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RISK ASSESSMENT OF DEFAULT BEHAVIOUR OF HOUSING LOANS OF A PUBLIC SECTOR BANK (AN EMPIRICAL STUDY)

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ABSTRACT

This paper aims at understanding the repayment behvaiour of borrowers of a public sector bank in Banaglore. The study uses the housing loan borrowers who were granted loan during 1999-2008. The primary focus of this paper is to examine the default behavior of defaulters and non defaulters by considering the socio demographic profiles and financial characteristics. The study adopts the Logistic regression model to estimate the likelihood of housing loan default. The result of the study shows that probability of default is higher among male borrowers and and those who belonged to the business class. Apart from this the probability of default decreases with increase in income, net worth. The default risk is higher with longer maturity period. The result also shows that EMI to income ratio is positively correlated to default risk indicating an increase in this ratio increasing the probability of risk of borrowers. The Nagelkerke R square is more than 70% and 73.6% of the variation in the dependent variable, default risk have been explained by the independent variables; socio demographic and financial variables .

KEY WORDS
Default risk, Socio demographic variables, Financial variables, Defaulters, Non defaulters.

INTRODUCTION

The retail credit market poses a special challenge to practitioners, regulators & academics due to its unique feature as compared to their corporate counter parts. Retail lending provides credit to small, typically unrated borrowers and often not syndicated unlike the corporate loans. The corporate credit market deals with large, negotiated loans to borrowers who often have credit ratings. These large loans have a secondary market that does not exist for retail bank loans. Hence the risk characteristics are not the same for both so that the parameters used for wholesale loan markets can be used reliably for retail markets (Saunders and Allen, 2002). Hence understanding the risk profile of retail loans could be interesting in building the credit risk models for the same. In India the growth in retail loans has gained significant momentum after the financial sector reform in 90's. Of the components of retail credit, the growth in housing loans was the highest in most years and remained at extremely high levels right up to 2006-07. As a result, the share of housing finance in total credit rose from five per cent in 2001-02 to 12 per cent in 2006-07 and was still at 10 per cent in 2009-10(Chandrasekhar & Ghosh, 2010). The growth in availability of credit couls be appreciable on one hand while on the contrary it also brings with it element of risk. Also among the retail loans, mortgage loans are a highly-secured asset class making the segment inherently attractive, driving intense competition. In order to increase volume in this environment the lenders are using various measures to make it attractive by lengthening the tenure, offering higher loan-to-value ratios and sometimes using direst sales agents to source new business. The increased access and availability of credit may result in diluting the credit quality. One of the primary aims of this paper is to estimate the likelihood of default risk associated with socio demographic and financial factors for the housing loans. The research examines the socio demographic issues including the level of education, type of occupation, no. of dependents and financial variables like income, net worth, EMI and others and their influence on the risk of default.

THEORETICAL BACKGROUND AND EMPIRICAL OVERVIEW

There are two alternative views relating to housing loan mortgage default behaviour: The *equity theory of default that is based on* CLTV ratio which measures the equity position of the borrower as an important factor impacting default decisions, the default mortgage tend to take place when the mortgagor is unable to pay the loan obligation and the market value of the property is currently less than its original purchase price as proposed by Vasanthi and Raja Peter (2006). On the other hand, *ability-to-pay theory of default* (the cash flow approach), considers current debt servicing ratio (CDSR), defined as the monthly repayment obligations as a percentage of current monthly income, which captures the repayment capability of the borrower, as a critical factor in accounting for default Jackson and Kasserman (1980).

The models proposed by Straka (2000) and Wheaton et al(2001) have expressed default as the end result of some trigger event, which makes it no longer economically possible for the borrower to continue in his status. Negative equity makes its advantageous to default rather than forbearance. There are several empirical studies on credit risk management which indicates the socio demographic factors and financial to have significant impact on default risk; The study by Roszbach K. and Jacobson T. (1998) shows that gender is significant variable in predicting the default behaviour and reveals that a borrower being a male significantly decreases the chance of being granted a loan and crook (1996) study shows that borrower with more education increases the demand for credit as more education enables a potential borrower to be more capable to forecast his/her payback ability, helping the decision of lender. The result also shows the probability of default decreases with age that is similar to Jappelli (1990) also indicating larger the family size the probability of default is more. Sexton (1977**)** analyzes the credit risk in

two types of American families: (*i*) low-income families; (*ii*) high-income families. The numerical results indicate that married couples and homeowners tend to pay their debt on time. On the other hand, credit default risk decreases when the income and age increase. Ozdemir & Boran (2004) investigates the payment performance of borrowers using the financial & demographic variables and reveals that longer the maturity time, higher is the interest rate & higher would be the credit default risk. Bandyopadhhyay and Saha (2009) empirically examine the functional role of various micro and macro economic as well as situational factors that determine residential housing demand and risk of borrower default in India. The empirical results shows that borrower defaults on housing loan payments is mainly driven by change in market value of the property vis-à-vis the loan amount and EMI to income ratio. A small increase in market value of the property vis-à-vis the loan amount raises the odds of default. Similarly, any change in EMI to income ratio raises the delinquency chance as well. The borrower characteristics like marital status, employment situation, regional locations, city locations, age profile and house preference act as default triggers. **Vasanthi Peter and Raja Peter (2006)** identifies income, financial, demographic characteristics, and locational factors as critical determinants of future risk for Australian housing loans. The results of the logistic regression show that the income variable is highly significant which means that lower income is one of the major contributory factors for default. These reviews have become basis for identifying the research question as under.

THE RESEARCH QUESTIONS THAT ARE EXAMINED IN THIS PAPER

1. Do Socio-demographic variables such as Gender, Occupational status, Age, educational level, experience in job, number of dependents, residential status affect the risk of default?
2. Do financial variables such as income, Net worth, Interest rate, EMI influence the default risk?

A LOGISTIC MODEL FOR RISK MEASUREMENT

In this paper, a logistic regression model of housing loan default is estimated. From the perspective of the lenders, predicting the future loan delinquency is important. As discussed earlier, there are number of financial and socio demographic factors that are systematically used to assess the creditworthiness of the borrowers. For this study a dummy variable L1 is flagged to measure the risk of default. The dependent variable credit risk is 0 if the borrower repays its loan on schedule and 1 if the borrower misses the payment for more than 90 days.

TABLE 1 BELOW GIVES A DESCRIPTION OF THE VARIABLES USED IN THE STUDY AND ITS DESCRIPTION

Variables	Description
L1= loan default	0 if borrower has repaid as scheduled; 1 otherwise (dependent variable)
X1= Gender	1 if Male; 0 if female.
X2= Age of the borrower	Age of the borrower at the time of loan (as indicated by the data base)
X3= Occupation	1 if Business, 2 if MNC, 3 if Private, 4 if Academics, 5 if public sector and 6 if Government
X4= No. of dependents	As indicated in the database;
X5= Experience in job	As indicated in the database;
X6=Residential status	1 if rent, 0 if own
X7=Income	As indicated in the database
X8=Net worth	As indicated in the database
X9= Maturity	As indicated in the database
X10=Loan amount	As indicated in the database
X11= Interest	As indicated in the database
X12= Loan amount to income ratio	Ratio of loan amount to income
X13= EMI to income ratio	Ratio of monthly payment to income

The logistic equation can be written as:

L1 = β0 + β1 gender + β2 age + β3 occupation + β4 No. of dependents + β5 Experience +β6 Residential Status +β7 Income + β8 Net worth + β9 Maturity + β10 loan amount + β11 Interest + β12 Loan amount to income + β13 EMI to income + e 2

RESEARCH DESIGN

The researcher has chosen a public sector bank in Bangalore for the study. This study uses the data of housing loan borrowers from the housing loan section of the bank. The data includes loans granted during 1999-2008. In order to preserve the confidentiality, the name of the bank is not disclosed in the study. The borrowers are classified into two groups. The first group is those who have not made their payment for > 90 days and are called "defaulters" and the second group are those borrowers who are regular payers and called "non defaulters"". Thus the sample of 219 housing loan borrowers includes 173 defaulters and 45 non defaulters. The sampling technique is based on purposive random sampling. The researcher collected the data by gathering information from the loan applications of the borrowers. The variables were identified through the risk rating score sheet used by the bank. The research design is descriptive and inferential in nature and employs logistic regression for analysis. Various goodness of fit measures such as -2 log likelihood, Pseudo R^2, Cox and Snell R^2, and Hosmer and Lemeshow values are used to asses model fit. To test the significance of its coefficients that the odds ratio does not change and the probability is not affected; logistic regression uses the Wald statistic.

DISCUSSION OF RESULTS

The study has 78 per cent (173) of the borrowers belonging to default accounts and the remaining 33 per cent (45) of the borrowers belonging to non default accounts. For socio-demographic variables, the average age of the borrowers is 43 years, 71.3% of them were married and were mostly business people followed by Government employees, private sector and MNC's. Also about 62.7% of the borrowers had 3-4 members as dependents. For financial variables, the average annual income is Rs.1.7 lakhs, average Net worth is Rs.11.5 lakhs, Average maturity is 12.5 years and the loan amount/ size is Rs.10 lakhs. Interest rate changes from 7.5% to 15% and average EMI is Rs.9500.

The analysis is done using Logistic regression which is similar to multiple regression with respect to measures of residuals, residual plots and measures of influence. But unlike multiple regression, logistic regression maximizes the likelihood that an event will occur (Vasanthi peter and Raja peter (2006)).

TABLE 2A: SHOWS THE RESULTS OF LOGISTIC REGRESSION WITH WALD SIGNIFICANCE

	B	S.E	Wald	df	Sig	Exp(B)	95.0% C.I for Exp(B)	
							Lower	Upper
Gend(1)	-2.621	0.720	13.253	1	0.000	0.073	0.018	0.298
Age	-0.029	0.039	0.560	1	0.454	0.971	0.899	1.049
occupn			11.965	5	0.035			
Occpn(1)	-4.182	1.413	8.755	1	0.003	0.015	0.001	0.244
Occpun(2)	-0.555	0.823	0.452	1	0.502	0.574	0.114	2.897
Occpn(3)	2.389	1.356	3.103	1	0.078	10.907	0.764	155.71
Occpn(4)	1.607	4.729	0.115	1	0.734	4.986	0.000	52883.6
Occpn5	-1.153	0.845	1.862	1	0.172	0.316	0.060	1.653
Depdt	-0.624	0.266	5.488	1	0.019	0.536	0.318	0.903
expe	-0.009	0.048	0.038	1	0.846	0.991	0.902	1.088
income	-0.218	0.106	4.217	1	0.040	0.804	0.653	0.990
Net worth	-0.023	0.011	4.630	1	0.031	0.977	0.957	0.998
Maturity	0.265	0.099	7.217	1	0.007	1.304	1.074	1.582
Res status	-0.976	0.705	1.915	1	0.166	0.377	0.095	1.501
Loan amt	-0.208	0.111	3.489	1	0.062	0.812	0.653	1.010
Loaninc	-0.230	0.372	0.382	1	0.537	0.794	0.383	1.648
Emi	0.000	0.000	0.446	1	0.504	1.000	1.000	1.000
Emiinc	0.710	2.542	0.078	1	0.780	2.034	0.014	296.403
Int	-0.160	0.213	0.561	1	0.454	0.852	0.561	1.295
constant	8.569	3.562	5.787	1	0.016	5265.0		

The Wald estimates gives the importance of the contribution of each variable in the model. The higher value indicates the importance of the variable towards default risk. The results of the logistic regression show that gender is highly significant (with B=-2.621,p=0.00) indicating the default is male borrowers. Another important factor in determining default is occupation and default risk is more with business class with (B=-0.4182,p-0.00) Apart from this the other significant variables are No. of dependents (with B=-0.624,p=0.019), Income (with B=-0.218,p=0.040), Net worth (with B=-0.023,p=0.031),Maturity (B=0.265,p=0.002), Loan amount (with B=-0.230,p=0.062) and residential status (B=-0.976,p=0.166). This implies that the probability of default is higher among male borrowers and business class people, Also probability of default decrease with increase in income, net worth. The default risk increases with increase in maturity period.

As we see from the model summary table (Table 2B), tests such as -2log likelihood, Cox and Snell R square and Nagelkerke R square are reasonably good. It is seen that Nagelkerke R square is more than 70% and 73.6% of the variation in the dependent variable, default risk have been explained by the independent variables.

TABLE 2A: MODEL SUMMARY FOR TABLE 2A

-2Log likelihood	Cox & Snell R square	Nagelkerke R square
91.273	0.488	0.736

The classification accuracy of the logistic model is presented in table 2C. The classification table shows percentage of correct prediction is 90.8% overall and 95.8% for “yes” and 74.5% for “no” default risk. Hence it can be concluded that model classification is statistically accepted and is not due to chance factor.

TABLE 2C: CLASSIFICATION TABLE FOR TABLE 2A

L1= Loan default Varaible		L1= Loan default Varaible		
		Yes default risk 1	No default risk 0	Percentage correct
	Yes default risk 1	160	7	95.8
	No default risk 0	13	38	74.5
Overall percentage				90.8

IMPLICATION AND CONCLUSION

The primary contribution of the research delineated in this paper is to demonstrate the importance of borrower specific characteristics in determining the default behaviour of housing loan repayment. With the retail lending growing significantly after the financial sector reforms

the growth in housing market also has been noticeable. Growing competition and relaxed regulatory norms on housing loans has provided a substantial incentive to the lending institutions in India resulting in aggressive practices to be followed to attract the borrowers which could include softening the collateral requirement, lengthening the tenure, using direct selling agents to source business and others. This surge in supply could attract several borrowers with unpalatable credit histories and very low margin. Understanding the interplay between various factors driving housing sector demand and their link with borrower default will help the lenders and policy maker in fine tuning their lending policy better.

The study uses the housing loan borrowers who were granted loan during 1999-2008 to observe the repayment behaviour. The researcher considers the socio demographic and financial variables and the result of the study shows that probability of default is higher among male borrowers and business class people, Also probability of default decrease with increase in income, net worth. The default risk increases with increase in maturity period. The future research could aim at considering other factors like locational and macro economic factors to check the influence on default behaviour.

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