DETERMINANTS OF GREEN CREDIT AND ITS INFLUENCE ON BANK PERFORMANCE IN BANGLADESH

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ABSTRACT

Green financing has emerged as a way to promote sustainable economic growth. Due to rising awareness about green finance and national commitments toward the sustainable development goals financial institutions across the world are encouraged in green lending or green credit. Governments and central banks in both developed and developing economies have formulated policies and regulations to promote green financing. Time series data of green credit ratio (GCR) reveal that the banks and other financial institutions of Bangladesh are gradually up-taking the green financing. Literature suggest that green credit have significant positive impact on bank profitability. However, all banks are not progressing at comparable pace in disbursing green credit. Moreover, ups and downs are observed in green lending. The eminent research question is therefore, what are the determinants of green credit? How do these determinants affect green lending? And how does green credit affect bank performance? This research investigates the determinants of green credit and their impact on the former. The research also analyzes the influence of green credit on bank performance. Variables of the study are identified by reviewing relevant literature. The hypotheses are tested using empirical data over the period of 2016 to 2018 from 20 commercial banks listed in Dhaka Stock Exchange. Data are collected from audited annual reports of the banks. Besides simple descriptive statistics, independent sample t-test and regression analysis are used to analyze data. Results indicated that green credit is a function of bank type, return on equity and financial stability. There is a cyclical relation of green credit with profitability and financial stability. In one hand, more profitable and financially stable banks disburse more green credit. In the other hand, banks disbursing more green credit turns out to be more profitable and financially stable. The relationship between green credit and other variables considered in the study namely the loan to deposit ratio and bank size were not statistically significant. The findings of the study provide evidence about the influence of green credit on financial performance and financial stability of banks. Such evidence is crucial for bankers and central bank authority to promote green lending further. However, due to limited data availability the results of the study may not be generalizable. Through this research, the researchers are raising the issue of data unavailability and inadequate standard reporting of green lending on the table. Stakeholders, especially the regulator should devise and implement policy regulations in this regard so that proper evaluation of green lending can be done in future.

Keywords: Green credit, determinants, bank performance.

INTRODUCTION

Sustainability is becoming one of the major concerns for everyday life of homo-sapiens, and it is no more related with natural or ecological environment only. John Elkington (1999) have pronounced about the three pillars of sustainability: economic, environment and social sustainability. Now, all countries of the world whether developed, developing or underdeveloped are concern about sustainability. In 2015, the United Nations adopted 17 Sustainable Development Goals (SDGs), by which all people will enjoy peace and prosperity by 2030. This was a universal call to action to end poverty, hunger, AIDS, discrimination against women, and protect the planet[1]. These interlinked 17 SDGs are to balance among three pillars of sustainability of John Elkington (1999). To ensure these SDGs, all organizations with, and sometimes without partnership with Government are working as part of corporate social responsibilities. The banking sector of Bangladesh has also taken several initiatives to fulfil SDGs. Green banking is a crucial part of those initiatives.

Green financing has emerged as a way to promote sustainable economic growth. The idea is to prioritize flow of fund to environment friendly endeavors. According to World Economic Forum (2020), green credit is any planned financial action or financial activity – a product or service, to ensure a better environmental result. In the 1990s, many investors started to look for those enterprises who were better of managing their environmental impact (Keane, 2009) for a sustainable economy (Blewit, 2014; and Chouinard, Ellison, and Ridgeway, 2011). Due to rising awareness about green finance and national commitments toward the sustainable development goals, financial institutions across the world are encouraged in green lending or green credit. Governments and central banks in both developed and developing economies have formulated policies and regulations to promote green financing. The government of Bangladesh has established a number of flagship funds worth USD958 million (approximately) to finance green initiatives taken by public and private enterprises. Besides this, the central bank of Bangladesh instructed the commercial banks to form 'Climate risk Fund' and allocate at least 10% of their corporate social responsibility budget to the 'climate risk fund'; offer concessional refinancing schemes for green projects; and mandated 5% credit quota for direct green finance. Time series data of green credit ratio (GCR) reveal that the banks and other financial institutions of Bangladesh are gradually up-taking the green financing (Akhter, Yasmin and Fariha, 2021). Literature suggest that green credit have significant positive impact on bank profitability ((Julia and Kassim, 2019). However, all banks are not progressing at comparable pace in

[1] https://www.undp.org/sustainable-development-goals?utm_source=EN&utm_medium=GSR&utm_content=US_UNDP_PaidSearch_Brand_English&utm_campaign=CENTRAL&c_src=CENTRAL&c_src2=GSR&gclid=Cj0KCQjw_fiLBhDOARIsAF4khR0mcjE7YEJbuuB5ct9-2pl4btChtncLTKRQdM5F-NVtt4PNDYXEANoaAi-OEALw_wcB

disbursing green credit. Moreover, ups and downs are observed in green lending (Akhter, Yasmin and Fariha, 2021). The eminent research question is therefore, what are the determinants of green credit? How do these determinants affect green lending? And how does green credit affect bank performance? This research therefore, investigates the determinants of green credit and their impact on the former. The research also analyzes the influence of green credit on bank performance.

LITERATURE REVIEW

Green is the symbol of nature, energy, freshness, environment, and many more which is related with meaningful life, and credit means an amount of money a consumer or business has available to borrow from bank in general sense. According to Ullah (2013), activities under green banking are: (a) online banking; (b) green accounts (ATM Service); (c) power savings equipment; (d) green debit cards/ credit cards; (e) saving use of paper; (f) mobile banking; and (g) green financing/ credit. In Bangladesh, all the green banking activities are up warding in trends (Ahsan & Uddin, 2015). Beside this, the government of Bangladesh also has established a number of flagship funds worth USD958 million (approximately) to finance green initiatives taken by public and private enterprises.

Green credit or green finance is one of the crucial activities of green banking, which is to lessen the internal carbon footprint and external carbon emission (Lalon, 2015; Sahoo & Nayak, 2008; Bahl, 2012) which ensure sustainable ecological balances (Bhardwaj & Malhotra, 2013). Green credit means making investment in projects and/or enterprises that use eco-friendly technologies such as clean power generation, clean brick production, energy efficient and low-carbon emitting industries etc. (Höhne, and Fekete, 2012). Investment in effluent treatment plant, protection of biodiversity, industrial pollution control, water sanitation etc. are also considered as green finance (Hoshen, Hasan, Hossain et al., 2017).

In Bangladesh, to inspire green credit, Bangladesh Bank has issued a policy guideline to all scheduled banks in February 2011 and for all other new banks in September 2013. Bangladesh Bank also proposed various benefits, such as “Refinance Scheme” with a 5% window on loan interest premium for all commercial banks (Bangladesh Bank, 2017). However, most of the banks practice green banking only in a narrow scale and volume (Hoque, Mowla, Uddin et al. 2019). Thus, it is very crucial question why the banking sector still not interested to go for large scale financing in green projects or is it not be able to reduce the risk of banking sector.

Though green credit has positive impact on firm financial performance (Ganda, Ngwakwe & Ambe, 2015; Iwata & Okada, 2011; Laskowska, 2018; Rajput, Arora, and Khanna, 2013; and Zhou, Sun, Luo and Liao, 2021), banks consider risk associated with green credit in terms of management of investment risk and environmental risk and how to integrate that with credit appraisal procedure of banks (Hoque, Mowla, Uddin et al., 2019). To avoid all types of risks associated with green credit, organizations need to develop green credit policy. China is the example of the country who is following Green Credit Policy for their domestic business for a long. The main goal of this policy is to reduce the financial risks from the heavily-polluting industries, and improve financial sector stability (Aizawa, and Chaofei, 2010; and He, and Zhang, 2007). In 2017, Weber found benefits from following green credit policy by some Chinese banks, where positive relation is found between the sustainability performance and the financial performance. Cui et al. (2018) also examined the effect of green credit on the non-performing loan (NPL) ratio on 24 Chinese banks over 5 years and found that high ratio of green lending (size of lending) is positively linked with a lower NPL ratio. Yin, Zhu, Kirkilak-Uludag and Zhu, (2020) studied on the determinants of green credit and its impact on the performance of Chinese banks in 2020 with 13 independent variables including one dummy variable. The variables are: GCR (GFR/GFTL in this research), ROE, NPL, Z-score, SIZE (LogTA in this research), CAP, LD (LTDR in this research), Bank’s Tobin Q ratio, GGDP, GDP, INVEST, GAP, GM2, and State-owned Dummy variable. In this research, Green credit ratio or Green finance ratio (GCR or GFR) has positive and significant relationship with ROE, and Loan size (LnSIZE), and LD (LTDR); no significant relationship with CAP, NPL, GGDP, and Z-score; and significantly negative relationship with variable INVEST.

Many of the researchers in Bangladesh have worked on green banking practices, and prospects in Bangladesh (Hossain, Momen, Bir and Atique, 2016; Rifat, Nisha, Iqbal and Suviitawat, 2016; Roy, Sarker and Parvez, 2015; Rahman, Ahsan, Hossain and Hoq, 2015; Lalon, 2015; Shakil, Azam, and Raju, 2014; Ahmad, Zayed and Harun, 2013; Masukujjaman & Aktar, 2014; Islam, 2014; Islam & Das, 2013; Ullah, 2013) and few of them have also compared with local and global green banking practices (Julia & Kassim, 2019; Rahman, Ahsan, Hossain and Hoq, 2015; Masukuzzaman & Akter, 2014; Ullah, 2013). However, few of them have worked on implication of green financing on financial performance (Akhter, Yasmin, and Fariha, 2021; Rahman, Huq and Roy, 2018).

Rahman, Huq and Roy (2018) investigated the impact of green financing on profitability of 11 private commercial banks in over the period 2013-2015. They used green finance to total finance, asset and equity ratios as independent variables, where green financing to total investment ratio showed significant positive association with ROI but not with ROA and ROE. Akhter, et al., 2021 measured green finance ratio and green banking compliance ratio 30 listed commercial banks operating in Bangladesh. They found that 20 out of 30 banks have disclosed their green financing data in annual reports over the sample period (2016-2018). They used ROI, GBCR (Green Banking Credit Ratio) and GFR (Green Financial Ratio) as independent variables. GFR and GBCR both have significant positive influence on ROE only.

None of the research have found to work on the determinants of green financing or green credit; how these determinants affect green credit; and how does green credit affect bank performance in Bangladesh banking sector. Therefore, this study intends to provide an insight about the determinants of green credit, and its effect on bank performance in Bangladesh banking sector.

RESEARCH QUESTION, AND OBJECTIVES OF THE STUDY

Research Question: The main research question of this paper is: What are determinants of green credit, how do they affect green credit amount of a bank? How green credit and its determinants affect the financial performance of a bank?

Research Objective: The main objective of this study is to identiy the determinants of green credit, their influence on green credit and overall financial performance of a bank.

The specific objectives are:

- To identify the determinants of green credit (GCR) or green lending.
- To see how does these determinants affect green lending; and
- To see how does green credit and its determinants affect bank performance

METHODOLOGY

Sample and Data sources

This research is done based on secondary data. Data regarding the green credit is collected from published annual reports of DSE listed 30 commercial banks operating in Bangladesh. We scrutinized annual reports over last five years, but data regarding the amount of green credit disbursed by the banks was available only over three-year period (2016-2018). Moreover, out of the 30 listed commercial banks, 10 did not report green credit information over this three-year period. Therefore, this study considers 20 listed commercial banks who disclosed quantitative data on green credit over the period 2016-2018. Published literature and policy papers are scrutinized for overall understanding to the green lending practices in Bangladesh.

Analysis Technique

Besides simple descriptive statistics, independent sample t-test, correlation and regression analysis are used to analyze the data. Statistical Package for Social Sciences (SPSS) version 25 has been used.

Variables

Green Credit Ratios

Green credit means channeling funds to environment friendly projects. In other words, providing loans and/or refinancing to projects that likely to contribute towards conserving the environment and/or reducing the harmful effect on environment. Two measures of green credit ratio are used in this study. First, GCTL (green credit to total loan ratio), calculated by dividing the total amount of fund channeled to green projects by total investment made over a particular period. Some previous studies such as Rahman, Huq and Roy (2018); Julia and Kassim (2016) and Zhou, Sun, Lou and Liao (2021) used this ratio. Second, GCTA (green credit to total assets ratio), calculated by dividing the amount of green credit with total asset value (Zhou, Sun, Lou and Liao 2021).

Profitability Ratios

Two widely used measures of profitability namely Net profit margin (NPM) and return on equity (ROE) are used here. ROE refers to the ratio of the profits a company generates to the total amount of shareholders' equity found in the balance sheet (Ongore & Kusa, 2013). It reflects the efficiency in generating income for an organization's (in this case bank's) shareholders whose value maximization is the ultimate goal of any company (Yin, Zhu, Kirkulk-Uludag and Zhu, 2020).

NPM refers to the ratio of net income to total revenue. It is a measure of the effectiveness of sales or revenue in generating net income (Yin, Zhu, Kirkulk-Uludag and Zhu, 2020). Low NPM indicate lower profitability per unit of revenue generated.

Bank Size

Size can be measured in terms of total revenue, number of employees, number of branches etc. But such measures are not considered objective. Total asset value is a better representation of firm size. But when using this in regression equation of statistical analysis with other variables expressed in decimal values of percentage (e.g. ROE, NPM, GCTL etc) scale incompatibility may give spurious results; that is why the logarithm of total assets represented by LogTA is widely used as proxy of firm size (Yin, Zhu, Kirkulk-Uludag and Zhu, 2020 and Rahman, Huq and Roy, 2018)

Financial Risk

Deposits are ideally the source of fund and debts are the use of fund for banks. Too much lending without adequate deposit and reserve capital is a signal of liquidity problem and financial risk. Many researchers such as Zhou, Sun, Lou and Liao (2021); and Yasmin and Islam (2020) have asserted that total loan to deposit ratio (LTDR) is a proxy of bank liquidity and financial risk.

Financial Stability

Altman's Z score, a widely used measure of financial stability is used to measure banks' financial stability (Boyd and DeNicolo, 2005; Laeven and Levine, 2008; Berger and Bouwman, 2013). High Z-score represent better financial stability hence lower risk. It is composite of a number of performance measures. the following formula is used to determine the value of Z.

$Z = (1.2 \times A) + (1.4 \times B) + (3.3 \times C) + (0.6 \times D) + (0.999 \times E)$

Where, A = Working capital / total assets; B = Retained earnings / total assets; C = Earnings before interest and tax payment /total assets; D = The equity's market value / total assets and E = Total sales / total assets.

Bank Type

Another variable named Bank Type is used to estimate whether Islamic vs Conventional banking practices have any impact on green credit. Conventional commercial banks are represented by dummy value 1 and the dummy value for the Islamic banks are taken to be 0.

FORMULATION OF THE HYPOTHESES

A large group of literature focusing green credit have investigated the influence of green credit on several aspects of bank performance e.g. environmental and credit risk, profitability, financial stability etc. For instance, Ng (2018) suggests that a green credit policy is a successful approach that embeds environmental risk management into financial credit risk assessment. Green credit is asserted to be a practical tool for banks to minimize credit risks, and to achieve better financial performance and financial stability (Aizawa and Chaofei, 2010; Zhang, yang, and Bi., 2011; Pang and Zadek.,2015).

Similarly, Tan (2020), Wu and Shen (2013) and Sufian and Habibullah (2009) argue that green credit policy drives banks to seek new green customers, which helps them to explore the new market thereby enhance the loan to deposit ratio and profitability. Weber, Hoque and Islam (2015); Goss and Roberts (2011); Weber, Scholz and Michalik (2010); and Bauer and Hann (2010) suggest that banks with a higher ratio of green lending have a lower credit risk hence better financial stability. According to credit risk theory, environmental risks influence major credit risk components, such as Altman's (1968) liquidity, profitability, and solvency ratio directly because of higher environmental costs and less income from non-green businesses. Furthermore, higher interest rates for polluting borrowers and even restrictions with regard to access to credit reduce their solvency and activity ratio thereby enhance financial risk and reduce financial stability. However, Ho (2018) negates the positive association of green credit with profitability and financial stability. He argued that green projects usually need a longer time to return an investment than ordinary projects. Longer maturity loans occupy more resources, which makes future cash flow hard to predict hence green finance may have negative influence on financial stability. Hence, we hypothesize the following-

H_{01}: Green credit has no influence on financial performance
H_{a1}: Green credit has positive influence on financial performance
H_{02}: Green credit has no influence on financial stability
H_{a2}: Green credit has positive influence on financial stability
H_{03}: Green credit has no influence on loan to deposit ratio
H_{a3}: Green credit has positive influence on loan to deposit ratio

But researchers like, Yin, Zhu, Kirkulk-Uludag and Zhu (2020) assert that banks with higher profitability level tend to give more green credit to firms. They also argue that banks with lower risk or higher financial stability is more likely to focus on green lending. However, the results of their study based on data from Chinese commercial banks reveal that financial risk or stability has no significant influence on the green credit ratios. Such results suggest that financial instability or risk level is not a barrier for banks issuing green credits. Therefore, the following hypotheses are formulated –

H_{04}: Financial performance has no influence on green credit
H_{a4}: Financial performance has positive influence on green credit
H_{05}: Financial stability has no influence on green credit
H_{a5}: Financial stability has positive influence on green credit

Moreover, Yin, Zhu, Kirkulk-Uludag and Zhu (2020); and Yin and Matthews, 2018 found that large banks are more likely to have a higher level of green lending. Hence, we hypothesize the following-

H_{06}: Bank size has no influence on green credit
H_{a6}: Bank size has positive influence on green credit

Yin, Zhu, Kirkulk-Uludag and Zhu (2020) study also asserts that high loan to deposit ratio means higher propensity to lend, which tends to lead a higher level of green credit disbursement. Therefore, we hypothesize the following-

H_{07}: Loan to deposit ratio has no influence on green credit
H_{a7}: Loan to deposit ratio has positive influence on green credit

In addition to the above, we believe that bank type meaning conventional or Islamic may have some influence on green credit. In fact, the idea of green banking is conceived with an objective to preserve the environment and surroundings by being economical in every deed and transaction so that the future generation can enjoy a better living environment. All these objectives of green banking let alone green lending are in line with Shariah and meet the Maqasid Shariah based on various verses of the Holy Quran and Hadith of Prophet Muhammad (pbuh) (Julia and Kassim, 2016). Hence, the following hypotheses are formulated.

H_{08}: Bank type has no influence on green credit
H_{a8}: Bank type determines the amount of green credit

FINDINGS OF THE STUDY

This section presents the findings of the study. First the status of green credit is presented. Then descriptive statistics of the green credit, its determinants and profitability measures are portrayed. Finally, the results of correlation and regression analysis and t-test are displayed.

Status of Green Finance

It is found that 20 out of 30 banks in our sample have disclosed their green financing data in annual reports over the sample period (2016-2018). As part of green financing initiatives, a large number of banks have provided loans to a number of noncompliance garment factories to convert them into environmentally complied factories.

Figure 1: Bank-wise green credit amounts (2016-2018)

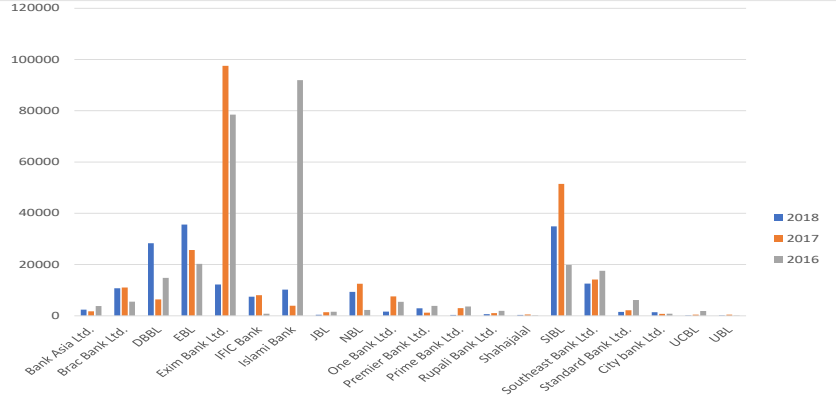

Figure 1: Green Finance Amount (in billion Taka)

Another good number of banks provided funds for establishing environment friendly industries and produce green products. Amount of green credit disbursed over the period of 2016 to 2018 are respectively 8651.46 billion Taka (2018), 12534.08 billion Taka (2017) and 14030.97 billion Taka (2018). Figure 1, displays the amount of green credit disbursed by the sample banks over the sample period. In 2016, Islamic Bank Bangladesh Ltd (IBBL) was the largest green lender, followed by Exim Bank. The top two green lender of 2017 were Exim bank and Social Islamic Bank Ltd. (SIBL). In 2018, SIBL was the leader of green credit followed by Eastern Bank Ltd. (EBL) and Dutch Bangla Bank Ltd. (DBBL).

Descriptive Statistics

Table 1 displays descriptive statistics (mean, median, standard deviation, max, min, skewness and kurtosis values) of the variables used in this study. In case of all the variables except GFTL and GFTA mean and median values are almost equal. GFTL, GFTA and LogTA shows slight positive skewness and the rest show slight negative skewness. High kurtosis values (greater than 3) of GFTA, ROE and NPM reveal flat distribution, whereas GFTL and LogTA (kurtosis value close to 3) represent bell shaped distribution and LTDR and Z represent (kurtosis less than 3) thin distribution.

Table 1: Descriptive Statistics

	GFTL	GFTA	LogTA	ROE	NPM	LTDR	Z
Mean	15.98%	3.72%	5.45	10.91%	18.27%	86.26%	4.67%
Median	8.57%	1.27%	5.45	10.25%	18.49%	86.98%	4.56%
SD	18.60%	5.95%	0.16	4.91%	7.67%	11.52%	1.19%
Max	87.80%	29.21%	6.00	26.11%	33.79%	111.57%	8.40%
Min	0.14%	0.04%	5.18	-10.23%	-18.69%	56.26%	1.97%
skew	1.78	2.80	1.21	-0.70	-1.82	-0.63	0.96
kurtosis	3.56	8.58	2.88	6.07	8.26	0.60	2.10

We have run independent sample t-test in order to investigate whether there is any difference between the Islamic and conventional commercial banks in terms of green credit and its determinants. The results of t-test are presented is presented in Table 2 and Table 3. Table 2 presents the mean and standard deviation of the variables for Islamic and conventional banks. High value of F-statistics of Levin's test results in Table 3 for LogTA, GFTA, ROE, LTDR, and Z indicate that equal variance can be assumed for these variables. For the other variables, namely GFTL and NPM equal variance cannot be assumed. Based on the two-tail sig. values in Table 3 it is asserted that conventional and Islamic banks have different mean values of LogTA, GFTA, ROE and Z. The mean differences are respectively 0.091, 5.55, -0.433 and -1.012 meaning that the Islamic banks have higher average LogTA and GFTA but lower average ROE and Z that those of conventional banks. Hence, the hypothesis H_{08} is rejected when GFTA is used as the measure of green credit. But the hypothesis is accepted when green credit is measured by GFTL.

Table2: Islamic versus Conventional Bank Statistics

Variables	Bank Type	N	Mean	Std. Deviation
GFTL	Islamic	15	13.303	13.617
	Conventional	45	16.878	20.046
LogTA	Islamic	15	5.521	0.240
	Conventional	45	5.430	0.122
GFTA	Islamic	15	7.855	9.889
	Conventional	45	2.340	2.934
ROE	Islamic	15	10.585	2.162
	Conventional	45	11.018	5.550
NPM	Islamic	15	19.441	5.613
	Conventional	45	17.876	8.257
LTDR	Islamic	15	90.364	6.193
	Conventional	45	84.893	12.570
Z	Islamic	15	3.907	0.365
	Conventional	45	4.920	1.267

Table 3: Results of Independent Sample Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
GFTL	Equal variances assumed	1.01	0.32	-0.641	58.000	0.524	-3.575	5.575
	Equal variances not assumed			-0.775	35.618	0.444	-3.575	4.614
LogTA	Equal variances assumed	7.84	0.01	1.928	58.000	0.059	0.091	0.047
	Equal variances not assumed			1.412	16.473	0.176	0.091	0.064
GFTA	Equal variances assumed	35.83	0.00	3.370	58.000	0.001	5.515	1.637
	Equal variances not assumed			2.129	14.830	0.050	5.515	2.591
ROE	Equal variances assumed	4.47	0.04	-0.293	58.000	0.770	-0.433	1.476
	Equal variances not assumed			-0.434	56.428	0.666	-0.433	0.998
NPM	Equal variances assumed	0.22	0.64	0.682	58.000	0.498	1.565	2.296
	Equal variances not assumed			0.823	35.588	0.416	1.565	1.901
LTDR	Equal variances assumed	4.56	0.04	1.615	58.000	0.112	5.471	3.388
	Equal variances not assumed			2.221	49.280	0.031	5.471	2.463
Z	Equal variances assumed	6.43	0.01	-3.036	58.000	0.004	-1.012	0.333
	Equal variances not assumed			-4.794	57.454	0.000	-1.012	0.211

Correlation Analysis

The results of correlation analysis presented is Table 4 reveal that GFTL and GFTA have significant positive association. GFTL shows statistically significant positive correlation with ROE and Altman's Z score. The correlation with other variables like LogTA, NPM and LTDR are not statistically significant. ROE shows significantly high positive correlation with NPM and Z, hence there is multi-co-linearity problem among these variables. In order to rectify this problem, ROE is not included as one of the independent variables when multiple linear regression analysis is done.

Table 4: Correlation Matrix

	GFTL	LogTA	GFTA	ROE	NPM	LTDR	Z
GFTL	1.000	-0.024	**0.566**	**0.341**	0.214	-0.096	**0.433**
LogTA		1.000	0.091	-0.240	**-0.297**	-0.044	-0.118
GFTA			1.000	0.123	0.230	0.040	-0.048
ROE				1.000	**0.783**	0.060	**0.701**
NPM					1.000	**0.292**	**0.353**
LTDR						1.000	-0.234
Z							1.000

Note 1: **Bold faced** indicate statistically significant at alpha less that 5%

Note 2: ROE has significantly high positive correlation with NPM and Z, hence there is multicolinearity issue

Regression Analysis

Results of simple linear regression analysis with GFTL as the dependent variable is presented in Table 5 below. Among the independent variables taken into consideration only ROE and Altman's Z score show significant positive association with GFTL.

Table 5: Simple linear regression results (GFTL)

Independent va	R-square	F-statistic	Sig.	B	beta	Constant
Bank Type	0.70%	0.411	0.524	3.57	0.084	13.3
LogTA	0.10%	0.034	0.854	-2.78	-0.024	31.16
ROE	11.60%	7.62	0.008	1.29	0.341	1.9
NPM	4.60%	2.789	0.1	0.52	0.214	6.49
LTDR	0.90%	0.542	0.465	-0.155	-0.096	29.39
Z	18.70%	13.352	0.001	6.742	0.433	-15.477

Based on the results of simple regression analysis following regression models are developed-

GFTL = 13.3 + 3.57 Bank Type (1)
GFTL = 31.16 -2.78 LogTA (2)
GFTL = 1.9 + 1.29 ROE (3)
GFTL = 6.49 + 0.52 NPM (4)
GFTL = 29.39 – 0.155 LTDR (5)
GFTL = -15.477 + 6.742 Z (6)

Among the models presented above only model 3 and model 6 is statistically significant at 95% confidence interval. Hence, the null hypotheses H_{04} and H_{05} are partially rejected.

Results of simple linear regression analysis with GFTA as the dependent variable is presented in Table 6 below. Among the independent variables taken into consideration only Bank Type shows significant positive association with GFTA.

Table 6: Simple linear regression results (GFTA)

Independent va	R-square	F-statistic	Sig.	B	beta	Constant
Bank Type	16.40%	11.354	0.001	-5.515	-0.405	7.855
LogTA	0.80%	0.481	0.491	3.33	0.091	-14.439
ROE	1.50%	0.894	0.348	0.149	0.123	2.089
NPM	5.30%	3.249	0.077	0.17	0.23	0.453
LTDR	0.20%	0.092	0.762	0.021	0.04	1.941
Z	0.20%	0.133	0.717	-0.238	-0.048	4.831

Based on the results of simple regression analysis following regression models are developed-
GFTA = 7.855 - 5.515 Bank Type (7)
GFTA = -14.439 +3.33 LogTA (8)
GFTA = 2.089 + 0.149 ROE (9)
GFTA = 0.453 + 0.17 NPM (10)
GFTA = 1.941 + 0.021 LTDR (11)
GFTA = 4.831 - 0.238 Z (12)

Among the models presented above only model 7 is statistically significant at 95% confidence interval. Hence the null hypothesis H_{08} is partially rejected. That means, bank type influences green credit when measured by GFTA. Conventional banks have negative prevalence of green lending.

Table 7 presents the results of multiple linear regression with GFTL as the dependent variable. The model derived and presented below is statistically significant and explains 19.7% of the variability is GFTL.

GFTL** = -31.436 – 2.82 Bank Type + 3.56 Log TA + 0.18 NPM – 0.05 LTDR **+ 6.653 Z *(13)*

Table 7: Multiple linear regression results (GFTL)

R-square	19.70%		
F	2.658		
Model Sig.	0.032		
Independent variable	B	beta	Sig.
Constant	-31.436		0.724
Bank Type	-2.82	-0.066	0.645
LogTA	3.56	0.031	0.818
NPM	0.18	0.076	0.629
LTDR	-0.05	-0.031	0.825
Z	6.653	0.427	0.008

Null Hypothesis H_{013} is rejected. That means, bank type, size, profitability and risk level determine GFTL. However, among the independent variables included in the model only Z is found to be statistically significant.

The results of multiple linear regression analysis with GFTA as the dependent variable is presented in Table 8.

Table 8: Multiple linear regression results (GFTA)

R-square	21.60%		
F	2.976		
Model Sig.	0.019		
Independent variable	B	beta	Sig.
Constant	-3.51445		0.90066
Bank Type	-5.2413	-0.384537	0.00862
LogTA	2.384027	0.06490753	0.62702
NPM	0.196957	0.25371665	0.10498
LTDR	-0.05915	-0.1144652	0.40439
Z	-0.07093	-0.0142257	0.92613

The regression model is presented below-

$$\textbf{\textit{GFTA}} = -3.51 - \textbf{5.24 Bank Type} + 2.38\ LogTA + 0.197\ NPM - 0.059\ LTDR - 0.07\ Z \quad (14)$$

The model is found to be statistically significant. Hence, the null hypothesis H_{014} is rejected. GFTA is determined by bank type, size, profitability and risk level. These variables together explain 21.6% of the variability in GFTA. However, among the independent variables included in the model only Bank Type is found to be statistically significant.

Table 9 presents the results of multiple regression analysis using GFTL and GFTA as independent variable.

Table 9: Multiple linear regression results with GFTL and GFTA as independent variables

Dependent variable	R-square	F-statistic	Model Sig.	Constant	Independent variable	B	beta	Sig.
ROE	12.35%	4.008	0.024	9.542	GFTL	0.105	0.399	0.01
					GFTA	-0.085	-0.103	0.498
NPM	6.30%	1.928	0.155	16.686	GFTL	0.051	0.123	0.431
					GFTA	0.207	0.16	0.307
LTDR	2.25%	0.652	0.525	86.992	GFTL	-0.108	-0.175	0.276
					GFTA	0.269	0.139	0.386
Z	31.35%	12.998	0.000	4.294	GFTL	0.043	0.676	0.0000
					GFTA	-0.086	-0.431	0.002
LogTA	1.70%	0.482	0.620	5.453	GFTL	0.0000	-0.111	0.4880
					GFTA	0.004	0.154	0.339

Following regression models are developed from the regression results-

$$\textbf{\textit{ROE}} = 9.542 + 0.105\ \textbf{\textit{GFTL}} - 0.085\ GFTA \quad (15)$$
$$NPM = 16.686 + 0.051\ GFTL + 0.207\ GFTA \quad (16)$$
$$LTDR = 86.992 - 0.108\ GFTL + 0.269\ GFTA \quad (17)$$
$$\textbf{\textit{Z}} = 4.294 + 0.043\ \textbf{\textit{GFTL}} - 0.086\ \textbf{\textit{GFTA}} \quad \textbf{(18)}$$
$$LogTA = 5.453 + 0.0\ GFTL + 0.004\ GFTA \quad (19)$$

Among these five models only model 15 and 18 is found to statistically significant. Hence, null hypotheses H_{01} and H_{02} are rejected. That means GFTL has significant positive influence on profitability when measured by ROE. GFTL has significant positive influence on financial stability Z, whereas GFTA has significant negative association.

Multiple linear regression was also run using the measures of financial performance or profitability as the dependent variable to test how green credit and its determinants affect profitability of the commercial banks. Results are presented in Table 10 (ROE is the dependent variable) and Table 11 (NPM is the dependent variable) respectively.

Table 10: Multiple linear regression results (ROE)

R-square	63.20%		
F	15.166		
Model Sig	0.0000		
Independe	B	beta	Sig.
Constant	23.089		0.124
Bank Type	-2.63	-0.234	0.031
LogTA	-6.11	-0.202	0.024
GFTL	-0.01	-0.046	0.715
LTDR	0.08	0.19	0.034
Z	3.427	0.833	0.0000
GFTA	0.087	0.105	0.402

Table 11: Multiple linear regression results (NPM)

R-square	42.40%		
F	6.501		
Model Sig	0.0000		
Independe	B	beta	Sig.
Constant	58.095		0.06
Bank Type	-2.82	-0.161	0.23
LogTA	-13.57	-0.287	0.011
GFTL	-0.055	-0.133	0.403
LTDR	0.23	0.347	0.002
Z	3.412	0.531	0.0000
GFTA	0.359	0.278	0.081

Following two regression models can be developed from the results of the regression analysis. Both the models are statistically significant. Model 20 explains 63.2% variability of ROE and model 21 explains 42.4% variability of NPM.

ROE = 23.089 ***-2.63 Bank Type – 6.11 LogTA*** *– 0.01 GFTL* ***+ 0.08 LTDR + 3.427 Z*** *+ 0.087 GFTA* *(20)*

NPM = 50.095 – 2.82 Bank Type ***– 13.57 LogTA*** *– 0.055 GFTL* ***+ 0.23 LTDR + 3.412 Z*** *+ 0.359 GFTA* *(21)*

However, in none of the models the measures of green credit (GFTA and GFTL) are statistically significant. Among the independent variables considered Bank Type, LogTA, LTDR and Z are found to be statistically significant in model 20. Incase of model 21, the variables having statistical significance are LogTA, LTDR and Z.

Hence the determinants of green credit affect profitability but green credit itself does not have any direct significant impact on profitability.

ANALYSIS OF THE FINDINGS

Results indicate that Bank Type is a determinant of green credit. Islamic Banks have higher average green credit than the conventional banks. T-test results as well as simple and multiple regression results assert this and thereby support the argument posed by Julia and Kassim (2016). However, such assertion is statistically significant only when green credit is proxied by GFTA not by GFTL. Such an anomaly may be due to the moderate correlation between GFTA and GFTL which is a result of low correlation between total assets (TA) and total loan (TL). Although loans and advances comprise a significant proportion of a bank's total asset, TA and TL may have low correlation in case other assets (total asset net of loans and advances) changes independent of the loans and advances.

The results of regression analysis reveal that Financially stable (high Z-score) and profitable (high ROE) banks disburse more green credit (high GFTL). Such results are in line with that of Yin, Zhu, Kirkuluk-Uludang and Zhu (2020) study on Chinese commercial banks. Hence, ROE and Z-score are the determinants of green credit. In fact, a cyclical relationship is found between green credit and these two determinants. Banks with high GFTL generate high ROE and Z score. A number of past researches such as Tan (2020); Wu and Shen (2013); Weber, Hoque and Islam (2015); Goss and Roberts (2011); and Bauer and Hann (2010) found the same.

However, unlike the findings of Yin, Zhu, Kirkulk-Uludag and Zhu (2020); and Yin and Matthews, (2018) this research did not find any significant association of bank size (LogTA) and loan to deposit ratio (LTDR) with green credit.

CONCLUSION

This is one of the pioneering research projects on the determinants of green credit in the context of the commercial banks in Bangladesh. The findings of the study provide evidence about the influence of green credit on financial performance and financial stability of banks. Such evidence is crucial for bankers and central bank authority to promote green lending further. However, due to limited data availability the results of the study may not be generalizable. Through this research, the researchers are raising issue of data unavailability and inadequate standard reporting of green lending on the table. Stakeholders, especially the regulator should devise and implement policy regulations in this regard so that proper evaluation of green lending can be done in future. Further

research, on the topic including nonbank financial institutions will capture a more comprehensive view of the green lending scenario of the country. Cross-country analysis may be pursued to benchmark local scenario at the international level.

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