The influence of micro economic factors on the default risk of leasing industry

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CHRONICLE	ABSTRACT
	The aim of this study is to establish a framework for measuring and managing credit risk for fifteen leasing companies in Iran. An analysis on the influence of internal factors on credit performance will then be performed. This will enable a leasing industry to progress towards its goals and objectives in the most direct and effective way. Credit risk consists of probability of non-return. This may be in the form of bankruptcy or a decrease in financial and credit situation of the lessee. We can assume a correlated market and credit risk. The variables are extracted from the Central Bank of Kanoon Leasing Association in Iran. Numerical analysis reveals that lessee credit risk can have a substantial impact on a lease term structure.

1. Introduction

A lease is a written agreement between the owner of the equipment, called the lessor, and a person who utilizes the equipment for a definite time at a given price. This may be referred to as periodic rent (Deelen et al., 2003). This type of contract consists of different parts: buyers or lessee, contract duration, amount and due date of rental payments, configurations of the equipment, its current condition, and the date for the nullification of the contract (Boobyer & Christopher, 2003). In terms of execution, leasing consists of several specialized steps based on the renting style in which the contract is signed between two or more people. The lessee can be an individual or legal representative, who utilizes the benefits of the commodity or the commodity itself. This can be either a property, tenant, or durable consumer (Hildreth, 1993). The style may include a collection of economic transactions. Buying or renting can produce a contract of ownership. In other words, the contract is signed between a leasing company, which is the owner or lessor, and the user of the rented facility (Stewart, 1994).

A vital and important subject in the allocation of credit to the lessee is the evaluation of credit risk. When companies involve decision making they must have high regard to investment to the firms' bonds in the evaluation of credit risk of lessee and bond issuers. The possibility of the anticipated rate of return in investment projects is called risk (Deelen et al., 2003). Business cycles, inflation, political situations and many other factors play a part in the trust or lack of trust in the future. An important issue in allocating a financial institution's credit such as leasing institutions and banks is assessing customers' credit risk. Assessing the possibility of non-recovery of the anticipated return rate in valuating capitalization is called risk (Aven, 2010; Aven & Renn, 2009), in other words, a lack of trust in investment future earnings. Business cycles, inflation, political situations and many other factors influence on lack of trust. A highly significant investment principle in all fields is that risk of investment, which should be in balance with the return of investment. Therefore, identifying skills of credit analysis in financial institutions is especially important (Bhattacharya, 2010).

When a customer applies for credit facilities or a lease, the institution ensues to give services after viewing customer's documents. Leasing tries to give facilities to customers who are fully capable of repaying the principal and interest in an agreed specified time (Krause, 2006). Modeling portfolio credit risk tends to be a relevant issue in credit risk analysis. One issue may be a modeling portfolio credit risk to aid in the development of an appropriate model. This helps quantify the interaction effects of the high risk credit entities within a portfolio. According to Moodys' Binomial Expansion Technique (BET), a model has been extensively used in finance and insurance industries. The BET model is adapted to believe that the any defaults in a bond portfolio are binomially distributed. This is with the intention of handling the dependence of defaults that the notion of diversify score was introduced in the BET model. This score groups the dependent leases jointly and shrinks the number of dependent existing leases. In every time step as the number of autonomous credit risk entities are identified, the BET model may be applied. It gives an extension to the BET model dependence of the default correlation in such a way that it defaults in a lease portfolio (Lee, 2006).

Default risk is also classified as credit risk. Schmit (2004) performed a survey reported that there was a direct relationship between default risk and the term of rental contracts. In other words, by an increase in contract terms, default risk also increases. It has also been proven that there is a reverse relationship between default risk and contract amount where others have revealed that the default risk of different economy parts were considerably different. Kisgen (2006) provided evidence that ratings effect of capital structure decisions when firms are near a credit default upgrade or downgrade. Faulkender and Petersen (2006) found that credit default is associated with better access to public debt markets and higher leverage. Previous research explains the analysis of various independent variables and found specific results in the relationships of the independent and dependent variables.

2. Conceptual framework and hypotheses development

Based on the literature review the structural analysis will be presented in line with Lee (2009). The usefulness of Lee's framework in presenting the evolution of the leasing industry in Iran is detailed as follows. Altman (1989), Shanmugam and Das (2004), Tang (2008) argued that the internal factors are not the only factors influencing on default risks and there are some other external factors that need to be considered. The internal approach only focuses on the internal characteristics in management's control while the external approach concentrates on the sensitivity of default risk to the changes in the economic environment.

2.1 The Research Hypotheses

Based on the proposed conceptual framework, several hypotheses will be developed in order to investigate the relationships between internal and default risk.

Default: is an exposure to loss for the lack of payment by the borrower of an obligation on a loan agreement. Any credit obligation is considered default if more than 90 days pass the due date (Basel Committee on Banking Supervision, 2001). Few studies surround the idea of default risk and probability default (PD) along with the loss given default (LGD). Moreover, studies have used the number of deferred payments as a default measurement (e.g. Altman, 1989; Schallheim et al., l987; McConnell & Schallheim, 1990; Grenadier, 1996; Siu et al., 2005; Rahmani, 2011). They aggregated these studies into the default risk dimensions of lease yield, recovery rate, interest rate, gross domestic product and foreign exchange rate. This is one of the oldest investigation review procedures known to be used by scholars. Financial instruments are often used to perform time-series analysis, cross-sectional analysis, panel-data analysis, profit analysis, trend analysis, correlation analysis, and regression analysis. The default data are obtained from the Central Bank and Kanoon Leasing Association in Iran. There is a relationship between default and internal variables:

Upfront prepayment (UPPR): There are cases where a borrower pays for a loan in advance as an upfront payment at the start of the subscription (Schmit, 2004; Grenadier, 1996). Upfront prepayment is widely implemented to measure the overall default and risk of a leasing and financial institute. Schallheim and McConnell (1990) and Madura (2003) used upfront prepayment as a default to measure credit risk. In light of the above rationale, the relationship between upfront prepayment and default is hypothesized as follows:

Hypothesis 1: Upfront prepayment is a negative relationship with default on the leasing industry.

Credit insurance contract (CRINCO): It is a legal agreement in which conditions of the coverage, policy terms, and costs are indicated by the insurance company. Consideration of the offer and the acceptance, indemnification, legal capacity and purpose are standardized features of an insurance contract (Porter et al., 2007). Credit risk is typically shared among the provider and user of lease agreement, which may be a public or private firm (Woo et al., 2004; Feldstein & Fabozzi, 2011). Credit insurance is a way to insure repayment of a lease even if the lessee loses his/her job, becomes disabled, or is deceased. All kinds of loans including home mortgage borrowing, car loans, credit card debt as well as loans from finance companies can be purchased by consumer credit insurance companies. Consumer credit insurance benefits are available for both the consumer and the financing company who purchase credit insurance for extending the credit to the consumers (Nelson & Loehman, 1987). Schallheim and McConnell (1985) and Elsas and Krahnen (2000) were among researchers initiated the use of insurance contracts as a measurement for default risk and credit. Based on the rationale, the relationship between credit insurance contracts and defaults poses the following hypothesis:

Hypothesis 2: Credit insurance contracts are positively related to defaults in the leasing industry.

Security deposits (SEDE): 'Security deposits' have different meanings in different parts of the world. Security deposits guarantee nonpayment of installments and other damages (Stickney et al., 2009). Elsas and Krahnen (2000), Tong (1977) and Schmit and Stuyck (2002) reported that the security deposits of bank loans had positive outcomes such as decreasing credit risk as well as increasing the access of borrowers to debt financing. Based on this rationale, the relationship between security deposits and defaults is hypothesized as follows:

Hypothesis 3: Security deposits have positive relationships with defaults on the leasing industry.

Time and period contract (TPCO): the leasing period for a contract is considered a reasonable time that begins with agreements of both parties. The contract duration is a reverse relationship with the rate (Schmit, 2004; Grenadier, 1996; Miri, 2008). Researchers have demonstrated the default risk of banking and time, which influence on equity returns and default risk. In light of the above reasoning, the relationship between time, period of contracts and defaults are hypothesized as follows:

Hypothesis 4: the time period of a contract has an overall positive relationship with a default in the leasing industry.

Collateral and guarantees (COGU): collateral generally refers to a financial institution's taking-back of an object that was either used as repossession or rented leased in transactions. Repossession is a "self-help" type of action in which the owner of the property takes the aforementioned property back from the sectors, thus, having the right of possession without invoking court proceedings. Schmit (2004) and Pozzolo (2004) showed negative relationships between the interest rate on bank loans and the presence of collaterals and guarantees. This study examines these factors in accordance to the following hypothesis:

Hypothesis 5: Collateral and guarantee show a negative relationship with default in the leasing industry.

2.2. Estimation Model

Based on the above discussion, Eq. (1) illustrates the estimation model that is used in the present study:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 X_{jt} + \ldots + X_{mt} + e_{it} \tag{1}$$

where Y_{it} is the credit risk for company i at period t; X_{it} represents the antenatal factors for company i at period t; X_{jt} is the external factors and finally e_{it} is an error term. The internal factors include (UPPR, CRCO, SEDE, TPCO, and COGU)

Credit risk =f (UPPR, CRCO, SEDE, TPCO, COGU)

In addition, Table 1 mentions the variables that used in this paper.

Table 1
Explanatory variables

Internal Factors		Expected sign to default
X_1	Up front prepayment (UPPR)	Negative
X_2	Credit insurance contract (CRCO)	Negative
X_3	Security deposits (SEDE)	Negative
X_4	Time and period contract (TPCO)	Positive
X_5	Collateral and guarantees (COGU)	Negative

2.3. Data Sources and Data Model

The researchers have used official records and public documents. These have been accessed by the extensive use of archives of the central Bank of Iran, Kanoon of Leasing in Iran and the Iran Stock Exchange. Six years of collected data are from 2005 to 2010. From the total of all leasing activities, approximately 90% belongs to 15 leasing companies and 10% to other companies with leasing activities (Central Bank and Kanoon leasing Association of Iran, 2011). In reference to using the panel data model with its data limitation across companies over time (15 companies and 7 years), currently, it was not feasible to do cross-section or time-series study applications, therefore, the panel data analysis was applied.

2.4 Estimation of Default Risk

The focus was mainly on the determinants of leasing companies using internal (microeconomic) and external (microeconomics) variables. This would include the various regression analysis carried out on 15 leasing companies in Iran from 2005 to 2010. In additional, it was imperative to assume that an underlying analysis was examined before the estimation model was tested. The assumptions to be addressed for the variables were the linearity and normality test of equal variance (Homoscedasticity). In additional, the correlation analysis was measured.

2.5 Introductory Statistics

Brief statistics for the variables utilized in this research is shown in Table 2 for the default and non-default groups. Table 2 demonstrated that the mean of UPPR for defaulted installment was negative (-2.2), though positive for non-defaulted groups (0.22). In addition, the means of the variables CRCO, TPCO, and COGU had a positive value while the SEDE had a negative mean in the defaulted group

thought it was evaluated with a positive mean in the non-defaulted group. Table 3 explains the correlation matrix of the variables in the default and non-default groups. The low inter-correlations between the explanatory variables (among defaulted and non- defaulted) utilized in the regressions have indicated no cause of erroneous results. When testing for heteroscedasticity, a Lagrange Multiplier test by Breusch-Pagan (Breusch & Pagan, 1979) was developed. The results demonstrated that our models do not tolerate the use of heteroscedasticity for this particular need.

Table 2
Summary Statistics for Default and Non-Default

	Default						Non-Default					
	Mean	Variance	Median	Max	Min	STDV	Mean	Variance	Median	Max	Min	STDV
UPPR	-2.2	40.54	-0.16	0.04	-30.65	6.58	0.22	0 .32	0.13	1.73	-1.23	0.56
CRCO	0.97	6.49	0.65	7.04	-5.74	2.43	0.52	0.22	0.41	1.86	0.025	0.47
SEDE	-0.27	0.36	-0.126	1.05	-1.2	0.41	0.02	0.026	0.06	0.35	-0.27	0.127
TPCO	0.18	0.44	-0.146	0.93	-2.17	0.58	0.21	0.18	0.17	0.4	0.37	0.28
COGU	0.38	0.14	0.26	0	1.29	0.56	0.57	0.231	0.48	1.94	0	0.48

Table 3
Correlation Matrix of Variables

		UPPR		CRCO		SEDE		TPCO		COGU	
		DF	ND	DF	ND	DF	ND	DF	ND	DF	ND
UPPR	DF	1									
	ND	0.318	1								
CRCO	DF	0.37	0.37	1							
	ND	0.212	0.28	0.11	1						
SEDE	DF	-0.202	-0.29	-0.502	-0.06	1					
	ND	0.3	0	0.142	0.204	0.03	1				
TPCO	DF	0.394	0.12	-0.391	0.057	0.38	0.233	1			
	ND	0.17	-0.11	0.118	0.187	0.12	0.212	0.08	1		
COGU	DF	0.47	0.12	0.507	0.076	-0.22	0.15	0.21	0.262	1	
	ND	0.186	0. 45	0.225	0.147	-0.22	-0.28	-0.11	-0.081	0.081	1

2.6 Parameter Estimation and Hypothesis Test

Table 4 summarizes the results of the Logit models analyses using a matched sample. Analogue to the linear regression, the analysis of Logit model, gives the approximated coefficient of the variables and the ratios to examine the assumption that each coefficient. Predicting the PD. Is a significant Cause of Hypothesis 1, the variable representing the leasing companies' upfront prepayment is expected to affect the corporate failure negatively. Table 4 shows the results of the sample. The coefficient of the UPPR, as suspected, is negatively and significantly related to the possibility of default. The negative sign points out that leasing companies with a high UPPR ratio have a decreased probability of default. Leasing companies with a high UPPR have a low debt ratio and a lower likelihood of default, as corporate cash flow displays the initial sources of funds. The findings of prior research including Zeitun (2009), have shown a negative relationship between a UPPR and the probability of default.

Hypothesis 2 predicts that leasing companies with a high CRCO tend to have a lower probability of default. From the regression results in Table 1, as expected by the cash flow theory, the coefficient of CRCO is significant at the 5% level of significance and show a negative value. A negative value is a significant sign which guides to the acceptance of the hypothesis where leasing companies with high contract credit insurance have a low probability of default.

Regarding hypothesis 3, the coefficient of SEDE is found to be negative with a significant level of 1%. A negative sign indicates that leasing companies with high Security deposits have a lower probability of default. This is a uniform result with earlier works of Altman (1989). In addition, the coefficients for the SEDE are negative and significance as a minimum of 10% and 1% levels, respectively. This is also consistent with the cash flow theory. Since a leasing company is able to create cash flow and cover

its obligation then, in turn, will decrease its probability of default. This further leads to an approval of the hypothesis. Leasing companies with low cash flow ratios have a higher probability of default. Hypothesis 4 reveals the coefficient of TPCO as negatively and significantly related to the possibility of default. The negative sign has pointed out that leasing companies with a high TPCO ratio have a decreased probability of default. Leasing companies with a high TPCO have a low debt ratio and a lower likelihood of default, as corporate cash flow displays the initial sources of funds. The finding of prior research including Schmit (2004) who reported a negative relationship between TPCO and the probability of default.

Hypothesis 5 predicts that leasing companies with a high COGU tend to have a lower probability of default. As seen from the regression results, it was expected through cash flow theory that the coefficient of COGU would be significant at the 11% level of significance and negativity. The positive and the significance sign guide align to an acceptance of the hypothesis whereby leasing companies with a high collateral and guarantee of contract decrease the default probability.

Table 4

Estimated Coefficients for the Participation Model

Variables	Expected Sign	Coefficient Estimates
Constant		-41.32 (-2.34)
UPPR	-	2.282 (-1.897)
CRCO	-	11.602 (-2.092)
SEDE	-	-6.452 (-2.55)
TPCO	-	-12.278 (-1.6874)
COGU	-	-7.078 (-2.58)
Percent of success		0.914
Log-likelihood		13.344
Likelihood Ratio statistic		(55.084)
(LR) McFadden $R2$	0.66	

Table 4 shows the regression results where the coefficients of UPPR, SEDE, CRCO, and COGU are negative and significant in predicting the probability of default. TPCO was found to have a significant and positive impact on leasing companies' probability of default. The empirical results for the panel samples are demonstrated in Table 5.

Table 5

Estimated Coefficients for the Participation Model two and three years before default

Variables	Two years before default	Three years before default
UPPR	-1.1541 -2.7285	(-1.197) (-1.2346)
TPCO	2.5981 3.7801	(0.80343) (1.2579)
SEDE	-4.2009 -2.0641	(-2.2421)** (-1.479)
CRCO	-3.0894 3.9954	(-0.76014) (0.8127)
COGU	-4.2020 -4.3282	2.2018)** (-2.758)***
Constant	25.554 25.962	(2.1164)** (2.708)***
No.of Observations	1557	P-value (0)***
Wald test	5584.40	Rhoρ (1) 0.4635**
Log likelihood	-164.69	
Adjusted R-square	0.20	

Notes: *, **, *** Significant at 10, 5, and 1 percent levels, correspondingly. The predicted sample includes 15 leasing companies from 2005 to 2010. The examined assumptions depend on the significance of the approximated parameters or coefficients. T-statistics are obtained with White (1980) standard errors to accurate for heteroscedasticity.

It is demonstrated that the probability of default decreases for a firm with possible increases in higher upfront prepayments (UPPR), higher Security deposits (SEDE), credit insurance contracts (CRCO). To investigate the effects of the selected variables on a leasing companies' probability of default, a marginal result after the logistic estimation is formulated. The COGU has the highest positive marginal effect on a leasing companies' probability of default followed by TPCO, with 3.799% and 0.873% respectively. The marginal effects show that COGU and TPCO have the greatest effect in formative and increasing the probability of default. On the other hand, SEDE has the highest negative effect on a leasing companies' probability of default, with a marginal effect of -2.24% .

Table 6
Results from Random Effects Binary Logit for the Unbalanced Panel of the leasing companies, the Panel Period 2005-2010

Variables	Coefficient Estimates	Marginal Effects
Constant	(15.278) (4.97)***	
UPPR	-0.2691 (-2.96)***	-0.26904
TPCO	0.8738 (1.75)*	0.87391
SEDE	-2.1018 (-3.34)***	2.10191
CRCO	-0.0103 (-0.73)	-0.01037
COGU	3.7996 (5.06)***	3.79986
No.of Observations	1554	P-value (0.00)***
Wald test	5584.41	Rhoρ (1) 0.4632**
Log likelihood	-164.65	
Adjusted R-square	0.21	

Notes: *, **, *** The examined assumptions depend on the significance of the approximated parameters or coefficients. T-statistics are obtained with White (1980) standard errors to accurate for heteroscedasticity.

2.7 Forecasting powers of the model

The compliance for the Logit model given with the McFadden R^2 and the LR statistic for the correlated sample are calculated and demonstrated in Table 7. This shows that the LR is equal to 55.08 whereas the McFadden R2 for the Logit model is at 67%, and statistically resulting at 1% which is within the corresponding asymptotic Chi-squared distribution. The explanatory power of the model was of two types for prediction error. A form I error occurs when the leasing companies are predicted to default but the result is non-default. A form II error occurs when the leasing companies are predicted not to default but the result is the default. As seen in Table 6, the predictive attainment for default and non-default leasing companies and the two classes of errors, form I and form II is entailed. The cost of error form II is, though, more than the cost of error form I.

Table 7
The cost of form I errors and form II errors

	Type I error Default	Type II error Non-default
Original sample	28	31
Number of right predictions	25	27
Number of wrong predictions	4	3
Percentage of right predictions	0.895	0.94
Overall accuracy of Logit	0.914963	

The correct prediction for default leasing companies is about 90% when compared with 94% for a correct prediction of non-default leasing companies. In general, model precision is about 93.2%, an acceptable value for the purpose of predicting default compared to other empirical models. The

identifying indication for panel data models have a good overall fit – the probability ratio test statistics are significant at the 1.2% level of the random results binary Logit model. The probability ratio (LR) test declared at the foot of each table highlights the results which indicate the random accomplish model is noteworthy as a minimum at the 1% level of significance.

3. Conclusion

During the examination of this research the effect of up-front prepayments, time and period contracts, security deposits, the credit insurance contracts, collateral and guarantees and a variety of lease on default risk in the leasing industry have been found. A quantity of important descriptive statistics on the defaulted and non-defaulted leasing industrial and variables applied in the analysis have been provided. In order to guarantee that these findings are valid, several diagnostic tests were developed, such as, the heteroscedasticity test, correlation matrix, and the likelihood power model.

The result indicates that variables such as up-front prepayments, security deposits, credit insurance contracts and gross domestic product as measured by UPPR, SEDE, and CRCO procedures seem to be associated with corporate failure in the leasing industry. This result has proven significant in predicting the Likelihood of default, since, they have a negative impact on leasing companies' probability of default.

Variables such as the time and period contracts and interest rates as measured by TPCO, had a positive and significant effect on corporate failure in samples as it increased the likelihood of default. These results are normally consistent with the cash flow theory and economical failure theory. The results suggested that an increase in lease financing will decrease the bankruptcy probability. Decreasing time periods of leasing contracts will decrease the probability of credit risk. Third, increasing the amount of up-front prepayments of leasing contracts will decrease the probability of credit risk. Fourth, physical collaterals play a major role in reducing credit risk leasing.

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