conclusions and policy implications.

2. Theoretical link and empirical evidence

In the quest of searching answer to the question of whether rapid loan growth leads to higher loan losses (nonperforming loans), Keeton (1999) incorporated the demand and supply analysis of the loanable fund market. According to Keeton, the consequences of loan growth on loan losses depend on whether loan growth emanated from supply-side factors or demand-side factors. A bank might shift the supply of the loanable fund rightward due to higher competitive forces and willingness of market expansion. In order to do this, the bank just needs to lower the price of the loan and relax some collateral conditions. In this circumstance, aggressive loan growth is associated with a declining expected rate of return of loans and accentuating loan loss possibilities. However, if loan growth is originated from the shift in demand of loanable funds, say for instance, due to the change in business preferences to loan over equity as a source of fund for commercial investment, and then loan growth might not have any pernicious impact on loan losses (nonperforming loans).

For supporting his market forces based view, Keeton also provided empirical evidence based on vector autoregression. Controlling for the economic state in the context of the US commercial banking system, Keeton used decadal analysis of data to show that the impact of loan growth happened to strike loan delinquencies only after some periods of abnormal loan growth during the early 1990s and late 1980s. The negative relation between loan growth and loan standards partially signalled supply shift as a source of loan growth because credit standards could also fall in the case of productivity shift. The demand side shock prevailed during the 1970s and early 1980s. During these periods, loan growth did not raise nonperforming loans. The negative relation was also strongly supported by another study conducted on eleven Central and Eastern European countries from 1999 to 2013 (Peric and Konjusak, 2017). Based on the dynamic system generalized method of moment estimation technique, the paper concluded that along with other macroeconomic and bank-specific

factors, at least the past two lags of loan growth had a significant negative impact on current nonperforming loans as a measure of loan loss. This result was robust when applied for different indicators of loan growth and method of estimations.

In contrast to the study of Keeton, the theoretical orientation of Accornero *et al.* (2017) demonstrated three possible channels through which both flow and stock of nonperforming loans could impact on loan supply decisions of banks. The first channel is the mechanical accounting principle in which higher nonperforming loans adversely affect the capital structure of banks via risk-weighted assets. An increase in nonperforming loans to the total loan ratio can negatively impact profitable opportunities for banks. In response, bankers become pessimistic about the lending policy. The second channel is the financing cost through which loan growth contrasts due to poor management capability. Bank requires the fund to support loan growth, and deposit is the vital source of funds. However, depositors' confidence about the performance and management of banks become low at a high growth scenario of nonperforming loan ratio. It impedes banks to mobilize sufficient funds for sanctioning new loans. The third channel is the credit risk preferences of banks in response to nonperforming loans. Under this channel, loan growth may stimulate yet of having higher nonperforming loans. It is so because banks' tolerance of inflated credit risk may be guided by bankers' myopic concern about reputation, competition and market share.

Accornero *et al.* (2017) showed a negative relationship between change in nonperforming loan to total loan and loan growth in the Italian banking industry from 2008 to 2015. One possible explanation of these findings was the changing economic circumstances in the Italian economy. It was characterized by a demand-side shock of the loanable fund by the borrowing firms. This study accounted for the borrower firm-specific fixed effects. In the same line, Cucinelli (2015) investigated the behaviour of 480 listed and unlisted commercial and cooperative banks in the crisis period of 2007–2013 in Italy. This paper incorporated an inter-temporal relationship between loan growth and loan losses into the analysis. It concluded that the two credit risk measures of lag of nonperforming loans and loan loss provisioning had a detrimental impact on the current lending behaviour of banks. Similarly, Vinh (2017) showed that nonperforming loans had a significant negative relationship with banks' profitability and lending behaviours.

From the above theoretical discussions with empirical evidence, we have a perplexing understanding of the direction of causality and the long-run equilibrium relationship between GNPL and PCG. The contemporary literature does not offer concrete decisions about the long-run equilibrium relationship between PCG and GNPL at the aggregate level. It also does not tell us about the direction of causality. The long-run equilibrium relationship and direction of causality may differ across countries. It may also vary from decade to decade within an economy subject to the inherent dynamism of the banking industry. However, this line of empirical investigation is remained salient to explore. This study aims to conduct a cointegration analysis to examine the long-run equilibrium and temporal causal relationship between PCG and GNPL in the context of the Bangladesh banking industry to fill this literature gap.

3. Model specification

The following linear model specification is formulated in this paper to assess the long-run and short-run impact of GNPL on PCG:

$$PCG_t = \alpha + \beta_t GNPL_t + \varepsilon_t \tag{1}$$

Where the measure of the private credit growth, PCG, is the dependent variable and the growth of gross nonperforming loan, GNPL is the independent variable of the model. Regardless of the type, almost all banks supply private credits that include sanctioning the

loan amount to the private sector of Bangladesh economy. The GNPL ratio is a broader measure of credit risk for banks that includes both the nonperforming loans and provisions to evaluate long-term financial stability, fragility and sustainability of the banking sector. According to the Bangladesh central bank, GNPL is the summation of sub-standard loans, doubtful loans, bad loans and accumulated interests up to a maximum of 9 months. The variables are measured in ratio scale and the quarterly growth rates of the variables are calculated using percentage change in the current quarter by Bangladesh Bank with reference to the same quarter of the previous year. The paper collects secondary data of PCG and GNPL from the quarterly report of the banking regulation and policy department of Bangladesh central bank. The range of data series spans from 2008 to 2019 which is given below (see Table 1)

In equation (1), α is the intercept, β is the coefficient of GNPL, ε is the error term and t denotes for time index. The model expression of equation (1) can be used to examine the long-run relationship between PCG and GNPL. However, we are also interested to see whether causality runs from GNPL to PCG and also the sign of β coefficient in the long run and short run. In order to do so, the error correction model (ECM) can be applied to explain the adjustment process of long-run equilibrium and short-run fluctuations. ECM is also used to draw the causal inference of the long-run and short-run relationship. So, we need to include short-term dynamics in equation (1) which can be done following Engle-Granger (1987) formulate. The error correction version of equation (1) gets the following form:

$$\Delta PCG_t = \alpha + \sum_{k=1}^{n} \omega_k \Delta PCG_{t-k} + \sum_{k=0}^{n} \beta_k \Delta GNPL_{t-k} + \delta \varepsilon_{t-1} + \omega_t \quad (2)$$

Here, ε_{t-1} is a stationary residual form (1). In this specification, testing the cointegration between variables requires that all variables are non-stationary and residuals in (1) are stationary or ε_{t-1} in the second equation has significant negative coefficient. In reality, variables could have mixture of integration of order. In this ground, a more sophisticated cointegration testing method was developed by Pesaran *et al.* (2001) that do not need pre-unit root testing. ARDL is feasible and generates efficient estimates when variables have a mixture of integration of order zero, I(0) and integration of order one, I(1), but not integration

Quarter	PCG (%)	GNPL (%)	Quarter	PCG (%)	GNPL (%)	Quarter	PCG (%)	GNPL (%)
2008_Q1	16.97	13.15	2012_Q1	22	6.57	2016_Q1	12.9	9.92
2008_Q2	17.96	13.02	2012_Q2	19.4	7.17	2016_Q2	14.2	10.06
2008_Q3	22.31	12.34	2012_Q3	19.5	8.75	2016_Q3	15.2	10.34
2008_Q4	26.11	10.79	2012_Q4	19.7	10.03	2016_Q4	16.6	9.23
2009_Q1	26.55	11.12	2013_Q1	19.9	11.9	2017_Q1	15.3	10.53
2009_Q2	21.77	10.5	2013_Q2	16.6	11.91	2017_Q2	15.6	10.13
2009_Q3	18.18	10.36	2013_Q3	12.7	12.79	2017_Q3	16.1	10.67
2009_Q4	13.55	9.21	2013_Q4	10.9	8.93	2017_Q4	15.9	9.31
2010_Q1	13.65	9.41	2014_Q1	11.1	10.45	2018_Q1	17.8	10.8
2010_Q2	19.2	8.67	2014_Q2	10.6	10.75	2018_Q2	18.1	10.4
2010_Q3	19.5	8.47	2014_Q3	11.5	11.6	2018_Q3	18	11.5
2010_Q4	25.4	7.27	2014_Q4	12.3	9.69	2018_Q4	17	10.3
2011_Q1	26.6	7.27	2015_Q1	12.2	10.47	2019_Q1	14.7	11.9
2011_Q2	27.6	7.14	2015_Q2	13.5	9.67	2019_Q2	13.2	11.7
2011_Q3	29.1	7.17	2015_Q3	13.6	9.89	2019_Q3	12.4	12
2011_Q4	25.8	6.12	2015_Q4	13.2	8.79	2019_Q4	11.3	9.3

Source(s): Quarterly Report of Banking Regulation and Policy Department, Bangladesh Central Bank

Table 1.
Quarterly data of PCG and growth of GNPL of banks operated in Bangladesh

of order two, I(2) because the software system will crash if a variable has I(2) (Pesaran and Shin, 1998). In the ARDL model specification, ε_{t-1} in equation (2) is replaced by lagged linear combination of all variables. This new ECM is known as ARDL which takes the following form:

$$\Delta PCG_t = \alpha + \sum_{k=1}^{n} \omega_k \Delta PCG_{t-k} + \sum_{k=0}^{n} \beta_k \Delta GNPL_{t-k} + \delta_1 PCG_{t-1} + \delta_2 GNPL_{t-1} + u_t \quad (3)$$

The decision of optimal lag selection of variables can be based on Akaike information criterion (AIC) and Schwarz Bayesian criterion (SBC). The bound testing procedure uses the joint *F*-statistic or Wald statistic. The null hypothesis states no cointegration, H_0: $\delta_1 = \delta_2 = 0$, against the alternative; H_0: $\delta_1 \neq \delta_2 \neq 0$ that supports cointegration. The bound testing generates two critical values: a lower critical bound that supposes all variables are I (0) and an upper critical bound that assumes all variables are I (1). A long-run equilibrium relationship exists if the calculated *F*-statistic goes above the upper critical bound. But if the calculated *F*-statistic falls below the lower critical bound, then the long-run equilibrium relationship does not exist. An inconclusive decision arises if the calculated *F*-statistic falls between these two critical bounds.

4. Findings

4.1 Unit root and stationarity test results

Time series analysis requires that variables under study must need to be stationary. In turn, the stationarity of a variable implies that the first moment and the second moment of the variable is constant over the stipulated period. In most cases, economic variables are not stationary at their level; but some transformation techniques such as first difference, second difference, natural logarithmic transformation and many more can be used to make them stationary. In this vein, testing for unit root or stationarity is mandatory before conducting time series analysis (Arltova and Fedorova, 2016). The following table shows the unit root and stationarity test results of PCG and GNPL (see Table 2).

PCG has an integration of order one, but GNPL has an integration of order zero at a 5% significant level according to the *Augmented Dickey–Fuller (*ADF) test. The Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test demonstrates that GNPL has an integration of order one, but PCG has an integration of order zero at a 2.5% significant level. The lag selection criterion is AIC with a maximum lag of 4 for the ADF test, while KPSS uses an automatic optimum lag selection procedure. We cannot reach a conclusive decision about the order of integration of variables. It motivates us to apply the ARDL cointegration methodology since it becomes more plausible when variables have different orders of integration to none of them having integration of order two.

4.2 Bound test results

The long-run equilibrium relationship between PCG and GNPL is tested by employing ARDL bound test. We assume an unrestricted intercept and no trend in the ARDL model specification. The results are reported in Table 3.

	ADF	KPSS
PCG	I (1)*	I (0)**
GNPL	I (0)*	I (1)**

Note(s): * and ** are significant at the 5% and 2.5% level, respectively

Table 2.
Integration of order of variables

As can be seen, the *F*-statistics (10.721) stands above the critical values (both the upper bound and lower bound). At the same time, the t-statistics (−4.494) also falls below the critical values (both the upper bound and lower bound). Hence, a long-run equilibrium relationship between PCG and GNPL is evident and can robustly be inferred from these statistics. However, both the *F*-statistics and *t*-statistics refute the possibilities of a long-run equilibrium relationship if we consider GNPL as a dependent variable and PCG as an independent variable. Thus, the bound test ensures the existence of a unique cointegrating vector and can confirm the rationale of choosing the ARDL method of cointegration analysis.

4.3 ECM results

We examine the long-run adjustment procedure or the speed of the adjustment process between PCG and GNPL. It helps us understand how the equilibrium relationship restores after exogenous shocks. The ECM can serve this purpose and can ascertain the direction of temporal causality. From table four, we can see the existence of a long-run unidirectional causality running from GNPL to PCG (see Table 4).

In the long run, GNPL contrasts PCG with having a negative significant coefficient of −2.32. So, for a 1% increase in GNPL, PCG will decline by approximately 2.32% in the long run. The findings also support short-run unidirectional causality running from GNPL to PCG with a positive significant coefficient (0.46). The adjustment process converges toward equilibrium with an adjustment speed of around 31% that is indicated by a statistically significant negative coefficient of ECT (−0.31). The model specification exhibits good explanatory power since the 47% variability of PCG is explained by GNPL. The root means the square error is reported to be 1.7073. It is a distance measure between the predicted value and the observed value.

4.4 Model stability and diagnostic testing

According to the Breusch–Godfrey LM test, there is no serial correlation among errors. The chi square-statistics is 2.151 with a probability value of 0.1425. The White and IM tests show the presence of unrestricted heteroskedasticity in the error term. Cusum squared test is utilized to examine the stability of the long-run and short-run coefficients. It ensures the stability of the coefficients since, at the 5% level of statistical significance, all the plots stay within the critical bounds. The graph of Cusum squared is given below (see Figure 2).

	Optimum Number of Lags[a]	Calculated *F*-statistic	Critical values[b] I(0)	I(1)	Calculated *t*-statistic	Critical values[b] I(0)	I(1)	Decisions
PCG is dependent and GNPL is independent	(3, 1)	10.721	4.94	5.73	−4.494	−2.86	−3.22	Long-run equilibrium exists
GNPL is dependent and PCG is independent	(4, 0)	2.539	4.94	5.73	−2.24	−2.86	−3.22	Long-run equilibrium does not exist

Table 3.
The result of ARDL bound test

Note(s): (a) The order of optimum number of lag is selected using AIC with maximum lag number of 4. Here, (3, 1) means that the dependent variable has past lags of 3 and the independent variable has pas lags of 1; (b) The critical values are given at 5% significance level which can be found in Pesaran *et al.* (2001)

5. Discussion and conclusion

The findings of this study confirm unidirectional causality running from GNPL to PCG both in the long run and short run for the banking sector of Bangladesh economy from 2008 to 2019. The findings contradict the theoretical guideline of Keeton (1999) that proposes causality moving from loan growth to loan losses (nonperforming loans). However, this paper supports the theoretical discussions of Accornero *et al.* (2017). The negative impact of GNPL on PCG, in the long run, reflects the scenario of the Bangladesh banking industry. The higher GNPL in the past (during the late 1990s) climbs up loan loss provisions. It adversely affects the profit and loss accounting of banks (Dey, 2019). In response, the whole banking industry becomes sensitive in sanctioning new loans to impose stringent collateral constraints and increase the loan prices. It reduces the PCG after some unexpected and unusual experience of nonperforming loans. It means, in the long run, banks seriously consider GNPL as a critical factor and signal of credit risk. In the short run, however, banks may not consider GNPL as an indicator of credit risk since it takes time for banks to declare a loan as nonperforming. The positive impact of GNPL on PCG in the short run could also be due to the manager's myopic concern about the reputation of banks in the competitive market (Accornero *et al.*, 2017). Therefore, it is observed for the Bangladesh banking sector that banks are sensitive in the long run but not in the short run to any change in the GNPL for making unfavourable loan decisions to the private sector.

Twofold policy implications can be drawn: for the credit risk management of banks and the legal and regulatory bodies of the Bangladesh banking system. Banks should initiate a

Variables Δ *PCG*	Coefficients	*R*-square	Adjusted *R*-square	Root MSE
GNPL	−2.32*	0.47	0.40	1.71
Δ *GNPLt–1*	0.46**			
ECT	−0.31*			

Note(s): * and ** are 1% and 10% level of significance, respectively

Table 4.
Causality test results

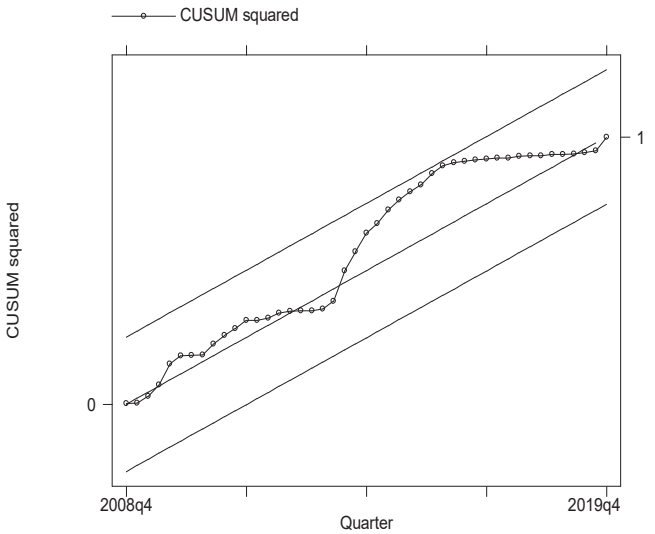

Figure 2.
Cusum squared

strategy to keep the GNPL in a band so that loan growth does not curtail the supply of funds for financing private investment projects. Proper credit management may reduce the volume of nonperforming loans and credit risk accordingly. Bankers of Bangladesh are advised to pay more caution on screening, monitoring and appraising business projects before sanctioning loans to avoid the problem of adverse selection, moral hazard and poor credit assessment (Ghosh *et al.*, 2020). Corrective and accurate policy strands need to be taken by the regulatory and legal bodies. Despite several reforms, the effectiveness of the policies and the efficiency of the legal system are questioned. The legal system ought to complement the regulatory policies to support the banking industry of Bangladesh.

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Further reading

Bangladesh Bank Quarterly (2021), available at: https://www.bb.org.bd/en/index.php/publication/publictn/2/7.

Corresponding author

N.M. Ashikuzzaman can be contacted at: nm.ashikuzzaman@northsouth.edu