

## The Effect of Broker–Borrower Interaction on Mortgage Defaults

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### Abstract

This research proxy uses the distance between brokers and borrowers to explore the interaction between brokers who provide consulting services to prospective property buyers. Meanwhile, the view from the banking side is assessing the risk profile of prospective mortgage borrowers. The research data collection is information on mortgage borrowers from Private Banks in Surabaya branches from the period 2015 - 2020 who used the help of real estate agents when buying a house and collected 1295 transactions. Data processing using probit regression. The test results show that the interaction between brokers and borrowers using distance as a proxy has no significant impact on mortgage defaults. Borrower interest rates raised by the company showed a substantial negative relationship with mortgage default. The study also reveals that borrower income has no impact on mortgage default. The managerial implication for banks is to determine the strategy of cooperation with property brokers to increase mortgage funding.

**Keywords:** borrower income, broker and borrower interaction, interest rates, mortgage default.

### 1. Introduction

Property agents or brokers in Indonesia are directly connected to the real estate sector. Broker property plays a crucial role in helping to market these assets to the public. Residential properties, including homes, apartments, and other products, are offered (Harjono, 2016). Property brokers must be familiar with several fundamental concepts, such as the laws governing the purchase and sale of real estate and the need for bank financing references for potential clients (Agarwal et al., 2009; Harjono, 2016). Agents also serve as financial advisors to potential purchasers, mainly when the two parties interact in person (face-to-face). The brokers-borrowers interaction can be directly face-to-face through other communication media, such as mobile phones or social media such as WhatsApp.

Numerous past studies have illustrated how face-to-face contact could affect borrowers' mortgage credit performance. Consumers prefer in-person interaction while preparing for a mortgage and purchasing a property (Lee, 2002). While self-directed learning or counseling conducted on mobile devices or other gadgets does not impact borrowers' usage of the expedited repayment option, face-to-face encounters increase the possibility that borrowers will make early repayments (Ding et al., 2008). Hira and Zorn (2001) noted that interactions with other communication mediums and social media had no discernible impact on the credit performance of mortgage borrowers. In contrast, those who had previously had face-to-face interactions had a lower risk of default.

Interest rates have become a crucial factor for potential mortgage borrowers to think about. With the

specified interest rate, both the total amount of debt due by the borrower and the monthly installment payments rise. With more outstanding payments, the borrowers' net income will be lower after subtracting their monthly loans. These can affect the borrowers' credit status and raise the risk of default (Syaleh, 2018). To lessen the impact of default risk, the internal bank policy uses fixed and floating interest rates. Furthermore, interest rates affect Indonesian banks' Non-Performing Loans (NPL) levels (Soebagio, 2005; Fakhrunnas et al., 2022).

Another research stated that income influences mortgage default risk. A considerable danger of default exists for low-income people (Firestone et al., 2007). Itoo et al. (2013) added that a high loan amount or value of mortgage debt increases the likelihood of default. Due to this, the bank that offers mortgage facilities usually limits the distribution of mortgages based on the potential borrowers' income (Rojas, 2021). The asset's value used as collateral will be considered on par with the debt's or the mortgage financing's values (McDonald & Thornton, 2008). According to Kim & Lim (2021), the bank considers that the higher the risk of default, the higher the value of the assets pledged as security.

For the bank to consider reducing the risk of credit failure, the existence of collateral or a guarantee from the borrowers is required (Chakrabarty, 2012). The type of credit guarantee is used as collateral for mortgage facilities, one of which is in the form of residential property or property for residential use, according to the explanation from Harjono (2016). Only consumptive guarantees, like homes and apartments, are permitted for mortgages that contain consumer loans. Credit with consumable and solely

used collateral will have a lower chance of default (Conklin, 2016). This is because of the psychological impact that the guarantee has on the borrowers; if they default on their payments, the collateral will be seized, leaving them without a place to live.

Borrowers may face default credit risk if they fail to meet their obligations to pay principal and interest installments by the terms of the credit agreement, which can jeopardize their creditworthiness (Indrawan, 2013; McDonald & Thornton, 2008; Syaleh, 2018). A condition where borrowers cannot repay the original agreement allows banks to seize the guaranteed collateral (Ito et al., 2013). Otoritas Jasa Keuangan Republik Indonesia (2019) provides a borrowers classification status so that banks can provide a different approach based on the quality of borrowers' repayments through an assessment of the quality of loan disbursement, which has been set into five qualities, including "Adequate," "Under Special Consideration", "Substandard", "Doubtful", and "Non-performing."

This study aims to consider the distance between the real estate agent's office and the property purchased by the borrower, extending research on broker-borrower interactions (Conklin, 2016). The impact of distance in obtaining information from potential borrowers, which is useful for banks to assess before lending, is also extended in this study by Agarwal and Hauswald (2010). In addition, this study refers to Agarwal et al. (2009), which shows how contact between real estate agents who provide real estate advice to potential borrowers can reduce the likelihood of mortgage default. We also contribute to mortgage finance from several previous studies, including Agarwal et al. (2009), Ambrose & Conklin (2014), Conklin (2016), Kim & Lim (2021), Hirad et al. (2001), and Rojas (2021).

## 2. Literature Review

On the one hand, credit is a creditor or lender who transfers money or resources to another party, called a debtor or borrower, where the second party does not immediately pay the first party but promises to return it later. The second party does not pay the first party immediately but promises to return it later (Prem, 2020). Both parties build a mutually beneficial working relationship. They are granting credit by the bank to prospective borrowers through a process known as 5C (character, capacity, capital, collateral, and condition of the economy) (Wasiuzzaman et al., 2020).

Default risk or credit risk is the risk that arises if the borrower fails to fulfill its obligation to pay principal and interest installments as agreed in the

credit agreement (Syaleh, 2018). The possibility of default can be caused by several factors, such as inaccuracy when analyzing credit applications so that they cannot predict the risk of default and the existence of deliberate or accidental elements from borrowers so that they cannot fulfill their obligations. The view of banks in dealing with defaults is to rescue bad debts in ways such as rescheduling (extending the credit period to reduce the number of installments that must be paid every month), reconditioning (capitalization of interest, postponement of interest and principal payments, lowering interest rates, or waiving interest), restructuring (increasing the amount of credit or equity), combination (combination of the three previous methods), confiscation of collateral, if the borrower does not have good faith to repay the debt (Ratnasari, 2012).

### 2.1. Broker-borrowers Interaction

According to Mulya & Japariato (2014) and Rafitas (2006), a property agent or broker is a legal entity with a permanent residence and a property brokerage business license. The Minister of Trade Regulation of the Republic of Indonesia has regulated the sustainability of property trade intermediary companies and parties referred to as experts or brokers (Menteri Perdagangan Republik Indonesia, 2017). Brokers can act as financial consultants because prospective buyers frequently inquire about issues other than the property itself, such as legality management, the availability of financing from various financial institutions, and so on (Conklin, 2016). Brokers should arm themselves with knowledge such as the legal basis for buying and selling property, which can help speed up the negotiation and transaction process with buyers (Harjono, 2016).

Prospective borrowers will understand more complex mortgage information if they receive it directly, affecting the performance of the borrowers' mortgage payments in the future (Conklin, 2016). Borrowers who interact with brokers learn more quickly and are less likely to default (Agarwal et al., 2009; Agarwal & Hauswald, 2010). Face-to-face interactions between brokers and borrowers have a more significant impact (Conklin, 2016). Buyers can see, feel, and be interested in the details explained in person (Lee, 2002). Consultations that begin with broker-borrower interactions can help banks reduce risky defaults (Agarwal et al., 2009; Conklin, 2016). In addition, Agarwal et al. (2009) added that prospective buyers who use consulting services with real estate agents have a low default rate. Based on studies from Conklin (2016) and Agarwal et al. (2009), this study examines the brokers-borrowers interaction, which indicates the effect of distance on

mortgage facilities from borrowers. The distance factor also influences information gathering for banks to make credit facility decisions for prospective borrowers (Agarwal & Hauswald, 2007; Alessandrini et al., 2009; Degryse & Ongena, 2005).

H<sub>1</sub>: Broker-borrower interaction affects mortgage default.

## 2.2. Interest Rates

Indonesia's Central Bank's interest rate policies have increased non-performing loans in several Indonesian banks (Soebagio, 2005). A recent study from Kösem (2021) shows that a decrease in the central interest rate can increase housing prices and mortgage loans via mortgage interest rates. Meanwhile, Conklin (2016) claims that borrowers with higher interest-rate loan facilities are more likely to default. The higher the interest rate offered, the less borrowers can pay credit installments, resulting in a higher risk of mortgage default (Morgan & Pontines, 2014). The bank compensates for the increased lending risk by charging a higher interest rate (McDonald & Thornton, 2008).

H<sub>2</sub>: Credit characteristics (interest rate) affect mortgage default.

## 2.3. Type of Credit Collateral

Borrowers with collateral assets will find it easier to obtain credit (Hanedar et al., 2014). A study by Teo & Ong (2005) found that the type of credit collateral significantly positively affects mortgage defaults. The lower the interest rate, the higher the collateral value (Comeig et al., 2015). In practice, consumptive property such as houses, shophouses, apartments, small office-home offices (SOHO), and vacant land with high values can be used as collateral for a mortgage application (Harjono, 2016). According to Conklin (2016), borrowers with investment-oriented collateral are more likely to default, whereas borrowers with consumer property guarantees are less likely to default. The collateral's value influences the borrower's default risk. The greater the value of the mortgage guarantee, the greater the borrower's sense of obligation to repay the debt. Borrowers will experience fear or loss if they fail to pay and the bank seizes high-value collateral (Nainggolan, Hasan, & Kamaliah, 2018). On the other hand, the bank will regulate how much credit facilities can be disbursed to borrowers depending on the Loan-To-Value (LTV) ratio and type of credit. The higher the LTV ratio, the greater the value of the type of property collateral pledged to the bank (McDonald & Thornton, 2008). A higher LTV ratio increases the

possibility of a higher default (Campbell & Cocco, 2015; Ito et al., 2013; McDonald & Thornton, 2008).  
H<sub>3</sub>: Type of credit collateral affects mortgage default.

## 2.4. Borrower Income

Borrowers' income is another factor that can be considered before providing mortgage financing (Campbell & Cocco, 2015; Fout et al., 2020; Goodman et al., 2014). A recent study from Rojas (2021) stated that the bank is the provider of mortgage facilities because credit distribution is limited based on the borrower's income. According to Joo and Pauwels (2002), higher-income individuals are more likely to seek professional advice when making financial decisions. Meanwhile, creditors with low and middle incomes have more difficulty obtaining loan facilities to purchase a private home (Fout et al., 2020). Borrowers with low or middle incomes have fewer financial reserves and a higher debt-to-income ratio. If their income changes significantly, they have a high risk of default and collateral confiscation (Ding et al., 2008). Some credit risks would occur if the borrower fails to pay and the borrower experiences an income shock, which can affect the borrower's ability to pay (Hatchondo et al., 2015).

H<sub>4</sub>: Borrower Income affects mortgage default.

## 3. Methods

The sample for this study was chosen using a purposive sampling method, which is a sampling technique that includes specific considerations or unique selection and aids in providing data that is relevant to the research objectives. The borrowers in this study were drawn from the mortgage database of the private bank (with the most significant market capitalization listed on the Indonesian stock exchange) Surabaya branch between 2015 and 2020. The sampling criteria are the borrowers having a mortgage facility and the services of a real estate agent or brokers accompanying the mortgage process.

The secondary data used in this research is from the mortgage borrowers of the private bank in the Surabaya branch from the 2015-2020 period. The data collection methods used are:

1. Collect data on distance between broker-borrower office locations, credit characteristics data (interest rates, debt values, and property prices), data on types of credit collateral, and borrower income from internal company data. The data that has been obtained will be processed and analyzed quantitatively.
2. Literature research by collecting and studying books and journals related to the research topic so

that research has a theoretical basis and appropriate analytical techniques in solving problems.

The Maximum Likelihood estimation method is used in statistical analysis to find a specific point to maximize a function (George & Mallery, 2018). This estimation technique is used in developing new test techniques to estimate the distribution parameters of the data. The Probability Unit (Probit) model was used in this study, with the following steps:

1. Gather data on the borrower's loan facility's collectability from the start of the current loan up to two years and classify whether the borrower has ever failed to pay within two years.
2. Obtaining data from the company database on the distance in kilometers between the brokerage office and the collateral.
3. Conduct a model significance test to determine the effect of the independent variables on the dependent variables in the model by examining the Likelihood Ratio parameters (Harlan, 2018). If p-values are less than 5%, the independent variable significantly affects the dependent variable.
4. Determine the goodness-of-fit from the regression model to predict the value of data observations. If the p-values > 0.05, the model can provide an appropriate description or prediction based on observational data (Harlan, 2018).
5. Determine the coefficient of determination Pseudo-R<sup>2</sup> (McFadden's R-squared) to see how the independent variables interact with the dependent variable. The coefficient of determination measures how well the independent variable explains the dependent variable.
6. Logistic regression analysis uses the link between two or more independent variables in the form of interval or categorical data, with one variable having two or more categories used to predict or predict a variable value depending on the independent variable (Hosmer & Lemeshow, 2000). We used logistic regression to explain nonlinear independent and dependent variables as follows

$$\Pr(Y_i = 1) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4$$

Description:

$\alpha$  = constant value

$\beta$  = coefficient of regression

$X_1$  = Broker-borrowers interaction using distance (kilometers)

$X_2$  = Interest Rates (%)

$X_3$  = Type of Property (0 = House, Apartment, 1 = Shophouse, SOHO, Homestay)

$X_4$  = Income (rupiah)

7. Calculate the odds ratio to compare the likelihood that an event will occur to the likelihood that it will not. The odds ratio is thought to have a reduced likelihood of influencing the dependent variable if the probability value is 0 and a greater possibility of doing so if the probability value is 1 (Harlan, 2018).

#### 4. Results

We used 1295 data from the mortgage borrowers' payment database of the private bank. The information was gathered using the Surabaya City branch office data during 2015-2020. Additionally, based on the requirements from the Financial Services Authority's (2018) collectability status, the researcher divides the data into two categories: "Adequate" and "Default" status. The default status comprises collectability status, which is a combination of data grouping with "Substandard," "Doubtful," and "Non-performing" statuses. Descriptive statistical information on mortgage borrowers is provided in Table 1.

Table 1 displays the descriptive statistics of mortgage borrowers with an "adequate" payment status of 1217 borrowers (93.98%), and the distance between the broker and the borrower is less than 25 kilometers. Meanwhile, 12 (twelve) borrowers have "default" status for the same distance. In the credit characteristics factor, 0.85% of borrowers defaulted at interest rates below 8%; when viewed from interest rates of less than 8% - 10%, the number of borrowers with "adequate" status was 665 borrowers (51.35%) and 608 borrowers (46.95%). Borrowers with "adequate" status for home ownership and SOHO loans, with an income between Rp. 10,000,000 - 50,000,000 per month.

Furthermore, we used the probit logistic regression analysis technique with EViews software. The likelihood ratio value is used in the regression analysis step to simultaneously test the independent variables on the dependent variable. The McFadden R-squared value collectively shows the independent variables' contribution to the dependent variable. If the coefficient is the closest to 1, it can be interpreted that the independent variable substantially influences explaining changes to the dependent. A regression model that is fit or considers the data observation's value is predicted by testing the goodness of fit estimate with a p-value > 0.05. (Harlan, 2018). We used the probit logistic regression model on all variables. We interpreted the odds ratio value, which is the calculated difference between success and failure probabilities, and is 0 for adequate status and 1 for default.

**Table 1.** Descriptive statistics of mortgage borrowers

Variable	Adequate		Default		Total Sample		
	Total	%	Total	%	Total	%	
<b>Broker-Borrower Interaction</b>							
Distance	< 25	1217	93.98%	12	0.93%	1229	94.90%
(kilometer)	25 – 50	33	2.55%	-	-	33	2.55%
	> 50	31	2.39%	2	0.15%	33	2.55%
<b>Interest Rates</b>							
	< 8 %	665	51.35%	11	0.85%	676	52.20%
	8 – 10 %	608	46.95%	3	0.23%	611	47.18%
	> 10 %	8	0.62%	-	-	8	0.62%
<b>Type of Credit Collateral</b>							
Property Type	House	964	74.44%	12	0.93%	976	75.37%
	Apartment	52	4.02%	-	-	52	4.02%
	Shophouse	56	4.32%	1	0.08%	57	4.40%
	SOHO	203	15.68%	1	0.08%	204	15.75%
	Homestay	4	0.31%	-	-	4	0.31%
<b>Income</b>							
(Million Rupiah)	< Rp 10	28	2.16%	1	0.08%	29	2.24%
	Rp 10 - 50	1216	93.90%	13	1.00%	1229	94.90%
	> Rp 50	37	2.86%	-	-	37	2.86%

**Table 2.** Probit regression

Variables	Coeff.	Odds Ratio
<b>Broker-Borrowers Interaction</b>		
Distance	0.000817	1.002
Interest Rates	-0.192115**	0.600**
<b>Type of Credit Collateral</b>		
Property Type	-0.421318	0.304
Income	-0.0000000000427	1.000
<b>Probit Regression Model Information</b>		
McFadden R <sup>2</sup>	0.048063	0.0472
Goodness-of-Fit	0.7492	0.7295
Prob. Chi <sup>2</sup>		
Prob (LR statistic)	0.115028	0.1211

Notes: \*\* p ≤ 0.05

The regression equation created based on the outcomes of the probit regression is provided below:

$$\begin{aligned} \text{Cap Pr}(\text{Default}_i = 1) \\ = -0.87634 + 0.000817 \text{ Di. } 192115 \text{ InterestRates} \\ - 0.421318 \text{ TypeofProperty} \\ - 0.000000000042 \text{ Income} \end{aligned}$$

According to the findings of the regression test conducted using the distance indicator and the broker-borrower interaction, there was no significant impact. Moreover, a significant relationship exists between the likelihood of mortgage defaults and Interest Rates. As a result of the test results demonstrating that interest rates significantly impact mortgage default, odds ratio values were used to describe the likelihood that a mortgage would be adequate or in default. The interest rate's odds ratio value indicates a probability of 0.6 times more significant to influence mortgage default.

According to the regression results, there is no discernible relationship between mortgage defaults and the type of credit collateral or property type. What

types of guarantees can be accepted for applying for a mortgage at the bank has been determined by the policies implemented by the private bank regarding risk mitigation from the beginning before the loan is disbursed. Based on the sample data (see Table 1), this action can help reduce the number of defaults, which could be as low as 14 out of 1295 mortgage borrowers for private banks during 2015-2020. The bank interprets the prospective borrower's income as a measure of their ability to repay the loan we used on the regression between income and mortgage defaults. As a result, income has no impact on mortgage defaults.

## 5. Discussion

Regression test results on the broker-borrower interaction with the distance indicator show it does not significantly influence mortgage default. Based on the numbers on mortgage loans disbursed to borrowers by private banks, 1217 borrowers were less than 25 meters away from the lender for most of their loans. This suggests that private banks take precautions when granting loans to reduce the risk of default. Proximity makes it easier for banks to acquire data on the profile of prospective borrowers (Agarwal & Hauswald, 2007; 2010). Broker and borrower interactions based on distance need further study to determine their impact on defaults. Good brokers tend to provide sound financial advice so borrowers get products that suit their needs and provide advice as they go through the loan application process and beyond. Face-to-face meetings can also be used as an indicator of the broker-borrower relationship (Conklin, 2016).

The interest rate variable that influences default reveals a negative correlation coefficient, which means that the higher the interest rate the bank charges mortgage borrowers, the greater the repayment of credit facilities will be. This is because, according to the company's internal policy, they must set a high interest rate and offset it with a long fixed interest rate payment period to offer mortgage facilities to borrowers during the 2015–2020 period. Therefore, the borrower will gradually make more extended payments. Based on this result, this finding aligns with Thornton's (2008) explanation that the higher the interest rate the bank offers, the more it is made to mitigate the high credit risk associated with providing mortgage facilities to borrowers.

Banks offer longer loan terms and options for fixed or floating interest rates (floating or adjustable-rate mortgages) in response to research showing a negative correlation between interest rates and mortgage defaults (Harjono, 2016; McDonald & Thornton, 2008). The application of a low-interest rate is typically paired with a shorter fixed period, according to internal regulations from the firm. This means that after the short-fixed period expires, the borrower will enter a floating interest period, with the condition of the interest being evaluated by the company every six months (McDonald & Thornton, 2008) and based on economic conditions at the time of evaluation. This paper seeks to contribute to previous studies by Kim and Lim (2021), which explain that the bank considers the risk of default by implementing a policy of charging prospective borrowers higher interest rates the more valuable the assets pledged as collateral.

In contrast to earlier research by Teo and Ong (2005) which explains that the type of credit collateral significantly positively impacts mortgage defaults, the results show that property type does not affect mortgage defaults. Additionally, this private bank already maps out its consumer and productive goals and implements a diversified loan portfolio that complies with the Consumer Credit Manual's guidelines. Most borrowers who have residential property collateral types can secure mortgage facilities, which could connect credit risk with consumptive purposes. Given the vast market scope of residential property, this has to do with the possibility of a mortgage (Bian et al., 2018). Moreover, according to Bian et al. (2018), bank officers who are appraisers of residential property types can also estimate the value of real estate using sales prices comparable to the current market value. Finally, income is seen by banks as the payment ability of the borrower. Low income will have difficulty obtaining mortgage facilities (Fout et al., 2020) and tend to

default more easily (Agarwal et al., 2014). This illustrates that banks pay attention to high-income levels that can be used to maintain a loan portfolio with current payment status. However, this study proves that income has no significant effect on mortgage default. The results of this study need to be tested further to understand the relationship between income and default.

## 6. Conclusions

The test results show that interest rates influence mortgage default. However, broker-borrower interaction, type of loan collateral, and prospective borrowers' income do not significantly affect the probability of mortgage default. This study explores broker-borrower interaction using distance as proximity and other factors that influence mortgage default. However, according to the processed mortgage data, banks lend too often to people in their neighborhoods. The proximity of potential borrowers to the bank will result in more significant time and cost savings during the information-gathering process. However, these conditions are proven not to affect defaults significantly. Furthermore, the results found that only interest rates significantly affect mortgage terrible debts. The higher the interest rate banks charge to mortgage borrowers, the greater the repayment rate of the credit facility. Banks will set high-interest rates and compensate them with a lengthy period of interest rate payments to reduce the high credit risk in providing mortgage facilities to borrowers. In addition, banks also provide longer loan terms and a choice of fixed or floating interest rates. The company will evaluate these policies every six months, depending on the economic conditions at the time of evaluation. Banks will implement policies to charge higher interest rates to potential borrowers as they use more valuable assets pledged as collateral to account for the risk of default. The limitations of this study are expected to be further developed with data before the pandemic and when the pandemic occurred in the 2020s, which will provide essential insights into the variability in objectives, roles, and regulations. In addition, since we only express distance as proximity when broker-borrowers interact, we recommend using more precise measurements, such as nearest, middle, and farthest distances, to gain insights into areas where future research could significantly impact mortgage defaults. The theoretical contribution of this research is that mortgage default is more influenced by the interest rate set by the mortgage bank. Thus, managerially, banks should pay more attention to changes in loan interest rates so as not to burden mortgage borrowers to avoid the opportunity to default.

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