Adverse Selection and Moral Hazard Effects in the Malaysian Credit Market: An Empirical Analysis

OMAR MARASHDEH

International Islamic University, Malaysia

ABSTRACT

The purpose of this paper is to test empirically the impact of adverse selection and moral hazard on the Malaysian credit market. The paper develops a supply and demand function for credit in Malaysia by using monthly data over the period from January 1983 to November 1993 which has seen a recession and several years of sustained economic growth. Unconstrained 3SLS is used to estimate the model.

The study shows that credit rationing is not practised in the Malaysian credit market, i.e., adverse selection is not present. However, commercial banks were willing to give more loans at higher interest rates which contributed to the problem of moral hazard. The reasons for the absence of credit rationing might be due to the enforcement of lending guidelines to the priority sectors during the period of the study and the concern of banks about their profitability which increases at higher interest rates. The policy implications of the findings are discussed.

KEY WORDS

Adverse selection
credit market
Malaysia
loan demand

moral hazard
loan supply
credit rationing

INTRODUCTION

Prices in markets with imperfect information may have two effects: sorting effects and incentive effects (Stiglitz and Weiss, 1981). In the credit market (a market with imperfect information) higher interest rates act as a screening device in rationing credit and may adversely sort bad customers with high risk from good customers with low risk. Credit rationing is a situation where borrowers cannot borrow even though they are willing to pay the going interest rate. Credit rationing takes place as a result of the perceived inability of the borrower to pay the loan (higher risk). The adverse selection takes place when honest or conservative borrowers are deterred from borrowing at higher interest rates. But customers who are reckless or careless will borrow because they do not expect to pay the

loan back if they go bankrupt. As a result borrowers at higher interest rates may invest in riskier projects to generate higher rates of return and be careless about minimization of risk (moral hazard). In the presence of adverse selection and moral hazard, the supply of loanable funds will be backward bending or concave over the rising portion of interest rates. The reason is that lenders, in order to overcome both adverse selection and moral hazard, use credit rationing, i.e., extending (smaller amount of) to all customers loans that are lower in amount than the requirements of the customers (Jaffee and Russell, 1976) or to ration some of the customers out of the market (Bester, 1985).

Theoretically, credit rationing has been studied extensively in the literature (see for example, Jaffee and Russell 1976; Bester 1981; Stiglitz and Weiss 1981, 1987; and Riley 1987).

Empirically only a few studies have tested the implication of credit rationing and these concentrated mostly on the mortgage market (see for example, Nellis and Thom, 1983; Stansell and Mitchell, 1985; Goodwin, 1986; and Martin and Smyth, 1991).

Martin and Smyth (1991) tested empirically the implications of adverse selection and moral hazard on the U.S. home mortgage market over the period from June 1968 to March 1989. By using three stage least squares (3SLS), they estimated two market models (the representative loan model and the aggregate loan model). They find that the mortgage supply under both models is a concave function in rate of interest, i.e., the presence of adverse selection and moral hazard; moreover, they find that the optimal interest rate at which the supply function bends backward is equal to 11 per cent.

Goodwin (1986: 459) studied the impact of credit rationing on the mortgage market and how it spills over into the housing market. He found that "a one standard deviation increase in excess mortgage demand (credit rationing) results in a 0.29 standard deviation decrease in houses sold". Marashdeh (1993) studied the sectoral demand for credit in Malaysia over the period from February 1972 to April 1991. He found that the demand for commercial banks credit is positively related to real income and real lagged credit demand and negatively related to real interest rates on loans and contractionary monetary policy.

The impact of credit rationing on other credit markets has not been studied empirically so far, and especially in Malaysia. Moreover, the impact of credit rationing on the Malaysian credit market has not been studied yet. Indeed, most of the empirical studies have confined themselves either to the U.S or U.K mortgage markets. Therefore, the purpose of this paper is to test empirically the impact of adverse selection and moral hazard on the Malaysian credit market. The paper will develop a supply and demand function for credit in Malaysia by using monthly data over the period from January 1983 to November 1993 period which has seen a recession and several years of sustained economic growth. Unconstrained 3SLS will be used to estimate the model.

It is expected that the supply of loanable funds is positively related to average lending rate and the flow of funds over the last four months, and negatively related to the costs of new funds and competing long and short term rates of return on alternative investments. Whereas, the demand for loanable funds is expected to be positively related to current income, and negatively related to down payment and average lending rates. It is also

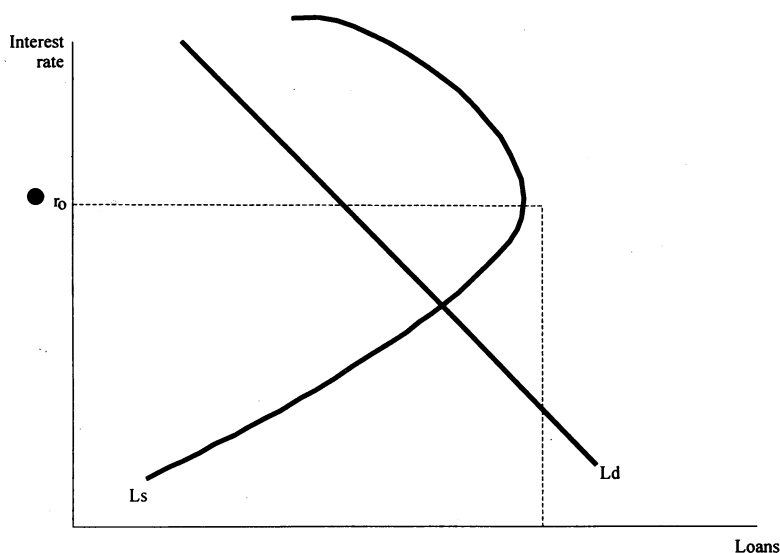FIGURE 1. Supply and Demand of Loans in the Presence of Adverse Selection

Table 1. Summary of Statistics for Average Lending Rates for Commercial Banks 1983-1992

Average	10.491	
Standard Deviation	1.435	
Minimum	8.7	(1989)
Maximum	12.81	(1984)
Range	4.11	
Median	10.11	

Source: Calculated from *Bank Negara Malaysia Annual Reports*

expected that the supply of loanable funds is a backward bending function in the rate of interest on loans.

Figure 1 shows the demands for and supply of loanable funds. The demand for loanable funds is negatively related to the rate of interest while the supply of loanable funds is positively related to the rate of interest up to r_0 and negatively related to the rate of interest at higher interest rates, i.e., more than r_0. This leads to the backward bending supply curve for loanable funds. Banks with higher interest rates reduce the number of loans to reduce their risk exposure. At higher interest rates investors prefer more risky investments to generate enough profit to repay their loans. However, higher rates of return are associated with higher risk. Therefore, investors at higher interest rates may become careless about the risk associated with investment decisions which leads to the problem of moral hazard. In Malaysia average lending rates for the 1980s were on the high side and only decreased recently as a result of deregulation (see Table 1).

THE MODEL

The loan supply is assumed to depend on interest rate (lending rate). However, in the presence of adverse selection and moral hazard, interest rate on loans is entered as a second degree polynomial which is expected to influence loan supply negatively.   In addition, it is expected that the cost of funds will influence the availability of loans. The interest rate on deposits is used to capture the costs of funds and is expected to influence loan supply negatively.

The flow of funds to commercial banks is expected to influence loan supply positively.

The change in deposits over the last four months is used as proxy for the net flow of funds to commercial banks. Competing short and long-term interest rates are expected to influence the loan supply negatively. With higher interest rates banks may divert their funds away from loans into investment in securities, thus negatively influencing loan supply. The default rate on loans is expected to influence loan supply negatively, that is, the higher the default rate is the lower the supply of loans will be.

The loan demand is assumed to depend on the interest rate on loans, current income, lagged credit, and down payment. Interest rate on loans negatively influences the loan demand. Current income is used rather than permanent income as it is the variable used by banks to qualify customers for loans, and is expected to influence loan demand positively (Goodwin, 1986). Down payment is expected to influence loan demand negatively. Savings (savings deposits and fixed deposits outstanding) are used to represent the down payment (Goodwin, 1986). Lagged credit is used to represent the habit persistence hypothesis (Marashdeh, 1993).   A dummy variable is added to the system to represent the deregulation of the base lending by the Central Bank on February 1, 1991. The dummy variable takes a value of 1 for the period from February 1991 to November 1993 and a value of zero otherwise.

The model could be written as follows:

Ls = F (RLENDRAT, RLENDRAT², RRRD, FLOW, RRTRAT, RGTRAT, DUMMY, DEFAULT RATE)

Ld = G (RLENDRAT, INCOME, SSAV, LAGGED

Ld, DUMMY)

where,

Ls is loan supply deflated by the consumer price index (CPI).

Ld is the loan demand deflated by the CPI.

RLENDRAT is real average lending rate for commercial banks calculated as average lending rate-expected annual rate of inflation (π^e).

RRRD is the real weighted mode deposit rate (rd) of savings and fixed deposits (rd - π^e) and is calculated as follows: RRRD=rs (savings deposits/total deposits) + rf (fixed deposits/total deposits), Where rs is the mode savings deposit rate; rf is the mode 6-month fixed deposit rate; total deposits is the sum of fixed, current, and savings deposit.

FLOW is the net flow of funds to commercial banks over the last four months deflated by the CPI.

RRTRAT is the real rate of interest on 3-month treasury bills (R-bill - π^e).

RGTRAT is real rate of interest on 10-year government securities (rg- π^e).

INCOME is current income represented by the industrial production index (IPI) deflated by CPI.

SSAV is the sum of fixed deposits and savings deposits at commercial banks deflated by the CPI which represents the size of the down payment which customers would be able to pay.

DEFAULT RATE is the rate of default on loans.

For estimation purposes the model could be written in level form as:

$$Ls = a_1 + a_2 RLENDRAT_t$$

$$- a_3 RLENDRAT_t^2$$

$$- a_4 RRRD_t$$

$$+ a_5 FLOW_t$$

$$- a_6 RRTRAT_t$$

$$+ a_7 DUMMY_t$$

$$Ld = b_1 - b_2 RLENDRAT_t$$

$$+ b_3 INCOME_t$$

$$- b_4 SSAV_t$$

$$+ b_5 CREDIT_{t-1}$$

$$\pm b_6 DUMMY_t$$

Moreover, seasonal dummies for the months February-December are added to the system. Lack of data on RGTRAT and DEFAULT RATE led to the exclusion of these variables from the model.

Data and Estimation Procedure
All data for the variables were collected from the Quarterly Bulletin of Bank Negara Malaysia. The net flow of funds variable was calculated as the sum of the net flow of deposits (fixed, current, and savings) over the last four months into commercial banks. Savings were calculated as the outstanding stock of savings and fixed deposit accounts at commercial banks.

Three stage least squares was used to estimate the model. All exogenous variables in the model were used as instruments in the first stage to estimate average lending rate and expected rate of inflation. The sample period is 1983:1-1993:11. The summary statistics of all variables is reported in Appendix 1.

Empirical Results
Table 2 reports the three stage estimate of loan supply and loan demand over 1983:3-1993:11. The Table shows that the fit of the model is good as indicated by the R-bar squared, SEE, and joint R-bar squared. For the supply equation, most of the explanatory variables are highly significant with the expected sign except for average lending rate squared and interest rate on 3-month t-bills which have the opposite signs.

Average lending rate squared is highly significant with a positive sign indicating that

TABLE 2. Three Stage Estimate of Loan Supply and Loan Demand 1983:3-1993:11

VARIABLE	LOAN SUPPLY		LOAN DEMAND	
	COEFFICIENT	T-STAT	COEFFICIENT	T-STAT
CONSTANT	1853.243	0.29	-427298.2	-13.34
FEBRUARY	4597.745	2.18	534.7206	0.72
MARCH	-665.0600	-0.34	672.4995	1.00
APRIL	1007.354	0.50	88.29555	0.12
MAY	168.8476	0.10	99.88208	0.14
JUNE	53.32643	0.03	-299.6279	-0.43
JULY	-2040.405	-0.99	-598.0791	-0.87
AUGUST	-246.9372	-0.12	-264.1492	-0.38
SEPTEMBER	-854.9692	-0.43	-61.71642	-0.09
OCTOBER	-278.8479	-0.14	107.5241	0.15
NOVEMBER	-563.9112	-0.28	-65.63604	-0.09
DECEMBER	893.1381	0.45	284.5456	0.41
LENDING RATE	5730.553	5.03*	-146.1259	1.97*
LENDING RATE SQUARED	183.5712	3.02*	-	
FLOW OF FUNDS	.5333466	2.69	-	
T-BILL RATE	13259.04	14.71	-	
DEPOSIT RATE	-15644.23	-15.09	-	
SAVINGS	-		0.039260	0.47
INCOME	-		64.71182	3.06*
LAGGED CREDIT	-		43660.66	13.12*
DEREGULATION	17288.56	10.49*	6989.282	11.78
RBAR-SQUARED	0.8997		0.988	
N	109		109	
DEGREES OF FREEDOM	91		92	
SEE	4641.1889		1631.3488	
JOINT RBAR-SQUARED	0.71			

* Statistically significant at the 5% level

TABLE 3. Commercial Bank Provisions for Bad and Interest-in-Suspense (Billion Ringgit)

Year	Bad & Doubtful Debt Provisions	Interest-in-Suspense	Non-Performing Loans	& Banks
1984	1.112	0.575	NA	NA
1985	2.098	1.178	NA	NA
1986	3.313	2.353	NA	NA
1987	4.035	3.296	NA	NA
1988	4.380	4.499	25.0	NA
1989	4.781	5.262	23.0	NA
1990	4.926	5.759	22.8	NA
1991	4.615	5.300	21.5	15.447
1992	5.161	5.556	23.0	15.926
1993p	5.52	5.748	21.1	16.062

Source: Compiled from *Bank Negara Malaysia Annual Report-various issues*

*   For the banking sector which includes commercial banks, finance companies and merchant banks (Separate data for commercial banks is not available prior to 1991.)

p   Preliminary

commercial banks are willing to offer more loans at higher interest rates. That is, credit rationing is not practised by commercial banks. This willingness may contribute to the problem of moral hazards, as borrowers who are willing to borrow at higher interest rates are more likely to take on risky projects and be careless.

Indeed this may explain the high default rate on loans and the problem of non-performing loans experienced by commercial banks over the study period (see Table 3 for more detail). Another reason for this result might be the lending guidelines imposed on commercial banks which give subsidized credit to the priority sectors. As a result, in order to improve their profitability, commercial banks were willing to lend more at higher interest rates rather than ration credit. Moreover, the absence of a Deposit Insurance Agency that insures deposits against bank failure contributes to the problem of bad loans and the positive sign of average lending rate squared. In addition, the implicit understanding that Bank Negara Malaysia will rescue or bail out any bank from financial troubles makes banks somewhat careless in their lending decisions. A 1% rise in real interest rate increases loan supply by 0.952% (see Table 4).

The dummy variable for deregulation is statistically significant with a positive sign in both demand and supply equations. The deregulation of base lending rates led to an increase in both loan supply and demand. Deregulation increased loan supply by 0.07% and loan demand by 0.03%.

The net flow of funds over the last four months is highly significant and has the anticipated positive sign. That is, the higher the net flow of funds to commercial banks, the more loans banks are willing to supply. A 1% rise in net flow of funds increases loan supply by 0.02%. The interest rate on deposits is significantly negatively related to loan supply, indicating that the higher the cost of funds the lower the supply of loans will be. A 1% rise in real interest rate on deposits reduces loan supply by 0.65%. Interest rate on 3-month t-bills is statistically significant but has a positive sign. This might be due to the fact that commercial banks are required to hold a certain percentage of their assets in terms of t-bills.

The loan demand is, as expected, positively related to income and lagged credit, and negatively related to average lending rate. A 1% rise in real income increases loan demand by 0.73%. Savings which represent the down payment have the wrong sign but are statistically insignificant. The seasonal dummies are statistically insignificant in both demand and supply equations except for February which is positively influencing loan supply.

CONCLUSION

The purpose of this paper has been to test empirically the impact of adverse selection and moral hazard on the Malaysian credit market. The paper develops supply and demand

TABLE 4. Elasticities at Mean

Variable	Supply Elasticity	Demand Elasticity
Average lending rate	0.740311	-0.018877
Deposit rate	-0.647363	
T-bill rate	0.566556	
Average lending rate squared	0.211647	
Deregulation	0.073551	0.029734
Savings		0.028030
Income		0.729643
Net flow of funds	0.017558	

functions for credit in Malaysia by using monthly data over the period from January 1983 to November 1993 period which has seen a recession and several years of sustained economic growth. Unconstrained 3SLS was used to estimate the model.

The policy implications of the findings are that banks in their pursuit of profit may forget the basic principle of banking, that is, 'prudence' and 'care'. If banks are driven by profit motives without paying attention to sound banking, especially in offering loans, then bad loans should be expected and profit may be lower in the future. Therefore, banks should not lose sight of their long-term commitments in pursuit of short-term gains followed by default when times are bad. The Central Bank should improve its supervision of the banking system to reduce the problem of bad loans faced by the banking system. Moreover, the establishment of a Deposit Insurance Agency to insure the deposits of customers in order to reduce the problem of bad loans is called for.

REFERENCES

Bester, H., Screening Vs. (1985). Rationing in Credit Markets with Imperfect Information *American Economic Review*, **75 (4) September**: 850-855.

Goodwin, T. (1986). The Impact of Credit Rationing on Housing Investment: A Multi-Market Disequilibrium Approach, *International Economic Review*, **27(2) June**: 445-464.

Jaffee, D.M., & Russell T. (1976). Imperfect Information, Uncertainty, and Credit Rationing, *Quarterly Journal of Economics*, **90 (November)**: 651-66.

Marashdeh, Omar (1993). The Sectoral Demand for Credit in Malaysia, *Capital Market Review*, **1 (2)**: 25-43.

Martin, R. & Smyth D. (1991). Adverse Selection and Moral Hazard Effects in the Mortgage Market: An Empirical Analysis, *Southern Economic Journal*, **57(4) April**: 1071-1084

Nellis, J.G. & Thom, R. (1983). The Demand for Mortgage Finance in the United Kingdom, *Applied Economics*, **15(4) August**: 521-529.

Rily, J.C. (1987). Credit Rationing: A Further Remark, *American Economic Review*, **77 (1) March**: 224-227.

Stansell, S. & Mitchell, A.C. (1985). The Impact of Credit Rationing on the Real Sector: A Study of the Effect of Mortgage Rates and Terms on Housing Starts, *Applied Economics*, **17 (5) October**: 781-800.

Stiglitz, J. & Weiss, A. (1981). Credit Rationing in Markets with Imperfect Information, *American Economic Review*, **71 (3) June**: 393-409.

_____(1987). Credit Rationing: Reply, *American Economic Review*, **77 (1) March**: 228-231.

ACKNOWLEDGEMENT

APPENDIX I

Sample Statistics on Data*

Variable	Mean	STD Error	Minimum	Maximum
Endogenous Variables				
Average lending rate (%)	8.0318	2.6891	2.3055	13.591
Expected inflation rate (%)	2.5313	1.6452	-.36300	6.4085
Loans (millions)	62172	17224	34664	95452
Exogenous Variables				
Deposit rate (%)	2.5725	2.5491	-3.4886	8.4044
T-bill rate (%)	2.6566	1.3192	-.91652	5.4350
Average lending rate squared (%)	71.681	45.231 [sic]	5.3153	184.70
Deregulation	0.2645	0.4429	0.0000	1.0000
Savings (millions)	44339	8613.4	28867	67733
Income (%)	103.98	23.787	57.751	146.46
Net Flow of funds (millions)	2046.8	2637.5	-2889.7	11097

* All variables are measured in real terms