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Dr. Pranjal Morang, M.Sc., Ph.D., Post Doc.
Principal i/c

Email: pduamtulungia@gmail.com
Mobile: 9864327718

Patron's Message

I am delighted to release the sixth issue of PDUAMT Business Review - an International Peer-Reviewed Annual Journal of Pandit Deendayal Upadhyaya Adarsha Mahavidyalaya, Tulungia, Bongaigaon. The journal provides a platform for researcher of the commerce domain for sharing their knowledge and insights since 2019. The research papers and article published in the current issue will enrich stakeholders. I assume this endeavor will offer a new tagline to the academic environment of the institution. Lastly, I express my sincere gratitude to all scholars, academicians and well-wishers for their noteworthy involvement to enrich the journal.

Dr. Pranjal Morang
Patron

Editorial

Dear Readers,

It springs an immense pleasure to publish the sixth issue of the PDUAMT Business Review. This issue is enriched by the academic community across the globe. The issue covers ten research studies contributed by the valued authors on the areas of managerial ownership on the tax-expertise and profitability, financial literacy and financial well-being, merger on asset quality and profitability, disrupt technology in banking industry, impact of behavioural biases on investment decision-making etc. The present issue will fill up the vacuum in existing literatures.

Lastly, I am indebted to the contributors for their valuable contributions. I am also grateful to authority concerned for the responsibility entrusted upon me.

Dr. Porag Pachoni
Editor

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Moderating the Impact of Managerial Ownership on the Tax-Expertise and Profitability Relationship of Nigerian Consumer Goods Companies

Ibrahim Abubakar Abubakar[1], Habib Abdulkarim[2], Iliya Garba[3] & Habiba Adamu[4]

Abstract

The study investigated the impact of management ownership on the relationship between tax expertise and profitability in consumer products firms located in Nigeria. Data for the research was gathered from the annual reports and accounts of the sampled companies from 2007 to 2019. Fifteen (15) of the twenty companies that made up the population were used as sample. The data was analyzed using regression analysis. Board size has a negative and negligible effect on the profitability of the tested companies. Tax knowledge, age, and managerial ownership considerably and favorably impacted consumer products companies' profitability. The study recommended that consumer goods companies include tax experts on their board, give management shareholding, and limit the size of board members in order to increase the profitability of the Nigerian consumer goods companies that were sampled.

Keywords: tax expertise, managerial ownership, board size, age and profitability

JEL Classification: M21, M40, M49

[1, 2, 3, & 4]Department of Accounting, Gombe State University

Introduction

Corporate entities aim to improve their financial performance in order to draw in investors and present a favorable image. Profit generating that is consistent will help achieve this. Profit is not only a critical component in assessing the effectiveness and performance of an organization, but it also plays a significant role in determining the growth and health of any given economy (Batra 2016). Profitability is a measure of efficiency, control and worth of investments to owners, a margin of safety to creditors, employee benefit pools, a measure of taxable capacity, and the basis for government legislative action, according to Weston & Brigham, 1968 as cited in Tanko, 2020. Profitability is a measure of the country's economic development and progress as well as the improvement of its residents' standard of living. It assesses a business's efficiency in using its resources and ability to generate enough revenue to pay all necessary, exclusive, and reasonable expenses, including taxes, with a surplus that may be reinvested in the business for expansion (Abiola & Lateef, 2020). Profitability is a goal shared by all businesses, but high taxes and expenses often make this impossible (Akintoye, Adegbie, & Onyeka-Iheme, 2020).

Seventy percent of domestic telecom enterprises have closed their doors due to high tax loads, and nine out of 10 indigenous telecom companies would fail within the next five years. In the last ten years, almost 80 airlines have disappeared, and out of the 756 businesses approved by the commission, 568 have collapsed. Many production sites have been closed by the Nigerian Bottling Company's (NBC) administration. The business environment for the food and beverage industry is becoming worse due to tax concerns (Festus, 2022). Telecom companies in Nigeria have to pay over thirty different taxes and fees. Due to all of these fees and taxes, the country's industry is expanding more slowly (Anuforo, 2022). Tax expenditures increase the cost of production and reduce the distributable profits that stakeholders can get. Therefore, in order to prevent having a detrimental effect on cash flow and investing capacity, they must be properly and legally prepared for and minimized. Hiring a tax expert can help with this. Although firms are encouraged to have at least one tax expert on their board, many are unaware that tax experts can assist in developing strategies to lower taxes owed and increase profitability without breaking any tax laws. Tax professionals are able to identify legal loopholes in the tax code and exploit them to reduce. Simultaneously, the management may exhibit little collaboration in regards to tax manipulation for increased profitability, maybe due to their desire to avoid being associated with tax defaulters. Another reason can be that they don't own any stock in the business. Nonetheless, if managers own stock in a firm, the volume of shares will rise in proportion to the amount of shares the management introduced; this will encourage investment and may boost the profitability of Nigerian companies (Ibrahim et al., 2023). Board members' ownership of shares can give management the ability to engage in tax planning to safeguard their financial stake in the business. Because the owner, who also serves as the company's manager, can directly share in the benefits and risks of every decision made, managerial ownership has the potential to increase profitability. This is because the owner, who also serves as the manager, is naturally inclined to want a good return and can take advantage of every opportunity to earn one.

Businesses can now manage their tax problems in a way that benefits their shareholders thanks to changes in global tax rules and accounting standards. However, in an attempt to control their finances, firms end up paying more in taxes than they are obligated to. Ibrahim et al. (2023) made an effort to investigate how tax knowledge affected consumer goods companies' profitability, but no research looked at the moderating effect of managerial ownership. Therefore, the moderating effect of managerial ownership on the association between tax expertise and profitability of Nigerian consumer products companies was investigated in this study.

There is a dearth of research in both developed and developing nations about the effects of managerial ownership on tax knowledge and firm profitability. This type of research is expected to contribute to the empirical body of knowledge about the role of tax experts on taxes and profitability, with management ownership acting as a moderator, in developing countries. The results of the study would serve as helpful library material and reference information for academics and students who might like to do related research in this area. The sector's users of accounting data, including management, shareholders, investors, financial analysts, and other stakeholders, would benefit from this research since it will help them make a range of financing and investment decisions. Professional accounting associations would benefit most from this study since the results will be used to improve the tax education programs that are provided to their members. Consequently, this study deepens our comprehension. The purpose of the study was to determine whether management ownership, specifically in this context, moderates the impact of tax knowledge on the profitability of conglomerate companies operating in Nigeria.

Review of Literature

The concepts of expertise reversal theory and tax expertise and profitability are examined in this section as they form the basis of the current study.

Concept of Tax Expertise

Bonner and Lewis (1990) defined expertise as increased performance on a task-specific basis. Definitions of competence that are based on performance or knowledge are both appropriate. From a knowledge-based approach, expertise is the capacity to carry out tasks requiring a high level of procedural understanding. Expertise, from a performance-based viewpoint, is the ability to do tasks related to one's work effectively. Therefore, whereas the knowledge-based approach emphasizes the information and skill necessary for expert performance, the performance-based view clearly admits that these cognitive abilities must be applied to tasks in a way that promotes superior performance (Davis & Solomon, 1989). Accounting financial expertise is defined as the proportion of audit committee members who are listed in the corporate library as having accounting experience as a public accountant, auditor, controller, principal or chief financial officer, or chief (principal) accounting officer (2012). Directors with extensive financial expertise, such as the CEO or president of the company, or those with direct accounting experience, such as a CPA or auditor, are considered to have financial competence according to the SEC's rigorous definition. For the purposes of this study, a director or management committee member with knowledge of accounting and/or taxation is regarded as a tax expert.

Concept of Profitability

A company's performance is only reliant on its basic ability to produce a profit and manage risks, according to the dividend irrelevance argument, which was initially put forth by Miller and Modigliani in 1961. Profitability is a prerequisite for any firm that hopes to endure and expand over time. According to Adejumo and Sanyaolu (2020), the company may achieve its goals by improving operational standards, meeting customer expectations, venturing into new markets, fending off competition from other businesses in the same sector, and utilizing economies of scale. Nguyen (2020) asserts that companies can use profitability as a useful tool to accurately forecast their future success. Return on Net Operating Assets, or profitability, is a metric used to assess how well an organization makes money from asset management (Sunarto, Widjaja, & Oktaviani, 2021).

Profitability is a key component in assessing a company's status, and financial ratios are the analytical instrument needed to do this. By examining sales and returns on investment, profitability ratios evaluate the efficacy of management (Bramasta & Budiasih, 2021). Return on Asset compares a company's revenue to its expenses and the degree to which it can grow sales, assets, and capital in order to produce income. This metric is used to evaluate an organization's capacity to make money from asset management. (2021 Furman). A company's ability to turn a profit from its investments or from employing its resources for production is measured by its profitability. As a result, profitability ratios evaluate the potential for profit, revenue, or income growth for a business (Olurankinse & Mamidu, 2021). The ability of a business to make a profit is a ratio used to assess profitability. This ratio also indicates the effectiveness of a company's management (Sari, Wardani, & Lestari, 2021). Hence, return on capital employed (ROCE), after net tax income is subtracted, is used to determine a company's profitability. ROCE, as defined by Kayode and Folajinmi (2020), is an accounting ratio that shows the profit margin of a business relative to its capital for a specific accounting period. It is used to analyze the relative profitability of enterprises after taking the amount of capital spent into consideration (Bayaraa, 2017). Thus, profitability is the state of being lucrative.

Concept of Managerial Ownership

The terms "managing ownership," "management ownership," "directors' ownership," and "insiders' ownership" are interchangeable and refer to the equity ownership of a company held by the management, which consists of managers and directors who are insiders. This ownership can be acquired directly or indirectly; for example, the percentage of ordinary shares held by the CEO and executive directors, which includes their deemed interests. Directors are encouraged to own a portion of the company. A board member's ownership of shares in a firm is referred to as managerial ownership. The ability to safeguard managers' financial interests in the company is made possible by board member ownership (Boussaidi & Hamed, 2014). Because tax methods involve significant effort to create and implement, especially if such effort (or lack thereof) is unobservable to outsiders, shifting managers may choose a lesser level of tax avoidance (Blaylock, 2016). A board member who owns stock in a company is said to have managerial ownership (Tanko, 2020). Jensen and Meckling (1976) argue that when managers have an ownership stake in their company, agency conflicts between them and shareholders can be resolved. Conversely, when managerial ownership is low, there is a higher agency cost because the manager is more inclined to take advantage of perks and less inclined to reduce incentives in order to maximize firm value. To cut the agency cost, external shareholders will therefore keep a closer eye on the manager's actions. In other words, any director or board member who owns stock in the company is considered to have managerial ownership.

Theoretical framework

This research is motivated by agency theory and expertise reversal. The expertise reversal theory was initially put forth by Australian educational psychologist John Sweller in 2000. The idea has been discussed in research on cognitive load theory and instructional design. According to the principle, employers should match an employee's competency level to the level of expertise required for a given activity. When working on tasks that require creativity and adaptation, having both experts and novices present may be beneficial. For routine tasks, it is best to have highly qualified personnel. It emphasizes how important it is to approach knowledge in the workplace with objectivity. This implies that when companies gain more knowledge about their business matters, performance improves. On the other hand, Jensen and Meckling (1976) developed agency theory. According to the theory, managers have an obligation to operate in a way that serves the interests of the shareholders as their representatives. Folajinmi and Kayode (2020). The theory states that tax managers should look for every opportunity to lower tax liability and burden through efficient tax planning, all while advancing the interests of shareholders (Olurankinse & Mamidu, 2021). These presumptions suggest that tax planning techniques, if correctly implemented and upheld by the manager, may lower tax obligations and boost profits, both of which are advantageous to the shareholders.

Research Methodology

The population covered by the methodology of this study was made up of consumer products businesses that were listed on the Nigerian Stock Exchange in 2019. The period of use is from 2007 to 2019. The year 2007 is fitting since it was the last time Nigerian companies' taxes were changed. The study is limited to 2019 to avoid any post-corona consequences, which are expected to affect the business operations of the corporation. Table 3.1 below lists the fifteen consumer goods companies that were used as the sample. Of the twenty consumer goods companies that were listed on the Nigerian stock exchange, only fifteen had complete data for the study period. The data was gathered for this study through a secondary data collection method.

The following linear regression equation has been adopted for this study with modifications from the following studies: Ibrahim et al., 2023; Adejumo & Sanyaolu, 2020; Fagbemi, Olaniyi, & Ogundipe, 2019; Gayatri & Wayan, 2021; Junaidu & Saidu, 2018; Karimullah, Lukman, Mamman, & Habib, 2021; Michael, 2020; Oeta, Kiai, & Muchiri, 2019; Salawu, Ogundipe, & Yeye, 2017).

$ROCE_{at} = \alpha + \beta_1 TE_{it} + \beta_2 BS_{it} + \beta_3 LQD_{it} + e_{it}$,,.........,,,,,eq 1

$ROCE_{at} = \alpha + \beta_1 MOTE_{it} + \beta_2 BS_{it} + \beta_3 LQD_{it} + e_{it}$,,eq II

$ROCE_{at} = \alpha + \beta_1 MO_{it} + \beta_2 BS_{it} + \beta_3 LQD_{it} + e_{it}$,,.........,,,,,eq III

Where: α = the constant
β = the coefficient
e_{it} = Random error term where i is cross sectional and t time identifier
ROCE=Return on Capital Employed
TE= Tax expertise,
MO= Managerial ownership,
BS=Board size
LQD=Liquidity

Table 1: Sample Size

S/N	Companies	Year of listing
1	Cadbury Nigeria PLC	1976
2	Champion Breweries PLC	1983
3	Dangote Sugar PLC	2007
4	Flour Mills PLC	1979
5	Guinness Nig. PLC	1965
6	International Breweries PLC	1995
7	Northern Nigeria Flour Mills	1978
8	Nascon Allied Industries PLC	1992
9	Nestle Nigeria PLC	1979
10	Nigerian Breweries PLC	1973
11	Nigerian Enamelware PLC	1079
12	P.Z Cussons Nigeria PLC	1972
13	Unilever Nigeria PLC	1973
14	Union Dicon Salt	1993
15	Vita Foam Nigeria PLC	1978

Source: African financials

Table 2: Variables Measurement

Variables	Proxies	Measurement	Source
Independent	Tax expertise (TE)	Directors with direct accounting/tax experience	(Robinson et al., 2012)
Dependent/ profitability	Return on capital employed (ROCE)	EBIT divided Total Asset minus Current Liabilities	(Kayode & Folajinmi, 2020)
Moderating variable	Managerial ownership (MO)	Propotion of shares of the directors	Ibrahim et al, 2023
Control variables	Board size	Numberof members in a board	Mohammed (2019)
	Liquidity	Liquid cash to total assets	Ibrahim (2017)

Source: Developed by the Researchers

Result and Discussion

The regression results of models I, II, and III using the robust test of ordinary least square regression are displayed in the table 3 below.

Table 3: Regression Result

MODEL I				MODEL II				MODEL III			
OLS ROBUST				OLS ROBUST				OLS ROBUST			
ROCE	Coefficient	T	p>/t/	ROCE	Coefficient	t	p>/t/z	ROCE	Coefficient	t	p>/t/
TE	.3966223	2.38	0.018	MOTE	.571766	2.87	0.005	MO	.1179581	1.92	0.056
BS	-.0007443	-0.71	0.476	BS	-.0010663	-1.06	0.289	BS	-.0013613	-1.38	0.170
AGE	.012169	2.97	0.003	AGE	.012237	2.91	0.012	AGE	.0134974	3.16	0.002
R^2		0.11		R^2	0.13			R^2 11			
Prob F		0.0002		Prob F	0.0000			Prov F 0.0001			
F Value		6.89		F Value	8.74			F Value 7.93			

Source: Compiled from annual report data of the sampled non-financial companies

Table 3 indicates that tax expertise (TE) has a positive and significant impact on profitability based on the coefficient (.3966223) and prob. F (0.018) of model I. This implies that the profitability of the studied enterprises will be positively and significantly impacted by an increase in TE while all other variables remain constant. The findings are in line with the findings of Ibrahim et al. (2023) and the Expertise Reversal Theory, which holds that having a mix of experts and beginners can be beneficial and that performance tends to rise as people gain knowledge and skills. Profitability is negatively and negligibly impacted by Board Size (BS), as indicated by the coefficient (-.0007443) and prob. F (0.476). This implies that the profitability of the tested enterprises will be slightly lowered by an increase in BS while all other factors remain unchanged. The outcome agrees with the Ibrahim et al. (2023) outcome. The result may suggest that members are getting larger allowances in comparison to their numbers. Consequently, as the number of boards increases, allowances rise and profitability falls. Furthermore, as demonstrated by the coefficient (.012169) and prob. F (0.003), the outcome demonstrates that AGE significantly and favorably affects profitability. This shows that, while all other factors remain constant, the profitability of the evaluated businesses will increase positively and significantly as age grows. This could mean that more successful projects are thought up and executed over time. The results align with the findings of Ibrahim et al (2023).

Furthermore, Table 3 indicates that tax expertise (TE) has a positive and significant impact on profitability based on the coefficient (.571766) and prob. F (0.005) of model II. This implies that the profitability of the tested enterprises will be positively and significantly impacted by an increase in TE while holding all other variables constant. The findings are in line with the findings of Ibrahim et al. (2023) and the Expertise Reversal Theory, which holds that having a mix of experts and beginners can be beneficial and that performance tends to rise as people gain knowledge and skills. Board Size (BS) has a negative and negligible impact on profitability, as evidenced by the coefficient (.0010663) and prob. F (0.289). This implies that a hike in BS will only marginally lower the selected companies' profitability when all other conditions remain same. The outcome is in line with the findings of Ibrahim et al. (2023). The result may suggest that, in comparison to their numbers, members are getting larger allowances. When a result, when the number of boards rises, profitability falls and allowances rise. Furthermore, as demonstrated by the coefficient (.012237) and prob. F (0.012), the outcome demonstrates that AGE significantly and favorably affects profitability. This shows that, while all other factors remain constant, the profitability of the evaluated businesses will increase positively and significantly as age grows. This may also mean that more successful projects are thought up and executed over time. The results align with the findings of Ibrahim et al (2023).

According to Table 3 Model III, managerial ownership (MO) has a positive and significant impact on profitability. This is indicated by the coefficient (.1179581) and prob. F (0.056), which suggest that if MO increases and all other control variables stay constant, the profitability of the sampled companies will increase in a positive and significant way. As anticipated, the results validate the agency hypothesis, which states that management acts in a way that best serves the interests of shareholders. In order to further the interests of shareholders, managers look for possibilities and loopholes in tax legislation to lower tax liability and burden. Hossain (2016), Berće-Berga, Dovladbekova, and Ābula (2017), Ayu, Trisnadewia, and BagusAmlayasab (2020), Susanto and Nuringsih (2020), and Tamburaka (2022) have all reached similar conclusions as this one. This outcome runs counter to the conclusions made by Saidu and Gidado (2018), Adamu and Haruna (2020), and Otuya & Omoye (2021), who discovered a substantial and adverse effect of management ownership on income. Mixed results (both favorable and negative) were found in Junaidu and Umar's 2019 study. Profitability is negatively and negligibly impacted by Board Size (BS), as indicated by the coefficient (-.0013613) and prob. F (0.170). This implies that the profitability of the tested enterprises will be slightly lowered by an increase in BS while all other factors remain unchanged. The outcome agrees with the Ibrahim et al. (2023) outcome. The result may suggest that members are getting larger allowances in comparison to their numbers. Consequently, as the number of boards increases, allowances rise and profitability falls.

Furthermore, as demonstrated by the coefficient (.0134974) and prob. F (0.002), the outcome demonstrates that AGE significantly and favorably affects profitability. This shows that, while all other factors remain constant, the profitability of the evaluated businesses will increase positively and significantly as age grows. This may also mean that more successful projects are thought up and executed over time. The results align with the findings of Ibrahim et al (2023).

Conclusion

The profitability of the sampled Nigerian consumer products companies has been positively and considerably impacted by tax expertise, management ownership, and tax expertise, which is tempered by managerial ownership. Older sampled consumer enterprises are more profitable, and board size had a negative impact on profitability. According to the research, Nigerian consumer goods firms ought to ensure that each employee and managerial shareholding has access to a tax professional. Larger money should be put in older companies, as this will increase their profitability, rather than large board members.

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Financial Literacy and Financial Well-being among the People of Assam: An Empirical Investigation

Dr. Sanjib Das

Abstract

This study is an attempt to measure the levels of financial literacy and financial well-being among the people of Assam through the use of an objective test approach. It also analyzes the factors that determine financial literacy, and explores the relationship between financial literacy and financial well-being. The study is based on a sample survey of 400 respondents from various districts in Assam. The collected data were analyzed using SPSS, and statistical tests such as ANOVA and Pearson correlation were employed to test the hypotheses. The findings of the study indicate a low level of financial literacy and an average level of financial well-being among the people. The study identifies several key factors, including gender, place of residence, occupation, education, income, social category, and religion, that significantly influence people's financial literacy level. Furthermore, the study reveals a positive correlation between financial literacy and financial well-being, and concludes that an increase in financial literacy leads to an improvement in the financial well-being position of the people.

Keywords: Financial Literacy, Major Components, Key Determinant Factors, Financial Well-being, Association.

JEL Classification: C12, D14, I31

Assistant Professor, Department of Commerce, Darrang College, Tezpur, Assam

Introduction

Finance is the practice of effectively managing available resources, such as money, wealth, investments, and securities. Within this realm, personal finance plays a crucial role, encompassing all financial decisions and activities undertaken by individuals or households. This includes the practice of saving, investing, and spending money. However, it is important to note that financial literacy is an integral component of personal finance. Financial literacy refers to the possession of knowledge, skills, and confidence necessary to navigate the various financial transactions encountered in everyday life (Foundation for Advancement of Investor Rights [FAIR], 2009). The ultimate objective of financial literacy is to enhance individuals' financial well-being. Financial well-being is characterized by the ability to meet current and ongoing financial obligations, feel secure about one's financial future, and make choices that enable a fulfilling life. It entails achieving financial sufficiency and safeguarding against economic risks such as unemployment, illness, bankruptcy, and destitution (Consumer Financial Protection Bureau [CFPB],2015). Several factors contribute to an individual's level of financial literacy, primarily of demographic and socio-economic nature. Age, sex, marital status, residential location, education, profession, earnings, religion and ethnicity are among the most significant determinants of financial literacy (Luksander et al., 2014). In recent years, financial literacy has emerged as a significant concern in numerous countries worldwide. The level of financial literacy varies across regions and population. According to a global survey conducted by the S&P, financial literacy ranges from 14 percent to 71 percent globally, with South Asian countries falling into the lower financial literacy group, where only one-third of the population possesses adequate financial literacy (Klapper et al., 2014). In India, the level of financial literacy stands at 27 percent (National Centre for Financial Education [NCFE],2019). The need for financial literacy in India is particularly pressing, as a significant portion of the population relies heavily on the formal financial system, and possesses comparatively low financial literacy.

Literature Review

A good number of literatures on "financial literacy and financial well-being" have been reviewed, and briefly presented here, in this section of the study.

Agarwalla et al. (2013) measured financial literacy and studied the determinants of financial literacy of the urban youth in India. The findings of the study revealed that 24 percent of respondents possessed good financial literacy, with the majority exhibiting desirable financial behavior and a positive financial attitude. Moreover, the study showed that factors such as gender, education, and family income significantly influence an individual's overall financial knowledge, understanding, attitude, and behavior.

Shaari (2013) assessed the financial literacy of university students in Malaysia and found that the overall level of financial literacy among students was moderate, with 65.7 percent scoring between 5-8 on a 12-point scale. The study also revealed that financial literacy is influenced by socio-economic variables such as age, gender, faculty and academic year, and spending patterns. Paul (2014) emphasized the risks of financial illiteracy and highlighted the importance of financial literacy at both micro and macro levels. The author argued that financial literacy extends beyond personal finances and encompasses an understanding of the power of money, the impact of financial choices on economic well-being, and the achievement of goals. The low literacy rate and a significant portion of the population outside the formal financial system were identified as the main reasons for low financial literacy in India. Labery (2015) investigated the financial literacy status of women in Australia and found lower levels of financial literacy among specific groups, such as young women, women without formal education, low-income women, and women with disabilities. The author recommended for allocating resources and establishing financial education programs to promote financial literacy in the country. Devi (2016) assessed women's financial literacy in the Kamrup district of Assam and compared the levels of financial literacy among different categories of women, such as rural-urban and independent-dependents. The findings indicated that urban women and working women had significantly higher financial knowledge compared to rural women and nonworking women, respectively. Adam et al. (2017) examined the effects of financial behavior, financial literacy, family size, monetary support, and retirement planning on the financial well-being of pensioners in Ghana. The study revealed that retirement planning, family support, and financial literacy all had a significant impact on the financial well-being of pensioners. Hasibuan et al. (2018) conducted research on the effects of financial behavior and literacy on the financial satisfaction and well-being of entrepreneurs in Medan city, Indonesia. The investigation found that financial behavior and literacy had statistically significant effects on the financial contentment and well-being of entrepreneurs. Hermawan et al. (2019) investigated the relationship between financial behavior, wellness, satisfaction, and financial literacy among Indonesian university students. Despite their lower levels of financial literacy, the study discovered a significant relationship between students' financial wellness, satisfaction, behavior, and their financial literacy. West and Cull (2020) explored the relationship between financial behavior, attitudes, satisfaction, and expectations among Australian university students. The findings revealed that negative financial habits, attitudes, and future expectations were associated with financial discontent among students, and the majority of students had inadequate financial literacy, making it challenging to manage their daily financial affairs. Yakoboski et al. (2021) evaluated the financial literacy and well-being of American adults of various generations. The assessment revealed low levels of financial well-being and a lack of financial knowledge across the population, particularly among the young adults. The study also found a strong correlation between financial literacy and individuals' financial well-being. Sabri et al. (2022) examined the relationship between financial literacy and well-being among Malaysian adults. The data indicated that adults' financial knowledge, behavior, and locus of control significantly influenced their financial well-being. The study highlighted that adults' financial behavior is influenced by their level of financial knowledge and understanding, which ultimately impacts their financial well-being. Rabeta and Sumi (2023) studied financial literacy and behavior among Bangladesh's urban middle class people. The findings of the study revealed that people have moderate understanding on financial literacy concepts such as interest calculation, inflation, and risk-return. Moreover, the findings of the study suggest that higher financial literacy generally leads to better decision-making but varies across individuals. The authors emphasized on the need for tailored financial education to improve financial resilience and well-being among the people.

From the literature review, it is evident that while numerous studies have been conducted on financial literacy and well-being in various regions and economies worldwide, such studies are scarce in the context of Assam. Additionally, most studies focused solely on financial knowledge and neglected other dimensions such as financial behavior and attitude. The influence of key determinant factors such as age, marital status, occupation, place of residence, education, social category, income, and religion on financial literacy was rarely examined. Furthermore, the association between financial literacy and financial well-being was investigated only in a few studies.

Considering the research gaps, the study was carried out with the following objectives.

i. To measure financial literacy and financial well-being among the people of Assam;
ii. To analyse the influence of the key determinant factors, viz., age, gender, marital status, place of residence, social category, education, religion, occupation, and income on financial literacy; and
iii. To examine the association of financial literacy with financial well-being.

In order to examine influence of the key determinant factors, viz., place of residence, gender, marital status, religion, social category, age, education, occupation and income on financial literacy, the following hypotheses were framed and tested.

$H_0$1: Financial literacy is not significantly influenced by place of residence.
$H_0$2: Financial literacy is not significantly influenced by gender.
$H_0$3: Financial literacy is not significantly influenced by marital status.
$H_0$4: Financial literacy is not significantly influenced by religion.
$H_0$5: Financial literacy is not significantly influenced by social category.
$H_0$6: Financial literacy is not significantly influenced by age.
$H_0$7: Financial literacy is not significantly influenced by education.
$H_0$8: Financial literacy is not significantly influenced by occupation.
$H_0$9: Financial literacy is not significantly influenced by income.

Moreover, in order to examine the association of financial literacy with financial well-the following hypothesis was framed and tested.

$H_0$10: Financial literacy is not significantly associated with financial well-being.

Research Methodology

Population and Sample Size: The target population for this study consists of the household families in Assam. The minimum sample size for the study was determined as 384, using the Krejcie & Morgan (1970) model of sample size determination. To ensure a sufficient sample size, the minimum required sample of 384 was rounded up to the nearest hundred, resulting in a total of 400 respondents from whom data for the study were collected.

Sampling Technique: The present study applied a multi-stage random sampling technique to select the respondents. All total 27 districts of Assam (Census of India, 2011) were arranged in a sequential order based on the prevailing literacy rates in the districts. These districts were then divided into three groups, i.e., high literacy rate districts, medium literacy rate districts, and low literacy rate districts, each group containing nine districts. *In the first stage,* one district was randomly selected from each group.

Table 1: Sample Selection Process

Districts	Population	Percent	Sample Unit	Area(rural-urban)	Percent	Sample Unit	Selected Area	Sample Unit
Kamrup (M)	12,53,938	20.81	83	Urban	14	12	Gauhati Municipal Corporation (G.M.C.)	12
				Rural	86	71	Sonapur G.P.	35
							Malaibari G.P.	36
Nagaon	28,23,768	46.85	188	Urban	14	26	Nagaon Municipal Board	26
				Rural	86	162	Samaguri G.P.	81
							Rupahi G.P.	81
Dhubri	19,49,258	32.34	129	Urban	14	18	Dhubri Municipal Board	18
				Rural	86	111	Golakganj G.P.	55
							Paglahat G.P.	56
Total	60,26,964	100	400					400

Source: Author's self-construct.

**Data relating to the population in the selected districts were extracted from the Census of India, 2011.

Consequently, three districts, viz., Kamrup (M), Nagaon, and Dhubri district, were selected with literacy rates of 88.71 percent, 72.37 percent, and 58.34 percent from the high, medium and low literacy districts group respectively. Such selected districts represent low, medium, and high literacy rate areas of Assam, ensuring the samples drawn are representative.

In the second stage, the selected districts were further divided into urban and rural areas to enhance the representativeness of the samples. Municipal corporation/boards were selected from the urban areas, while Gram panchayats were chosen from the rural areas. One Municipal corporation/board was selected comprising of the district headquarter from the urban area of each district. Additionally, two Gram panchayats were randomly selected from the rural area of each district. The composition of the sample respondents was determined to be 86 percent from the rural areas, and 14 percent from the urban areas, maintaining a parity with the rural-urban composition in the state (Census of India, 2011). *In the third and final stage,* respondents were randomly selected from the respective Municipal corporation/boards and Gram panchayats. Throughout all the stages of sampling, the lottery method was employed to select the required number of samples. Table 1 presents sample selection process.

The number of samples selected from each district is proportionate to the population in the respective district. In case of urban areas, the required samples were selected from one Municipal corporation/board, and in case of rural areas, the required samples were selected from two Gram panchayats in equal proportion in each district. For selecting the sample respondents, the list of voters/household families available with the Municipal corporation/board and Gram panchayats in the respective area formed the base. Within a selected household, only one member of the household who is a permanent resident and whose age is above 18 years was considered.

The required data were collected through a standardised questionnaire containing 30 multiple choice questions, of which, 20 questions were on financial literacy, and the rest 10 questions on financial well-being.

Data Analysis: The data obtained for the study were analyzed using SPSS software (version 20.0). Various statistical tests, including ANOVA and Pearson correlation analysis, were employed in the analysis process.

Measurement Scales: There are two primary methods for measuring financial literacy: the self-assessment approach and the objective test approach. The self-assessment approach involves asking individuals subjective questions to gauge their own financial literacy. For example, respondents may be asked to rate their overall financial literacy on a scale from 1 to 10. However, this approach has not gained widespread popularity due to the tendency of respondents to overestimate their financial knowledge and present a positive financial attitude and behavior. On the other hand, the objective test approach involves asking individuals multiple-choice questions in a questionnaire or interview. Each question is scored based on the correctness of the respondent's answer, and the overall score is used to determine their level of financial literacy. This approach has been found to be more effective in assessing financial literacy compared to the self-assessment approach (Organisation for Economic Co-operation and Development [OECD], 2006).

In this study, the measurement of financial literacy was done using a standardized scale developed by the NCFE, India (NCFE, 2013). This scale was designed based on the objective test approach and underwent a pilot survey to ensure its validity. Approval for the use of this scale in financial literacy surveys in the country was obtained from the National Institute for Securities Market (NISM). The scale used in this study measures financial literacy by combining three main components: financial behavior, financial knowledge, and financial attitude. It consists of a total of 20 multiple-choice questions, with 8 questions focusing on financial knowledge, 9 questions on financial behavior, and 3 questions on financial attitude. To determine the level of financial literacy, a cutoff score of 15 points was fixed. This cutoff score includes 6 points from financial knowledge, 6 points from financial behavior, and 3 points from financial attitude. An individual who achieves the minimum required score or higher in each of these dimensions, and has a total score of 15 points or more out of the maximum aggregate score of 22 points, is considered financially literate. However, within the financially literate segment, two categories were identified: moderately literate and highly literate. Respondents who scored 15 points or more on an aggregated basis, but less than or equal to 20 points, were classified as moderately literate. On the other hand, respondents who scored more than 20 points on an aggregated basis were classified as highly literate.

The financial well-being of individuals in Assam was assessed using a standardized scale developed by the CFPB, United States (CFPB, 2015). This scale, which follows an objective test approach, was originally employed in the national consumer financial well-being survey conducted in the United States in 2016.

It consists of 10 questions that aim to gauge financial security, financial freedom of choice, and the overall perception of financial well-being. Each question offers five response options, with scores ranging from 0 to 4. Consequently, the maximum attainable score on the financial well-being scale is 40, while the minimum is 0. The financial well-being position of the respondents are divided into three levels: low financial well-being (score from 5 to 19), moderate financial well-being (score from 20 to 24) and high financial well-being (score from 25 to 40) based on the Z-conversion formula (Sood, 2011).

Results and Discussion

Financial Literacy among the People of Assam

The level of financial literacy along with the levels of financial knowledge, financial behavior and financial attitude of various socio-economic and demographic groups of people in Assam were measured, and are presented here in this section of the study. Table 2 gives category and component wise financial literacy level among the people of Assam.

Table 2 shows that financial literacy among the people of Assam is 34.5 percent of which 24 percent is moderate financial literacy and 10.5 percent is high financial literacy. Financial literacy among the urban people is higher than that of the rural, i.e.,38 percent and 31. Male are more financially literate than the female respondents which stands at 41.5 and 26.6. Married people have more financial literacy than the unmarried people. In case of religion, Hindus have the highest level of financial literacy which stands at 39.4 followed by the Muslims and Christians at 29.2 and 28 percent. So far as social category is concerned, respondents from the general category have the highest level of financial literacy, i.e.,41.4 percent followed by OBC, MBOC and SC category. Respondents belonging to ST category have the lowest level of financial literacy, i.e., 24.1 percent. In case of age, respondents from the age group of 44-56 years have the highest financial literacy level, i.e., 44.4 percent followed by 31-43 years and 57-69 years. Respondents from the age group of 18-30 years and 70 & above have the lower financial literacy, i.e., 26.8 and 26.9 percent. Financial literacy differs depending on educational qualification. PG and above qualified respondents have the highest level of financial literacy, i.e., 58.6 percent followed by the graduates and high school pass respondents. Financial literacy is the lowest among the illiterates, i.e., 14.3 percent followed by the respondents having primary education. Occupation makes difference in financial literacy level. Service holders have the highest financial literacy, i.e.,63.3 percent followed by the businessmen at 47.8 percent. It is the lowest among the agricultural people, i.e., 15.5 percent followed by house wives, students, and others (informal). So far as income is concerned financial literacy is the highest, i.e., 61.5 among the respondents having income Rs.25, 001-35,000 followed by the respondents of the income group of Rs.15, 001-25,000 and above Rs. 35,000. Financial literacy is the lowest, i.e., 17.5 among the respondents of income below Rs.5, 000.

Influence of the Determinants of Financial Literacy

Influence of the key determinant factors, viz., place of residence, gender, marital status, religion, social category, age, education, occupation and income on financial literacy of the people was tested using the ANOVA technique. Table 3 gives results of the ANOVA test which shows the differences of the mean score of financial literacy among the socio-economic and demographic groups under the study.

The results of the ANOVA test as presented in Table 3 show that place of residence, gender, marital status, religion, social category, age, education, occupation and income of the people have influence on their financial literacy level.

Influence of Place of Residence on Financial Literacy: Financial literacy level differs with place of residence of the people. The mean score of financial literacy of the rural people (13. 48 percent) is lower than the urban people (15.47 percent), and the difference is significant at 5 percent level of significance($p=.000<.05$). Hence, H_01: Financial literacy is not significantly influenced by place of residence is rejected, and concluded that financial literacy is significantly influenced by place of residence of the people.

Table 2: Financial Literacy among the People of Assam

Categories and Components		Financial Knowledge		Financial Behaviour		Financial Attitude		Financial Literacy		Moderate Literacy		High Literacy		Illiteracy		Total	
		Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Assam		*170*	*42.5*	*178*	*44.5*	*274*	*68.5*	*138*	*34.5*	*96*	*24*	*42*	*10.5*	*262*	*65.5*	*400*	*100*
Place of Residence	Rural	84	42.0	78	39.0	132	66.0	62	31.0	44	22.0	18	09.0	138	69.0	200	100
	Urban	86	43.0	100	50.0	142	71.0	76	38.0	52	26.0	24	12.0	106	53.0	200	100
Gender	Male	100	47.2	104	49.0	160	75.5	88	41.5	58	27.4	30	14.1	124	58.5	212	100
	Female	70	37.2	74	39.4	114	60.6	50	26.6	38	20.2	12	06.4	138	73.4	188	100
Marital Status	Married	88	41.1	110	51.4	152	71.0	86	40.2	60	28.0	26	12.1	128	59.8	214	100
	Unmarried	82	44.1	68	36.6	124	65.6	52	27.9	36	19.3	16	08.6	134	72.0	186	100
Religion	Hindu	96	46.1	100	48.0	146	70.2	82	39.4	60	28.8	22	10.6	126	60.6	208	100
	Muslim	56	39.4	50	35.2	94	66.2	42	29.2	28	19.7	14	09.8	100	70.4	142	100
	Christian	18	36.0	28	56.0	34	68.0	14	28.0	08	16.0	06	12.0	36	72.0	50	100
Social category	General	64	45.7	80	57.1	104	74.3	58	41.4	38	27.1	20	14.3	82	58.6	140	100
	SC	32	38.1	42	50.0	52	61.9	26	30.9	18	21.4	08	09.5	58	69.0	84	100
	ST	22	37.9	20	34.5	30	51.7	14	24.1	10	17.2	04	06.9	44	75.9	58	100
	OBC	42	47.7	24	27.2	68	77.7	30	34.1	22	25.0	08	09.1	58	65.9	88	100
	MOBC	10	33.3	12	40.0	20	66.7	10	33.3	08	26.6	02	06.6	20	66.7	30	100
Age (Years)	18 – 30	34	41.5	30	36.6	54	65.9	22	26.8	18	21.9	04	04.9	60	73.2	82	100
	31 – 43	40	44.4	44	48.9	68	75.5	30	33.3	22	24.4	08	08.9	60	66.7	90	100
	44 – 56	38	42.2	46	51.1	56	62.2	40	44.4	28	31.1	12	13.3	50	55.6	90	100
	57 – 69	38	44.19	38	44.19	62	72.1	32	37.2	18	20.9	14	16.3	54	62.8	86	100
	70 and above	20	38.5	20	38.5	34	65.4	14	26.9	10	19.2	04	07.7	38	73.1	52	100
Education	Illiterate	08	14.3	16	28.6	32	57.1	08	14.3	06	10.7	02	03.6	48	85.7	56	100
	Primary	12	14.6	42	51.2	38	46.3	16	19.5	12	14.6	04	04.9	66	7.3	82	100
	High school	24	28.6	42	50.0	60	71.4	28	33.3	20	23.8	08	09.5	56	66.7	84	100
	Graduate	82	68.3	46	38.3	94	78.3	52	43.3	34	28.3	18	15.0	68	56.7	120	100
	PG and above	44	75.9	32	55.2	50	86.2	34	58.6	24	41.4	10	17.2	24	41.4	58	100
Occupation	Student	44	46.8	26	27.6	70	74.5	24	25.5	18	19.1	06	06.4	70	74.5	94	100
	House wife	12	20.0	20	33.3	28	46.7	12	20.0	10	16.6	02	3.33	48	80.0	60	100
	Agriculture	24	18.2	34	51.5	38	57.6	10	15.1	08	12.1	02	3.0	56	84.8	66	100
	Business	48	52.2	44	47.8	68	73.9	44	47.8	28	30.4	16	17.4	48	52.2	92	100
	Service	42	70.0	40	66.7	52	96.7	38	63.3	22	03.3	16	26.7	22	36.7	60	100
	Others (Informal)	12	42.8	14	50.0	12	42.8	10	35.7	10	35.7	00	00.0	18	64.3	28	100
Income (Monthly in Rs.)	Below 5000	14	17.5	34	42.5	42	52.5	14	17.5	10	12.5	04	05.0	66	82.5	80	100
	5001-15000	48	37.5	40	31.2	88	06.2	28	21.9	22	17.19	06	04.7	100	78.1	128	100
	15001-25000	50	67.6	32	43.2	56	75.7	34	45.9	22	29.8	12	16.2	40	54.1	74	100
	25001-35000	28	53.8	32	61.5	48	92.3	32	61.5	28	53.8	04	07.7	20	38.5	52	100
	Above 35000	30	45.4	40	60.6	40	60.6	30	45.4	14	21.1	16	24.2	36	54.5	66	100

Source: Primary data.

Influence of Gender on Financial Literacy: Financial literacy level differs with gender of the people. The mean score of financial literacy of male respondents (14.39 percent) is higher than that of the female respondents (13.55 percent), and the difference is significant at 5 percent level of significance ($p=.042<.05$). Hence, H_02: Financial literacy is not significantly influenced by gender is rejected, and concluded that financial literacy is significantly influenced by gender of the people.

Table 3: Results of ANOVA Test

Variables		Mean Score	F-value	p-value
	Rural	13.48		
Place of Residence	Urban	15.47	19.232	.000
	Male	14.39		
Gender	Female	13.55	4.170	.042
	Married	14.41		
Marital Status	Unmarried	13.49	4.944	.027
	Hindu	14.56		
Religion	Muslim	13.59	5.119	.006
	Christian	12.82		
	General	14.66		
	SC	14.64		
Social Category	ST	13.13	2.572	.037
	OBC	13.80		
	MOBC	13.00		
Age (Years)	18 – 30	13.45		
	31 – 43	13.92		
	44 – 56	14.33	.810	.519
	57 – 69	14.44		
	70 and above	14.20		
	Illiterate	12.40		
	Primary	13.23		
Education	High school	13.57	9.363	.000
	Graduate	15.16		
	PG and above	15.79		
	Student	13.57		
	House wife	13.48		
	Agriculture	13.07		
Occupation	Business	14.81	5.873	.000
	Service	16.08		
	Others (Informal)	12.94		
	Below 5000	12.19		
	5001-15000	13.22		
Income (Monthly, in INR)	15001-25000	14.47	10.176	.000
	25001-35000	14.90		
	Above 35000	15.79		

Source: Author's computation based on primary data.

**Level of significance (α) =.05

Influence of Martial status on Financial Literacy: Financial literacy level differs with marital status of the people. The mean score of financial literacy of the married respondents (14.41 percent) is higher than that of the unmarried respondents (13.49 percent), and the difference is significant at 5 percent level of significance (p=.027<.05). Hence, $H_0$3: Financial literacy is not significantly influenced by marital status is rejected, and concluded that financial literacy is significantly influenced by marital status of the people.

Influence of Religion on Financial Literacy: Financial literacy level differs with religion of the people. The mean score of financial literacy of the Hindu respondents (14.56 percent) is the highest followed by the Muslim respondents (13.59 percent) and Christian respondents have the lowest mean score of financial literacy (12.82 percent). The difference in the mean financial literacy scores of various religious groups is significant at 5 percent level of significance (p=.006<.05). Hence, $H_0$4: Financial literacy is not significantly influenced by religion is rejected, and concluded that financial literacy is significantly influenced by religion of the people.

Influence of Social category on Financial Literacy: Financial literacy level differs with social category of the people. The mean score of financial literacy of the respondents belonging to the General category (14.66 percent) is the highest followed by the respondents belonging to the SC category (14.64 percent).

Respondents belonging to the MOBC category have the lowest mean score of financial literacy (13 percent) followed by the respondents belonging to the ST category (13.13 percent).

The difference in the mean financial literacy scores of various social categories is significant at 5 percent level of significance (p=.037<.05).

Hence, $H_0$5: Financial literacy is not significantly influenced by social category is rejected, and concluded that financial literacy is significantly influenced by social category of the people.

Influence of Age on Financial Literacy: Financial literacy differs with age of the people. The mean score of financial literacy of the respondents belonging to the age group of 57-69 years (14.44 percent) is the highest followed by the respondents of the age group of 44-56 years (14.33 percent). Mean score of financial literacy is the lowest among the respondents of the age group of 18-30 years (13.45 percent) followed by the respondents of the age group of 31-43 years (13.92 percent). The difference in the mean financial literacy scores of various age groups is not significant at 5 percent level of significance ($p=.519>.05$). Hence, H_06: Financial literacy is not significantly influenced by age is accepted, and concluded that financial literacy is not significantly influenced by age of the people.

Influence of Education on Financial Literacy: Financial literacy level of the people differs with their educational qualification. The mean score of the PG and above qualified people is the highest (15.79 percent) followed by the Graduates (15.16 percent). The means score of financial literacy level of the illiterate people is the lowest (12.40 percent) followed by the Primary school passed (13.23 percent). The difference in the mean financial literacy scores of various educational qualification groups is significant at 5 percent level of significance ($p=.000<.05$). Hence, H_07: Financial literacy is not significantly influenced by education is rejected, and concluded that financial literacy is significantly influenced by education of the people.

Influence of Occupation on Financial Literacy: Financial literacy level changes with occupation of the people. The mean score of the service holders is the highest (16.08 percent) followed by the businessmen (14.81 percent). The mean score of financial literacy is lowest among the others (informal) occupational (12.94 percent) followed by the house wives (13.48 percent) and students (13.57 percent). The difference in the mean financial literacy scores of various occupation groups is significant at 5 percent level of significance($p=.000<.05$). Hence, H_08: Financial literacy is not significantly influenced by occupation is rejected, and concluded that financial literacy is significantly influenced by occupation of the people.

Influence of Income on Financial Literacy: Financial literacy of the people increases with the increase in their income level. The mean score of financial literacy is the highest among the people having income above Rs.35, 000 (15.79 percent) followed by people of the income group of Rs.25, 001-Rs.35, 000 (14.90 percent). The mean score of financial literacy is the lowest among the people having income below Rs.5, 000 (12.19 percent) followed by the income group of Rs. 5,001-Rs.15, 000 (13.22 percent). The difference in the mean financial literacy scores is significant at 5 percent level of significance ($p=.000<.05$). Hence, H_09: Financial literacy is not significantly influenced by income is rejected, and concluded that financial literacy is significantly influenced by income of the people.

To sum up, it is concluded that financial literacy among the people of Assam is significantly influenced by the place of residence, gender, marital status, social category, religion, education, occupation and income of the people, except age of the people which does not have significant influence on financial literacy.

Financial Well-being among the People of Assam

Financial well-being among various socio-economic and demographic groups of people in Assam were measured in terms of high financial wellbeing, moderate financial wellbeing and low financial wellbeing. Table 4 gives category and component wise level of financial well-being among the people of Assam.

Table 4 shows financial well-being among the people of Assam as 41.0 percent low financial well-being, 42.5 percent moderate financial well-being, and 16.5 percent high financial well-being. Majority of the people have moderate and low financial well-being, and only a few have high financial well-being. Urban respondents have better financial well-being than that of the rural. Again, financial well-being is better for the male respondents as compared to the female. Married respondents have better financial well-being position than the unmarried. Moderate and high financial well-being is higher for the respondents from the Hindu religion and Christians have more of low financial well-being. Most of the respondents from all the age groups have medium financial well-being, only a small percentage has high financial well-being. Respondents from the General and SC category have higher percentage of high financial well-being, and low financial well-being is more among the respondents of MOBC category.

High and moderate financial well-being is better for the higher age group and respondents from low age group have lower level of high and moderate financial well-being. Post-graduation and above qualified have more of high financial well-being, and graduates have higher of moderate financial well-being.

Illiterates and Primary school pass respondents have more low level of financial well-being. Moderate level of financial well-being is flat for respondents from all the income groups. High financial well-being is more among the respondents having higher income and respondents of low-income group have more of low financial well-being. Businessmen and service holders have more high and moderate financial well-being. Students and agricultural people have less high financial well-being and it is nil for the respondents having other (informal) occupation. Low financial well-being is more for the respondents belonging to other (informal) occupation.

Table 4: Financial Well-being among the People of Assam

Categories and components		High		Moderate		Low		Total	
		Count	%	Count	%	Count	%	Count	%
Assam		*66*	*16.5*	*170*	*42.5*	*164*	*41.0*	*400*	*100*
Place of Residence	Rural	28	14.0	84	42.0	88	44.0	200	100
	Urban	38	19.0	86	43.0	76	38.0	200	100
Gender	Male	46	21.7	100	47.2	66	31.1	212	100
	Female	20	10.6	70	37.2	98	52.1	188	100
Marital Status	Married	42	19.6	94	43.9	78	36.4	214	100
	Unmarried	24	12.9	76	40.9	86	46.2	186	100
Religion	Hindu	38	18.7	86	41.3	84	40.4	208	100
	Muslim	18	12.7	78	47.9	56	39.4	142	100
	Christian	10	20.0	16	32.0	24	48.0	50	100
Social category	General	30	21.4	56	40.0	54	38.6	140	100
	SC	16	19.0	36	42.8	32	38.1	84	100
	ST	08	13.8	32	55.2	18	31.0	58	100
	OBC	10	11.4	40	45.4	38	43.2	88	100
	MOBC	02	06.7	06	20.0	22	73.3	30	100
Age (year)	18 – 30	04	04.9	32	39.0	46	56.1	82	100
	31 – 43	16	17.8	42	46.7	32	35.5	90	100
	44 – 56	14	15.5	38	42.2	38	42.2	90	100
	57 – 69	20	23.2	36	41.9	30	34.9	86	100
	70 and above	12	23.1	22	42.3	18	34.6	52	100
Education	Illiterate	02	03.6	20	35.7	34	60.7	56	100
	Primary school pass	12	14.6	28	34.1	42	51.2	82	100
	High school pass	18	21.4	32	38.1	34	40.5	84	100
	Graduate	16	13.3	68	56.7	36	30.0	120	100
	PG and above	18	31.0	22	38.0	18	31.0	58	100
Occupation	Student	12	12.8	40	42.5	42	44.7	94	100
	Agriculture	10	15.1	26	39.4	30	45.5	66	100
	Business	24	26.1	42	45.6	26	28.3	92	100
	Service	10	16.7	38	63.3	12	20.0	60	100
	Others (Informal)	00	00.0	12	42.8	16	57.2	28	100
Income (Monthly in Rs.)	Below 5000	08	10.0	34	42.5	38	47.5	80	100
	5001-15000	18	14.1	50	39.1	60	46.8	128	100
	15001-25000	12	16.2	32	43.2	30	40.5	74	100
	25001-35000	10	19.2	24	46.2	18	34.6	52	100
	Above 35000	18	27.3	30	45.4	18	27.3	66	100

Source: Primary data.

To sum up, it can be concluded that financial well-being among the people of Assam is average as most of the people have moderate or low financial wellbeing and least of them have high financial well-being.

Financial Literacy and Financial Well-being

Financial literacy and financial well-being are closely linked to each other. Financial literacy leads an individual towards better financial well-being position in life. Higher the financial literacy, better is the financial well-being and vice-versa (Taft,2013). Table 5 shows the association of financial literacy and financial well-being.

In Table 5, it is observed that financial literacy is associated with financial well-being of the people. Majority of the low financially literate people, i.e., 51.91 percent have low level of financial well-being, and only 6.11 percent of the low financially literate people have high financial well-being. In case of moderate financially literate people most of them have moderate and high financial well-being, i.e., 39.58 percent and 35.42 percent. High financial well-being as well as moderate financial well-being is the highest for the high financially literate people, i.e., 38.10 and 52.39 percent. High financially literate people have the lowest percentage of low financial well-being, i.e., 9.21 percent only.

The results of the correlation analysis show significant association between financial literacy and financial well-being($p=.000<.05$). Hence, $H_0 10$: Financial literacy is not significantly associated with financial well-being is rejected, and concluded that financial literacy is significantly associated with financial well-being of the people, and the association is positive and strong (r=.581) (Cohen, 1988).

An increase in financial literacy results into the increase in financial well-being of the people.

Table 5: Association of Financial Literacy and Financial Well-being

		Financial Well-being						Total		Pearson correlation
		High		Moderate		Low				
		Count	%	Count	%	Count	%	Count	%	
Financial Literacy	Low	16	6.11	110	41.98	136	51.91	262	100	r =.581 p-value =.000 α =0.01
	Moderate	34	35.42	38	39.58	24	25.00	96	100	
	Highly	16	38.10	22	52.39	04	09.51	42	100	

Source: Author's computation based on primary data.

**Low financial literacy (score<15).

Summary of the Findings

The financial literacy level in Assam is reported to be 34.5 percent, with 24 percent of the population having moderate financial literacy and 10.5 percent having high financial literacy. Various factors contribute to the level of financial literacy, including place of residence, gender, marital status, religion, social categories, age, education, occupation, and income. Gender, place of residence, social category, education, occupation, and income are found to have a positive, strong, and significant association with financial literacy, while age does not show statistical significance. In case of financial well-being, 41.0 percent of the population in Assam has low financial well-being, 42.5 percent has moderate financial well-being, and 16.5 percent has high financial well-being. Financial literacy and financial well-being are closely associated, as the level of financial well-being is influenced by one's financial literacy. Correlation analysis reveals a positive, significant, and strong association between financial literacy and financial well-being among the people of Assam. Furthermore, an increase in financial literacy is found to lead to an improvement in financial well-being.

Conclusion

From the above analysis it is concluded that financial literacy among the people of Assam is more than the Indian national average, and the level of financial literacy has a positive, strong and significant association with gender, place of residence, social category, education, occupation and income of the people, except age of the people which does not have significant influence on financial literacy. In case of financial well-being, majority of people have medium and low financial well-being, and only a few of them have high financial well-being. Financial literacy and financial well-being are closely linked. The results of the correlation analysis show positive, strong and statistically significant association between financial literacy and financial well-being. An increase in financial literacy of the people results in an increase in their financial well-being. Therefore, it is suggested to take necessary measures by the stakeholders in order to improve knowledge, skills, understanding and awareness of the people on financial matters, especially for the students, women and the poor people which will promote their financial well-being and accelerate economic growth and development.

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Assessing the Impact of Merger on Asset Quality and Profitability: A Study on Bank of Baroda

Meghna Dey* and Dr Subit Dutta**

Abstract

The banking sector has witnessed significant consolidation in recent years. Bank merger is being considered as a key strategy for banks to improve their overall performance and competitiveness. This study attempts to evaluate and compare asset quality and profitability of the Bank of Baroda during pre and post-merger period. This study investigates the effect of merger on asset quality and profitability of the respective bank using data of last ten years covering the period from 2014-15 to 2023-24. The data are analyzed with the help of few parameters such as Gross and Net NPA, Gross and Net NPA Ratio to evaluate asset quality and RoA, RoE and Net Profit Margin as a few indicators of profitability. Compound annual growth rate along with descriptive statistics have been used to respond research queries. The study has found that asset quality as well as profitability of the bank have improved post bank merger but the improvement during the study period was not significant. Though in long run the bank

Keywords: Bank merger, Asset Quality, Profitability, NPA, Bank of Baroda
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*Assistant Professor, Department of Accountancy, Pandit Deendayal Upadhyaya Adarsha Mahavidyalaya, Tulungia
** Assistant Professor and Head i/c, Department of Commerce, Assam University, Diphu Campus

Introduction

The banking sector is facing unprecedented challenges, including increasing competition, regulatory pressures, and rising operational costs. In this challenging environment, consolidation has emerged as a strategic imperative for banks to achieve sustainability. The banking industry is vital to the formation of capital in the country. However, various impediments to excellent progress in the banking industry exist, including managing risks, efficiency in bank operations, loan portfolio management, etc. (Veena & Pathi, 2018). To make Indian Banks capable of meeting higher funding needs and to compete globally, the Public Sector Banks (PSBs) in India went through the biggest consolidation in the year 2019 which reduced the number of PSBs to 12 in India. This consolidation is popularly termed as Mega Merger of banks in the history of bank mergers in India. These mega mergers often lead to the creation of banks with a larger asset base, enhanced capital strength, diversified portfolios, and an expanded geographical presence. However, while these mergers hold great potential for positive outcomes, they also pose challenges in terms of integrating corporate cultures, streamlining operations, and managing human resources across different entities (Singh & Yadav, 2021).

After the merger, it is anticipated that larger financial institutions will be inclined to extend their lending activities by assuming additional risks, potentially altering the risk profiles of these institutions if such actions are undertaken without adequate oversight. To increase the advisory oversight RBI proposed that banks should have a position of chief risk officer (CRO) and ensure that high standards of risks management are maintained (Ray, 2019). There have been number of studies raising issues of bank consolidation and impact on credit availability with numerous other policy level issues.

Bank mergers, especially in India, are seen as a key strategy to address the rising issue of Non-Performing Assets (NPAs). The consolidation of weaker banks with stronger ones aims to improve overall asset quality and financial stability. Merged entities benefit from an expanded capital base, which allows them to absorb bad loans more effectively. Additionally, they can implement better risk management systems and recovery mechanisms to reduce NPAs over time (Ghosh, 2021).

A larger bank can also leverage economies of scale, optimize operational costs, and improve loan recovery processes, contributing to the reduction in NPAs (Singh & Yadav, 2021).

Bank of Baroda has a rich history dating back to 1908. The Bank of Baroda became the third largest bank in India on April 1, 2019, after merging with Dena Bank and Vijaya Bank. As a leading public sector bank, Bank of Baroda has played significant role in the country's economic development, with a strong focus on financial inclusion, rural development and social welfare initiatives. The merger has significantly increased bank business which will increase profitability for long run and has improved its lending capacity, simultaneously increases the chances for bad and loss assets. Thus, present study attempts to evaluate and compare profitability and asset quality of the bank before and after the merger considering 10 years period in total.

Review of Literature

Muhammad Usman (2011) examined the profitability performance of the Royal Bank of Scotland from 2005-06 to 2008-09 by using ratio analysis. It is found that pre-merger profitability, liquidity, and solvency ratios are higher than post-merger ratios. It concluded that the merger had not improved the Royal Bank of Scotland's performance. Dilshad (2012) in his study examines the efficiency of market with respect to announcements of mergers and acquisitions using an event study methodology. Evidence of excess returns after the merger announcement was also observed along with the leakage of information that resulted in the rise of stock prices few days before the announcement of merger or acquisition. Meena and Kumar (2014) in their research have concluded that overall result of merger led to higher level of cost efficiencies for the merging banks. The forced merger among these banks helps in protecting the interest of depositors of weak banks but didn't yield any gain for stakeholders of the banks. They have suggested government and policymakers to take precautions before considering and promoting merger as a way to reap economies of scale. Sharma and Sidana (2017) in their paper expressed the impact of SBI merger on financial condition of SBI. The SBI will get visibility at global level in the network increase of SBI & it is also able to provide cheaper funds more easily. The gross & net NPA of SBI it will come down after merger with their associate. The efficiency & effectiveness of the business it will increase because of single management. Ritesh Patel (2018) evaluated the performance of Public Sector Banks taking 4 PSBs as sample of the study for the period of 2008-09 to 2016-17. The study showed substantial decrease in ROE, ROA, Net Profit Margin, investment yield whereas Earnings per share, profit per employee grew post merger. Ravi Agarwal (2019) analysed the performance of nationalised banks from 2013-2018 using CAMEL model which showed that Indian Bank took top outstanding position in overall performance followed by Andhra Bank whereas Union Bank of India showed poor performance in that respect. Nanda and Goswami (2020) in their study stated that the track record of merger and acquisition in Indian banking have been fruitful so far for the economy but at individual level it has not been that good. Many have stated various arguments in favors and against the merger drive. Sasikala (2022) evaluated the performance of the SBI after the merger from 2016-17 to 2020-21. The study utilized secondary data and the analysis discovered that the SBI performance was better after the merger.

The objective of the present study is to evaluate and compare the asset quality and profitability of the Bank of Baroda before and after the merger.

Hypotheses of the Study

For the present research, following hypotheses have been developed:

Ho_1 = There is no significant difference in asset quality of the Bank of Baroda before and after the merger.

Ho_2 = There is no significant difference in profitability of the Bank of Baroda before and after the merger.

Research Methodology

The study employs a quantitative research design to achieve the objective the study. 10 years data has been considered for the study which includes 5 years before merger and 5 years after merger for the period 2014-15 to 2023-24. Data to evaluate asset quality of the bank and profitability have been collected from the annual reports of the bank for the said period. To ascertain the asset quality of the bank Gross Non Performing Asset (GNPA), Gross Non Performing Asset (GNPA) ratio, Net Non Performing Assets (NNPA), Net Non Performing Assets (NNPA) ratio have been considered and Return on Assets (RoA), Return on Equity (RoE) and Net Profit Margin are some of the parameters for evaluating profitability of the bank. Compound annual growth rate (CAGR) for 5 years has been determined for each parameter. Descriptive statistics such as mean and standard deviation and inferential statistic i.e. paired t test at 5% level of significance has been used to test the hypotheses of the study.

Results and Discussion

Table 1: Asset Quality- Descriptive Statistics

Pre Merger Period (₹ in crore)					Post Merger Period (₹ in crore)				
Year	Gross NPA (₹)	Gross NPA Ratio (%)	Net NPA (₹)	Net NPA Ratio (%)	Year	Gross NPA(₹)	Gross NPA Ratio (%)	Net NPA (₹)	Net NPA Ratio (%)
2014-15	16261	3.72	8069	1.89	2019-20	69381	9.4	21577	3.13
2015-16	40521	9.99	19406	5.06	2020-21	66671	8.87	21800	3.09
2016-17	42719	10.46	18080	4.72	2021-22	54059	6.61	13364	1.72
2017-18	56480	12.26	23483	5.49	2022-23	36764	3.79	8384	0.89
2018-19	48233	9.61	15609	3.33	2023-24	31834	2.92	7213	0.68
CAGR (%)	24%	21%	14%	12%		-14%	-21%	-20%	-26%
Mean	40842.90	9.21	16929.50	4.10		51741.8	6.318	14467.6	1.902
SD	15058.25	3.23	5715.08	1.48		17029.73	2.92	6985.07	1.17

Source: Compiled by authors from annual reports

From the above table it has been observed that GNPA has increased from ₹16261 crore in 2014-15 to ₹48233 crore in 2018-19 during pre merger period with a positive CAGR of 24% which was not desirable. Five year annual average GNPA during the period was ₹40842.90 crore. GNPA has increased initially to ₹69381 crore in 2019-20, the first financial year post merger. GNPA recorded continuous decrease to ₹31834 crore in 2023-24 over the post merger period. Even though GNPA has decreased continuously, the five year annual average in the post merger period stood at ₹51,741.8 crore. The CAGR for the post merger period was negative (-)14% and considered as desirable as it showed improvement in asset quality leading to reduction in GNPA.

In the pre merger period, GNPA ratio of the bank has increased from 3.72% in 2014-15 to 9.61% in 2018-19. the CAGR of pre merger period stood as 21% . In the first year of the post merger period, GNPA ratio of the bank was 9.4% which declined continuously from 9.4% in 2019-20 to 2.92% in 2023-24. CAGR was negative at -14%, which was appreciable.

NNPA has increased from ₹8069 crore in 2014-15 to ₹15609 crore in 2018-19 during pre merger period with a positive CAGR of 14% which was not desirable . Five year annual average NNPA during the period was ₹16929.50 crore. On the other side, NNPA in the first year post merger recorded an increase to ₹21577 crore which substantially decreased to ₹7213 crore in 2023-24 over the post merger period. Even though NNPA has decreased continuously, the five year annual average in the post merger period stood at ₹14467.6 crore. The CAGR for the post merger period was negative (-)20% which has been considered desirable as the quality of asset improved during post-merger period.

In the pre-merger period, NNPA ratio of the bank stood at 1.89% in 2014-15, showed fluctuations during the period and stood to 3.33% in 2018-19. the CAGR of pre-merger period stood as positive 12% . During the post-merger period, NNPA ratio of the bank was 3.13% 2019-20 declined to 0.68% in 2023-24. CAGR was recorded as negative at -26% considered as better than the pre-merger period NNPA ratio indicating improvement in asset quality of the bank.

Table 2: Asset Quality- Paired t Test

Parameters	p value	Hypotheses
Gross NPA (₹)	0.468	Accept Ho_1
Gross NPA Ratio (%)	0.309	Accept Ho_1
Net NPA (₹)	0.641	Accept Ho_1
Net NPA Ratio (%)	0.084	Accept Ho_1

Source: Generated through MS-Excel

The above table showed the paired t test result of pre and post-merger asset quality on the basis different parameters at 5% level of significance. It has been observed that calculated p value of different parameters above 0.05 indicated no significant difference in asset quality of the bank before and after the merger. Thus, Ho_1 has been accepted.

During the pre merger period the Net profit of the bank drastically decreased in the year 2015-16 and 2017-18 as a result of which RoA, RoE and Net Profit Margin during these years showed a negative result. Negative performance of these parameters during mid years of pre merger study period has affected CAGR of the study period. However, the five years annual average of Ro A was -0.08% which was also due to negative change in RoA in the year 2015-16 and 2017-18. Five years annual average of RoE and Net profit margin also showed negative result for the same cause. Post merger period has shown a constant increase in all the selected parameters of profitability for the present study.

During the first two initial years after bank merger, RoA, RoE and Net profit margin increased at a marginal rate whereas these three parameters has changed positively from 2021-22 to 2023-24. CAGR of RoA recorded at 86%, RoE recorded at 73% and Net Profit margin recorded at 83% for post-merger study period.

Table 3: Profitability- Descriptive Statistics

Pre-Merger Period (₹ in crore)				Post Merger Period (₹ in crore)			
Year	RoA (%)	RoE (%)	Net Profit Margin (%)	Year	RoA (%)	RoE (%)	Net Profit Margin (%)
2014-15	0.48	9.21	7.17	2019-20	0.05	1.23	1.45
2015-16	-0.8	-17.46	-30.42	2020-21	0.07	1.5	2.01
2016-17	0.2	4.53	6.82	2021-22	0.57	11.86	16.49
2017-18	-0.34	-7.64	-10.96	2022-23	0.97	18.34	27.46
2018-19	0.06	1.18	1.75	2023-24	1.12	18.95	30.04
CAGR (%)	-34%	-34%	-25%		86%	73%	83%
Mean	-0.08	-2.04	-5.13		0.556	10.376	15.49
SD	0.50	10.60	15.93		0.50	8.68	13.55

Source: Compiled by authors from annual reports

Though the first glance of descriptive statistics indicated substantial improvement in bank's profitability post-merger but the comparison has not brought fair result as the bank sustained fluctuations in its net earnings during pre-merger period led by several reasons and increased in its operating cost.

Table 4: Profitability- Paired t Test

Parameters	p value	Hypotheses
RoA (%)	0.108	Accept Ho_2
RoE (%)	0.103	Accept Ho_2
Net Profit Margin (%)	0.065	Accept Ho_2

Source: Generated through MS-Excel

The result of paired t test for profitability parameters at 5 % level of significance showed that the determined p value for different parameters was above the standard value 0.05 which indicated that the improvement in profitability of the bank after the bank merger was insignificant and Ho_2 has been accepted which stated no significant difference between the profitability of the bank before and after the bank merger.

Conclusion

Based on the aforementioned analysis of collected data, it is apparent that the Bank of Baroda has exhibited enhancements in terms of asset quality and profitability performance after the merger. The improvement is insignificant in terms of Asset quality and profitability of the bank. Nonetheless, the degree of progress varies across different parameters, underscoring the imperative for the bank to augment these facets by concentrating on early indicators signaling a transition of standard loans into the Non-Performing Assets (NPA) category, bolstering credit evaluation procedures, and effectively managing the accrual of new NPAs. In conclusion, while the Bank of Baroda has made commendable progress in improving its asset quality and profitability post-merger, there is still room for further enhancement. By continuing to focus on early indicators, strengthening credit assessment procedures, and efficiently managing NPAs, the bank can solidify its position as a resilient financial institution in the market.

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A Systematic Literature Review: How Behavioural Biases Impact Investment Decision-Making?

Nilakhi Baruah* and Dr. Jutimala Bora**

Abstract

Making logical financial selections is the most fascinating thing an investor can do. Typically, when things remain ambiguous, investors engage in behavioural biases either intentionally or unintentionally. Investor decision-making is influenced by a variety of cognitive processes, which might lead to controlling other people's behaviour. The core objective of the study is to investigate the presence of behavioural biases in investment decision-making. This study is based on a secondary source of data, collected from Google Scholar and Scopus databases. The study reviewed the previously published manuscripts from the duration of 2007 to 2024. Results showed that even rational investors don't always act rationally. Whether or not they are aware of them and regardless of their level of training and experience, investors are impacted by behavioural biases.

Keywords: Review, Biases, Investment, Decision – making

JEL Classification: G4, G41

* PhD Scholar, **Associate Professor, Department of Commerce, Dibrugarh University

Introduction

As *Meir Statman*'s quote states it, *"standard finance people are modeled as 'rational,' whereas behavioral finance people are modeled as 'normal.'"*

This quote enlightens that traditional finance assumes the investors of the market are rational thinkers, on the other hand; behavioural finance presumes the investors are not rational thinkers, rather they are normal or irrational people who often make mistakes and errors.

Behavioural finance, broadly understood as the application of psychology to the financial sector, has gained significant momentum since the tech-stock bubble burst in March 2000 and has been at the forefront of advisors' and investors' minds ever since the financial crisis of 2008–2009 (Pompian, 2012)

Financial economics appears to be at the Centre of a transitional shift from a neoclassical-based model to a behaviorally-based model. Psychologists have studied decision-making behaviour and found adequate evidence to show that decision-makers do not always behave consistently and rationally and do not formulate decisions according to the theories of classical statistics. Instead, they behave in a way different from both. Eventually, the behavioural psychologists Daniel Kahneman and Amos Tversky developed a theory known as prospect theory, which is thought to be the conceptual basis of BFMI (Pompian, 2012). According to Pompian M. (2012) the topic of behavioural finance can be segregated into two different sub-topics a) Behavioural Finance Micro (BFMI) and b) Behavioural Finance Macro (BFMA). Under BFMI, the behavioural mistakes made by the individual investors are examined; whereas, the anomalies in the efficient market hypothesis or behavioural biases or errors performed by the investors as a whole are investigated under the BFMA approach.

The study addresses the biases that people have when making any kind of decision in complex situations. Even a professional investor can't claim that biases don't influence his choices.

The main objective of the study is to examine the presence of behavioural biases in the investor's decision-making while investing.

Research Methodology

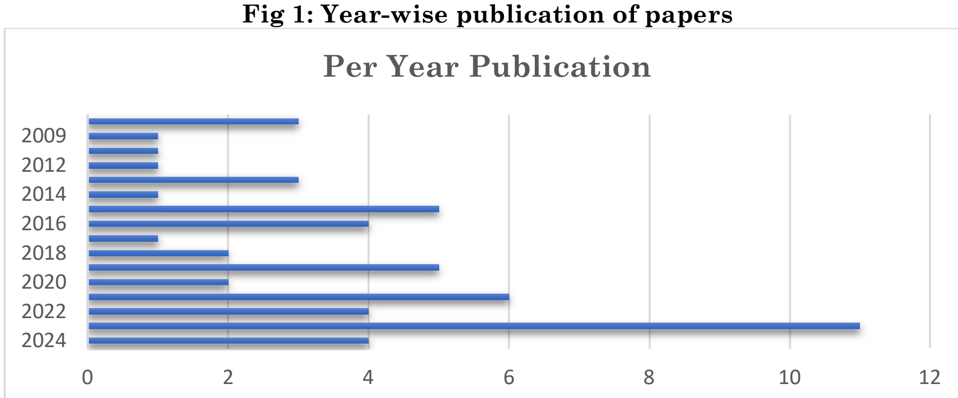
The literature review was framed, mentioning the article selection criteria, search strategy, data extraction, and data analysis procedures. All the previous studies related to 'behavioural biases on investment decision-making' were considered eligible for the current study. The inclusion criteria were: time frame of publication from 2007 to 2024, in English language, accessibility of full-text papers and related to 'Behavioural Biases' and 'Investment decision making'. Google Scholar and Scopus databases were utilized for the study. The information was processed methodically and combined into an MS Excel document and framed as a sketch of the review. A total of 54 studies were found to be eligible for fulfilling the objective of the study.

Result and Discussion

Year-wise Publication

About the frequency of year-wise paper publication, Fig. 1 shows the highest number of papers published in the year 2023 which highlighted how the theme was currently more relevant across a range of fields of study.

Fig 1: Year-wise publication of papers

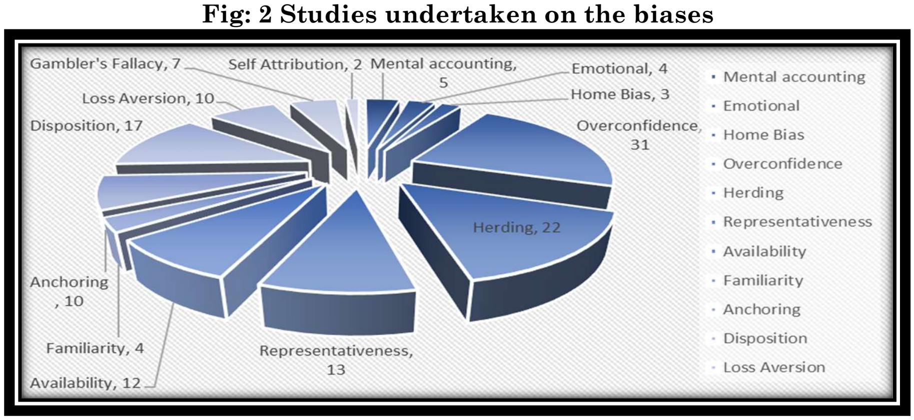


Source: Authors Compilation

Behavioural Biases in Literature

A rational investor may be impacted by various behavioural biases under various conditions. After analysing the studies, it was shown that overconfidence bias was examined in the greatest number, and it was found that most of the researchers examined several behavioural biases in their studies.

Fig: 2 Studies undertaken on the biases



Source: Authors Compilation

Previous Studies with Citations

A table has been enlisted with the four important columns which are the author's name & year of the publication, methods adopted, results and citations compiled from the Google Scholar database.

Table No: 1 Previous Literature and Citations

Authors	Methods Adopted	Findings	Citations
Peprah et. al (2024)	Snowball sampling	The COVID-19 epidemic dramatically illustrated how US investors contributed to the stock market catastrophe by using 87.5% cognitive biases and 75.6% heuristic approaches.	0
Suresh 2024	Convenient sampling	Heuristic bias and the emergence of behavioural bias in decision-making were strongly positively correlated. The framing effect, cognitive illusions, and herd mentality all negatively impact behavioural biases.	39
Aziz et.al (2024)	Face-to-face interviews	Several factors influence investment decisions, including overconfidence biases, loss aversion, bandwagon effect, negativity, gambler's fallacy, and confirmation. Investment decisions are somewhat impacted favourably by endowment and status quo biases.	0
Mamidala et.al (2024)	Interviews and Systematic sampling	Retail investors' intentions to invest are influenced by factors: - regret avoidance, switching costs, sunk costs, availability, herding, anchoring, and perceived threat.	7
Sathya & Prabhavathi (2023)	Online survey	Social media can affect risk perception while making investing decisions and amplify the consequences of behavioural biases like herding and overconfidence bias.	1
Mahadwartha et al. (2023)	Purposive sampling	Gambler's fallacy and Familiarity occur in investment decision-making, Halo effect more or less occurs in investment decision-making.	0
Srinivasan & Karthikeyan (2023)	Random Sampling	Biases reported a negative link between prospect theory and the herding effect, although heuristics showed a favourable relationship with them.	0
El Oubani (2023)	Convenient sampling	Moroccan investors are influenced by disposition, they may exhibit disposition bias during the rational decision-making process. However, when they experience losses, their overconfidence disappears, their perception of risk shifts, and they resume being rational.	0
Deka et.al (2023)	Random Sampling	The study's chosen biases and perceived risk are significantly correlated, as evidenced by the substantial influence of risk perception on stock investment decisions. Higher ESG consciousness diminishes the positive association between investors' perceived biases and risk perception, according to a significant negative moderation effect of ESG consciousness on the relationship between the selected biases and investors' perceived risk.	3
Mulasi et al. (2023)	Purposive sampling	Individual financial behaviour is adversely affected by herding and conservatism bias. The impact of conservatism and herding bias on financial behaviour is mitigated by financial self-efficacy.	3
Sudirman et al. (2023)	Online survey	Representativeness bias does not affect investment decision-making while anchoring and availability bias have a favourable influence. While anchoring and availability bias is not supported, investment time mitigates the impact of representativeness bias on irrational investment decision-making.	3
Marjerison et al. (2023)	Online survey	It appears that representativeness, risk aversion, and herding behaviour have a minor impact on investors' decisions to invest in funds in the second half of 2020.	7
Souza et al. (2023)	Non-Probability	Loss aversion has a negative impact on investors'	1

	Sampling	decision-making, but overconfidence and anchoring have a positive effect. There is no influence from the herd effect.	
Benayad & Aasri (2023)	Random sampling, Survey method	There was no statistically significant relationship between overconfidence bias and the investment decisions of Moroccan SME managers.	0
Edeh et al. (2023)	Online Survey	The information showed that investment success and behavioural factor indicators were positively correlated. Thus, the study suggests that NSE should consistently educate clients and provide information to positively impact investment choices. The NSE ought to assess the impact of previous occurrences on the particular counter being examined. [NSE= Nigeria Stock Exchange]	3
Singh & Kumar (2022)	Survey method	An increased degree of market efficiency would benefit the Indian IPO market from human decision-making's psychological biases.	2
Parmitasari et al. (2022)	Survey method	Emotion significantly boosted the perception of control, but not overconfidence or judgment. There was a notable 86.4% effect of the illusion of control on overconfidence, which was followed by a notable rise in decision-making.	15
Yadav et al. (2022)	Survey	The study showed that diversification is significantly related to both the biases used. The other variables considered are found to be non-significant for both biases.	1
Hasnawati et al. (2022)	Non-Probability	During the COVID-19 pandemic, the data demonstrated that behavioural bias factors strongly influenced investment decisions.	0
Bhatia et al. (2021)	Purposive sampling	The irrationalities of investing decision-making are favourably and strongly influenced by behavioural biases. The results also offer empirical proof that individual investors' use of robo-advisory services is unable to reduce overconfidence and loss-aversion bias.	32
Zhdanov & Simonov (2021)	Experimental study	Portfolio holders familiar with the assets in their portfolios were 1.10 times more likely to be persistent in purchasing downgraded assets and 1.34 times more likely to be persistent in selling winners and holding losers.	3
Sharma & Firoz (2021)	Survey	The investor's rationality and behavioural biases are strongly correlated. Optimism, herding, and disposition effects all have a significant impact on an investor's rationality and investment choices.	5
Youssef et al. (2021)	Convenient sampling	The impact of financial literacy on behavioural biases varies depending on the type of bias; information processing biases are most affected, belief perseverance biases are moderately affected, and emotional biases are least affected. Women are more affected by financial literacy when it comes to behavioural biases than men are.	2
Kartini & Nahda (2021)	Snowball sampling	Investment decisions are significantly impacted by anchoring, representativeness, loss aversion, overconfidence, optimism, and herding behaviour. It highlights how behavioural aspects affect investors' decisions.	116
Khan et al. (2021)	Simple Random Sampling	Investors' investing decisions are significantly and favourably impacted by availability and representativeness bias.	56
Ullah et al. (2020)	Random Sampling	The herd mentality, disposition effect, and overconfidence all have significantly favourable	38

		effects on investment choices. Active investors exhibit more overconfidence bias while passive investors exhibit more herding bias.	
Ratnadi et al. (2020)	Survey	Availability bias is the heuristic element used in investing decisions. Herding had a negative impact on investment decisions, prospect factors influenced decisions, market behaviour variables influenced decisions, and heuristics had no effect on decisions.	16
Baker et al. (2019)	Email and telephone Survey	Biases and investing decision-making have a significant relationship.	74
Madaan & Singh (2019)	Survey	Strong correlations between investing decision-making and overconfidence, anchoring, disposition effect, and herding behaviour. Herd mentality and overconfidence have a big impact on investing decisions. Investors' decision-making regarding investments is unaffected by anchoring or disposition.	165
Sabir et al. (2019)	Cluster Sampling, Questionnaire Survey	Overconfidence has a strong positive correlation with stock market investors' herding behaviour. Investor herding behaviour is exacerbated by a rise in investor overconfidence.	108
Khilar & Singh (2019)	Judgment and snowball sampling technique	Overconfidence bias affects the investment decisions made by investors in the Bhubaneswar region, India.	9
Trejos et al. (2019)	Survey	Gender, career, and educational attainment all contribute to the explanation of overconfidence; age, nationality, and earnings do not. Overconfidence is more common among investors displaying disposition effects.	77
Phan et al. (2018)	Quota and snowball sampling	Positive evidence for overconfidence and evaluation frequency on overtrading, as well as a social transmission bias on under diversification and equity allocation.	31
Rasheed et al. (2018)	Convenience Sampling	The locus of control has no discernible moderating influence, yet both of the heuristics under investigation considerably lead investors to stray from rational decision-making.	155
Jonsson et al. (2017)	Random Method	Financial literacy affects the attenuation of the disposition effect. Knowledge about mutual funds and knowledge about current market conditions affect the attenuation of the disposition effect,	83
Kumar & Goyal (2016)	Judgemental and Snowball	In India, overconfidence and herd mentality are more common in male investors. When making financial decisions, investors use reason. Behavioural biases develop at various phases of the decision-making process.	230
Khan et al. (2016)	Simple random sampling, survey method	Trading activities are determined by the simultaneous recognition of overconfidence, optimism, and stated preferences for firm features. A firm's liquidity preferences and trading volume features combined with a better-than-average degree of overconfidence, relative optimism in the financial sphere, and optimism in personal investments are likely to stimulate trading activity among investors.	43
Singh et al. (2016)	Judgemental and Convenient sampling	Gender has no bearing on reference point biases, overreaction, or the framing effect, although women are more self-attributable than men and males are more overconfident.	24
Tekçe et al. (2016)	-	Investors are prone to biases: Overconfidence is	136

		positively correlated with familiarity bias; Representativeness heuristic deteriorates wealth while status quo bias results in higher trade performance; Familiarity bias has a nonmonotonic effect on return; lower (higher) levels of familiarity bias have a negative (positive) effect on return; Male, younger, and investors in low-income, low-education regions exhibit more familiarity bias; Female, older, and investors with high portfolio values are more susceptible to the disposition effect and representativeness heuristic.	
Frino et al. (2015)	Account-based Survey	A large sample of individual investor accounts is used to find the disposition effect across various investor groups. Investors with Chinese ancestry, women, and older investors are more likely to experience the disposition impact. The disposition effect can be predicted by a number of other biases, such as regular trading, round-size trading heuristics, and the investor's degree of portfolio diversification.	64
Rzeszutek et al. (2015)	Convenience Sampling	Reliability to behavioural biases is correlated with stock market investment skills, according to statistical assessments. Some personality features have an impact on one's vulnerability to behavioural biases.	63
Tekçe & Yilmaz (2015)	Account Based Survey	Overconfidence is more common among male and younger investors, investors with smaller portfolio values, and investors in low-income and low-education areas. The wealth of a portfolio is negatively impacted by overconfidence.	112
Prosad et al. (2015)	Judgemental and Snowball Sampling	Investors' age, occupation, and frequency of trading are the most significant determinants of behavioural biases, along with their level of trading expertise. Every bias is associated with a distinct set of investor traits, and in the Indian context, overconfidence emerges as the most significant bias.	149
Lucchesi et al. (2015)	Account Based Survey	Prospect theory appears to direct managers' decision-making, but it was not possible to verify the assumption that mean reversion bias is the cause of the dispostion effect.	27
Du & Shelley (2014)	Experimental	Ambiguity makes managers more likely to deceive and investors more likely to follow, and investors' dependence on managers' advice may increase when they feel too comfortable with them.	7
Bodnaruk & Simonov (2013)	Account Based survey	Financial professionals outperform their peers in terms of performance, risk diversification, and behavioural bias reduction. Instead, they make superior investing judgments. Stocks that provide managers with an informational edge over other investors—stocks that are also owned by mutual funds, for example—perform significantly better for them.	126
Lakshmi et al. (2013)	Offline and Online survey	Investors with a shorter investing horizon tend to exhibit higher levels of overconfidence, Herding, Social Contagion, and Representative Heuristic behaviour. Investment decisions typically become long-term as risk aversion, the disposition effect, and cognitive dissonance increase to a significant degree.	49
Kudryavtsev et al. (2013)	Online survey	Male and more experienced investors have higher correlation coefficients between the biases, suggesting that while these investor categories are likely to act more consistently, they are also more	94

		likely to make their own decisions about whether to reject all or mostly rely on simplifying techniques.	
Kalra & Arora (2012)	Judgment and snowballing sampling	Segmenting the individual investors based on their investment biases, yielded four segments namely, novice learners, competent confirmers, cautious anticipators and efficient planners. Different investors face different biases according to their investment experience.	132
Nikiforow (2010)	Interview method	Training rather influences fund managers' perception than their investment behaviour. Training significantly sharpens the awareness towards the reflection effect, which is an important and desirable result, as this bias partly explains the well-known disposition effect.	38
Graham et al. (2009)	Telephone survey, Random sampling	More often trading and internationally diversified portfolios are characteristics of proficient investors.	945
Chen et al. (2007)	Account-based Survey	Three behavioural biases affect Chinese investors: representativeness, disposition and overconfidence. Compared to past research, Chinese investors appear to be more overconfident than US investors (i.e., they hold fewer stocks but trade more frequently), and their disposition effect is more prominent.	886
Glaser & Weber (2007)	Online survey	Investors who think that they are above average in terms of investment skills or past performance (but who did not have above-average performance in the past) trade more.	1143
Lütje & Menkhoff (2007)	Survey method	The majority of them favour local assets, which is consistent with findings for other groups in earlier research.	109

Source: Authors Compilation

The researcher found that behavioural biases were present in investment decision–making. Investors in the stock market are subject to various behavioural biases, regardless of their investor types, investing goals (long- or short-term), frequency of investments, or portfolio composition. Most investors believe that their choices are unaffected by behavioural biases or that they base their choices on computations, analysis, and historical performance. However, this is not the case; instead, investors mistakenly misjudge the circumstances and make significant mistakes. The government or the share market's authorities might hold conferences, webinars, seminars, workshops, and training sessions to lessen behavioural biases. In addition, investors should receive adequate information about the share and mutual fund markets so they can make impartial investing decisions. Moreover, the concerned authorities can take initiatives for educating the students of higher education institutions irrespective of their streams or backgrounds.

Conclusion

The results demonstrate the existence of behavioural biases in decision-making connected to investments. The results suggest that more research should be conducted regarding behavioural biases. Since humans are not robots, we cannot say that their behaviour or cognitive processes are rational. People frequently make mistakes and tend to be affected by other forces. Future studies can be carried out in different directions under review work. Using PRISMA guidelines in the review work is also a future scope of the related study.

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Disrupt Technology in Banking Industry—A Study on the Consumer Satisfaction with Special Reference to Jorhat

Dr. Alimpiya Bordoloi*

Abstract

Disruptive technology is a technology changing and overturning a traditional way and process or model of doing things. With the intertwining relationship of banks, markets and technology; traditional banking has undergone paradigm shift from being based only in form of physical branch to increasingly using digitalization in their core businesses. The increasing usage of technology has given rise to innovative and automated technology in the financial services which can be often understood and described as financial technology or fintech sector. The Fintech sector can thus be said to disrupt the traditional banking model referring it to as disruptive technology in banking industry. The rise and advent of Fintech has enabled the customers to enjoy easy access to financial services and even personalized services at a greater convenience and speed with higher degree of efficiency and service quality. Thus, financial technology is rising in leaps and bounds and consumers are seen to be adapting fintech services for its innumerable advantages. The present study aims to analyse the consumers who are using fintech banking services about their satisfaction and their perception towards financial technology. A total of 200 respondents using convenience sampling technique have been selected and the data collected through a structured questionnaire and analyzed through SPSS using a few statistical and mathematical tools and techniques. The study is significant for various stakeholders who are directly or indirectly related to financial services and in evolving the landscape of financial sector.

Keywords: Fintech, consumer satisfaction, banking industry.
JEL Classification: G2, G20, O33, M31

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*Assistant Professor, Department of Accountancy, Mariani College

Introduction

The word fintech has become a catchword and an emerging global phenomenon since its surfacing in the early 2000s when financial services and technology associated and converged with the growth of internet and proliferation of digital technologies. The interaction of the people with financial services transformed and the world of finance which was once dominated by banking institution encountered a new player – fintech companies. With globalization and evolution of internet, the world has witnessed the revolutionary change in the business sector and the financial sector did not remain untouched. Technological advancement crept in financial services sector and together they have combined to bring in change in traditional banking procedures. This disruptive force in banking industry is fintech which can be understood as merger between finance and technology that updates and improves and automates the delivery and use of financial services. In fact, traditional technology like ATMs, payment through cards, online transaction also encompasses under fintech. In a nutshell, using technology to provide financial service is financial technology.

Customers today are tech-oriented, they are the king of market and the advent and rise of fintech has enabled the customers to access financial services in greater efficiency and high degree of efficiency and speed. Thus, fintech is rising in leaps and bounds in areas such as payments, lending and investment services, secured contactless payments through mobile wallets, use of digital currencies, matching borrowers with investors are some easy and transparent offers of fintech. In such a situation it becomes imperative for the banking industry to cope up with the demand of the consumers. Banks are creating their own offerings in the form of apps that can be installed in any smart phone. They offer similar services as offered by fintech companies.

Thus, both the partners – fintech firms and banks are trying to stay relevant by evolving the financial landscape. In this regard the customer satisfaction towards fintech in banking field needs to be analysed.

Significance of the Study

Fintech has brought a disruption in the traditional banking business through its revolutionary offerings and solution which were not available before. It has now become an essential component of the financial sector. It has been successful in luring the customers as it has been able to offer user friendly platform, facilities and services personalized customer support and even tailored to meet requirement. When fintech offers such facilities and services it becomes imperative to analyse the customers satisfaction. Consumers experience cannot be kept at back seat while discussing about fintech. Shedding light on such aspects will enable the pivotal players in creating ways and means to raise happy customers thereby focusing on base line.

Literature Review

Fintech services have revolutionized the traditional banking sector and has drawn a quite attention among the academicians, researchers, industrialist to have an understanding of it. A few of the literature have been reviewed which have been presented below.

Samuel & Arya, (2022) studied on the impact of fintech on banking industry. Taking a sample of 150 respondents, the study concludes that the respondents are highly dissatisfied with the storage capacity of fintech apps but satisfied with the communication and user friendliness of the apps. However, in India there are many hindrances related to usage and security among unbanked population. The study suggests that the regulators should frame effective policies to remove such hindrances and try to upgrade the banking system of India through fintech.

Goswami (2022) investigates on the critical success factors influencing the adoption of disruptive financial technology in rural India. The study concludes that the fintech can be used to bridge the gap of banked and unbanked by removing spatial barriers and enabling customers to conduct financial transactions affordably and dependably.

Dwivedi (2021) empirically tested 76 banking professionals and executives of Dubai (UAE) to study on the impact of Fintech on the competitiveness and performance of the banking industry in UAE. The findings of the study concludes that adoption of fintech in UAE has significant influence on the competitiveness and performance of banking industry there.

Huparikar et al, (2022) explored the role of fintech and its influence on the customers satisfaction of the banks in Pune city. The article concludes that fintech is meeting and exceeding the customers satisfaction in banking field for the young generation who are more techno savvy. However, security, trust and confidentiality of data is still a matter of concern for the customers.

Shin, (2021) studied on the mediating effect of customer satisfaction in the relationship between customer experience and intention to reuse digital banks in Korea. Shin observes how customer satisfaction and reuse intention are affected by digital banking experience. 247 Korean users of digital banks have been analyzed to investigate the association between the customer experience and intention.

Chouhan et al, (2023) studied on the effect of financial technology on banking sector. Digital disruption affects both traditional and banking business models. The study concludes on the responses of 300 bank customers through a conduct of primary survey. The findings of the study implies that the banks have been positively impacted by the use of financial technology as it can now enhance their value proposition which includes improve service quality.

Murthy et al (2024) examines the impact of fintech on banking industry. The study remarks that customer experience and operational frameworks have been completely transformed by fintech integration with banking operations.

Choudhury et al (2023) aims to investigate the impact of financial technology adoption on customer satisfaction in banking sector. The research study is based on primary data to see how fintech advancements influence customers perceptions of service quality and overall satisfaction. The study concludes that fintech have become very significant part of the banking system and has positive impact on the satisfaction of its users.

Sethi (2022) explored the customer behaviour towards technologies that are used in banking industry. The study concludes that the banks are integrating with digital technology to survive in the market and change their core mechanism. The customers responses have been positive towards the banks after being digitalized and the customers are highly benefited from online services. The study concludes that integration of fintech with the banking sector is the only way to survive.

Shailaja et al (2023) studies on the impact of fintech and customers satisfaction in Hyderabad city. The article explores the role of fintech in meeting and exceeding the customer satisfaction in banking field. It concludes that fintech has gained momentum in the field of banking and through proper planning, careful review fintech can contribute in meeting and exceeding customer expectation.

The reviewed literature shows that adopting fintech services in banking field have an impact on customer satisfaction. However, it is necessary to have a deeper investigation between fintech and customer satisfaction. Thus, ongoing and continuous research is quite essential and the present study is expected to have significance and enrich the research gap by empirical evaluation.

The present study is undertaken to explore the factors which influences customer to adopt fintech in banking field. Besides, the satisfaction level of customer towards these factors will also be analyzed.

Research Methodology

The research design is descriptive and exploratory. The study tries to find out the factors influencing customer satisfaction towards fintech services. Hence, the research is both descriptive and exploratory in nature. Both primary and secondary sources of data have been used in the study. The primary source has been the respondents participating in the survey. The secondary source has been various journals and books. The sampling technique adopted is non-probabilistic sampling technique, the convenience sampling. The population of the study is all the fintech service users of Jorhat city and the sample size is 200. The sampling unit of the study is the 'fintech service users.' The statistical tools used for the study is mean analysis and impact analysis. The measurement used in the study to explore the factors influencing customer satisfaction towards fintech services are Perceived usefulness, Ease of use, Trust and privacy and security and Innovativeness. These factors are again stated in some more detailed statements to have a better and detailed picture of the provided factors. These sub- factors are to be rated in a five-point Likert scale to determine the level of influence where 1 denotes no influence and 5 denotes very high influence. The level of satisfaction of the customers towards fintech services are rated in five-point Likert scale where 1 denotes least satisfied and 5 denoting highly satisfied.

The present study tries to answer the following research questions:

i. What are the different factors which influence consumer satisfaction while adopting fintech in banking field?

ii. Whether the factors have different level of satisfaction?

Results and Discussion

The data collected have been analyzed using mean analysis which have been tabulated below. In order to explore the factors, the various factors have been rated in 5-point Likert scale and their means are as follows:

Table 1: Influence level of the factors towards adopting fintech services

Factors	Sub factors	Mean	Overall mean	Remarks
Perceived usefulness	Can meet various needs of customers	**3.68**	**3.66**	**High influence**
	Access to various facilities when using fintech	**3.41**		
	Speedy, automated and time convenience	**4.21**		
	Provision of customized services	**3.12**		
	Provision of financial benefits like discounts, offers etc	**3.88**		
Ease of use	Easy operations	**4.18**	**4.00**	**High influence**
	Easy and understandable instructions	**3.48**		
	Can be used anywhere anytime	**4.34**		
Trust and privacy and security	Secured transactions	**3.52**	**3.45**	**High influence**
	24*7 customer support to solve any related issue	**3.84**		
	Safety of personal and financial information	**3.00**		
Innovativeness		**3.71**	**3.71**	**High influence**

Source: Self compiled from field survey

The above table shows that the sub factors 'can be used anywhere anytime' has the highest mean with 4.34 followed by speed and time convenience with 4.21 score and thirdly with 4.18 'easy operations' influence the customers. Safety of personal and financial information is the least influencing factor with 3.00 mean score. However, on analysing the overall mean of the factors 'ease of use' is the most influencing factor for the customers to use fintech services. The least influencing factor has been trusted and privacy and security with the lowest mean of 3.45.

To examine the satisfaction level the statements drawn have been rated on five-point Likert scale which is presented below.

Table 2: Table showing satisfaction levels of customers towards fintech services in banking sector

Statement	Mean	Remark
Fintech services can satisfy diverse needs of customers in a single platform.	**3.90**	**Satisfied**
Fintech services give access to various.	**4.11**	**Satisfied**
Fintech services are speedy automated and time saving.	**4.4**	**Very satisfied**
Fintech understands customers' individual requirement and provides highly customized products to customers.	**3.98**	**Satisfied**
Fintech is simple and easy to operate.	**3.88**	**Satisfied**
Fintech ensures easy and understandable instructions while providing the information the customers need.	**3.60**	**Satisfied**
Fintech provides place convenience and flexibility of working hours.	**4.24**	**Very satisfied**
It ensures secrecy and safety of transaction.	**3.20**	**Neutral**
Provides better customer support service.	**3.40**	**Neutral**
Personal and financial information can be kept private.	**2.8**	**Neutral**
Fintech provides innovative products and services with the advent of technology.	**4.00**	**Satisfied**
Fintech provides time to time discount and offers to its users.	**4.14**	**Satisfied**

Source: Self compiled

The above table shows the level of satisfaction of the fintech users. Speedy and time convenience has the highest satisfaction level with the mean score of 4.4 followed by place convenience and flexible working hours. These aspects highly influence the customers to use fintech services and they are also very satisfied with them. On the other hand, privacy issue has the least mean score and they have a neutral attitude denoting their concern towards safety. Security issue also act as a challenging issue thereby lowering their satisfaction level. The customers are also satisfied with issues such as innovativeness, financial benefits, easy application, catering to diverse financial needs, availing customized as well various online financial facilities.

Findings and Suggestions

From the data analysis it can be said that convenience factor is the most influencing aspect when comes to availing fintech services. Easy interface and operations, easy usage and most importantly time and place approachable makes it most desirable among the masses. Utility of fintech services in the form of provision of customized services, offers, discount, speedy transactions also persuade the customers of banking facilities to avail services.

The trust and confidentiality issue are the least influencing factor and it is also evident from Table 2 that the customers are skeptical regarding the privacy issue as their responses depict neutral attitude. This can be understood as fintech frauds have become very common now a days. Identity theft, payment fraud, loan and credit fraud, phishing scams etc. are prime fraudulent activities targeting the fintech ecosystem. All these have undermined the customer trust.

Prevention of these frauds can make fintech sector to bloom in full fledge. Some strategies to safeguard fintech platform and its users are advanced encryption of data so that data cannot be misused or easily understood, regular audits of security infrastructure can identify and even address the vulnerabilities, prioritizing the security of software development practices, educating the customers about frauds and risks. No doubt, this has become a regular practice. However, transaction alerts and limits can also mitigate frauds. These alerts and limits can help customers to spot unauthorized transactions.

Conclusion

Financial technology has become unavoidable in the current scenario. The banks in order to stay relevant and provide value to the customers in ever changing financial landscape, needs to partner with fintech firms to deliver their digital offerings. Customers are also attracted towards it as it offers competitive advantage such as speed, time saving approach, intensive customer support etc. India being dominated mainly by the young and working age group, who are techno oriented are happy with the fintech services and have a considerable customer experience. However, there is always a room for improvement. For continuous achievement of customer satisfaction, the primary emphasis should always be safety and privacy. The Indian fintech ecosystem have witnessed impressive momentum. This sector has a positive impact but a larger Environmental, Social and Governance (ESG) impact can lend to sustained and inclusive economic growth.

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Financial Performance of SHG Member Households: A study in Lakhimpur District of Assam

Dr. Mahendra Hazarika

Abstract

The study focuses on the financial performance of Self-Help group member's households and has given emphasis on their income and expenditure patterns. By using primary data in Lakhimpur District of Assam, the study found a significant increase in the average monthly income of Self-Help Group households after joining the SHGs, statistically demonstrating the positive impact of SHGs on household and per capita income of the beneficiary families. Similarly, the expenditure pattern of SHG households shifted notably after joining the program - food expenditure rose by 35%, non-food expenditure increased by 90%, education expenditure tripled, and health expenditure decreased by 60%. Concurrently, savings increased by approximately four times. These changes in the expenditure pattern suggest that SHGs has substantial contribution to altering the consumption patterns of the beneficiary households.

Keywords: Microfinance, Self-Help Group, Household Finance, Assam

JEL Classification: G21, G23, E62

***** Associate Professor, Dept. of Economics, Madhabdev University, Assam, India

Introduction

Self-help groups represent a method of organizing underprivileged individuals to collectively address their personal challenges. This approach is utilized by governments, non-governmental organizations, and others globally. The impoverished deposit their savings with banks, which in turn provide them with easy access to affordable loans to establish their own micro-enterprises. Thousands of India's poor and marginalized populations have leveraged SHGs to improve their lives, support their families, and contribute to their communities. The Government of India's Ninth Five-Year Plan recognized the significance and relevance of the SHG model in implementing developmental initiatives at the grassroots level (Sundaram, 2012). Self-Help Groups are small, economically homogeneous communities of rural impoverished individuals who voluntarily convene to regularly save small sums, which are deposited into a shared fund. This common pool of resources is then used to address members' emergency financial needs and to provide collateral-free loans, as determined by the group (Jha, 2000). Rural areas dominated by marginal and small farmers, as well as the poor segment of the population, can lead to economic imbalances if neglected. The economic imbalance among these rural inhabitants may exacerbate income inequality, inter-regional disparity, and the rural-urban divide (Agrawal et.al. 1997). In such an environment, the weaker sections heavily depend on credit. Micro-finance institutions and SHGs have significant potential to reach the rural poor and address the basic issues of rural development, where formal financial institutions have struggled to make significant progress (Kamal Vatta, 2003). Self-Help groups can play a crucial role in empowering and uplifting the poorer sections of society by fostering their active economic participation and financial independence.

The Self-Help Group model originated from the Grameen Bank of Bangladesh, founded by Professor Mohammed Yunus in 1975. Through this initiative, Bangladesh has sought to integrate women into the mainstream economy by establishing SHGs and instilling the practice of thrift and savings among the impoverished population.

Significance of the study

The rural poor often face a multitude of challenges, stemming from their social marginalization, lack of education, low motivation, and limited economic resources. Individually, the poor tend to be disadvantaged not only in socioeconomic terms but also in terms of access to knowledge and information, which are crucial components of contemporary development processes. However, by organizing and working collectively, the rural poor can overcome many of these limitations and empower themselves. SHGs are designed to deliver services to the economically disadvantaged and impoverished sections of society. Consequently, the effective participation of the poor in self-help groups significantly contributes to enhancing their living standards. The present study aims to analyze the financial performance of SHG member households. Therefore, the study is based on the objective-

To make a comparative study on Income and Expenditures of SHG member families before and after joining the SHG.

Research Methodology

This study examines the financial performance of SHG member families of Lakhimpur District, Assam. The research utilizes both primary and secondary data sources. The primary data were collected from the field survey of the sample district. A pre-tested questionnaires have been prepared for the collection of primary data. For the purposes of this research, three development blocks were randomly selected from the nine within the district. These were the Narayanpur, Bihpuria, and Karunabari blocks. For the present study, the information was collected by interviewing people who joined the self-help groups at least 5 years before. Total 60 SHGs (20 each from a block) have been randomly selected from the district and then 300 SHG members (5 from each SHG) have been randomly selected for collecting information through personal interview process. Secondary information was gathered from various sources, such as development agencies, financial institutions, and non-governmental organizations. Furthermore, to conduct a thorough investigation, additional data was collected from published and unpublished materials, including academic journals, reports, and books relevant to the study.

Statistical techniques such as measures of central tendency (mean, median, mode), measures of dispersion (standard deviation), and measures of shape (skewness, kurtosis) have been utilized extensively for data analysis and drawing inferences. In addition, tables were used to analyze the data.

Result and Discussion

General Profile of the SHG Households

The study reveals that the average family size in Bihpuria Block is 5.2 individuals, while in Narayanpur and Karunabari Blocks it is 5.0. According to the data presented in Table 1, around 49% of family members across the surveyed households are male, and 51% are female. Additionally, approximately 62.5% of the population are adults, and the remaining 37.5% are minors. Considering all the Blocks, it is observed that nearly 42% of individuals are earning members, while 58% are dependent. The dependent members are lowest in Bihpuria Block at 56.70%, followed by Narayanpur and Karunabari Development Blocks. The study findings indicate that the literacy rate in all three Blocks is around 85%, and the percentage of school-going children is approximately 33%. Furthermore, the study reveals that the percentage of the female population is higher than the male counterpart in the surveyed households. The literacy rate is highest in Narayanpur Development Block at 87.34%, followed by Bihpuria at 86.51%, and Karunabari at 80.45%.

India is traditionally known for its joint family system. But the concept of nuclear family system has been steadily rising in India (both in urban and rural areas). It is because the benefits of small family system in the new market system have greatly influenced both in urban and rural sectors. It is found that nearly 85 per cent families are nuclear in the sample district.

Table 1: Composition of SHG Households

Composition of Household	Block						Total	
	BHP[1]		KBR[2]		NRP[3]			
	Number	% of the total	Number	% of the total	Number	% of the total	Number	% of the total
Total member	522	100.00	497	100.00	498	100.00	1517	100.00
Adult	341	65.32	303	60.96	304	61.04	948	62.5
Children	181	34.67	194	36.41	194	37.55	569	37.5
Male	256	49.05	240	48.28	248	49.9 8	744	49.05
Female	266	50.95	257	51.72	250	50.02	773	50.95
Earning member	226	43.30	205	41.25	209	41.96	640	42.2
Dependent	296	56.70	292	58.75	289	58.50	877	57.81
School going	161	30.84	164	32.99	182	36.545	507	33.42
Literate	420	80.45	430	86.51	435	87.34	1285	84.70
Illiterate	102	19.54	67	13.48	63	12.65	232	15.30
Joint Family	18	18.0	10	10.0	18	18.0	46	15.3
Nuclear family	82	82.0	90	90.0	82	82.0	254	84.7

Source: Compiled from field survey. (Bihpuria [1], Karunabari [2], Narayanpur [3])

Annual Income of SHG Households

The annual household income of the SHG member families is categorized into three groups: up to Rs.12,000, Rs.12,000 to Rs.24,000, and above Rs.24,000. According to Table 2, approximately 59% of families have an annual income within Rs.12,000, while nearly 40% of households have an annual income within Rs.24,000, and the remaining 1% of families have an income exceeding Rs.24,000 from their primary source of income in the district. The distribution of households across these income groups is relatively similar across different blocks. Table No 5.8 also presents the contribution of supplementary sources of income to the total family income of SHG households. It is found that 97% of respondents' households fall within the income group of less than Rs.12,000, while only 3% of families have an income between Rs.12,001 and Rs.24,000. Furthermore, regarding the percentage of households with annual domestic income from all sources, only 1% of households are in the lower income group, 92% are in the middle-income group, and the remaining 7% of families have a higher income of Rs.24,000 per annum.

Comparison of monthly income before and after joining SHG

Table 3 presents the income statistics of SHG member families before and after joining the groups in the study area. Prior to SHG participation, the respondent families had a monthly mean income of around Rs.1,011 with a standard deviation of Rs.575 in the district. The median income was Rs.950, and the mode was Rs.800. The mean income being significantly higher than the mode indicates a positively skewed income distribution, with a greater number of families earning less than the mean. However, after joining the SHGs, the monthly average income increased by around 50%, reaching Rs.1,536. The median and mode income also increased. The mean income remained higher than the median and mode, but the degree of positive skewness decreased compared to the previous situation. This suggests a more even income distribution among the SHG member families. Furthermore, the measurement of the coefficient of Kurtosis reveals that the income distribution shifted from leptokurtic to platykurtic after SHG participation.

Table 2: Annual Income of SHG Households (in Rs)

Income group	Block			Total	
	BHP[1]	KBR[2]	NRP[3]		
	Number	Number	Number	No	%
Annual Income of SHG Households from Main Source					
Up to 12,000	50	71	55	176	59.0
12001-24,000	49	29	42	120	40.0
>24,000	1	-	3	4	1.0
Total	100	100	100	300	100
Annual Income of SHG Households from Supplementary Source					
Up to 12,000	97	100	95	292	97.0
12001-24,000	3	-	5	8	3.0
>24,000	-	-	-	-	-
Total					100
Total annual Income of SHG Households					
Up to 12000	1	0	4	5	2.0
12001-24000	91	100	84	275	92.0
>24000	8	-	12	20	7.0
Total	100	100	100	300	100.0

Source: Compiled from field survey

Table 3: Comparison of monthly income of households (In Rs.)

	Monthly Income	
	Before joining	**After joining**
Mean	1011.43	1536.42
Median	950.00	1496.00
Mode	800	1416
Std. Deviation	574.91	352.45
Skewness	0.37	0.34
Kurtosis	115.448	7.159

Source: Compiled from field survey

To know about the impact of SHGs on income the following hypothesis is tested.
Ho: "The SHG has no significant contribution on household income and per capita income of the SHG families."
The hypothesis is tested with the help of Sample t- test at 5% level of significance. The mean difference, standard error of sample mean income of the SHG member before and after joining SHG are found to be Rs.525 and 35.12 respectively (Table 4). The mean income difference has increased after joining SHGs and that has increased the household income as well as per capita income of SHG families. The calculated value of t is found to be 14.94, at 1% level of significance. Since the t value is much higher at 1 percent level of significance, the hypothesis is rejected**.** This implies that SHGs has significant effect on household income and per capita income of the beneficiaries.

Table 4: Paired t- test on Monthly income of SHG households

Pair	Mean income	Mean difference	Std. Error Mean	t	df	Sig
SHG family before joining income	Rs1011.43	524.99	35.12	14.94*	299	.001
SHG family after joining income	Rs1536.42					

Source: Primary Data   * at 5 per cent level of Significance

Expenditures pattern of surveyed families:
The Table 5 depicts the average expenditures and their standard deviations of different heads of expenditure such as food items, non-food items, health, and education and savings of the surveyed households in the district before joining and after joining SHGs.

Table 5: Expenditures on families before and after joining SHGs (in Rs)

Pair		Average	Std. Deviation
1	Before joining SHG food expenditure	626.59	101.283
	After joining SHG food expenditure	846.68	316.513
2	Before joining SHG nonfood expenditure	199.37	96.995
	After joining SHG nonfood expenditure	377.50	175.358
3	Before joining SHG health expenditure	52.44	48.676
	After joining SHG health expenditure	22.38	43.867
4	Before joining SHG education expenditure	54.25	68.228
	After joining SHG education expenditure	185.85	361.920
5	Before joining SHG savings	35.11	53.883
	After joining SHG savings	134.04	116.432

Source: Compiled from field survey

It is found that the average food expenditures of SHG households before and after joining SHGs are Rs.626.59 with its standard deviation Rs.101 and Rs.846.68 with the standard deviation of Rs.317 respectively.
It is observed that the average monthly expenditure on food teams has increased by 35 per cent and on non-food items has increased by 90 per cent after joining SHGs. Similarly, expenditure on education has increased by three times from Rs.54.25 to Rs.185.85 per month. But the expenditure on health care has decreased by 60 per cent. However, most striking feature of this study is that the rural saving has increased considerably. These families' monthly savings have increased by around four times from meager Rs.35.11 with its standard deviation of Rs.54 to Rs.134 with its standard deviation of Rs.116.

Conclusion

The study found a significant increase in the average monthly income of Self-Help Group households after joining the SHGs. This statistically demonstrates the positive impact of the poverty alleviation program on both household and per capita income of the beneficiary families. Similarly, the expenditure pattern of SHG households shifted notably after joining the program. Food expenditure rose by 35%, non-food expenditure increased by 90%, education expenditure tripled, and health expenditure decreased by 60%. Concurrently, savings increased by approximately four times. These changes in the expenditure pattern suggest that SHGs have made a substantial contribution to altering the consumption patterns of the beneficiary households. The present study suggests that self-help groups have substantial potential to alleviate rural poverty in Lakhimpur district. The program has positively impacted the income, assets, and consumption patterns of the beneficiaries. It has also played a significant role in enhancing the standard of living of the beneficiaries.

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Socio-Economic Conditions and the Problems Faced by The Women Weavers of Sualkuchi Silk Industry of Assam

Dr Rimakhi Borah* and Jogita Ray**

Abstract

The production of various silk fabrics could be seen all over Assam but this activity is mainly concentrated in Sualkuchi which is a prominent silk weaving centre. This handloom weaving tradition has a very important effect on the socio-economic lives of the people of Sualkuchi area. But the present condition of the Sualkuchi Silk Industry is gradually deteriorating due to various factors so it is necessary to understand the problems of this industry for which it is required to study the phenomenon in different settings. The people of Sualkuchi demand a change in the present situation of the silk village of Sualkuchi. For these, the present study has tried to understand the socio-economic conditions and the role of women weavers of silk industry of Assam with particular reference to Sualkuchi area. In the study area there are numbers of women weavers but due to paucity of time the researcher have selected 50 women weavers belonging to 3 blocks to conduct the study. The secondary data has been collected from various journals, articles, websites, books, etc. The study has found that the present scenario of Sualkuchi Silk Industry is not very favorable as the demand for the product is decreasing due to the availability of alternative options with a wide variety of choices. Moreover, the study has found that the raw materials required to produce Sualkuchi Silk products are scarce, and this must be imported from other areas at a higher price. In addition to this Sualkuchi silk industry weavers still adopt the traditional method i.e. manual technology to produce finished goods which consume more time as compared to machine product.

Keywords: Handloom, Weavers, Silk industry, Sualkuchi, Assam.

JEL Code: L26

***** Assistant Professor, Department of Accountancy, Nalbari Commerce College,

** M.Com. Student, Nalbari Commerce College, Nalbari, Assam, India.

Introduction

'Sualkuchi' is the main centre of Kamrup district of Assam where large amount of silk are produced. Sualkuchi has the largest number of cottage industry engaged in handloom among the whole state of Assam. The pride village Sualkuchi is situated under Kamrup rural district of Assam and the village is known as the 'Manchester of Assam'. Mekhela chadors and gamosas are made from this indigenous material and are in high demand throughout the world. These products are used not only for domestic consumption but are also exported to other countries.

In order to provide financial assistance in an integrated manner to the handloom weavers and to strengthen the design segment of the fabric, the government of India has taken new initiatives in addition to ongoing programme by launching new schemes, namely Deen Dayal Hathkargha Protsahan Yojana and has set up a national centre for Textile Design. Government has also set up the National Handloom Development Corporation in order to provide a boost to the implementation of the various welfare schemes for the development of the weavers.

The production of various silk fabrics could be seen all over Assam but this activity is mainly concentrated in Sualkuchi which is a prominent silk weaving centre. This handloom weaving tradition has a very important effect on the socio-economic lives of the people of Sualkuchi area. It is said that the weaving industry has successfully sustained its worth by transfer of skills from one generation to the other. The process of silk manufacturing, involves four major stages that of rearing the cocoons, twisting and reeling the thread and weaving. Since silk processing and manufacturing, is a household industry, in the study area it would be interesting to assess the role played by women in it. But, the condition of the Sualkuchi Silk industry is gradually deteriorating due to various factors so it is necessary to understand the problems of this industry for which it is required to study the phenomenon in different settings. The present research work is an attempt to study the silk industry of Sualkuchi in the Kamrup district of Assam situated about 30 kms from Guwahati city. The objective of the study is to understand the socio-economic conditions and the role of women weavers in silk weaving industry of Sualkuchi area of Assam and to find out the problems faced by the weavers involved in this sector.

Significance of the Study

The production of various silk fabrics could be seen all over Assam but this activity is mainly concentrated in Sualkuchi which is a prominent silk weaving centre. The condition of the Sualkuchi Silk Industry is gradually deteriorating due to various factors so it is necessary to understand the problems of this industry for which it is required to study this industry phenomenon. The problems need to be looked into for smooth functioning of this sector. The people of Sualkuchi demand a change in the present situation of the silk village of Sualkuchi. For these, the present study has tried to understand the socio-economic conditions and the role of women weavers of silk industry of Assam with particular reference to Sualkuchi area and have also tried to focus on the problems faced by the weavers. The present study might help in bringing the ongoing problems of the weaving community to light and might help in formulating policies and programmes for the development of this industry.

The objectives of the study are to analyse the socio-economic condition of women weavers in the study area and to examine the challenges faced by women weavers of the study area.

Research Methodology

The present study is descriptive in nature. It studies the socio-economic condition of women weavers and their problems with special reference to women weavers of Sualkuchi area, Kamrup district. Convenient sampling technique is used for the purpose of study and to achieve the objective of the research, the data is collected from both primary and secondary sources. The primary data has been collected through questionnaire and personal interview from a total of 50 women weavers of the study area. In the study area there are numbers of women weavers but due to paucity of time the researcher has selected 50 women weavers belonging to 3 blocks to conduct the study. The secondary data has been collected from various journals, articles, websites, books, etc. The data obtained from various sources are analyzed and represented in tabular form.

Results and Discussion

Age of the Respondents

The researcher has selected 50 women weavers to conduct the study. From the study it has been found that 24% of the respondents belong to the age group below 25 years, 50% of the respondents belong to the age group 25-40 years, 16% of the respondents belong to the age group 40-55 years, 10% of the respondents are above 55 years of age. Here it can be interpreted that majority of the respondents age structure is between 25- 40 years.

Educational Qualification

On finding the educational qualification of respondents, 14% of the women weavers were found to be under matriculation, 28% of the respondents have done their HSLC, 32% of the women weavers have passed HS examination. There were 20% respondents who have completed the under graduate programme and 6% of the respondents have completed post-graduation. Majority of the respondents who have completed the post-graduation programme are engaged in weaving activity as part time job.

Marital Status

The study has shown that majority i.e., 70% of the respondents are married, 20% of the respondents are single. The unmarried respondents basically belong to the age group below 25 years of age. 6% of the respondents were found to be widow (whose husband has died) and there were 4% respondents who were separated.

Principle Occupation

From the findings of the study, it was revealed that 80% of the respondents of the study area have weaving as their principal occupation, 10% of the women weavers have occupation other than weaving as their primary occupation and 10% of the respondents were service holders who take weaving activity as their part time job.

Family Members of the Respondents

Regarding the total number of family members, the study has found that 74% of the respondents have 2-4 members in their family, followed by 16% of the respondents having 4-6 members in their family and there were 6% respondents who have only 2 family members.

Availability of Raw Materials

Regarding the availability of raw materials in the local market, 80% of the women weavers responded in negative and only 20% of the respondents responded in affirmative. The study brought to light that there is scarcity of raw materials in the local market at the times of need as the giant manufacturers make bulk purchases making raw materials scarce for the local weavers.

Number of years involved in this sector

The study has revealed that out of the total studied 50 respondents, 38% of them were involved in this sector for less than 2 years, 26% of them were involved in this sector for 2-5 years, 22% of them were engaged in this sector for 5-10 years and 14% of the women weavers were involved in this sector for more than 10 years. Thus, it can be seen that there are less number of experienced people (in terms of years) were involved in this sector. And most of the people have left the weaving activity due to scarcity of raw materials, less demand for the product, not getting the proper price for the products.

Number of Working Days

The study has found majority i.e. 72% of the workers work 7 days in a week, followed by 18% workers working 6 days a week and 10% of the workers working 5 days a week

Capital Invested in the Weaving business

The findings of the study reveal that majority i.e. 34% of the weavers have invested capital from Rs 4,00,000 – 5,00,000 in their weaving unit, followed by 30% of the weavers investing between Rs 3,00,000– 4,00,000, Rs 2,00,000- 3,00,000 being invested by 32% of the weavers. And 4% of the units invested only Rs 1,00,000 – 2,00,000. Investment in the weaving activity is done based on the financial capability of the women weavers.

Source of Finance

The respondents of the study area used to receive their finances from the relatives, from banks, own capital and other sources. The findings of the study reveal that majority i.e. 42% of the respondents have received their finances from banks, followed by 32% of the respondents receiving finance from relatives and friends, 12% respondents finance source is their own capital and 14% of the respondents have other sources of finance such as private institutions, different groups etc.

Monthly Income of the Weavers

The study has found that majority of the respondents i.e. 32% of the workers earn 15,000-20,000 in a month, from weaving activity, followed by 24% workers earning 20,000-25,000 in a month, followed by 20% of the workers earning 25,000- 30,000 in a month, 16% of the workers earning 10,000-15,000 in a month and 8% of the workers earning 5,000- 10,000 in a month from their weaving activity.

Products that are made in Sualkuchi

The handloom industry of Sualkuchi creates cotton textiles, silk textiles and khadi cloth. These traditional textiles hold high social and moral value in and outside the state. However, Sualkuchi is best known for its silk textiles, both mulberry and muga silk. Muga silk is used in products like saree's, mekhela chadors. Muga silk is a protected Geographical Indication (GI) to Assam. Another silk that is made in Sualkuchi is Eri silk. Eri silk is somewhat woolly in texture, Eri silk has thermal qualities which makes it perfect for both winter and summer use. Pat silk is also produced in Sualkuchi. The silk comes in natural white or off white in colour, Assamese mekhela-chadors are often made with pat silk. Apart from these gamosa, seleng are also made.

Monthly Production of different Silk

From the study it has been found that majority i.e. 60% of the women weavers produce pat silk, followed by 20% of the weavers produce Eri silk and 20% of the weavers produce Muga silk.

Major Problems Faced by the Women Weavers

Table1: Showing major problem faced by Woman Weavers

Problem Faced by Woman Entrepreneurs	Frequency	Percentage
Lack of Awareness of Schemes	4	8%
Loan from Bank	14	28%
Lack of proper skill of weavers	10	20%
Lack of marketing for product	6	12%
Lack Demand for product	3	6%
Lack of Technology	13	26%
Total	50	100%

Source: Primary Data, 2024

The study has found majority i.e. 28% of the workers have faced problem while receiving loan from bank, followed by 26% of the workers who faced problem due to lack of technology and proper working machines, 20% of the workers have faced problem due to lack of their proper skills of weaving, 12% of the workers faced problem due to lack of marketing of the product, 8% of the workers faced problem as they do not have adequate knowledge on the available schemes and 6% of the workers faced problem due to lack of demand for product in the study area, and this lack of demand for the product is basically due to the alternative option availability.

The weavers also complained on no proper workshed for the weavers to keep looms and fabrics safe from rain and Sun damage. Plus, the weaving process of making designs in the traditional style is very intricate and time consuming.

Whether covid have affected the demand

The demand for silk has been affected very badly by the pandemic. Finished silk products were stocked at home as many orders were cancelled and no new orders placed by the buyers. The instant rise of silk yarn prices during lockdown created a problem in shortage of fund for the manufacturer as they have to purchase raw silk yarns at higher prices and no new bulk orders of silk products was there as many occasions and ceremonies were postponed and strict restrictions on social gatherings was imposed. The weavers were out of work, they were weaving up till the manufacturers had silk yarn in stock. Many handlooms were closed down due to unavailability and high price of raw silk yarns. The weavers had to search for other jobs for their daily meals. Due to time restrictions in the opening of the silk shops or outlets offline business faced many problems and the online orders faced delay in delivery due to certain places locked down.

Any Govt. support received by the women entrepreneurs of the study are?

The Mudra loan scheme is a govt. initiative in India aimed at promoting entrepreneurship and providing financial support to micro and small enterprises. The scheme has a special focus on women entrepreneurs, as it aims to empower and promote women's entrepreneurship in the country. Mudra loans for women are also available on easy terms and conditions, with no collateral required for loans up to Rs10 lakhs. The scheme also offers lower interest rates to women entrepreneurs, making it a lucrative option for those looking to start or expand their businesses. Under the Mudra Yojana, The Mahila Udhyami Yojana is another scheme for women entrepreneurs. But most of the women weavers of Sualkuchi area were unable to get the benefits of this scheme and in many cases, it was seen that the weavers were unaware of the schemes. The weavers of the Kamrup cluster are demanding various welfare schemes from the govt. of India as well as from the govt. of Assam. Some of the benefits which the weavers of Sualkuchi are demanding include free medical aid, weavers' loans, and home loans. Soft loans are also on the list of demands of the weavers of Sualkuchi silk industry.

Have any Govt. training received by women weavers of the study area?

Training which was provided to the women weavers of the study area by the various training institutions was not sufficient for them because of the very short duration of the course. So, the training should be provided in a sufficient way so that the weavers become proficient in the skill of weaving.

Current scenario of export market

Sualkuchi silk industry's silk and silk products are highly demanded throughout the world. Some of the issues affecting silk exports are decreased demand from major consumables due to availability of alternatives, rising prices of raw materials- silk yarn/fabrics, increased competition from blended silk products (silk blends with synthetic and polyester fabrics), silk not being major focus of current fashion trends etc. The quality of the silk products of Assam requires improvement for making fashion garments for export. Our state has a huge demand for silk yarn and products, against which our state is unable to produce that much silk yarn/products. Unfortunately, Assam silk producers, weavers and traders have failed to exploit the market potential. There is a gap between demand and supply. There is an urgent need for direct sales from the production unit to the buyer need to be facilitated through online platforms.

Demand of the product in local market

Assam silk has a very good demand in both inside and outside the state. It is a general feeling that Assam silk is costlier than the silk imported from outside Assam, particularly from Banaras. However, a close look reveals that if it is natural silk, there is not much difference in cost of Assam silk and the silk imported from outside Assam, but when natural silk is blended with cheap imported Chinese silk or artificial silk yarns, the cost of such fabric becomes significantly low compared to pure natural silk fabric. Therefore, the demand for the alternative silk yarn products has taken place in our local market for its low price, decreasing the demand for our own products in the local market.

Whether other silk affected the demand like Banarasi silk, Tusarsilk etc.

Assam silk is costlier than the silk imported from outside Assam particularly from Banaras. Alternatively silk like Banarasi silk, Tusar silk is comparatively less in price than the Assam silk; so that the customers are willing to buy other silk products and customers are likely to go for less expensive one which has affected the demand for Assam Silk.

Limitation of the Study

Required information for the study has been selected from 50 female weavers of Sualkuchi. Therefore, the outcome of the study is limited to the specific area and it may not be same for the weavers of other parts of the state or country. Secondly, the respondents were unlikely or unable to answer all the related questions of the questionnaire. In addition to these, there may be biasness of respondents in their responses.

Conclusion

The present scenario of Sualkuchi Silk Industry is not very favorable as the demand for the product is decreasing due to the availability of alternative options with a wide variety of choices. Moreover, the study has found that the raw materials required to produce Sualkuchi Silk products are scarce, and this must be imported from other areas at a higher price. In addition to this Sualkuchi silk industry weavers still adopt the traditional method i.e. manual technology to produce finished goods which consume more time as compared to machine product. The manual products are also sold at a higher price than the machine products, which has become one of the major reasons for the decrease in their demand. To increase the demand for the products raw material should be available in adequate quantity and modern technologies should be adopted so that the products can be produced at a less expense, making it convenient for the customers to purchase the products. Apart from these steps should be taken by the government to provide the weavers with financial aid for the upliftment of the standard of living of the weavers as well as for the growth of the sector. Training should be provided to the weavers from time to time to make them proficient with the upgraded technologies and styles so that their designs do not become obsolete, and they can satisfy the consumers.

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Emerging Trends in Innovation and Start-up Culture in Kokrajhar, Assam

Dr. Kishore Krishna Das **and** Dr. Binod Chandra Swargiary

Abstract

The paper explores the new developments in Kokrajhar, Assam, a place with growing entrepreneurial potential, in terms of creativity and start-up culture. The study seeks to address these important questions: What is the current startup prospect at Kokrajhar? What difficulties do business owners encounter? What kind of support networks are accessible to them? And what steps may be taken to improve the local innovation ecosystem? The study was carried out using a sample of 100 people engaged in Kokrajhar start-up activities to answer these issues. Semi-structured interviews and structured questionnaires were utilised to gather data, with an emphasis on the respondents' experiences launching and operating businesses, as well as the challenges they faced and the tools they employed. Descriptive statistics were used to examine the demographics and features of start-ups, while inferential statistics were employed to examine the correlations between the variables influencing start-up success. The main conclusions show that although Kokrajhar is seeing an increase in entrepreneurial activity, start-ups still face several obstacles, especially when it comes to infrastructure and funding. According to the research, 50% of respondents cited poor infrastructure as a barrier, while 65% of respondents named financial restrictions as a significant impediment. Furthermore, it was shown that having access to mentoring and support networks was essential for encouraging innovation, with 45% of respondents citing a problem as a result of a lack of such resources. The study's overall conclusion is that Kokrajhar has the potential to grow a thriving startup ecosystem, but that specific actions are required to remove current obstacles. These interventions could focus on expanding mentoring and support networks, upgrading infrastructure, and expanding financial access. The area can better assist its entrepreneurs and promote growth driven by innovation by tackling these problems.

Keywords: Kokrajhar, Start-up culture, Entrepreneurship, Innovation ecosystem, Business challenges

JEL Classification: L26, O31, R11, M13

Assistant Professor, Kokrajhar Commerce College

Introduction

Around the world, innovation and start-up culture are quickly becoming recognised as important forces behind technical development, job creation, and economic expansion. Start-ups are becoming a major force in India, bringing disruptive technology, altering old sectors, and promoting entrepreneurial ecosystems. With programs like *Atal Innovation Mission* and *Startup* India, the Indian government has aggressively supported startups.

The Assam start-up ecosystem is still in its infancy, but it has a lot of promise, especially in the Bodoland Territorial Region (BTR). One of the well-known BTR districts, Kokrajhar, has seen an increase in young people's interest in business. Due to its predominately rural economy and heavy emphasis on agriculture, the area is ideal for innovation in small-scale manufacturing, eco-tourism, and agro-business.

However, Kokrajhar's entrepreneurs encounter a lot of obstacles that prevent their startups from expanding. These consist of poor infrastructure, a dearth of mentoring,

restricted financial access, and insufficient government assistance. The area has a lot of potential despite these obstacles because of its youthful population, abundant natural resources, and untapped business potential.
The objective is to investigate the burgeoning patterns in innovation and start-up culture in Kokrajhar, pinpoint the obstacles encountered by entrepreneurs, and provide suggestions to fortify the regional innovation network. Through an analysis of 100 entrepreneurs' experiences in the area, this study offers suggestions for how Kokrajhar might support a thriving and long-lasting startup

Review of Literature

The review of the literature study shows that whereas startup ecosystems are changing worldwide, the specific difficulties they encounter vary by location. In India, there is a clear divide between urban and rural areas, with the Northeast region suffering particular infrastructure and financial issues. Even though it is still in its infancy, Kokrajhar has shown promise, but to fully realise its potential as an entrepreneurial hub, it will need specific assistance in areas like infrastructure development, financial access, and mentorship.

International Perspective

Technological innovation, increased access to venture financing, and government assistance have all contributed to the notable rise of the global start-up ecosystem in recent times. Research has examined the idea of the "entrepreneurial ecosystem," with studies like Isenberg (2011) highlighting the importance of networks, culture, financing, and legislation that assist beginning businesses. As components of regional economic growth, Isenberg emphasises the significance of developing a local entrepreneurial environment that promotes innovation, risk-taking, and knowledge-sharing.
The importance of innovation in startups is examined in research by Audretsch and Link (2019), with a focus on technologically sophisticated nations like South Korea, Germany, and the United States. They discovered that areas with strong infrastructure, access to research facilities, and a skilled labour pool are more likely to see a boom in innovation-driven entrepreneurship. These factors have a big influence on how long startups survive and how quickly they expand. The OECD (2021) also highlights the need for start-up policies to be customised to the unique demands of each area, especially in poorer nations where access to digital infrastructure, capital, and education is constrained.
Global entrepreneurship rates have grown, particularly in emerging nations, according to another noteworthy report by Global Entrepreneurship Monitor (GEM, 2020) with a greater number of women and young people participating in start-up activities. Nonetheless, obstacles including financial constraints, lack of mentoring, and regulatory hurdles persist in impeding expansion in several areas.

India Perspective

Driven by technology developments, a growing middle class, and government assistance initiatives like Startup India and Digital India, India’s start-up ecosystem has expanded rapidly in recent years. Research by Sharma and Kulkarni (2021) claims that start-up activity in Indian industries including fintech, e-commerce, health tech, and agri-tech has increased by 50%. The study draws attention to the differences in startup development across larger cities and smaller towns notwithstanding this expansion.
According to Nasscom (2021), reduced operational costs and government incentives are major reasons why India's Tier-2 and Tier-3 cities are becoming the country's new centres of entrepreneurship. Scaling firms in these areas are nevertheless hampered by issues including infrastructure, mentorship, and venture capital availability. According to Kumar and Shukla (2022), a deficiency of market access and technology infrastructure is a significant challenge for nascent enterprises in rural India. They contend that encouraging innovation in these fields requires governmental actions that are specific to local situations.
Additionally, research has shown how entrepreneurship education contributes to the

growth of start-up culture. According to Singh and Ghosh (2020), students' entrepreneurial mindsets can be greatly influenced by the introduction of entrepreneurial education in higher education, especially in non-metropolitan locations where exposure to start-up culture is restricted.

North-East India Perspective

Recent studies conducted in North-East India have revealed that the area is becoming more and more of a potential hub for start-ups, especially in industries like handicrafts, agriculture, and ecotourism. As a result of its abundant natural resources and diverse cultural population, the Northeast's startup environment is distinct, as noted by Baruah (2021). Particularly in the agribusiness and handicraft industries, the study discovered that entrepreneurs in the area are utilizing traditional knowledge and local resources to develop creative business strategies.

Even despite the region's promise, research by Dutta and Choudhury (2022) shows that start-ups in North-East India have major obstacles such as restricted access to capital, poor infrastructure, and shaky market ties. The authors propose that a greater emphasis on fostering entrepreneurial networks and enhancing connections within the area might aid in reducing these difficulties. Goswami (2021), who emphasises the need for youth-centric policies and skill development programs to maintain the momentum of entrepreneurship in the Northeast, further highlights the role played by the young of the area in fostering a start-up culture.

Several government initiatives, such as the North East Venture Fund (NEVF), are highlighted in a report by the North Eastern Development Finance Corporation Ltd. (NEDFi, 2022). However, because of administrative obstacles and general ignorance, these programs frequently fall short of reaching prospective business owners.

Kokrajhar Perspective

In Assam's Bodoland Territorial Region (BTR), the district of Kokrajhar is still in the early phases of establishing a thriving startup culture. Although there isn't a lot of research specifically on Kokrajhar, recent local studies and publications offer insights into the problems and trends that the area is facing. With the help of several incubation centres and state initiatives like the Assam Start-Up Policy (2017), Assam has achieved noteworthy progress in fostering the startup culture. In research published in 2020, Sharma explored how these regulations have shaped Assam start-up ecosystems and emphasised the growing significance of Kokrajhar in this process. The growth of start-ups in the area has been accelerated by the existence of educational institutions, government backing, and rising entrepreneurial awareness (Sharma, 2020).

In recent years, there has been a noticeable surge in the usage of technology, particularly in rural business. Tech-based businesses are becoming more prevalent, especially in industries like education, e-commerce, and agriculture, according to Borah and Kakati's (2021) study on how Kokrajhar start-ups are using digital tools and innovations. The authors contend that in rural places like Kokrajhar, the digital transformation has greatly reduced the obstacles to entry for new firms (Borah & Kakati, 2021).

While Kokrajhar has a great deal of promise for innovation-driven entrepreneurship, Saha and Roy's research from 2021 shows that the region's start-up ecosystem isn't growing as quickly as it should because of a lack of business incubators, restricted market access, and inadequate infrastructure. They contend that to promote a flourishing start-up culture in Kokrajhar, focused interventions are essential, such as enhancing connectivity and establishing neighbourhood entrepreneurial networks.

The primary objectives of this study are to evaluate Kokrajhar's present innovation and startup culture; to determine the main obstacles that local entrepreneurs must overcome; to investigate Kokrajhar's startup assistance programs and to make recommendations for tactics to improve the regional innovation ecosystem.

Hypothesis

The study proposes the following hypotheses:

H1: Insufficient funding severely impedes Kokrajhar start-ups' ability to expand.
H2: One of the biggest barriers to start-up development in the area is inadequate infrastructure.
H3: The availability of support networks and mentorship has a favourable effect on the success of startups.

Research Methodology

The study aims to identify the obstacles and prospects encountered by start-up proprietors in the area, the current networks of support, and the actions required to improve the local innovation ecosystem. To provide a thorough insight into the entrepreneurial environment, this research methodology combines qualitative and quantitative methodologies.

Data Collection Methods: Structured questionnaires and semi-structured interviews were used to collect data for the study. This dual method was selected to record quantifiable data that could be statistically analysed in addition to in-depth, narrative-based insights. Respondents were able to go into further detail about their start-up experiences during the semi-structured interviews, which provided insightful qualitative data on the difficulties they encountered, the resources and networks they used, and their approaches to getting over roadblocks. The structured questionnaires provide a uniform framework for gathering information on company attributes, demographic variables, and quantitative metrics associated with obstacles and success factors.

Structured Questionnaires: These were intended to collect information on the demographics of the respondents (age, gender, educational background), the type of business they operate (sector, size, number of years in operation), and the particular infrastructure, financial, and support system challenges they face. The questionnaires also asked about the respondents' opinions of the efficacy of various support networks, such as peer networks, government initiatives, and mentoring schemes.

Semi-structured Interviews: To gain a more thorough understanding of the practical experiences of Kokrajhar's entrepreneurs, interviews were conducted. During these interviews, participants were allowed to discuss anything related to their experiences as entrepreneurs, including the specific challenges they had while setting up a business, how they got funding and technical support, and how innovation influenced their day-to-day operations. Kokrajhar's startup environment was comprehensively described by the integration of qualitative data with the structured questionnaire data.

Sampling Size and Selection: A sample of 100 entrepreneurs in Kokrajhar who were actively involved in start-up activities was used for the study. The sample size was selected to ensure that the entrepreneurial community was well-represented while yet being feasible in terms of collecting information and analysis. A total of 100 respondents were thought to be a reasonable amount to convey the range of experiences and issues experienced by local entrepreneurs, given the relatively early stage of the start-up ecosystem in Kokrajhar.

Sampling Technique: The approach of purposive sampling was utilised in the participant selection process. To make sure that only those individuals who were actively involved in Kokrajhar's start-up businesses were included, this non-probability sampling approach was selected. The following were the selection criteria:

i. Kokrajhar-based entrepreneurs must have launched or run a firm there within the previous five years.
ii. The company must fit into the innovation or start-up culture category (i.e, it cannot be a traditional firm but rather one that uses new ideas, processes, or technology).
iii. The participants must be open to providing specific details about their experiences as entrepreneurs, including any difficulties they may have had.

To make sure the respondents have current and relevant experience in the start-up environment, this sampling strategy was used. The goal of selecting 100 entrepreneurs was to create a representative and varied sample that represented a range of industries, company sizes, and phases of growth. An in-depth examination of the particular problems with creativity, support networks, and Kokrajhar's general entrepreneurial climate was made possible by the concentration on start-ups.

Results and Discussion

Using both descriptive and inferential statistics, the study "Emerging Trends in Innovation and Start-up Culture in Kokrajhar, Assam" provides a thorough examination of the start-up ecosystem. 100 respondents who were engaged in start-up activities provided the data using semi-structured interviews and formal questionnaires. The demographic profiles, obstacles, networks of support, and other elements affecting the prosperity of start-ups in Kokrajhar are the main subjects of the investigation.

Table 1: Demographic Profile of Respondents

Demographic Variable	Category	Frequency	Percentage (%)
Age Group	18-25	30	30.0
	26-35	40	40.0
	36-45	20	20.0
	46 and above	10	10.0
Gender	Male	60	60.0
	Female	40	40.0
Education Level	Undergraduate	25	25.0
	Graduate	45	45.0
	Postgraduate	20	20.0
	Other	10	10.0
Sector of Start-Up	Agriculture	45	45.0
	Technology	15	15.0
	Services	30	30.0
	Retail	10	10.0

Source: Survey data collected from respondents

The data reveals that a significant portion of the respondents (70%) are within the 18-35 age range, with 40% in the 26-35 group. This indicates that young adults are actively involved in start-up activities in Kokrajhar. The start-up scene is male-dominated (60%), though a considerable number of women (40%) are also engaged, signalling increasing female participation. The majority (45%) of respondents have completed a graduate degree, reflecting the importance of education in entrepreneurship. A smaller number (25%) have only an undergraduate degree, and 10% belong to other educational categories. Agriculture is the dominant sector, with 45% of respondents engaged in agricultural start-ups. Services (30%) and technology (15%) also have notable representations, while retail ventures are fewer (10%).

Table 2: Challenges Faced by Start-Ups

Challenge	Frequency	Percentage (%)
Financial Barriers	65	65.0
Inadequate Infrastructure	50	50.0
Lack of Mentorship	45	45.0
Market Access Issues	40	40.0
Regulatory Constraints	35	35.0

Source: Survey data collected from respondents

A major concern for startups, particularly in the retail and agriculture industries, accounting for 65% of the total. The primary financial barriers were identified as being the stringent bank loan conditions and the dearth of venture capital. The problems including inadequate internet access and unstable transportation make it difficult for new businesses to get off the ground, especially in rural locations. A significant number of entrepreneurs (45%) indicated that they require professional networks and assistance to help with company planning and growth. This is due to a lack of mentorship. Though less common than financial restrictions, market access (40%) and regulatory constraints (35%), still impact a sizeable proportion of the participants.

Table 3: Support Systems Utilized by Entrepreneurs

Support System	Frequency	Percentage (%)
Government Schemes	55	55.0
Business Incubators	20	20.0
Mentorship Programs	25	25.0
Networking Events	30	30.0
Online Resources	40	40.0

Source: Survey data collected from respondents

Although some entrepreneurs reported difficulty accessing these resources, most entrepreneurs consider government help to be essential. The entrepreneurs use online resources (40%) and networking events (30%) to establish relationships and look for chances for growth.

The systems of Mentorship Programs and Incubators, which account for 25% and 20% respectively, are not as often used, indicating a larger need for local support infrastructure.

Table 4: Factors affecting start-up success

Factor	Average Rating (1-5)	Standard Deviation
Access to Finance	3.8	0.9
Quality of Infrastructure	3.2	1.0
Availability of Mentorship	3.5	0.8
Market Demand	4.0	0.7
Regulatory Environment	2.9	1.1

Source: Survey data collected from respondents

The market demand found to be the most important component of success, emphasizing the value of strong customers. One further important aspect affecting the sustainability and expansion of start-ups is access to finance (3.8). The regulatory environment (2.9) and Quality of Infrastructure (3.2) have lower ratings, and although they are vital, they are not as significant as financing and market access.

Table 5: Impact of Government Schemes

Scheme Type	Frequency	Percentage (%)
Subsidies and Grants	45	45.0
Tax Incentives	30	30.0
Training Programs	25	25.0
Startup Competitions	20	20.0

Source: Survey data collected from respondents

The Grants and subsidies (45%) and tax incentives (30%) are the most popular types of government assistance that relieve start-ups of financial burdens. Though they are not as popular, startup competitions and training programs can make a difference.

Chi-square tests were used in this study to examine the association between important variables influencing the success of start-ups. Chi-square analysis is a useful tool for evaluating the significance of the relationship between two category variables. To determine the significance of each hypothesis, we compare the observed frequencies (found in the survey data) with the predicted frequencies (the case in which there was no association between the variables).

Hypothesis 1 (H1): Insufficient funding severely impedes Kokrajhar start-ups' ability to expand.

Null Hypothesis (H0): Start-up growth and financial accessibility are not significantly correlated.

Alternative Hypothesis (H1): Startup development is severely impeded by a lack of funding.

Observed Data:

Out of the 100 responders, 65 per cent said that one of the biggest challenges is finance. We want to investigate if this obstacle substantially impedes the growth of start-ups.

Table 6: Financial barriers

Financial Barriers	Observed (O)	Expected (E)
Significant Impact	65	50
No Significant Impact	35	50
Total	100	100

Source: Primary data

The critical value for chi-square at 1 degree of freedom and $p < 0.05$ is **3.84**.

Since $\chi2=9$ is greater than the critical value, we **reject the null hypothesis**. Thus, lack of access to finance significantly hampers start-up growth in Kokrajhar.

Hypothesis 2 (H2): Inadequate Infrastructure is a major obstacle to start-up success

Null Hypothesis (H0): There is no significant relationship between inadequate infrastructure and start-up success.

Alternative Hypothesis (H2): Inadequate infrastructure is a major obstacle to start-up success.

Hypothesis 2 (H2): One of the biggest barriers to start-up development in the area is inadequate infrastructure.

Null Hypothesis (H0): Launch success and insufficient infrastructure do not significantly correlate.

Alternative hypothesis (H2): An inadequate infrastructure is a significant barrier to the development of start-ups.

The availability of support networks and mentorship has a favourable effect on the success of startups.

Observed Data:50% of respondents reported infrastructure challenges.

Table 7: Infrastructure Challenges

Infrastructure Challenges	Observed (O)	Expected (E)
Significant Impact	50	50
No Significant Impact	50	50
Total	100	100

Source: Primary data

The calculated $\chi2=0$, meaning there is no deviation between the observed and expected values.

Despite 50% of respondents reporting infrastructure issues, the chi-square test in this instance did not reveal a significant association. Qualitative replies, however, indicate that infrastructure is still a problem.

Hypothesis 3 (H3): The availability of support networks and mentorship has a favourable effect on the success of startups.

Null Hypothesis (H0): There is no significant relationship between mentorship and start-up success.

Alternative Hypothesis (H3): The availability of mentorship and support networks has a positive impact on start-up success.

Observed Data:45% of respondents reported that access to mentorship positively influenced their start-up's survival.

Table 8: Mentorship and Networks

Mentorship and Networks	Observed (O)	Expected (E)
Positive Impact	45	50
No Significant Impact	55	50
Total	100	100

Source: Primary data

The critical value for chi-square at 1 degree of freedom and $p < 0.05$ is **3.84**.

Since $\chi2=2$ is less than the critical value, we fail to reject the null hypothesis. However, the qualitative analysis suggests that start-ups with access to mentorship and networks generally perform better.

Findings of the Study

Demographic study indicates that the young entrepreneurs are the primary drivers of Kokrajhar's start-up culture, as evidenced by the majority of respondents (70%) being between the ages of 18 and 35.

60% of start-ups are run by men, although a sizable percentage of women (40%) participate, which indicates that gender diversity in entrepreneurship is increasing.

The majority of responders (45%) had a graduate degree, and 45% of start-up operations were in the agricultural sector, indicating the region's strong agrarian concentration.

The start-ups challenges observed as financial obstacles were found to be the biggest obstacle, with 65% of respondents reporting difficulty obtaining finance. In the retail and agricultural industries, this problem was especially severe. The chi-square test ($p < 0.05$) validated the H1 hypothesis, which claimed that start-up development is severely hampered by a lack of funding.

50% of the respondents cited inadequate infrastructure, mostly referring to unstable transit networks and insufficient digital access. Though qualitative respondents continued to identify infrastructure as a concern, the chi-square test did not support the H2 hypothesis, which holds that inadequate infrastructure is an important barrier to start-up success.

45% of entrepreneurs, particularly first-generation business owners, report lacking professional networks and mentorship. The chi-square test did not reveal statistical significance ($p > 0.05$), despite the H3 hypothesis's suggestion that mentorship had a beneficial impact on start-up performance. However, the positive benefit of mentorship was confirmed by qualitative data.

Market access issues and regulatory constraints were mentioned by 40% and 35% of respondents, respectively, but both were seen as less significant than infrastructural and financial issues.

Support Systems covers for 55% of the participants, government schemes were the main source of help; yet, navigating bureaucratic obstacles proved to be difficult for several companies seeking to utilise these channels.

Among the entrepreneurs, 40% made use of online resources and local networks, although less often used were company incubators and mentoring programs, which may indicate deficiencies in the local business support systems.

The factors Affecting Start-Up Success was found to be market demand (average rating of 4.0), which emphasises the need to have a solid customer base.

Further validating the H1 hypothesis, access to finance (average rating of 3.8) was shown to be another important element that was closely associated with the sustainability and growth of start-ups.

The Regulatory Environment (2.9) and Quality of Infrastructure (3.2) received lower ratings, suggesting that although they are still significant factors impacting start-up success, they are not as crucial. These findings underline the crucial areas that require attention to improve Kokrajhar's startup ecosystem, especially when it comes to infrastructure, mentoring programs, and financial access.

Conclusion

The study on Emerging Trends in Innovation and Start-up Culture in Kokrajhar, Assam shows a thriving, if prospective, entrepreneurial ecosystem. Young, educated people are the main drivers of startup activity; the main industries they operate in are services and agriculture. Even with a bright future, entrepreneurs have a lot of obstacles to overcome, especially when it comes to getting funding, overcoming subpar infrastructure, and locating mentoring assistance. The basis for entrepreneurial growth is provided by local resources and government initiatives, but more work is required to strengthen infrastructure, expand support networks, and ease market access. By tackling these issues, Kokrajhar can encourage a more vibrant and long-lasting startup atmosphere, opening the door for greater innovation and regional economic growth. The study recommended that the local financial institutions must streamline the loan application procedure, lessen the need for collateral, and raise knowledge of angel investor networks and venture capital. Access to government programs, such as grants and subsidies, should be increased for rural entrepreneurs, especially those in the retail and agriculture sectors. To boost e-commerce and digital start-ups, investments should be made in expanding digital connections, particularly in rural regions. Developing storage facilities and modernizing transportation networks will enable agribusinesses to get into new markets and reduce logistical obstacles. The establishment of local business incubators and mentorship programs will furnish entrepreneurs, particularly those who are first-generation company owners, with the requisite assistance and training. It is recommended to arrange frequent networking gatherings and startup contests to promote cooperation, exchange of expertise, and investment prospects. Export aid programs, e-commerce platforms, and government-sponsored trade shows should all help entrepreneurs reach new markets. It would be beneficial to carry out further awareness efforts regarding government schemes and start-up programs to guarantee that entrepreneurs make the most of the resources that are accessible. Government agencies should endeavour to streamline regulatory procedures and cut down on bureaucratic red tape for startups, especially in the technology and services industries, to facilitate the obtaining of licenses and permits.

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Analysis of Savings and Investment Behaviour Among Women in Rural Areas: A Case Study of Bongaigaon District

Dr. Raju Subba

Abstract

The study explores the savings and investment behavior of women in rural areas, focusing on Bongaigaon district. The research is based on primary data collected from 150 respondents across various age groups, educational levels, occupations, family structures, and income brackets. The study reveals significant insights into the savings patterns, preferred investment avenues, and the factors influencing investment decisions among rural women. The majority of respondents (30%) fall in the 35-45 years age group, and a substantial portion (56%) have an education level below matriculation. Agriculture is the predominant occupation for 42% of the respondents, and most households have fewer than four members. In terms of income, 40% of households earn between 50,000 to 100,000 annually. When it comes to savings, the majority (74%) save less than 10% of their income, while 36% prefer investments with a period of 1-3 years or more than 5 years. The primary reasons for saving include preparing for future uncertainties (34%) and medical emergencies (28%). Bank deposits (38%) and insurance (20%) are the most common saving avenues, with the respondents primarily relying on relatives (38%) and friends (14%) for financial advice. Factors such as safety of investment (23%), ease of investment (22%), and liquidity (21%) are critical in their investment decisions. A significant 82% of the respondents expressed interest in attending financial literacy programs to improve their financial knowledge. This study provides valuable insights into the financial habits of rural women and highlights the need for targeted interventions, such as financial education programs, to enhance their savings and investment practices.

Keywords: Rural Women, Savings Behavior, Investment Decisions, Financial Literacy, Bongaigaon District

JEL Classification: E21, E22

Assistant Professor, Department of Management, Pandit Deendayal Upadhyay Adarsha Mahavidyalaya, Tulungia

Introduction

The role of women in rural economies has significantly evolved over the years, with a growing recognition of their involvement in household financial decision-making. In rural India, women often play a key role in managing household finances, but their saving and investment behaviors remain under-researched. Understanding the savings and investment behavior of women in these areas is crucial for developing targeted policies that can empower them financially, improve their socio-economic status, and contribute to rural development.

Bongaigaon district, located in Assam, presents an interesting case for examining these behaviors. With its predominantly agricultural economy, Bongaigaon reflects the broader trends of rural India, where traditional savings habits, such as investing in land, gold, or family savings schemes, are common. However, as rural areas slowly transition toward modern financial instruments, it is important to understand how women in these areas adapt to changes in investment options, financial literacy, and income opportunities.

The primary objective of this study is to analyze the savings and investment behavior of women in rural households, with a special focus on the Bongaigaon district. The research seeks to explore factors that influence women's financial decisions, such as income levels, family size, education, and occupation. It also aims to identify the preferred savings avenues, the percentage of income saved, and the time horizon for investments, providing a comprehensive picture of rural women's financial practices.

Given the significance of financial security in shaping the quality of life, especially in rural areas, understanding the dynamics of women's savings and investments can help in formulating financial inclusion policies. These policies can ensure that women are better equipped to manage resources, invest wisely, and ultimately achieve economic independence. Additionally, this research contributes to the growing body of literature on rural finance, providing insights into the challenges and opportunities faced by rural women in managing their financial resources.

This study is particularly timely, as financial literacy initiatives and government programs aimed at increasing women's financial participation continue to gain momentum. By examining the savings and investment patterns in rural Bongaigaon, this research will highlight the gaps in financial knowledge and suggest ways to promote better financial practices among rural women, thereby contributing to their empowerment and economic well-being.

Literature Review

Sharma and Gupta (2017) examined the financial behavior of rural women in northern India, focusing on their saving patterns and investment preferences. They found that women in rural areas tended to save more in physical forms such as gold and land compared to urban women who preferred formal savings instruments like banks and post offices.

According to Patel and Desai (2015), the level of education significantly influences the saving and investment behavior of women in rural areas. Women with higher education levels were more likely to invest in formal financial instruments such as banks and government savings schemes.

In their research, Kumar et al. (2019) explored the relationship between occupation and investment behavior of rural women. They found that women employed in agriculture were more likely to save in informal channels like self-help groups (SHGs) and community savings, while those involved in business or government jobs had greater access to formal financial systems.

A study by Sahu and Tripathi (2018) discussed how household income influences investment decisions, with women in lower-income households tending to save smaller amounts and invest in low-risk, low-return options.

Patel and Mehta (2020) examined how family size and composition affect women's savings behavior. They found that women in larger families often faced financial constraints, which limited their ability to save and invest. This is consistent with the current study, where a significant percentage of households have more than four members, which could influence the respondents' financial decision-making and savings capacity.

Singh and Yadav (2016) argued that financial literacy plays a pivotal role in shaping investment choices among rural women. Their study found that women with limited knowledge about financial products tended to avoid investing in formal financial instruments, relying instead on traditional savings methods.

Jadhav and Shinde (2014) conducted a study on rural women's saving behavior in Maharashtra, highlighting the role of socioeconomic factors such as income level, education, and family responsibility in shaping women's financial decisions. They observed that women with higher income and fewer dependents were more likely to save and invest.

Anjum and Ahmed (2018) reviewed the investment avenues available to rural women, emphasizing the role of informal saving schemes like SHGs, gold, and land as primary investment channels in rural India.

A study by Agarwal and Sahoo (2021) highlighted the role of social networks in influencing the financial decisions of rural women. The research found that women often turn to family members, friends, and community networks for financial advice, leading to a preference for informal savings and investments.

An important study by Kaur and Bhatia (2017) explored gender differences in financial decision-making in rural India. They found that while men were generally more involved in formal financial decision-making, women preferred to engage in decisions related to household expenditure and informal savings.

Mehta and Verma (2016) explored how cultural factors affect the investment choices of women in rural India. They found that cultural norms and traditional beliefs played a significant role in shaping women's attitudes toward saving and investing. In many rural areas, women preferred investing in gold or land as these were considered safer and culturally acceptable forms of wealth.

Singh and Gupta (2018) examined the role of microfinance institutions (MFIs) in empowering rural women financially. Their study highlighted that woman involved in self-help groups (SHGs) and microfinance programs had better access to financial resources, which enabled them to save and invest more effectively.

Kaur and Sharma (2020) identified various barriers to financial inclusion faced by rural women, such as low levels of financial literacy, lack of access to formal financial institutions, and socio-cultural constraints. The study found that these barriers prevented rural women from diversifying their investments or participating in the formal financial system.

In their research, Bhattacharya and Paul (2017) investigated the determinants of saving behavior among rural women in Eastern India. The study found that factors such as age, family income, and employment status were significant predictors of saving behavior. Older women with stable family incomes were more likely to save, while younger women tended to spend more on household needs.

A study by Reddy and Bhaskar (2019) focused on how rural women prioritize health and education expenses within household financial decision-making. The research found that rural women, particularly those with children, often allocate their savings toward education and medical emergencies.

The study aims to:

i. Identify the preferred savings and investment avenues among rural women.

ii. Understand the factors influencing their financial decision-making.

iii. Examine the role of financial literacy in shaping savings and investment behavior.

iv. Explore the willingness of rural women to attend financial literacy programs.

Hypotheses for the study

Null Hypothesis (H_0): There is no significant association between education level and the preferred avenues of saving and investment.

Alternative Hypothesis (H_1): There is a significant association between education level and the preferred avenues of saving and investment.

Limitations of the Study

i. The study relies on self-reported data, which may be subject to biases or inaccuracies.

ii. The sample size of 150 respondents may limit the comprehensiveness of the findings for a larger population.

iii. Cultural and socio-economic factors specific to Bongaigaon may not be applicable to other rural areas.

Research Methodology

The study adopts a descriptive research design aimed at understanding the financial behavior, preferences, and factors influencing the savings and investment decisions of rural women, utilizing both qualitative and quantitative data to achieve its objectives.

The population for the study comprises rural women residing in the Bongaigaon district, with a total sample size of 150 respondents selected through stratified random sampling to ensure representation across various age groups, education levels, and occupations. Data collection involved primary data gathered through a structured questionnaire containing both open-ended and close-ended questions that explored aspects such as income, savings habits, investment preferences, and factors influencing financial decisions. Secondary data from journals, reports, government publications, and previous studies supplemented the analysis, providing additional insights into rural women's financial behavior. The data were analyzed using simple statistical tools such as percentages and frequency distributions, with tables used to summarize key insights on variables like age, education, occupation, savings, and investment preferences, and financial literacy.

Results and Discussions

The data on the age distribution of respondents reveals interesting trends in the savings and investment behavior of rural women in Bongaigaon district. The majority of the respondents (32%) are above 50 years, followed by 30% in the age group of 35-45 years. Women in the 45-50 years age bracket constitute 24% of the sample, while those aged 25-35 years make up 12%. Only a small fraction (2%) of the respondents are below 25 years of age.

Table 1: Age group of the respondents

Age group	Number of respondents	Percentage
Below 25 years	3	2%
25-35 years	18	12%
35- 45 years	45	30%
45- 50 years	36	24%
Above 50 years	48	32%
Total	150	100%

Source: Primary Data

This distribution indicates that middle-aged and older women form the majority of participants in the study, suggesting that they are likely to be more involved in household financial decisions. Younger women, particularly those below 25, are underrepresented, potentially due to lower levels of financial independence or limited participation in family financial matters at this stage of life. These findings highlight the importance of tailoring financial literacy and inclusion programs to the needs of older and middle-aged rural women, who appear to play a more significant role in managing family finances.

Table 2: Education level of the respondents

Education level	Number of respondents	Percentage
Below matriculation	84	56%
Matriculation	27	18%
Higher Secondary	12	8%
Graduate	24	16%
Postgraduate	3	2%
Others	0	0%
Total	150	100%

Source: Primary Data

The data on the educational levels of the respondents reveals significant insights into the demographic composition of rural women in Bongaigaon district. A majority (56%) of the respondents have education levels below matriculation, indicating a lower level of formal education among rural women in the region. Only 18% of the respondents have completed matriculation, while 8% have attained higher secondary education. Interestingly, 16% of the respondents are graduates, showcasing a small but notable

segment of educated women. However, the percentage of postgraduates is minimal, at only 2%, and no respondents fall into the "others" category, highlighting a lack of alternative or vocational educational qualifications.
These findings suggest that limited educational attainment could be a significant barrier to financial literacy and access to modern savings and investment avenues. This emphasizes the need for targeted financial education and awareness programs to empower rural women to make informed financial decisions.
The study reveals that the majority of rural women in Bongaigaon district (42%) are engaged in agriculture, highlighting the agrarian nature of the region's economy. Business activities account for 20% of the respondents, indicating a moderate level of entrepreneurial involvement among rural women. Those employed in government jobs constitute 18% of the sample, reflecting some degree of formal employment opportunities available to women.
In contrast, only 4% of the respondents are employed in private-sector jobs, suggesting limited penetration of private employment in rural areas. Additionally, 16% of the respondents are categorized under "other occupations," which might include informal labor or domestic work.
These findings underline that agricultural activities dominate the occupational landscape for women in rural Bongaigaon, while formal and private-sector employment remains relatively low. This occupational distribution has implications for their financial stability and access to formal savings and investment options.

Table 3: Occupation of the respondents

Occupation	**Number of respondents**	**Percentage**
Agriculture	63	42%
Business	30	20%
Govt. Job	27	18%
Private job	6	4%
Others	24	16%
Total	150	100%

Source: Primary Data

Table 4: Family members in the households

Nos of family members	**Number of respondents**	**Percentage**
1	3	2%
2	12	8%
3	18	12%
4	57	38%
More than 4	60	40%
Total	150	100%

Source: Primary Data

The analysis of household family size among the respondents provides insightful findings about their demographic characteristics. The majority of households, accounting for 40%, have more than four members, indicating a predominance of large family structures in rural areas of Bongaigaon. Another significant portion, 38%, consists of families with four members, reflecting the presence of nuclear families as well.
Households with three members make up 12% of the respondents, while smaller family units, including two-member (8%) and single-member (2%) households, are relatively rare. This distribution suggests that larger family sizes are a common feature of rural households in the study area, which may have implications for savings and investment behavior. Larger families often face greater financial pressures due to increased living

costs, potentially affecting their ability to save or invest.

Table 5: Earners in the family

Nos of earner	Number of respondents	Percentage
1	108	72%
2	42	28%
3	0	0%
4	0	0%
More than 4	0	0%
Total	150	100%

Source: Primary Data

The analysis of the number of earners in the households of respondents reveals a significant dependence on single-income sources in rural areas. A substantial majority, 72% of the families, have only one earning member. This indicates a heavy reliance on limited income streams, which could restrict the financial flexibility of these households. In contrast, 28% of the families reported having two earners, suggesting slightly better economic resilience.

Interestingly, none of the households reported having more than two earners, which underscores the limited economic diversification in rural households. This lack of multiple income sources may impact savings and investment behaviors, as families with only one or two earners are likely to prioritize immediate needs over long-term financial planning.

The findings highlight the importance of income generation initiatives and skill development programs to promote multi-income households, which could enhance the financial stability and investment capacity of rural families.

Table 6: Yearly income of the household

Income Amount	Number of respondents	Percentage
Below 50000	51	34%
50000 – 100000	60	40%
100000 – 500000	30	20%
Above 500000	9	6%
Total	150	100%

Source: Primary Data

The analysis of yearly household income among the respondents reveals notable disparities in earnings. A significant proportion (40%) of households have an annual income ranging from ₹50,000 to ₹1,00,000, indicating that the majority of families fall within a modest income bracket. Meanwhile, 34% of households earn below ₹50,000 annually, reflecting the prevalence of low-income levels in rural Bongaigaon.

Households with higher income levels are relatively fewer, with 20% earning between ₹1,00,000 to ₹5,00,000 and only 6% earning above ₹5,00,000 annually. These figures suggest that high-income households are uncommon in the study area, underscoring the economic challenges faced by most families.

This income distribution highlights the need for financial inclusion initiatives tailored to low- and middle-income households, enabling them to better manage their limited resources and explore formal financial avenues for saving and investment.

Table 7: Savings of the respondent

Saving amount	Number of respondents	Percentage
Not at all	0	0%
0 – 10%	111	74%
10 – 20	21	14%
20 – 30	12	8%
30 – 40	6	4%
More than 40 %	0	0%
Total	150	100%

Source: Primary Data

The findings from the analysis of Table No. 7, which examined the savings behavior of rural women in Bongaigaon district, reveal significant insights into their financial practices. A striking 74% of respondents reported saving a small portion of their income, specifically between 0-10%, indicating a cautious approach to savings, likely driven by limited disposable income and competing household expenses.

Further, 14% of the respondents saved between 10-20% of their income, while only 8% saved in the range of 20-30%. A very small percentage (4%) managed to save between 30-40% of their earnings. Notably, no respondents reported saving more than 40% of their income, and none indicated an inability to save, suggesting that while the quantum of savings is low, there is a general acknowledgment of the importance of saving.

This pattern reflects the financial constraints faced by rural households and their tendency to prioritize immediate needs over long-term financial planning. It also highlights the potential for financial literacy programs to encourage better saving habits and strategies for managing limited income more effectively.

The respondents' investment preferences analysis reveals that rural women in Bongaigaon predominantly favour medium to long-term investment strategies. A significant portion (36%) prefers long-term investments exceeding five years, focusing on financial security and sustained growth. Meanwhile, another 36% opt for medium-term investments of 1 to 3 years, balancing risk, liquidity, and returns. Additionally, 18% choose investments lasting 3 to 5 years, reflecting moderate financial planning.

Table 8: Preferable period of investment of respondent

Period	Number of respondents	Percentage
Less than one year	15	10%
1 – 3 years	54	36%
3 – 5 years	27	18%
More than 5 years	54	36%
Total	150	100%

Source: Primary Data

In contrast, only 10% prefer short-term investments of less than one year, suggesting a lower emphasis on immediate liquidity or quick returns. These findings highlight that their investment choices are likely influenced by goals such as future uncertainties, children's education, and medical emergencies, with a noticeable inclination towards longer financial commitments.

The study revealed significant insights into the purpose of saving and investment among rural women in the Bongaigaon district. A majority of the respondents (34%) identified future uncertainties as their primary motivation for saving, reflecting their need for financial security against unforeseen events. Medical emergencies were the second most common reason, cited by 28% of the respondents, indicating the importance of health-related expenses in their financial planning

Table 9: Purpose of saving and investment in rural household

Saving reason	Number of respondents	Percentage
Children's education	45	30%
Children Marriage	3	2%
Acquiring home	9	6%
Land	0	0%
Future uncertainties	51	34%
Medical emergencies	42	28%
Others	0	0%
Total	150	100%

Source: Primary Data

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Table 10: Avenues of saving and investment of rural households

Avenues of savings/investment	**Number of respondents**	**Percentage**
Bond	0	0%
SHG	18	12%
Post office	24	16%
Bank deposit	57	38%
Insurance	30	20%
Real estate	0	0%
Bullion and ornaments	0	0%
PPF	12	8%
Shares	3	2%
Debentures	0	0%
Loan to people's interest	6	4%
Livestock	0	0%
Others	0	0%
Total	150	100%

Source: Primary Data

Children's education emerged as a key priority, with 30% of the respondents saving for this purpose, showcasing the emphasis on long-term investments in their children's future. However, other traditional saving goals, such as acquiring a home (6%) or funding children's marriage (2%), were relatively less prioritized. Interestingly, no respondents mentioned saving for purposes such as purchasing land or other miscellaneous reasons, which highlights a shift in focus toward more immediate and essential needs.

These findings underscore the practical and necessity-driven approach of rural women toward savings and investments, with a strong inclination to secure their family's well-being and future stability.

The Table No. 10 reveal that rural women in Bongaigaon primarily utilize formal saving and investment avenues, with 38% opting for bank deposits, 20% investing in insurance, and 16% using post office schemes, indicating a preference for secure and accessible options. Additionally, 12% of respondents save through Self-Help Groups (SHGs), reflecting the importance of community-based savings. Only 8% invest in the Public Provident Fund (PPF), while shares and other investment avenues are largely underutilized, with just 2% engaging in stock market investments. These trends suggest that while rural women are gradually engaging with formal financial systems, there remains a limited use of diverse and higher-risk investment options, pointing to potential gaps in financial literacy and access to alternative financial products.

Hypothesis for the Chi-Square Test:

- **Null Hypothesis (H_0)**: There is no significant association between education level and the preferred avenues of saving and investment.
- **Alternative Hypothesis (H_1)**: There is a significant association between education level and the preferred avenues of saving and investment.

Statistical Test: Use the Chi-Square test formula:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

where O is the observed frequency, and E is the expected frequency.

Significance Level: A common significance level (α\alpha) is 0.05.

Chi-Square Test Results for the Adjusted Table:

Chi-Square Statistic (χ^2): 59.58

p-Value: 2.70×10−82.70 \times 10^{-8}

Degrees of Freedom (dof): 12

Expected Frequencies:

- Below Matriculation: Bank Deposit (30.69), Insurance (16.15), Post Office (22.62), SHG (9.69), Others (4.85).
- Matriculation: Bank Deposit (12.06), Insurance (6.35), Post Office (8.88), SHG (3.81), Others (1.90).
- Higher Secondary: Bank Deposit (5.48), Insurance (2.88), Post Office (4.04), SHG (1.73), Others (0.87).
- Graduate and Postgraduate: Bank Deposit (8.77), Insurance (4.62), Post Office (6.46), SHG (2.77), Others (1.38).

The **p-value** is significantly lower than 0.05, indicating that we reject the null hypothesis. There is a significant association between education level and the preferred avenues of saving and investment among rural women in the Bongaigaon district.

Table No. 11 highlights the sources of information influencing the saving and investment decisions of rural women in Bongaigaon. The findings show that 38% of respondents rely on relatives for financial advice, indicating the strong influence of family and community networks in shaping their financial decisions. Friends are the second most common source of information, cited by 14% of respondents. Additionally, 12% of women gain financial insights through programs, while 10% are influenced by advertisements.

Table11: The source of income toward savings and investment

Source of information	Respondents	Percentage
Friends	21	14%
Advertisement	15	10%
Relative	57	38%
Financial literacy	9	6%
Program	18	12%
Book	0	0%
Self-assessment	30	20%
Others	0	0%
Total	150	100%

Source: Primary Data

Financial literacy plays a relatively smaller role, with only 6% of respondents relying on it, and 20% of women trust their own self-assessment for making financial decisions. This suggests that personal relationships and community-based sources are more significant in shaping investment behavior than formal financial education or external sources.

Table 12: Factors affecting respondents' investment decision

Factors	Respondents	Percentage
High return	15	10%
Safety of investment	35	23%
Ease of investment	33	22%
Fewer documentary formalities	28	12%
Timely updates on the invested money	7	5%
Liquidity of investment	32	21%
Total	150	100%

Source: Primary Data

Table No. 12 highlights the factors that influence rural women's investment decisions in Bongaigaon. The most significant factor is the safety of investment, with 23% of respondents prioritizing secure options. Ease of investment follows closely, with 22% indicating it as a key consideration. Liquidity of investment is another important factor for 21% of the women, suggesting a preference for investments that are easily accessible when needed. Fewer documentary formalities were important for 12% of respondents, showing that women favor investments with minimal paperwork. Lastly, high returns and timely updates on invested money are less critical, with only 10% and 5% of respondents, respectively, prioritizing these factors. These findings suggest that rural women in Bongaigaon are primarily concerned with the security, simplicity, and accessibility of their investments rather than seeking high returns or frequent updates.

Table 13: Interest in attending financial literacy program

Interested	Respondents	Percentage
Yes	123	82%
No	27	18%
Total	150	100%

Source: Primary Data

The findings from Table No. 13 indicate that a significant majority of rural women in Bongaigaon are interested in enhancing their financial knowledge, with 82% expressing a desire to attend financial literacy programs in the future. In contrast, 18% of respondents were not interested in such programs. This strong interest in financial education highlights the recognition among rural women of the importance of improving their understanding of savings and investment options, suggesting that targeted financial literacy initiatives could play a crucial role in empowering them to make more informed financial decisions.

Conclusion

The study on the savings and investment behavior of rural women in Bongaigaon highlights several key insights into their financial decision-making processes. The findings suggest that rural women predominantly rely on formal and informal savings avenues such as bank deposits, insurance, and Self-Help Groups (SHGs), with a preference for low-risk and accessible investment options. However, the limited engagement with higher-risk financial instruments like shares and debentures reflects a lack of exposure to diverse investment opportunities. Additionally, the study reveals a strong interest among rural women in financial literacy programs, with 82% expressing a desire to improve their financial knowledge. This indicates a significant opportunity for intervention through targeted financial education programs to enhance their understanding of various savings and investment options, ultimately leading to better financial security and empowerment. The research underscores the need for improved access to financial services, awareness campaigns, and support systems that can help rural women diversify their investments and become more active participants in the formal financial sector.

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Reliability Estimation of Cascade System Using Rayleigh Distributions and Failure Model

C. Doloi

Abstract

The paper examines an n-cascade system in which components can fail in specific ways. To estimate the reliability of the cascade system, we analyze a model where the operation of an active component is influenced by m stresses that fall within an interval (a_j,b_j). A component is considered to have failed if any of the stresses exceed these defined limits. In particular, when the stress-strength of the components follows a Rayleigh distribution, we derive expressions for the reliability of the model. Additionally, we present numerical values of reliability in tabular form for selected parameter values.

Keywords: *Cascade system, Stress- Strength, reliability, Rayleigh distribution, failure.*

JEL classification: *C4*

Assistant Professor, Department of Statistics, Pandit Deendayal Upadhyaya Adarsha Mahavidyalaya, Tulungia, Bongaigaon.

Introduction

An n-cascade system is a specific type of n-standby system [6]. In a cascade system, the stresses on subsequent components are reduced by a factor k, known as the attenuation factor. This factor is typically assumed to be constant across all components or to have different fixed values for individual components. However, it is also possible for the attenuation factor to be a random variable [7]. Let $X_1, X_2,\ldots,X_n$ be the strengths of n-components in the order of activation and let $Y_1, Y_2,\ldots,Y_n$ are the stresses working on them. In cascade system after every failure the stress is modified by a factor k [1] such that

$Y_2=kY_1,\ Y_3=kY_2=k^2Y_1\ldots,Y_i=k^{i-1}Y_1$ etc.

In the stress-strength model, the reliability R of a component (or system) is defined as the probability that its strength X is greater than or equal to the stress Y applied to it, where both X and Y are random variables.

i.e. $R=\Pr(X\geq Y)$

In many scenarios, a component can fail in various ways, such as electrical or mechanical failures. Each failure type can be linked to different stresses, which can be modeled using distinct random variables. Suppose a component may fail in m different ways, each associated with a specific stress. If X represents a random variable for the strength of the component, the reliability of the component can be expressed as follows:

$$R= P[X\geq Y_1, X\geq Y_2,\ldots, X\geq Y_m] \qquad (1.1)$$

The paper examines an n-cascade system in which components can fail in various ways. We focus on the following model:

Model: In an n-cascade system, we assume that the operation of an active component requires that the m stresses acting on it remain within the interval (a_j, b_j) for $j=1,2,\ldots,m$. The component will fail if any of the stresses exceed these specified limits. Both limits a_j and b_j are considered constants, and all components are assumed to be identical. For this model the constants (a_j, b_j) and (a_{ij}, b_{ij}) must have been fixed on the basis of the strength of the components.

Sriwastav and Dutta [8] examined an n-standby system incorporating different types of failures within the stress-strength model. Doloi and Gogoi [2] discussed a cascade system with Rama distributed random variables. They estimated the cascade reliability when stress strength is Rama distributed random variables. For multicomponent systems, Hilton and Fergen [4] addressed structural reliability problems where the failure modes of the components are independent. Moser and Kinser [5] explored a similar issue. Heller and Donat [3] evaluated the reliability of a "multiple-load-path" structure, which can continue functioning with m-1 failed components when it initially has m components. In this system, the applied stress is redistributed among the surviving components after each failure, and the system ultimately fails when all components are inoperable. They also considered statistical dependence among different failure modes.

Here, we have considered an n-cascade system. To our knowledge, no previous study has addressed a cascade model for this type of system. The objective of this paper is to estimate the system reliability R_n under a specific failure model.

The paper is organized as follows: Section 2 presents the general expression for the proposed model. In Section 3, the reliability expressions for an n-cascade system are derived when the stress-strength of the components follows a specific distribution. Subsection 3.1 focuses on the reliability expressions R_n for $n<4$, assuming Rayleigh distributions for the stress and strength. Section 4 provides numerical values for the reliabilities R(1), R(2), R(3) and R_3 under the proposed model in a tabular form.

Development of the Mathematical Models

Let us consider an n-cascade system operating under the influence of m different stresses. Our goal is to derive the reliability of this system under the proposed model.

Model: We have an n-cascade system. Let represent the stresses acting on the first component. We assume that, for a component to function correctly, the jth stress must lie within a specified interval, denoted as (a_j, b_j) for j=1, 2,…, m. When the first component fails, the second component experiences m stresses given by and the third component experiences m stresses and so on. We further assume that all components are identical, meaning that the intervals (a_j, b_j) are the same for each component.

Then the probability that the ith component works is given by

$$R'(i) = P\left[X_i \ge k^{i-1}Y_1, X_i \ge k^{i-1}Y_2, \ldots, X_i \ge k^{i-1}Y_m\right], \; i = 1,2,\ldots,n \tag{2.1}$$

Then, the reliability of the system is given by

$$R_n = R'(1) + [1-R'(1)]R'(2) + [1-R'(1)][1-R'(2)]R'(3) + \ldots + [1-R'(1)]$$

$$[1-R'(2)]\ldots[1-R'(n-1)]R'(n) \tag{2.2}$$

$$= R(1) + R(2) + \ldots + R(n), say \tag{2.3}$$

where R(i), i=1,2,…,n is the marginal reliability due to the i^{th} component, given by

$$R(i) = [1-R'(1)][1-R'(2)]\ldots[1-R'(i-1)]R'(i) \tag{2.4}$$

But now,

$$\begin{aligned} R'(i) &= P\left[(a_1 < k^{i-1}Y_1 < b_1), (a_2 < k^{i-1}Y_2 < b_2), \ldots, (a_m < k^{i-1}Y_m < b_m)\right] \\ &= P\left(a_1 < k^{i-1}Y_1 < b_1\right)P\left(a_2 < k^{i-1}Y_2 < b_2\right)\ldots P\left(a_m < k^{i-1}Y_m < b_m\right) \end{aligned} \tag{2.5}$$

i=1, 2,…,n, since the stresses on the components are independent random variables.

Let $g_j(y)$ be the p.d.f. of Y_j, then

$$R'(i) = \prod_{j=1}^{m} \int_{\frac{a_j}{k^{i-1}}}^{\frac{b_j}{k^{i-1}}} g_j(y)\,dy_j \quad i = 1,2,\ldots,n \tag{2.6}$$

Now from (2.4) and (2.6), we get

$$R(1) = R'(1)$$

$$= \prod_{j=1}^{m} \int_{a_j}^{b_j} g_j(y)\, dy_j \tag{2.7}$$

$$R(2) = R'(2) - R'(1)R'(2)$$

$$= \prod_{j=1}^{m} \int_{a_j/k}^{b_j/k} g_j(y)\, dy_j - \left(\prod_{j=1}^{m} \int_{a_j}^{b_j} g_j(y)\, dy_j \right) \left(\prod_{j=1}^{m} \int_{a_j/k}^{b_j/k} g_j(y)\, dy_j \right) \tag{2.8}$$

$$R(3) = R'(3) - R'(2)R'(3) - R'(1)R'(3) + R'(1)R'(2)R'(3)$$

$$= \prod_{j=1}^{m} \int_{a_j/k^2}^{b_j/k^2} g_j(y)\, dy_j - \left(\prod_{j=1}^{m} \int_{a_j/k}^{b_j/k} g_j(y)\, dy_j \right) \left(\prod_{j=1}^{m} \int_{a_j/k^2}^{b_j/k^2} g_j(y)\, dy_j \right) - \left(\prod_{j=1}^{m} \int_{a_j}^{b_j} g_j(y)\, dy_j \right)$$

$$\left(\prod_{j=1}^{m} \int_{a_j/k^2}^{b_j/k^2} g_j(y)\, dy_j \right) + \left(\prod_{j=1}^{m} \int_{a_j}^{b_j} g_j(y)\, dy_j \right) \left(\prod_{j=1}^{m} \int_{a_j/k}^{b_j/k} g_j(y)\, dy_j \right) \left(\prod_{j=1}^{m} \int_{a_j/k^2}^{b_j/k^2} g_j(y)\, dy_j \right) \tag{2.9}$$

Substituting R (1), R (2),…, R(n) in (2.3) we can obtain R_n.

Stress-Strength follows Specific distribution

In this section, we consider stress and strength variables that follow Rayleigh distributions, which may have different parameters. In the following subsection, we derive the reliability of a 3-cascade system under the model described in Section 2.

Rayleigh stress-strength distribution

Model: Let $g_j(y)$ be the Rayleigh densities with parameters $\beta_j^{\,2}$, j=1, 2,…,m respectively.

Then from (2.6) we get,

$$R'(i) = \prod_{j=1}^{m} \left(e^{-\frac{a_j}{k^{i-1}}} - e^{-\frac{b_j}{k^{i-1}}} \right); \quad i = 1,2,\ldots,n \tag{3.1.1}$$

Now from (3.1.1) and using (2.4) we get the marginal reliabilities R(1), R(2) , R(3) as follows.

$$R(1) = R'(1)$$

$$= \prod_{j=1}^{m} \left(e^{-a_j} - e^{-b_j} \right) \tag{3.1.2}$$

$$R(2) = \prod_{j=1}^{m} \left(e^{-\frac{a_j}{k}} - e^{-\frac{b_j}{k}} \right) - \prod_{j=1}^{m} \left(e^{-a_j} - e^{-b_j} \right) \prod_{j=1}^{m} \left(e^{-\frac{a_j}{k}} - e^{-\frac{b_j}{k}} \right) \tag{3.1.3}$$

$$R(3) = \prod_{j=1}^{m} \left(e^{-\frac{a_j}{k^2}} - e^{-\frac{b_j}{k^2}} \right) - \prod_{j=1}^{m} \left(e^{-a_j} - e^{-b_j} \right) \prod_{j=1}^{m} \left(e^{-\frac{a_j}{k^2}} - e^{-\frac{b_j}{k^2}} \right) - \prod_{j=1}^{m} \left(e^{-\frac{a_j}{k}} - e^{-\frac{b_j}{k}} \right)$$

$$\prod_{j=1}^{m} \left(e^{-\frac{a_j}{k^2}} - e^{-\frac{b_j}{k^2}} \right) + \prod_{j=1}^{m} \left(e^{-a_j} - e^{-b_j} \right) \prod_{j=1}^{m} \left(e^{-\frac{a_j}{k}} - e^{-\frac{b_j}{k}} \right) \prod_{j=1}^{m} \left(e^{-\frac{a_j}{k^2}} - e^{-\frac{b_j}{k^2}} \right) \tag{3.1.4}$$

By substituting the values of R (1), R (2) and R (3) from equations (3.1.2) to (3.1.4) into equation (2.3), we obtain R_3.

4. Numerical Evaluation

From the table, we observe that R(i) for i=2,3 increases as k increases. For example, when $a_1 = 0.2,\ b_1 = 3.0,\ a_2 = 0.4,\ b_2 = 3.0,$ then R(1)=0.7189, R(2)=0.1489, R(3)=0.0489. When any of the upper limits increase, R(i) for i=2,3 may decrease in some cases. Similarly, when any of the lower limits increase, R(i) for i=2,3 may also decrease in certain instances.

Table1: Values of R(1), R(2), R(3) and R_3 for the failure model where Stress-Strength Distributions are Rayleigh

a_1	a_2	b_1	b_2	k	R(1)	R(2)	R(3)	R_3
0.2	0.4	3	3	0.4	0.7189	0.1489	0.0489	0.9167
				0.6	0.7189	0.1787	0.0566	0.9542
				1	0.7189	0.2164	0.0589	0.9942
				1.2	0.7189	0.2183	0.0599	0.9971
0.3	0.3	5	5	0.4	0.6567	0.1561	0.0540	0.8668
				0.6	0.6567	0.2201	0.0679	0.9447
				1	0.6567	0.2233	0.0722	0.9522
				1.2	0.6567	0.2243	0.0813	0.9623
1	0.5	6	6	0.4	0.2898	0.0554	0.0027	0.3479
				0.6	0.2898	0.1102	0.0383	0.4383
				1	0.2898	0.1347	0.1359	0.5604
				1.2	0.2898	0.2110	0.1709	0.6717
0.4	0.2	6	6	0.4	0.4675	0.1211	0.0121	0.6007
				0.6	0.4675	0.1327	0.0547	0.6549
				1	0.4675	0.2224	0.1763	0.8662
				1.2	0.4675	0.2437	0.1983	0.9095

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