

PREDICTION AND DETERMINANTS OF LOAN DEFAULT; USING LOGISTIC REGRESSION ANALYSIS

Rais Ahmad Itoo* and A.Selvarasu**

*PhD Scholar, Department of Business Administration, Annamalai University, Tamil Nadu, India.

**Professor, Department of Business Administration, Annamalai University, Tamil Nadu, India.

raisitoophd@yahoo.com and aselvarasu@gmail.com

Abstract: This study explores the factors influencing mortgage loan default by using the data of mortgage default case from Jammu and Kashmir Bank by using logistic regression analysis. To achieve the objectives three dimensions as Borrower's Profile, Loan Value Contents and Collateral Security were taken and sixteen variables were divided into these three dimensions. The analysis of data was done by using SPSS 18.0 package. The results indicate that the borrower's gender, borrower's age, borrower's marital status, the borrower's income, loan rate, loan type, loan amount, amount repaid, LTV, LTI, form of collateral security, Value of collateral security, purpose of loan and secondary finance on collateral security are significantly positively correlated with the defaulter's outstanding loan amount. While as education qualification of borrower is significantly negatively correlated with defaulter's outstanding loan amount. Logistic regression results indicate that income, secondary finance on collateral security and interest rate are mainly responsible for mortgage default.

Keywords – Mortgage Default, Loan value contents, Collateral, LTV, LTI, Logistic regression.

1. Introduction

A mortgage loan is a loan secured by real property through the use of a mortgage note which evidences the existence of the loan and the encumbrance of that realty through the granting of a mortgage which secures the loan. However, the word mortgage alone, in everyday usage, is most often used to mean mortgage loan.

According to Anglo-American property law, a mortgage occurs when an owner (usually of a fee simple interest in realty) pledges his or her right to the property as security or collateral for a loan. Therefore, a mortgage is an encumbrance on the right to the property just as an easement would be, but because most mortgages occur as a condition for new loan money, the word mortgage has become the generic term for a loan secured by such real property. The borrower is declared as defaulter and the loan is said to be 'in default', when he/she is not able to repay the loan or interest amount.

A mortgage default is a situation in which someone is not making payments on his or her mortgage, and the loan is considered to be "in default," meaning that the agency which holds the note choose to take over the property. Defaulting on a mortgage result in the loss of a piece of real estate, and it should be avoided at all costs. Even if the property is not lost to the bank, a mortgage default will drag down a credit score significantly, making it harder to negotiate with the bank or to secure credit for other loans in the future.

A mortgage is issued along with a monthly due date for payments is usually specified. Many mortgages include a grace period of one to two weeks, meaning that payments sent during the grace period are considered on time. After the grace period has elapsed, however, late fees start to be levied. If more than 30 days after the due date go by, the mortgage is considered to be in default. Once the bank determines that 30 days has elapsed, it sends a notice of mortgage default to a credit agency, impacting the credit score immediately. The

bank usually retains the services of a credit collection agency in an attempt to get the homeowner's past due payments within weeks time. This adds to the fees associated with mortgage default. Many banks also insists on a full payment including late fees and collection fees to bring the homeowner current, and they do not accept partial mortgage payments when the mortgage is in default.

The bank sends a notice of mortgage default to the homeowner within 60 to 90 days of the determination that the mortgage has defaulted. This is the first step in foreclosure proceedings, giving the property owner a chance to make up the missed payments immediately and in full, or to risk having the property taken over by the bank and sold at auction. The bank also be oblige to post a public notice about the foreclosure, and the property owner have a chance to **buy the property back during the foreclosure auction**, if he or she muster up the funds in cash.

Some people choose to default on their mortgages and simply walk away, deciding that the negative impact on their credit scores is better than sinking any more equity into the home. This is most common in areas where property values have declined radically; leaving people with loans which are larger than their homes are worth. Other people may try to sell their homes before their mortgages go into default so that they wipe the slate and start over again.

Indian Mortgage market scenario:

India Mortgage Market is one of the largest divisions in the banking financial services and insurance sector in India. The India Mortgage Market was previously known as the Indian housing finance industry. At present the total worth of the India Mortgage Market is nearly US \$ 18 billion. The gross domestic product to mortgage ratio in India is very low in comparison to other developed countries. The ratio in the foreign countries ranges from 25% to 60% whereas in India the ratio is 2.5%. The India Mortgage Market is showing fast growth in the past few years. The foremost players in this sector are the finance corporation but presently the commercial banks are also started playing an important role in the development and growth of the India Mortgage Market. At present the market leader in the India mortgage market is the Housing Development Finance Corporation (HDFC), with the State Bank of India (SBI) following the lead. Mortgage defaults are widely seen as costly, which has led to both academic and policy discussions about the reduction of default rates. For instance, in the U.S., Qualified Residential Mortgage rules proposed by regulators make higher down payments necessary to obtain more favorable interest rates. Critics argue that these rules could have significant negative effects on the homeownership rate. Others have proposed to allow mortgage creditors to take defaulters' assets or income (Feldstein, 2008). The findings in this paper shed light on the possible effects of such mortgage default prevention policies (IMF, 2011) describes the utilization of these policies across countries.

2. Review of literature

Related to borrowers profile

Borrower's age is negatively correlated with the default probability [Capozza et al. (1997); Hakim and Haddad (1999); Jacobson and Roszbach (2003); Cairney and Boyle (2004)]. Von Furstenberg and Green (1974) and Avery et al. (2004) in their studies they have assessed local situational factors as factors of default risk. They found that inclusion of a situational factor like the age of the borrower improves the performance of the scoring models. Orla and Tudela (2005) found that persistence in mortgage payment problems was greater among households in which the head's age was 35 years old, or over than it was among households headed by younger individuals. The younger households are more capable of getting out of problems than those aged 35 or over. Kumar (2010) found that there is no significance between the age of the borrower and mortgage defaults. Von Furstenberg and Green (1974), Avery et al. (2004) in their studies they have assessed local situational factors as factors of default risk. They found that inclusion of situational factor like marital status of

borrower improves the performance of the scoring models. Cairney and Boyle (2004) showed that the marital status (single, widowed, or divorced) was significantly positively correlated with the default risk of credit loans. Jacobson and Roszbach (2003) indicated that the applicant's gender was significantly negatively correlated with the unsecured loan default. Education level is significantly negatively correlated with the mortgage loan default [Liu and Lee (1997); Cairney and Boyle (2004)]. Stansell and Millar (1976); Vandell (1978); Ingram and Frazier (1982) found that payment-to-income ratio is positively correlated with the probability of default i.e. higher the payment to income ratio, greater is the default risk. Clauretie (1987) has also argued that other non-equity factor like sources of income play a larger role in affecting default levels. Income is negatively correlated with the default probability [Capozza et al. (1997); Hakim and Haddad (1999); Cairney and Boyle (2004); Har and Eng (2004)]. While as Jacobson and Roszbach (2003); Teo and Ong (2005) indicated that the annual income from wages was significantly positively correlated with the unsecured loan default.

Related to Loan Contents

Clauretie (1987) has argued that other non-equity factor like property value played a large role in affecting default levels. The default imposes personal costs on borrowers that include limits on occupational and credit opportunities, social stigma and damage to reputation (Kau, Keenan and Kim, (1993) and Vandell and Thibodeau, (1985)). The costs exceed the absolute value of negative equity. The borrower will not default when Paul Bennett et al. (1997) found that the structural change in the mortgage market had increased homeowners' propensity to refinance. Bajari et al. (2008) studied empirically the relative importance of the various drivers behind subprime borrower's decision to default. They emphasize the role of the nationwide decrease in home prices as the main driver of default. Foote et al. (2008) examined homeowners in Massachusetts who had negative home equity during the early 1990s and found that fewer than 10% of these owners eventually lost their home to foreclosure. Lee (2002) has identified the 'purpose of purchasing real estate property' is one of the key determinants of default risk. Therefore, when the market price of collateral falls sharply or economic performance becomes much worse, the property frequently is abandoned by the owners thereby limiting their loss. Har and Eng (2004) showed that the use purpose of collateral was negatively correlated with the mortgage loan default. Paul Bennett et al. (1997) found that loan size is negatively correlated with the mortgage defaults. Hakim and Haddad (1999) studied the influences of the borrower's attributes and the loan characteristics on the mortgage loan default using failure-time model. Their results indicated that the loan amount was negatively correlated with the default probability. Campbell and Dietrich (1983) showed that the interest rates significantly explain mortgage prepayment, delinquencies and defaults by using logit model. Har and Eng (2004) showed that the loan interest rate was significantly positively correlated with the mortgage loan default. Teo and Ong (2005) indicated that the interest rate was significantly negatively correlated with the mortgage loan default. Danny (2008) indicated that any empirical test of the relation between the LTV ratio and the default risk incorporated the interrelationship among the LTV ratio, credit score and interest rate. Smith et al. (1996) found that the default probability was significantly affected by the loan type. Campbell and Dietrich (1983) showed that the LTV ratio explain mortgage prepayment. Lawrence et al. (1992) stated that the default risk was positively correlated with the ratio of loan amount to collateral. Smith et al. (1996) found that the default probability was significantly affected by the loan-to-value (LTV) ratio. Liu and Lee (1997) presented that the LTV ratio were significantly positively correlated with the mortgage loan default. Capozza et al. (1997) indicated that the LTV ratio was an important factor affecting the mortgage loan default. Campbell and Cocco (2010)

showed that mortgage default is triggered by negative home equity, which results from declining house prices in a low inflation environment with large mortgage balances outstanding. The level of negative home equity that triggers default depends on the extent to which households are borrowing constrained. High loan-to-value ratios at mortgage origination increase the probability of negative home equity. High loan-to-income (LTI) ratios also increase the probability of default by making borrowing constraints more severe. Interest-only mortgages trade of an increased probability of negative home equity against a relaxation of borrowing constraints.

Related to collateral

Teo and Ong (2005) indicated that the collateral type was significantly positively correlated with the mortgage loan default. Yildiyary Yildirium (2007) found that loans within the same geographical area and property type tend to exhibit correlation in default incidence. Claurette (1987) has also argued that other non-equity factor like property value played a large role in affecting default levels. The default imposes personal costs on borrowers that include limits on occupational and credit opportunities, social stigma and damage to reputation.

3. Research Methodology

This section includes the statement of the problem, presents arguments for the need for the study, the objectives, data collection, sampling, statistical tools; proposition and the limitations of the study. The description of all these aspects of methodology follows.

Statement of the Problem

In changing economic conditions customers are not able to foresee their income and value of their own property. It is because of the existence of limited sources of information available to them. When the customer income and their property value decreases, it is likely to result in mortgage default. Companies try to maximize their returns in various means of charges on mortgage loan. The increased charges of banks lead to mortgage default. Mortgage default has an additional cost of transaction for both lender as well as borrower. The different factors which are responsible for mortgage default are payment records, the ratio of loan amount to collateral value and the ratio of the borrower's income to expenditure (Lawrence et al. 1992), loan-to-value ratio, length of loan, the fluctuation rate of housing price, unemployment rate, divorce rate, and the borrower's moving frequency (Capozza et al. 1997; Liu and Lee, 1997) percentage of first loan, the loan interest rate, the floor area, and the borrower's credit risk (Har and Eng, 2004) and whether the borrower's house is owned by himself or rented, the marital status (single, widowed, or divorced), the degree of living pressure, and the borrower's credit risk (Cairney and Boyle, 2004). In effect, the mortgage default is on the rise due to piling up of various reasons in personal risk, loan value and collateral security.

Need for the Study

In this study, researchers have attempted to evaluate three pronged approach of important dimensions which directly or indirectly affect mortgage default. The effects of borrowers' profile, loan value and collateral security on mortgage default are studied. Therefore the present study is an effort to bring an understanding of the existing situation with respect to mortgage default. This study aims to evaluate the procedure that facilitates the existing mortgage loan borrowers and also in time with bank's policy. Also the suggestions take care of customer in order to manage mortgage defaults.

Objectives of the Study

This work aims:

1. To study the impact of borrower's profile on mortgage default.
2. To measure the association of borrower profile, loan value and realty of collateral security on mortgage defaulters' outstanding balance.
3. To assess relationship of loan value, collateral security and outstanding balance.

4. To find out the difference between the present market value of collateral security against outstanding balance of mortgage defaulters.
5. To extrapolate the reason for mortgage default due to socio-economic variables, interest rate, loan schemes, use of loan, secondary finance, loan-to-value ratio and loan-to-income ratio.

Research Design

The study is a descriptive research about mortgage default. A mortgage default is a situation in which borrower is not making payment on his/her loan. The variables used in this study are categorized into three dimensions: borrower profile, loan value and collateral security. Borrower profile includes age, marital status, gender, educational qualification and income of borrower. Loan value includes loan amount, loan amount repaid, outstanding balance, interest rate, loan type, loan-to-value ratio (LTV), loan-to-income ratio (LTI) and purpose of loan. By its side collateral security includes value of security, type of security and secondary finance.

Data Collection Design

The whole study is based on extracted data collected from Jammu and Kashmir Bank Ltd. from secondary sources maintained in bank but not published. The collected data is from those borrowers who have been declared as defaulters from April 2011 up to March 2012. One of the researchers has spent twenty days in the bank in order to understand the problem in depth and to understand suitability and reliability of data. This researcher has recorded the data from the default borrower's file. Details about all the variables for the whole sample size are collected.

Sampling Design

The systematic sampling methods have been adopted to select sample defaulters. The total number of defaulters was 578, out of which 115 is taken as sample. Every fifth borrower was chosen. Due to more variation of data from average value 15 cases of the sample were eliminated in order to maintain proper intervals. The study area is Jammu and Kashmir and sample unit is mortgage defaulters. The study period spread from September 2011 to August 2012. Sample size is calculated based upon the scale given by Aaker et al. (2009). Co-efficiency of variance for loan-to-value (LTV) has been computed for 30 cases as a pilot study. The computed value is 0.19 and based on this value sample of 99 was taken.

Statistical Design

The researchers have adopted relevant statistical tools for analysis of data describing mortgage loan defaulters. The following are the relevant tools used for analysis of data viz., chi-square, correlation, regression, ANOVA, paired 't' test and logistic regression have been selected for the proper of analysis of data. SPSS 17.0 is used for the analysis of all the above statistical tools and tabulation of processed data.

Propositions

P1: Average amount of default loan is not varying with the loan value, property market value directly and the collateral security, secondary finance, socio-economic variables, marital status, gender and age of both commercial and residential borrowers indirectly.

P2: The amount of default loan is not significantly associated with the loan value, property market value directly and the collateral security, secondary finance, socio-economic variables, marital status, gender and age of both commercial and residential borrowers indirectly.

P3: The amount of default loan has no linear relationship with the loan value, property market value directly and the collateral security, secondary finance, socio-economic variables, marital status, gender and age of both commercial and residential borrowers indirectly.

Limitations of the Study

Bank kept some of borrower's information confidential. The confidential data maintained by banks, especially contact details were not provided to the researchers. The area of borrower was not available for research and therefore it was difficult to denote the geographic location where there was loan default. Researchers want to study as much data as possible in order to identify replication of results. This was not supported for completion. Electronic softcopy of data was sought by researcher, but it was not permitted to him. The crosscheck of data collection was done by the researcher and not by the bank.

4. Analysis and Interpretation

The dimensions viz. borrowers profile, loan value contents and characteristics of collateral security have been tested for relationship with borrowers outstanding loan balance by applying correlation test. The borrower profile consists of five variables as age, gender, marital status, educational qualification and monthly income of borrower. The value of correlation co-efficient between outstanding balance and the age of the borrower " r "=0.308 indicates that 30.8% of the variation in outstanding balance is explained by the age of the borrower. And p value is <0.01 so, there exists a positive relationship between the outstanding balance and age at 99% level of confidence. The value of correlation co-efficient between outstanding balance and educational qualification of borrower " r "=-0.088 indicates that 8.8% of the variation in outstanding balance is explained by the age of the borrower. And p value is >0.05 so, there exists a very weak relationship between the outstanding balance and educational qualification at 95% level of confidence. The value of correlation co-efficient between outstanding balance and gender of borrower " r "=0.196 indicates that 19.6% of the variation in outstanding balance is explained by the age of the borrower. And p value is >0.05 so, there exists a very weak relationship between the outstanding balance and gender at 95% level of confidence. The value of correlation co-efficient between outstanding balance and marital status " r "=0.385 indicates that 38.5% of the variation in outstanding balance is explained by the marital status of the borrower. And p value is <0.01 so, there exists a positive relationship between the outstanding balance and marital status of borrower at 99% level of confidence. The value of correlation co-efficient between outstanding balance and monthly income " r "=0.539 indicates that 53.9% of the variation in outstanding balance is explained by the monthly income of the borrower. And p value is <0.01 so, there exists a positive relationship between the outstanding balance and monthly income of borrower at 99% level of confidence.

The loan content dimension consists of four variables as loan amount, amount repaid, loan-to-value ratio and loan-to-income ratio. The value of correlation co-efficient between outstanding balance and interest rate " r "=0.424 indicates that 42.4% of the variation in outstanding balance is explained by interest rate. And p value is <0.01 so, there exists a positive relationship between the outstanding balance and interest rate at 99% level of confidence. The value of correlation co-efficient between outstanding balance and type of loan " r "=-0.155 indicates that 15.5% of the variation in outstanding balance is explained by the type of the loan. And p value is >0.05 so, there exists a very weak negative relationship between the outstanding balance and type of loan at 95% level of confidence. The value of correlation co-efficient between outstanding balance and loan amount " r "=0.847 indicates that 84.7% of the variation in outstanding balance is explained by the loan amount. And p value is <0.01 so, there exists a positive relationship between the outstanding balance and loan amount at 99% level of confidence. The value of correlation co-efficient between outstanding balance and loan amount repaid " r "=0.036 indicates that 3.6% of the variation in outstanding balance is explained by the loan amount repaid. And p value is >0.05 so, there exists very weak relationship between the outstanding balance and loan amount repaid at 95% level of confidence. The value of correlation co-efficient between outstanding balance

and loan-to-value ratio “ r ”=0.557 indicates that 55.7% of the variation in outstanding balance is explained by loan-to-value ratio. And p value is <0.01 so, there exists a positive relationship between the outstanding balance and loan-to-value ratio at 99% level of confidence. The value of correlation co-efficient between outstanding balance and loan-to-income ratio “ r ”=0.371 indicates that 37.1% of the variation in outstanding balance is explained by loan-to-income ratio. And p value is <0.01 so, there exists a positive relationship between the outstanding balance and loan-to-income ratio at 99% level of confidence.

The collateral security characteristics consist of three variables as form of security, value of security and secondary finance. The value of correlation co-efficient between outstanding balance and type of security “ r ”=0.209 indicates that 20.9% of the variation in outstanding balance is explained by type of security. And p value is <0.05 so, there exists a positive relationship between the outstanding balance and type of security at 95% level of confidence. The value of correlation co-efficient between outstanding balance and value of property “ r ”=0.602 indicates that 60.2% of the variation in outstanding balance is explained by value of property. And p value is <0.01 so, there exists a strong positive relationship between the outstanding balance and value of property at 99% level of confidence. The value of correlation co-efficient between outstanding balance and secondary finance “ r ”=0.099 indicates that 9.9% of the variation in outstanding balance is explained by secondary finance. And p value is >0.05 so, there exists a very weak relationship between the outstanding balance and secondary finance at 95% level of confidence. The value of correlation co-efficient between outstanding balance and use of loan “ r ”=0.048 indicates that 4.8% of the variation in outstanding balance is explained by use of loan. And p value is >0.05 so, there exists a very weak relationship between the outstanding balance and use of loan at 95% level of confidence. (Table 1)

I. ANOVA Analysis

The variables viz. income, loan amount, LTV, value of collateral security and loan amount repaid has been tested for equality of mean with borrower’s outstanding balance by applying ANOVA.

Outstanding Loan Balance Based on Monthly Income

In order to test the group variation in mean scores, a null hypothesis was proposed.

H_0 : Means of outstanding loan balance is not significantly influenced by monthly income.

H_A : Means of outstanding loan balance is significantly influenced by monthly income.

In order to test the hypothesis, ANOVA test has been applied (Table 5). It has been found that F value is 34.536 and the ‘p’ value for the level of significance is 0.000. As the ‘p’ value is less than 0.01, it indicates that alternative hypothesis is accepted as outstanding loan balance is significantly influenced by monthly income at 99% level of confidence.

Outstanding Loan Balance Based on Loan Amount

In order to test the group variation in mean scores, a null hypothesis was proposed.

H_0 : Means of outstanding loan balance is not significantly influenced by loan amount.

H_A : Means of outstanding loan balance is significantly influenced by loan amount.

In order to test the hypothesis, ANOVA test has been applied (Table 3). It has been found that F value is 65.503 and the ‘p’ value for the level of significance is 0.000. As the ‘p’ value is less than 0.01, it indicates that alternative hypothesis is accepted as outstanding loan balance is significantly influenced by loan amount at 99% level of confidence.

Outstanding Loan Balance Based on Loan Amount Repaid

In order to test the group variation in mean scores, a null hypothesis was proposed.

H_0 : Means of outstanding loan balance is not significantly influenced by loan amount repaid.

H_A : Means of outstanding loan balance is significantly influenced by loan amount repaid.

In order to test the hypothesis, ANOVA test has been applied (Table 3). It has been found that F value is 0.039 and the 'p' value for the level of significance is 0.844. As the 'p' value is greater than 0.05, it indicates that null hypothesis is accepted as outstanding loan balance is not significantly influenced by loan amount repaid at 95% level of confidence.

Outstanding Loan Balance Based on Value of Security

In order to test the group variation in mean scores, a null hypothesis was proposed.

H₀: Means of outstanding loan balance is not significantly influenced by value of security.

H_A: Means of outstanding loan balance is significantly influenced by value of security.

In order to test the hypothesis, ANOVA test has been applied (Table 3). It has been found that F value is 41.374 and the 'p' value for the level of significance is 0.000. As the 'p' value is less than 0.01, it indicates that alternative hypothesis is accepted as outstanding loan balance is significantly influenced by value of security at 99% level of confidence.

Outstanding Loan Balance Based on Loan-to-Value Ratio (LTV)

In order to test the group variation in mean scores, a null hypothesis was proposed.

H₀: Means of outstanding loan balance is not significantly influenced by LTV.

H_A: Means of outstanding loan balance is significantly influenced by LTV.

In order to test the hypothesis, ANOVA test has been applied (Table 3). It has been found that F value is 13.471 and the 'p' value for the level of significance is 0.000. As the 'p' value is less than 0.01, it indicates that alternative hypothesis is accepted as outstanding loan balance is significantly influenced by LTV at 99% level of confidence.

II. Logistic Regression

Strength of relationship between outstanding balance with age, income, educational qualification, LTV, interest rate, purpose of loan and secondary finance has been studied.

Accuracy is measured as correctly classified records in the holdout sample. There are four possible classifications:

1. Prediction of 0 when the holdout sample has a 0 (True Negative/TN)
2. Prediction of 0 when the holdout sample has a 1 (False Negative/FN)
3. Prediction of 1 when the holdout sample has a 0 (False Positive/FP)
4. Prediction of 1 when the holdout sample has a 1 (True Positive/TP)

Precision and recall is calculated as (Table 5)

Precision= $tp/(tp+fp)$

Precision= $49/(49+5) = 0.908$

Recall= $tp/(tp+fn)$

Recall= $49/(49+10) = 0.830$

The percent of correctly classified observations in the holdout sample is referred to the assessed model accuracy. Additional accuracy can be expressed as the model's ability to correctly classify 0, or the ability to correctly classify 1 in the holdout dataset.

The regression model is given as: (Table 6)

Outstanding balance = $0.258 - 0.91*age - 4.895*Income + 2.618*LTV + Edu*0.377 - 2.405*Interest Rate - 0.915*Loan Amount + 0.684*Purpose of loan + 3.601*Secondary Finance$.

The R square value is 0.643, (Table 4) which means that 64.3% of variation in outstanding balance is due to the variation of LTV, LTI, Income, Loan amount, Interest rate, age, educational qualification, purpose of loan and secondary finance. The precision of the model is 90.8% and its recall percentage is 83%. The level of significance from table 8 shows that Income (0.000), LTV (0.051) and Secondary finance (0.026) are mainly responsible for mortgage default.

The ROC curves (figure 1 & 2) have been drawn for the outstanding balance above and below the average with age, income, LTV, LTI, educational qualification, interest rate, loan amount, purpose of loan and secondary finance on collateral security. The results shows that

the age of the borrower, income of borrower and interest rate are the main factors responsible for mortgage default (Table 6). Income has been main factor in both the cases.

6. Findings

6.1 Impact of borrower profile on Mortgage Loan

Relationship between outstanding balance and borrower's profile

The correlation result shows that outstanding balance has positive relationship with age, which is against the results of Jacobson and Roszbach (2003). The correlation result shows that outstanding balance has positive relationship with marital status which is supported by of Cairney and Boyle (2004). The correlation result shows that outstanding balance has positive relationship with income which is supported by Jacobson and Roszbach (2003). The correlation result shows that outstanding balance has positive relationship with gender which is against the results of Jacobson and Roszbach (2003). While as educational qualification is negatively correlated with outstanding balance which are in line with the results of Liu and Lee (1997), Cairney and Boyle (2004).

6.2 Impact of Loan Value Contents on Mortgage Default

The interest rate shows that higher the interest rate more the defaults. The defaults according to loan scheme are dominated by those borrowers who have opted for term loan. Loan amount borrowed shows that higher loan amount have less defaults compared to the lower loan amounts. Loan amount repaid is dominated by 0-15lacs group.

Relationship between outstanding balance and loan value contents

Correlation between loan value contents and outstanding balance has been studied. The correlation result shows that outstanding balance has positive relationship with loan amount which is against the results of Hakim and Haddad (1999). The correlation result shows that outstanding balance has positive relationship with loan amount which is supported by the study made by Lawrence et al. (1992). The correlation result shows that outstanding balance has positive relationship with LTI which is supported by the results of Campbell and Cocco (2010). The correlation result shows that outstanding balance has positive relationship with loan amount repaid.

Influence of monthly income, loan amount, LTV, value of security and loan amount repaid on mean of outstanding balance amount-ANOVA

Mean and S.D based on outstanding balance and monthly income, loan amount, LTV, loan amount repaid and value of security has been studied. The results show that mean of outstanding balance is significantly influenced by monthly income, loan amount, LTV and Value of security. While as mean of outstanding balance is not significantly influenced by loan amount repaid.

6.3 Impact of characteristics of collateral security on mortgage default

The value of security shows lower the value of property higher the defaults and vice versa. LTV ratio shows that 78% of defaults have LTV value between 0.51-0.75. LTI ratio is dominated by 0.26-0.5 group. The form of security shows that those who has kept "land" as security defaults more. 'Purpose of loan' shows that 48% of defaulters have used loan for business investment. Secondary finance variable shows that 87% of defaulters have not opted for secondary finance.

Relationship between outstanding balance and characteristics of collateral security

Correlation between characteristics of collateral security and outstanding balance has been studied. The correlation result shows that outstanding balance has positive relationship with value of security which is supported by the results of Clauretje (1987). The correlation result shows that outstanding balance has positive relationship with form of collateral security which is supported by the results of Teo and Ong (2005). The correlation result shows that outstanding balance has positive relationship with secondary finance.

Logistic Regression findings

Logistic regression results shows that Income, LTV and secondary finance are mainly responsible for mortgage default. While as ROC curves show Age, Income and Interest rate are responsible for mortgage default. In both the cases **Income** has been the factor of loan default.

Suggestions

The study is about mortgage default and the researcher is intending to propose the following suggestions in order to manage mortgage loan accounts in an effective way.

1. There is need for effective evaluation of borrowers profile especially age, marital status and monthly income. Lesser loan amount should be sanctioned to married people with age group of 37-47years and income level of 66-116k.
2. Loan value contents mainly LTV, LTI & interest rate and Characteristics of collateral security especially value of security and form of security land have direct effect on outstanding balance and should be taken care of, at the time of loan agreement. The LTV and LTI ratio should be kept below 0.5 and 0.25 respectively. The loans with interest rate of 9+4.25 should be given preference.
3. Revenue generating securities should be preferred over idle securities.
4. Borrowers whose property value lies in between 11-70lacs group should be sanctioned loan within 4-42lacs group.
5. Interest rate, secondary finance and income should be given more weightage while sanctioning the loan.

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Table 1: Correlation test between borrower’s profile, Loan value contents, collateral security and outstanding balance

| Variables | Pearson Correlation Coefficient | Sig. (2-Tailed) |
|---------------------|---------------------------------|-----------------|
| Educational qual. | -0.088 | 0.385 |
| Gender | 0.196 | 0.052 |
| Age | .308** | 0.002 |
| Marital Status | .385** | 0.000 |
| Income of Borrower | .539** | 0.000 |
| Loan Rate | .424** | 0.000 |
| Loan Type | -0.155 | 0.126 |
| Loan amount | .847** | 0.000 |
| Amount repaid | 0.036 | 0.361 |
| LTV | .557** | 0.000 |
| LTI | .371** | 0.000 |
| Collateral Security | .209* | 0.038 |
| Property Value | .602** | 0.000 |
| Secondary finance | 0.099 | 0.328 |
| Use of loan | 0.048 | 0.636 |

**correlation is significant at the 0.01 level (2-tailed)

*correlation is significant at the 0.05 level (2-tailed)

Table 2: Descriptive based on outstanding balance

| Factors | Outstanding balance groups (lacs) | Mean | Std. Deviation | Std. Error | 95% Confidence | |
|-------------------------------------|-----------------------------------|--------|----------------|------------|----------------|-------------|
| | | | | | Lower Bound | Upper Bound |
| Monthly Income (k) | 4-44 | 64.77 | 37.774 | 4.650 | 55.49 | 74.06 |
| | 44-84 | 107.97 | 24.778 | 4.380 | 99.04 | 116.90 |
| | Total | 78.88 | 39.584 | 3.999 | 70.94 | 86.81 |
| Loan Amount (lacs) | 4-44 | 26.24 | 16.493 | 2.030 | 22.18 | 30.29 |
| | 44-84 | 55.80 | 17.895 | 3.163 | 49.35 | 62.26 |
| | Total | 35.89 | 21.882 | 2.210 | 31.51 | 40.28 |
| Loan Amount Repaid (lacs) | 4-44 | 6.92 | 13.762 | 1.694 | 3.54 | 10.31 |
| | 44-84 | 6.42 | 5.908 | 1.044 | 4.29 | 8.55 |
| | Total | 6.76 | 11.753 | 1.187 | 4.40 | 9.12 |
| Value of Collateral Security (lacs) | 4-44 | 46.86 | 30.203 | 3.718 | 39.43 | 54.28 |
| | 44-84 | 84.77 | 20.154 | 3.563 | 77.51 | 92.04 |
| | Total | 59.24 | 32.565 | 3.290 | 52.71 | 65.77 |
| LTV | 4-44 | .5720 | .10440 | .01285 | .5463 | .5976 |
| | 44-84 | .6572 | .11456 | .02025 | .6159 | .6985 |
| | Total | .5998 | .11450 | .01157 | .5768 | .6228 |

Table 3: ANOVA

| Factors | Sources of variation | Sum of Squares | Df | Mean Square | F | Sig. |
|-------------------------------------|----------------------|----------------|----|-------------|------|-------|
| Monthly Income (k) | Between Groups | 40211.97 | 1 | 40211.9 | 34.5 | .000 |
| | Within Groups | 111778.5 | 96 | 1164.36 | | |
| | Total | 151990.5 | 97 | | | |
| Loan Amount (lacs) | Between Groups | 18838.45 | 1 | 18838.4 | 65.5 | .000 |
| | Within Groups | 27609.25 | 96 | 287.596 | | |
| | Total | 46447.71 | 97 | | | |
| Amount Repaid (lacs) | Between Groups | 5.461 | 1 | 5.461 | .039 | .844* |
| | Within Groups | 13393.05 | 96 | 139.511 | | |
| | Total | 13398.51 | 97 | | | |
| Value of Collateral Security (lacs) | Between Groups | 30981.53 | 1 | 30981.5 | 41.4 | .000 |
| | Within Groups | 71886.82 | 96 | 748.821 | | |
| | Total | 102868.3 | 97 | | | |
| LTV | Between Groups | .157 | 1 | .157 | 13.5 | .000 |
| | Within Groups | 1.115 | 96 | .012 | | |
| | Total | 1.272 | 97 | | | |

Table 4: Model Summary

| Model Summary | | | |
|---------------|---------------------|----------------------|---------------------|
| Step | -2 Log likelihood | Cox & Snell R Square | Nagelkerke R Square |
| 1 | 69.620 ^a | .476 | .643 |

Table 5: Classification table

| Classification Table | | | | | |
|----------------------|---------------------|---|---------------------|----|--------------------|
| | Observed | | Predicted | | |
| | | | Outstanding Balance | | Percentage Correct |
| | | | 0 | 1 | |
| Step 1 | Outstanding Balance | 0 | 35 | 5 | 87.5 |
| | | 1 | 10 | 49 | 83.1 |
| | Overall Percentage | | | | |

Table 6: Variables in the Equation

| Variables in the Equation | | | | | | | |
|---------------------------|----------|--------|-------|--------|----|------|--------|
| | | B | S.E. | Wald | Df | Sig. | Exp(B) |
| Step 1 | Age | -.091 | .635 | .020 | 1 | .887 | .913 |
| | Income | -4.895 | 1.267 | 14.928 | 1 | .000 | .007 |
| | LTV | 2.618 | 1.340 | 3.815 | 1 | .051 | 13.709 |
| | EDU | .377 | .645 | .341 | 1 | .559 | 1.458 |
| | Interest | -2.405 | 1.521 | 2.501 | 1 | .114 | .090 |
| | Loan | -.915 | .614 | 2.218 | 1 | .136 | .401 |
| | Purpose | .684 | .877 | .608 | 1 | .436 | 1.981 |
| | Second | 3.601 | 1.613 | 4.986 | 1 | .026 | 36.647 |
| | Constant | .258 | 1.570 | .027 | 1 | .870 | 1.294 |

Figure 1: ROC Curve for values above average of Outstanding Balance

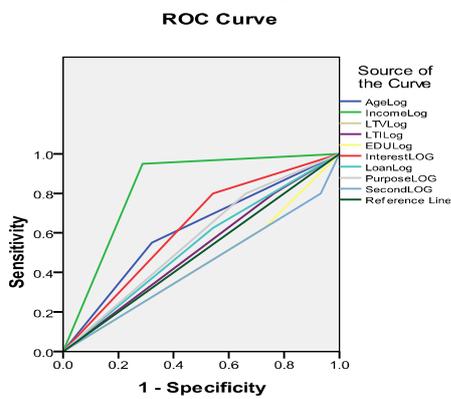


Figure 2: ROC Curve for values below average of Outstanding Balance

