The debtor-attributes information and the probability of performing loans in the microfinance sector

Bayu Sindhu Raharja[1]*

Department of Zakat and Waqf Management, The Faculty of Sharia, Institut Agama Islam
Negeri (IAIN) Surakarta, Indonesia
*bayusindhu@iain-surakarta.ac.id

Abstract

Based on the recent evidence of the high rate of non-performing loans in Indonesia's microfinance sector, there is a need to formulate a mechanism that could control such credit risk. This study attempts to identify the pivotal determinant factors responsible for performing loans. In particular, this research proposes demand-side factors, such as debtor-attributes information, as critical for ensuring installment payments. Using unique data from microfinance in Central Java, it employs logistic regression analysis to prove that debtors' age and type of collateral significantly affect loan performance. This paper further shows that other variables, such as the payment period and the interest rate, also substantially affect credit risk. These findings have empirical and practical significance. For practical purposes, this research develops the new perspective that debtor-specific information, particularly on their behavioral aspects, requires more in-depth review. This insight may be useful for developing new credit-analyzing tools to alleviate severe non-performing loans. Empirically, this research improves the study of antecedent variables that influence performing loans.

Keywords: Banking; credit risk; financing decisions; non-performing loans; small-medium enterprises (SMEs).

JEL Classification: G21, G23, G29

INTRODUCTION

The data from Bank Indonesia, the Republic of Indonesia's monetary authority, shows that from 2013 to 2017, the rate of non-performing loans (NPLs) in microfinance steadily worsened. Indeed, NPLs increased by 2.5% each year. This situation is exceptionally urgent due to the systemic shocks that will probably occur in the future. Indonesia experienced a severe financial crisis in 1998, and the problem began with the high number of uncontrolled NPLs. Therefore, as a central government institution in the banking industry with direct control, Bank Indonesia should formulate a policy to push down the rate of NPLs.

Based on the Bank Indonesia data from 2013 to 2016, microcredit is declining. This paper argues that the policy of cutting off credit for micro-businesses aims to curtail

the increase of NPLs in the microfinance sector. However, this decision may have other consequences. It creates a barrier to microcredit accessibility. It also limits the micro-business sector's contribution to the economy as a whole. Thus, Indonesia should consider an alternative policy for reducing the NPL rate while ensuring the accessibility of microcredit. This study argues that a new approach to microcredit scoring could minimize NPL risk. To formulate a sophisticated microcredit scoring system, we need to determine several antecedent variables that affect NPLs.

Many scholars have examined the variables that affect the NPL rate of financial institutions. The variables involved in non-performing loans include bank deposits, total debt, ROA, capital adequacy (Malimi, 2017; Li, 2003; Alexandri & Santoso, 2015; Chodnicka-Jaworska & Jaworski, 2017; Irawati, Maksum, Sadalia, & Muda, 2019; Bhattarai, 2016; Chijoriga, 2011; Alali & Romero, 2013; Assibey & Asenso, 2015; Vithessonthi, 2016), unemployment rate, inflation, economic growth, export, import, etc. (Vatansever & Hepsen, 2015; Festić, Kavkler, & Repina, 2011; Kauko, 2012; Saba, Kouser, & Azeem, 2012; Messai & Jouini, 2013; Dimitrios & Dimitrios, 2016; Amuakwa-mensah, Marbuah, Ani-asamoah, & Amuakwa-mensah, 2017; Kjosevski & Petkovski, 2017; Betz, Kruger, Kellner, & Rosch, 2017; Waqas, Fatima, Khan, & Arif, 2017).

However, instead of analyzing specific debtor-attributes information, many previous scholars paid more attention to banking-specific information (ROA, total debt, capital adequacy, etc.) and macroeconomic factors (inflation, interest rate, economic growth, etc.). In other words, they placed more weight on the supply-side than the demand-side determinant factors. Nonetheless, according to Arya et al. (2013), the ability and willingness to pay are pivotal for credit payments. The ability to pay is related to how many resources the debtor has to cover the installments. Simultaneously, the willingness to pay is connected to the debtor's desire to pay each installment, which is usually affected by his or her behavior. In light of studies on behavioral science, such variables could be proxied by debtor-attributes information, such as age, gender, and amount of collateral. The ability and the willingness to pay are related to the demand-side determinant indicators, and they should both be present to assure credit payment.

This study aims to fill the research gap in the understanding of microcredit by shedding light on the relationship between debtor-attributes information and NPLs. It employs unique data from microfinance institutions in Central Java to analyze this relationship, then utilizes a logistic regression model to prove it statistically. The paper is divided into four steps. The first of these elaborates on the original idea of this research. Step 2 offers a literature review and proposes our hypotheses. Step 3 develops the research method to prove the hypothesis. Finally, Step 4 presents the results and discusses their implications.

The pioneering studies of the relationship between individual attributes and corporate performance investigated how the socio-demographic characteristics of managers and CEOs affect their decisions. For example, Faccio, Marchica, and Mura (2016) examined how CEOs' gender affects corporate risk-taking behavior. They found that female CEOs tend to make less risky investment decisions than male CEOs. This result supports the previous research, which found that gender is a determinant factor in how individuals choose their level of risk (Khan & Vieito, 2013). Risk-taking behavior is one of the several variables that affect debtors' willingness to pay. Arya, Eckel, and Wichman (2013) argued that people who are more prone to taking risks tend to have a higher probability of defaulting on their debts. Bachan (2014), in his study of student loans in the United Kingdom, noted that female students are less likely than their male counterparts to apply for credit. In other words, the ease with which people take out a loan is used as a proxy for higher risk-taking behavior. This evidence is in line with Yordanova and Alexandrova-Boshnakova (2011), who found that females tend to exhibit lower risk-taking behavior in business decision making. Risk-taking is positively correlated with a

higher use of credit because more borrowing entails a larger number of installment payments per period. This will cause the burden of spending to become heavier. According to psychological theory, the lower risk-taking behavior of women is due to their lower sense of autonomy, self-confidence, and optimism (Marinelli, Mazzoli, & Palmucci, 2016). On the contrary, women tend to give better professional advice and make decisions more wisely than men.

The other individual attribute that affects decision-making is the dimension of age. While it has not been discussed extensively in the finance literature, it is examined in behavioral management studies. For example, Schubert (1988) analyzed how age is related to leadership style and found that more senior leaders tend to use more passive methods than younger leaders. Younger leaders tend to embrace the latest, most innovative practices because they have a higher risk tolerance than senior leaders. Ouimet and Zarutskie (2014) found that young workers dominated in young firms. They made highly creative contributions in high-tech industries and then pushed businesses to create more growth. On the other hand, they argued that young companies have a higher probability of failure, possibly due to the behavior of their young, risk-taking workers. Based on this research, we can conclude that younger people are more creative, innovative, and risk-taking, while older people are more cautious. In the literature on non-performing loans, two factors prompt people to pay their debts: their ability to pay and their willingness to pay. Based on the previous research, people who have higher risk-taking behavior tend to have a higher probability of defaulting on their debt payments (Arya et al., 2013).

Debtor-attributes information also includes the amount of collateral for the loan. Capponi and colleagues (2020) argued that collateral is an important factor affecting credit risk. Brigo, Morini, and Pallavicini (2013) asserted that collateral is a critical requirement for prompt installment payments. Collateral reflects the symmetry of risk between lenders and debtors, that is, lenders require high collateral when facing a high credit risk (Brigo, Liu, Pallavicini, & Sloth, 2014; Gregory, 2012, 2015; Saunders & Allen, 2010). Manove, Padilla, and Pagano (2001), however, observed that high collateral requirements increase the probability of defaulting. Two theoretical suppositions underpin this interpretation. First, being willing to offer a high amount of collateral to lenders implies an imminent risk of bankruptcy, as debtors urgently need more funds to operate their companies. Second, lenders impose high collateral requirements when they are unable to prove their credit analysis accurately. Thus, lenders require it as compensation for carrying a higher credit risk.

However, this study does not entirely agree with the statements above. This research argues that high collateral requirements stem from asymmetric information between debtors and lenders. They represent the second way to increase debtors' moral obligation to repay their debt. These requirements also minimize the lenders' adverse selection bias when making loan decisions. Many previous studies also noted that high collateral requirements positively affect the probability of loans being repaid. In Indonesian society, the land or home deed is viewed as the best form of collateral.

METHODS

The research uses individual debtors' data from a sample of microfinance transactions collected by an independent non-formal organization in Klaten. The sample size was 175 debtors. The data consisted of the loan status (LS) as a proxy of credit default, debtors' age (DA), debtors' gender (DG), and debtors' collateral information (DCI). The loan status reflects whether the debt is in default. This research categorized the loan status into dummy variables: 1 for performing loans and 0 for non-performing loans. The debtors' collateral information is categorized into two types. The first is a guarantee in the

form of a land or home certificate. The second is any other kind of collateral. This variable was categorized into dummy variables: 1 for a land/home certificate and 0 for other collateral types.

This study examines the relationship between debtor-attributes information and the rate of performing loans. It employs the likelihood of achieving credit as the dependent variable. Debtors' age, gender, and collateral type are considered debtor-attributes information. Therefore, they are used as independent variables in this study. In addition, this research includes the loan size, payment period, and interest rate as control variables because it uses dummy values for both the dependent and independent variables. Therefore, it employs logistic regression analysis to analyze and estimate the data. The equation below explains how logistic regression works.

$$P_i = F(Z_i) = (\beta_0 + \beta_1.X_i) = \frac{1}{1 + e^{-z_i}} = \frac{1}{1 + e^{-(\beta_0 + \beta_1.X_i)}}$$

Thus the probability of the loan status will be default or not is,

$$P_i = \frac{1}{1 + e^{-z_i}}$$

if we multiply the right side of the probability with e^{z_i}, it will produce the equation.

$$P_i = \frac{e^{z_i}}{1 + e^{z_i}}$$

$$1 - P_i = 1 - \left(\frac{e^{z_i}}{1 + e^{z_i}}\right) = \frac{1}{1 + e^{z_i}}$$

Therefore, we can calculate the ratio of the credit default and the performing credit.

$$\frac{P_i}{1 - P_i} = \left(\frac{e^{z_i}}{1 + e^{z_i}}\right).\left(\frac{1 + e^{z_i}}{1}\right) = e^{z_i}$$

We can transform the equation above into logarithm natural (Basheer & Ibrahim)

$$\ln\left(\frac{P_i}{1 - P_i}\right) = Z_i lne = Z_i$$

$$\ln\left(\frac{P_i}{1-P_i}\right) = Z_i = [\beta_0 + \beta_1.DA_i + \beta_2.D(DG_i) + \beta_3.D(DCI_i) + \beta_{4.}.PP_i + \beta_5.INT_i + \beta_6.SIZE_i + e_i]$$

Where,
|	
DA_i	= the age of the debtor i
$D(DG_i)$	= the debtors' gender. 1 for man, 0 for women
$D(DCI_i)$	= the debtors' collateral information. 1 for land/home certificate, 0 for the others
PP_i	= the payment period
INT_i	= the interest rate of the debtors' loans
$SIZE_i$	= the debtors' total loans

RESULTS AND DISCUSSION

Results

This research used data from 175 debtors to non-formal microfinance organizations in Central Java. Table 1 illustrates the sample used in this study and provides the basic statistics of the debtor-attributes information, such as gender, collateral type, age, payment period, interest rate, and loan size.

Table 1
**Descriptive Statistics of the Variables**

		Size of Loans (IDR)		Interest Rate (P/A)		Payment Period (monthly)		Age	
		Mean	*Std. Dev*	*Mean*	*Std. Dev*	*Mean*	*Std. Dev*	*Mean*	*Std. Dev*
Gender	*Male*	28,634,259	34,741,341	15.38	2.95	30	8	38	10
	Female	23,590,909	29,230,636	15.20	2.86	29	14	41	11
Collateral	*Home/Land Certificate*	38,587,838	45,358,795	15.17	3.04	32	6	40	9
	Not Home/ Land Certificate	17,940,000	13,257,984	15.44	2.81	28	12	39	12

Source: Data Analysis

Figures 1 and 2 summarize these statistics. Figure 1 insists on comparing the loan size between male and female debtors. In contrast, Figure 2 presents the interest rate for loans based on gender and the presence of a home/land certificate as collateral.
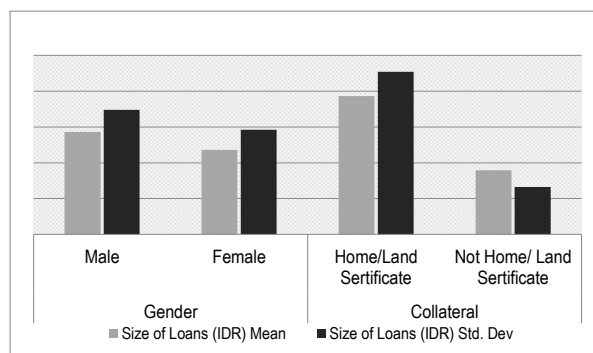
Figure 1
The Size of Loans
Sources: Data processes (2020)
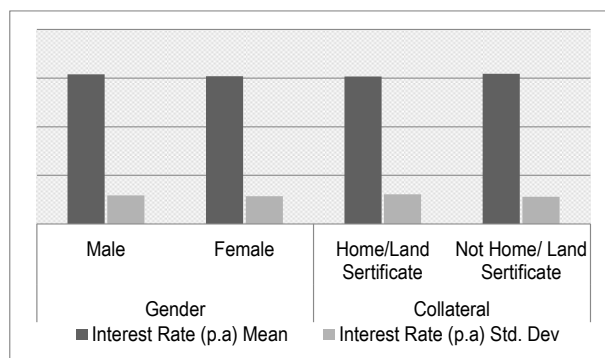
Figure 2
The Interest Rate
Sources: Data processes (2020)

According to Table 1 and Figure 2, loans that are assured by a house or land certificate tend to be larger and have a lower interest rate than others. These findings implicitly prove the theoretical foundation of this study: lenders require a home or land certificate as collateral to minimize credit risk. Larger loans implied a higher possibility of default, and lenders asked for high-quality collateral to mitigate the risk. Lower interest rates indicated that lenders felt safe extending more credit after receiving a secure type of collateral. However, a deeper analysis of Figure 2, which compares the interest rate between genders (male and female) and collateral types (presence/absence of a home/land certificate), shows that these variables have a very limited effect on the interest rate. This means that gender and collateral information do not influence lenders in determining the level of interest charged. Instead of being affected by demand-side factors, the interest rate is more likely to be responsive to supply-side factors, such as banking-specific financial performance and macroeconomic indicators. Moreover, such supply-side factors probably influence the size of loans. This paper presents a statistical analysis of the data in Table 2.

Table 2
Results of Logistic Regression Analysis

	Probability of Performing Loans
Constant	4.12
	(1.32)
Debtors' Age (DA)	0.80
	(2.17)***
Debtors' Gender (DG)	-0.02
	(-0.11)
Debtors' Collateral Information (DCI)	0.44
	(1.91)***
Payment Period (PP)	-1.09
	(-2.55)***
Interest Rate (INT)	-8.15
	(-1.91)***
Size of Loans (SIZE)	-0.10
	(-0.60)
Chi-Square	20.55
	(0.000)
McFadden R-Square	0.10

*** A significant level is 5%.
Source: Data analysis (2020)

Discussion

Based on the results, the logistic model used in this research is robust, as shown by the value of the Chi-square (0.002 < 0.05). This analysis confirms hypotheses 2 and 3. They are proven by the probability values of debtors' age and debtors' collateral type, which are under 0.05. However, the results indicate that the probability value of debtors' gender is above 0.05, which disproves the first hypothesis. Beyond these research hypotheses, the analysis found that payment periods and interest rates significantly affect loan performance. According to Table 2, the z-values of debtors' age and debtors' collateral are 2.18 and 1.90, respectively. This means that older debtors are as much as 2.18 times less likely to default, whereas securing a loan with a home or land certificate will raise performance as much as 1.90 times. This research also found that the two other explanatory variables significantly affect performing loans, with z-statistics of -2.25 for

the payment period and -1.90 for the interest rate. That is, the longer the payment period and the higher the interest rate, the more likely the debtor will be unable to pay.

According to the analysis, debtors' gender is not significantly related to loan performance. This means that females and males have an equal probability of having performing loans. In other words, this study insists that performing loans are not related to gender, but rather, are influenced by specific attributes associated with it, such as age. This result is not in line with some previous research that found gender to be a determinant factor in loan performance, possibly due to this study's distinct sociocultural research sample. Many previous studies were conducted in Western countries where people make decisions independently, including those about their finances. The culture is slightly different in our research setting, Central Java, Indonesia, where people have limited freedom in decision making (Anderson, Reynolds, & Gugerty, 2017; Agarwal & Mazumder, 2013; Kenkel, 1961; Lackman & Lanasa, 1993; Osanya, Adam, Otieno, Nyikal, & Jaleta, 2020; Permana, Aziz, & Siong, 2015), particularly when seeking loans. For instance, the wife has always asked her husband's opinion when making financial decisions, and the choice to take out a loan in Central Java has always been made with both parties' approval. Thus, it is quite difficult to assess loan performance based on individual gender, especially since most people in our research sample are married. Therefore, it is plausible that our study found that gender does not affect loan performance. This is in line with Setargie (2013), who determined that gender was not the primary factor in performing loans. The author argued that instead of considering how individual gender affects credit performance, we should investigate how the effective control mechanism determines loan quality. Campbell, Loumioti, and Wittenberg-Moerman (2019) asserted that gender-associated discrepancies in loan performance were not dependent on gender itself, but were likely derived from related soft information such as individual psychology.

This study discovered that debtors' age positively affects loan performance, with older debtors tending to have a higher probability of meeting their payment installments ($p < 0.05$, $z > 1.96$). This is congruent with many previous studies that found a significant relationship between debtors' age and loan performance (Gonzalez & Loureiro, 2014; Özdemir & Boran, 2004). For instance, Gonzalez and Loureiro (2014) argued that loan success is substantially affected by debtors' age. They noted that older debtors suffered less from heuristics and biases in decision making. Therefore, they faced lower credit risk because they did not seek to aggressively enhance their capital.

Older debtors have a more mature way of thinking than younger debtors. They are usually more cautious with their money and use their funds to finance their businesses. This leads to lower credit risk due to less reactive financial decision-making. Raharja et al. (2017) provided empirical evidence of how over-reactive decision-making severely harms financial performance. The results suggest that debtors' age is a practical consideration in credit performance, which may be particularly useful when formulating a credit scoring mechanism. In such a tool, debtors' age should be entered in the system as a primary credit approval variable.

Debtors who give their land or home certificate as collateral tend to have a higher probability of repaying their loans (see Table 2). This is statistically significant ($p < 0.05$, $z > 1.96$). These findings are similar to those of previous studies that also observed the critical role of collateral in alleviating the risk of defaulting (Chen & Kao, 2011; Coco, 2000; Cossin & Hricko, 2003; Adebisi & Matthew, 2015; Heider & Hoerova, 2009; Hull & White, 2014; Jiménez & Saurina, 2004; Karumba & Wafula, 2012; Steijvers & Voordeckers, 2009).

Most people value their land and home as primary assets. Indeed, they would be reluctant to lose them and would therefore strive to maintain these investments. In an experimental study to prove this claim, Mandala et al. (2012) showed that loans with a more valuable source of collateral (i.e., home, land, car) are more likely to perform better than loans with less valuable collateral. Lenders should consider requiring valuable collateral (i.e., a land or home certificate) for loans with a higher credit-risk score to encourage debtors to pay.

As mentioned earlier, this study found that higher interest rates are negatively associated with loan performance. This is statistically proved by a p-value below 5% (p < 0.05) and a z-value above 1.96 (z-value > z-statistic). The higher the interest rate charged, the higher the probability will be that debtors will default. It is widely accepted that lenders charge higher interest rates to offset higher credit risks when channeling loans. Therefore, finding a significantly negative correlation between high-interest rates and loan performance is not surprising. The result is in line with those of previous scholars, who also noted the negative effect of high rates of interest on credit performance (Altavilla, Boucinha, & Peydró, 2018; Collins & Wanjau, 2011; Cadena & Schoar, 2011; Chen, Cheng, & Wu, 2013; Fabozzi, Mann, & Choudhry, 2003; Liao, Li, & Wang, 2014; Van Deventer, Imai, & Mesler, 2013; Vickery, 2008).

As Table 2 shows, this study statistically proved that longer payment periods have a significantly negative relationship to loan performance, with a p-value below 5% (p < 0.05) and a z-value above 1.96 (z-value > z-statistic). This means that the longer the loan period is, the higher the risk of defaulting. The following equation for loan instalment payments illustrates this finding:

$$VoL_M = LIP$$

Based on the equation, the loan value at the maturity date (VoL_M) equals the sum of loan installment payment (LIP).

$$LIP = [\left(\frac{L}{n}\right).(1+i)]^n$$

LIP is the result of dividing the loan (L) by the payment period (n) multiplied by 1 plus the interest rate (i), then multiplied by the payment period (n). If the payment period (n) increases, the loan value at the maturity date (VoL_M) also rises.

If the amount of the loan is large and the loan period is long, the more money the debtor will be required to pay the lender before it matures. These conditions increase the debtor's risk of being in default. Therefore, the evidence regarding the significant negative relationship between the payment period and performing loans is logical. This result aligns with previous studies that found that more extended payment periods increase the credit risk (Wang, Zhao, & Peng, 2018; Karan, Ulucan, & Kaya, 2013; Wilson, Summers, & Hope, 2000). For instance, Mandala, et al. (2012). Moreover, simulations found that along with the amount of collateral, the payment period plays a critical role in loan performance. Loans with a payment period of less than 34 months had a greater likelihood of repayment than those with more extended schedules.

CONCLUSION

This study examines the relationship between demand-side factors, such as individual debtors' attributes, and the probability of successfully repaying loans. This information is essential to microfinance development. Many previous studies have neglected to pay attention to the role of behavioral attributes in credit default. Some earlier scholars overemphasized supply-side credit performance factors, such as banking-specific financial performance and macroeconomic indicators, and largely ignored demand-side aspects. Employing unique data from a micro-lending organization in Klaten, Central Java, this study uses a logistic regression model to analyze the effects of demand-side variables on loan performance.

The results show that debtors' age and collateral information significantly influence non-performing loans in the non-formal microfinance sector. Collateral information is related to the type of collateral debtors use to guarantee their credit. This study found that securing a loan with the deed to a home or land decreases credit risk. This result supports Karumba and Wafula (2012), who implied that the higher value of this form of collateral would indirectly increase the debtor's moral obligation to pay each installment. Therefore, employing this type of collateral as a prerequisite for extending credit will increase the probability of repayment.

Moreover, the study revealed that debtors' age significantly affects loan performance. It found that older debtors are more likely to be responsible borrowers, while younger debtors are more prone to default on paying their installments. Moreover, this research found no significant effect of the debtors' gender on non-performing loans.

This study offers practical solutions to lenders on decreasing credit risk while improving the probability of loan repayment. They should also consider other explanatory variables such as the payment period and interest rate. Indeed, our results show that longer payment periods and higher interest rates have a significantly adverse effect on debtors' ability to cover their loans.

In the future, scholars should investigate other aspects of debtors' behavior in making credit decisions. As we previously noted, the success of repayment is related not only to debtors' ability to pay, which is influenced by the attributes discussed in this study, but to their willingness to pay. Future research on debtors' behavior should concentrate on this aspect of debt repayment. More research is also needed to help lenders formulate credit-analyzing tools to facilitate sustainable microfinancing.

REFERENCE

Adebisi, J. F., & Matthew, O. B. (2015). The impact of non-performing loans on firm profitability: A focus on the Nigerian banking industry. *American Research Journal of Business and Management, 1*(4), 1-7.

Agarwal, S., & Mazumder, B. (2013). Cognitive abilities and household financial decision-making. *American Economic Journal: Applied Economics, 5*(1), 193-207.

Alali, F., & Romero, S. (2013). Characteristics of failed US commercial banks: An exploratory study. *Accounting and Finance*, *53*(August 2011), 1149–1174. https://doi.org/10.1111/j.1467-629X.2012.00491.x.

Alexandri, M. B., & Santoso, T. I. (2015). Non-performing loan: Impact of internal and external factors (Evidence in Indonesia). *International Journal of Humanities and Social Science Invention, 4*(1), 87-91.

Amuakwa-mensah, F., Marbuah, G., Ani-asamoah, D., & Amuakwa-mensah, F. (2017). Re-examining the Determinants of Non- Performing Loans in Ghana's Banking Industry: Role of the 2007–2009 Financial Crisis Re-examining the Determinants of Non-Performing Loans in Crisis. *Journal of African Business*, *0*(0), 1–23. https://doi.org/10.1080/15228916.2017.1308199

Anderson, C. L., Reynolds, T. W., & Gugerty, M. K. (2017). Husband and wife perspectives on farm household decision-making authority and evidence on the intra-household accord in rural Tanzania. *World Development*, 90, 169-183.

Arya, S., Eckel, C., & Wichman, C. (2013). Anatomy of the credit score. *Journal of Economic Behavior and Organization*, *95*, 175–185. https://doi.org/10.1016/j.jebo.2011.05.005

Assibey, E. O., & Asenso, K. J. (2015). Regulatory capital and its effect on credit growth, non-performing loans, and bank efficiency. *Journal Pf Financial Economic Policy*, *7*(4), 401–420. https://doi.org/10.1108/JEIM-02-2014-0013

Altavilla, C., Boucinha, M., & Peydró, J.-L. (2018). Monetary policy and bank profitability in a low-interest rate environment. *Economic Policy, 33*(96), 531-586.

Bachan, R. (2014). Students' expectations of debt in UK higher education. *Studies in Higher Education, 39*(5), 848-873.

Bhattarai, Y. R. (2016). Effect of non-performing loan on the profitability of commercial banks in Nepal. *European Business & Management, 6*(6), 164-170. doi: 10.11648/j.ebm.20200606.15

Betz, J., Kruger, S., Kellner, R., & Rosch, D. (2017). Macroeconomics effects and frailties in the resolution of non-performing loans. *Journal of Banking & Finance*. https://doi.org/10.1016/j.media.2017.03.008

Brigo, D., Morini, M., & Pallavicini, A. (2013). Counterparty credit risk, collateral, and funding: With pricing cases for all asset classes. John Wiley & Sons.

Brigo, D., Liu, Q., Pallavicini, A., & Sloth, D. (2014). Non-linear valuation under collateral, credit risk and funding costs: A numerical case study extending Black-Scholes. Handbook in Fixed-Income Securities, Wiley.

Cadena, X., & Schoar, A. (2011). *Remembering to pay? Reminders vs. financial incentives for loan payments*. Working Paper retrived from https://www.nber.org/papers/w17020

Campbell, D., Loumioti, M., & Wittenberg-Moerman, R. (2019). Making sense of soft information: Interpretation bias and loan quality. *Journal of Accounting and Economics*, *68*(2-3), 101240.

Capponi, A., Cheng, W. A., Giglio, S., & Haynes, R. (2020). The collateral rule: Evidence from the credit default swap market. Retrieved from http://www.columbia.edu/~ac3827/assets/files/CollateralRuleEmpirics_JME.pdf

Chen, A., & Kao, L. (2011). Effect of collateral characteristics on bank performance: Evidence from collateralized stocks in Taiwan. *Journal of Banking & Finance, 35*(2), 300-309.

Chen, R.-R., Cheng, X., & Wu, L. (2013). Dynamic interactions between interest-rate and credit risk: Theory and evidence on the credit default swap term structure. *Review of Finance*, *17*(1), 403-441

Chijoriga, M. M. (2011). Application of multiple discriminant analysis (MDA) as a credit scoring and risk assessment model. *International Journal of Emerging Markets*, *6*(2), 132–147. https://doi.org/10.1108/17468801111119498

Chodnicka-Jaworska, P., & Jaworski, P. (2017). Fundamental determinants of credit default risk for European and American banks. *Journal of International Studies, 10*(3), 51-63.

Coco, G. (2000). On the use of collateral. *Journal of Economic Surveys*, *14*(2), 191-214.

Collins, N, J., & Wanjau, K. (2011). The effects of interest rate spread on the level of non-performing assets: A case of commercial banks in Kenya. *International Journal of Business and Public Management, 1*(1), 58-65.

Cossin, D., & Hricko, T. (2003). A structural analysis of credit risk with risky collateral: A methodology for haircut determination. *Economic Notes*, *32*(2), 243-282.

Dimitrios, A., Helen, L., & Mike, T. (2016). Determinants of non-performing loans: Evidence from Euro-area countries. *Finance Research Letters*, *18*, 116–119. https://doi.org/10.1016/j.frl.2016.04.008.

Fabozzi, F. J., Mann, S. V., & Choudhry, M. (2003). *Measuring and controlling interest rate and credit risk* (Vol. 104): John Wiley & Sons.

Faccio, M., Marchica, M. T., & Mura, R. (2016). CEO gender, corporate risk-taking, and the efficiency of capital allocation. *Journal of Corporate Finance*, *39*, 193–209. https://doi.org/10.1016/j.jcorpfin.2016.02.008

Festić, M., Kavkler, A., & Repina, S. (2011). The macroeconomic sources of systemic risk in the banking sectors of five new EU member states. *Journal of Banking and Finance*, *35*(2), 310–322. https://doi.org/10.1016/j.jbankfin.2010.08.007

Gonzalez, L., & Loureiro, Y. K. (2014). When can a photo increase credit? The impact of lender and borrower profiles on online peer-to-peer loans. *Journal of Behavioral and Experimental Finance*, 2, 44-58.

Gregory, J. (2012). Counterparty credit risk and credit value adjustment: A continuing challenge for global financial markets: John Wiley & Sons.

Gregory, J. (2015). The xVA Challenge: Counterparty credit risk, funding, collateral, and capital: John Wiley & Sons.

Heider, F., & Hoerova, M. (2009). Interbank lending, credit risk premia, and collateral. *SSRN Papers*

Hull, J. C., & White, A. (2014). Collateral and credit issues in derivatives pricing. *Rotman School of Management Working Paper* (2212953).

Irawati, N., Maksum, A., Sadalia, I., & Muda, I. (2019). Financial performance of Indonesian's banking industry: The role of good corporate governance, capital adequacy ratio, non-performing loan, and size. *International Journal of Scientific and Technology Research, 8(*4), 22-26.

Karan, M. B., Ulucan, A., & Kaya, M. (2013). Credit risk estimation using payment history data: A comparative study of Turkish retail stores. *Central European Journal of Operations Research*, *21*(2), 479-494.

Karumba, M., & Wafula, M. (2012). Collateral lending: Are there alternatives for the Kenyan banking industry. Nairobi: KBA Centre for Research on Financial Markets and Policy Working Paper Series.

Kauko, K. (2012). External deficits and non-performing loans in the recent financial crisis. *Economics Letters*, *115*(2), 196–199. https://doi.org/10.1016/j.econlet.2011.12.018

Kenkel, W. F. (1961). Husband-wife interaction in decision making and decision choices. The *Journal of Social Psychology*, *54*(2), 255-262.

Khan, W. A., & Vieito, J. P. (2013). Ceo gender and firm performance. *Journal of Economics and Business*, *67*, 55–66. https://doi.org/10.1016/j.jeconbus.2013.01.003

Kjosevski, J., & Petkovski, M. (2017). Non-performing loans in Baltic States: Determinants and macroeconomic effects. *Journal of Economics*, *17*(1), 25–44. https://doi.org/10.1080/1406099X.2016.1246234

Lackman, C., & Lanasa, J. M. (1993). Family decision-making theory: An overview and assessment. *Psychology & Marketing*, *10*(2), 81-93.

Li, Y. (2003). The Asian Financial Crisis and non-performing loans: Evidence from commercial banks in Taiwan. *International Journal of Management*, *20*(1), 69-74.

Liao, L., Li, M., & Wang, Z. (2014). The intelligent investor: Not-fully-marketized interest rate and risk identify: Evidence from P2P lending. *Economic Research Journal*, 2014, 125-137.

Malimi, K. (2017). The influence of capital adequacy, profitability, and loan growth on non-performing loans a case of Tanzanian banking sector. *International Journal of Economics, Business and Management Studies, 4*(1), 38-49.

Mandala, I. G. N. N., Nawangpalupi, C. B., & Praktikto, F. R. (2012). Assessing credit risk: An

application of data mining in a rural bank. *Procedia Economics and Finance*, 4, 406-412.

Manove, M., Padilla, A. J., & Pagano, M. (2001). Collateral versus project screening: A model of lazy banks. *The RAND Journal of Economics*, *32*(4), 726. https://doi.org/10.2307/2696390.

Marinelli, N., Mazzoli, C., & Palmucci, F. (2016). How does gender really affect investment behavior? *Economics Letters*, 1–8. https://doi.org/10.1016/j.econlet.2016.12.006.

Messai, A. S., & Jouini, F. (2013). Micro and macro determinants of non-performing loans. *International Journal of Economics and Financial Issues*, *3*(4), 852–860. https://doi.org/10.1300/J079v27n04_02.

Osanya, J., Adam, R. I., Otieno, D. J., Nyikal, R., & Jaleta, M. (2020). *An analysis of the respective contributions of husband and wife in farming households in Kenya to decisions regarding the use of income: A multinomial logit approach.* Paper presented at the Women's Studies International Forum.

Ouimet, P., & Zarutskie, R. (2014). Who works for startups? The relation between firm age, employee age, and growth. *Journal of Financial Economics*, *112*(3), 386–407. https://doi.org/10.1016/j.jfineco.2014.03.003

Permana, A. S., Aziz, N. A., & Siong, H. C. (2015). Is mom energy efficient? A study of gender, household energy consumption, and family decision-making in Indonesia. *Energy research & social science*, 6, 78-86.

Raharja, B., Suhaeli, D., & Mranani, M. (2017). Research of the stock price overreaction and investor overconfidence issues. *Business, Management and Economics Engineering*, *15*(1), 127-139.

Saba, I., Kouser, R., & Azeem, M. (2012). Determinants of non-performing loans: The case of Ethiopian Banks. *The Romanian Economic Journal*, *44*(XV), 141–152.

Saunders, A., & Allen, L. (2010). Credit risk management in and out of the financial crisis: New approaches to value at risk and other paradigms (Vol. 528): John Wiley & Sons.

Setargie, S. (2013). Credit default risk and its determinants of microfinance industry in Ethiopia. *Ethiopian Journal of Business and Economics, 3*(1), 1-21.

Schubert, J. N. (1988). Age and active-passive leadership style. *American Political Science Review*, *82*(3), 763-772.

Steijvers, T., & Voordeckers, W. (2009). Collateral and credit rationing: A review of recent empirical studies as a guide for future research. *Journal of Economic Surveys*, *23*(5), 924-946.

Van Deventer, D. R., Imai, K., & Mesler, M. (2013). *Advanced financial risk management: Tools and techniques for integrated credit risk and interest rate risk management*: John Wiley & Sons.

Vatansever, M., & Hepsen, A. (2015). Determining impacts on non-performing loan ratio in Turkey. Journal of Applied Finance and Banking, 5(1), 1

Vickery, J. (2008). How and why do small firms manage interest rate risk? *Journal of Financial Economics*, *87*(2), 446-470.

Vithessonthi, C. (2016). Deflation, bank credit growth, and non-performing loans: Evidence from Japan. *International Review of Financial Analysis*, *45*, 295–305. https://doi.org/10.1016/j.irfa.2016.04.003

Waqas, M., Fatima, N., Khan, A., & Arif, M. (2017). Determinants of non-performing comparative study of Pakistan loans: A comparative study of Pakistan, India, and Bangladesh. *Finance & Banking Studies*, *6*(1), 51–68.

Wang, K., Zhao, R., & Peng, J. (2018). Trade credit contracting under asymmetric credit default risk: Screening, checking, or insurance. *European Journal of Operational Research, 266*(2), 554-568.

Wilson, N., Summers, B., & Hope, R. (2000). Using payment behavior data for credit risk modeling. *International Journal of the Economics of Business*, *7*(3), 333-346.