

Verifying the Determinants of the Mortgage Defaults on Home Mortgage

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ABSTRACT

Banks face severe challenges pertaining to their operations owing to changes in the financial environment. Identifying methods for reducing mortgage defaults and lowering the ratio of nonperforming loans is crucial. Mortgage defaults occur because of complex factors. The present study developed a decision making trial and evaluation laboratory. The results confirmed that the methods proposed by this study feature high applicability and are able to identify the key factors contributing to the mortgage defaults for commercial banks (CBs) and local banks (LBs). In addition, the methods could verify the determinants of the mortgage defaults for both CBs and LBs and uncover the differences that exist between the two patterns of mortgage defaults, and provide valuable information for bank management to make better decisions during the development of loan strategies.

Keywords: Mortgage Default, Decision Making Trial and Evaluation Laboratory, Decision Making

JEL Classifications: C02, C18, G32

1. INTRODUCTION

Starting from the 1990s, the Taiwanese authority approved the founding of 15 new banks in response to the emergence of financial internationalization and liberalization, leading to vigorous competition in the financial industries. The financial institutions in Taiwan comprise 39 general commercial banks (CBs), 3 small and medium CBs, 32 foreign banks with branches in Taiwan, 28 credit unions, 254 credit departments of farmers' associations (CDFAs), and 25 credit departments of fishermen's associations. The number of financial institution branches is nearly 6000. Regardless of the "age" of banks (i.e. whether they are old or new), similarly loose loan strategies are adopted, which include the lowered credit check requirements, credit check quality and interest rates, and increased loan amounts.

The loose loan strategies taken by the banks created an increase in the nonperforming loan ratio (NPLR). In 2001, the total nonperforming loan amount had reached NT\$1.3274 trillion, where CBs accounted for NT\$1.087 trillion, while local banks (LBs hereafter) such as the CDFAs and credit unions taken up to NT\$131.4 billion and NT\$49.7 billion, respectively. So far as the

NPLR is concerned, CBs accounted for 7.48%, whereas the CDFAs and credit unions reached up to 19.33% and 11.66%, respectively. One of the key reasons inducing to an increase in NPLR was the rising in mortgage defaults.

General CBs primarily consist of CBs, while LBs include credit unions, CDFAs, and credit departments of fishermen's associations, all of which feature comparatively smaller scales of operation. CBs are nation-wide financial institutions, whereas LBs are local financial institutions. Since CBs and LBs involve varying operational conditions, the factors contributing to their mortgage defaults might also differ. Therefore, identifying the determinants contributing to the mortgage defaults for both CBs and LBs and uncovering the differences that exist between the two patterns of mortgage defaults would provide valuable references for the government and bank management during the development of mortgage policies.

In view of the operation predicament encountered by Taiwanese banks resulting from the increase in NPLR, finding methods that effectively reduce mortgage defaults is crucial. Mortgage defaults are arisen from a number of complicate factors. We began

by identifying the determinants related to mortgage defaults to structuralize the problems of mortgage defaults and to locate key factors. Second, we systematically explored the factors contributing to mortgage defaults for both CBs and LBs. Third, we clarified the similarities and differences between the two patterns of mortgage defaults. We analyzed the characteristics and advantages that the decision making trial and evaluation laboratory (DEMATEL hereafter) approach.

The remainders of this paper are organized as follows: Section 2 is a relative literature review. Section 3 the final section concludes with a brief summary and suggestions.

2. LITERATURE REVIEW

Jung (1962) and Page (1964) examined the impact of changes in loan interest rates on mortgage defaults. Von Furstenberg et al., (1974) further proposed loan-to-value ratio, loan period, borrower's age and income as determinants of the default risk. Vandell (1978) argued that in addition to a borrower's loan information, like unemployment rates, divorce rates and death rates are associated with the loan default risks. Most banks previously evaluated the credit of borrowers in terms of employing the five C's of credit, which were character, capacity to repay, capital, collateral and condition of business. However, thanks to the rapid changes in the financial environment and the global economy, since the 1970s, banks have turned to take a new credit evaluation framework, the five P's of credit (i.e. people, purpose, payment, protection, and perspective), for a comprehensive assessment of borrowers' credit ratings.

Though the five C's of credit differs from the five P's of credit, both use borrower characteristics as the credit evaluation criteria. Since the 1980s, how banks assessed the credit of borrowers has been expanded to also include lending contracts and macroeconomic factors. Accordingly, this study applied borrower characteristics, lending contracts and macroeconomic factors to investigate mortgage defaults. Some studies documented the differences in default likelihood between loans of varying borrower and loan characteristics (Jagtiani and Lang, 2010; Lentz and Wang, 1998; Avery et al., 1996; Davidoff, 2014; Elul et al., 2010; Fontela and Gabus, 1976; Coles, 1992; Diaz-Serrano, 2005; Atanasios and Zaidi, 2009).

2.1. Borrower's Characteristics

Ingram and Frazier (1982) noticed that borrower's characteristics are a critical factor causing mortgage defaults. Vandell and Thibodeau (1985) emphasized the importance of borrower's characteristics in explaining the causes of loan defaults. Morton (1975) indicated that the higher the number of a person's dependents, the more frequently that loan payments are delayed, which lead to loan defaults. Canner et al. (1991) found that the older the borrower, the less the occurrences of mortgage defaults. Von Furstenberg and Green (1974) asserted that an increase in the borrower's income lowers the possibility of delayed loan payments and that the borrower's occupation is an essential evaluation criterion. Other studies frequently examined the roles of borrower characteristics on the mortgage defaults including borrower's income (Von Furstenberg, 1969; Von Furstenberg and Green,

1974), marital status (Vandell, Thibodeau, 1985; Canner et al., 1991), previous credit status (Grander and Mills, 1989; Lawrence et al., 1992), occupation (Herzog and Earley, 1970; Webb, 1982) and borrower's age (Von Furstenberg, 1969; Canner et al., 1991; Lawrence et al., 1992).

2.2. Terms of Lending Contract

The terms of lending contracts might also be a factor contributing to mortgage defaults. These terms generally include loan-to-value ratios, loan periods, loan amounts, location of residence, and the age of the house. Among the various terms, a number of prior studies have drawn attention to loan-to-value ratio and loan period. Vandell (1978) and Aylward (1984) found that the higher the loan-to-value ratio, the higher the default risk while a borrower's income declines, which had been supported in related literature (Jung, 1962; Page, 1964; Von Furstenberg, 1969; Grander and Mills, 1989; Lawrence et al., 1992; Kau and Keenan, 1999; Deng et al., 1996; 2000). Moreover, Von Furstenberg (1969) confirmed that as the loan-to-value ratio is constant, mortgages for new houses with a 30-year mortgage amortization is eight times more likely to go into default than those with a 20-year mortgage amortization, suggesting that the longer the loan period, the higher the risk of default.

2.3. Macroeconomic Factors

Banks might fail to prevent the increase in the default probability because of changes in the overall economy despite that they design lending contracts based on borrower's characteristics to reduce the probability of default. Economic recessions lead to borrower unemployment, decreases in collateral prices and increases in loan interest rates, resulting in borrowers' inability to pay off interest. Stansell and Millar (1976) found the evidence that borrowers' inability to repay loans is more likely to occur when interest rates increase too rapidly or as economies go into recession. Therefore, when evaluating mortgage defaults, lenders should consider not only borrower characteristics and lending contracts, but also macroeconomic factors.

Some studies of mortgage defaults focused on the effect of macroeconomic factors such as changes in market interest rates (Jung, 1962; Page, 1964), unemployment and divorces rates (Vandell, 1978; Grander and Mills, 1989; Deng et al., 1996; 2000), and mortality rates (Vandell, 1978). Other studies have examined the relationships between mortgage defaults and changes in house prices (Deng et al., 1996; 2000; Kau and Keenan, 1999; Belke and Wiedmann, 2005; Bellotti and Crook, 2009). Some previous studies dealt with risk of default on home mortgage loans using different model (Jackson and Kaserman, 1980; An et al., 2010; Lentz and Wang, 1998; Ambrose and Capone, 1980). Other researchers studied the potential model instability problem with respect to mortgage default risk and examine to what extent it helps explain the default shock during the recent crisis (Wong et al., 2004; Jagtiani and Lang, 2010; Anderson and Dokko, 2011; An et al., 2010).

Prior studies documented the determinants of CBs and LBs facing loan defaults by employing econometric models. However, it failed to observe the interaction sequence among the factors. Through

the DEMATEL methods in the present study, we might explore the interaction sequence among the factors of mortgage defaults. To further examine the characteristics of loan defaults of the CBs and LBs, we constructed the DEMATEL-FDM by modifying the DEMATEL. Using the DEMATEL-FDM, we investigate the difference in professional cognition of mortgage defaults and further compare the key factors with a larger difference.

3. DEMATEL APPROACH

3.1. Dematel

DEMATEL, proposed by the Battelle Memorial Institute (led by Fontela and Gabus, 1976), enables the analyses of complex factors in a cause and effect relationships, producing meaningful results. More importantly, DEMATEL could visualize sophisticated causality relationships through causal diagrams, allowing decision-makers to intuitively grasp the structural layout of the problems as well as the details of the problems in relation to the entire operation. Decision-makers could then concentrate on the key factors and reflect on the causal relationships among these factors to enhance the quality of their decisions.

DEMATEL is an analytical method that has been used in a variety of fields for investigating the relationships among key factors, and these involving improved models based on DEMATEL are increasing. Studies using DEMATEL that have been published in journals could be roughly divided into four categories: (1) DEMATEL employed as the primary method of analysis (Dytczak and Ginda, 2008; Li and Tzeng, 2009; Lin and Tzeng, 2009; Lee et al., 2010; Wu et al., 2010; Lin et al., 2011); (2) DEMATEL used in combination with fuzzy theory (Wu and Lee, 2007; Lin and Wu, 2008; Tseng, 2009; Jassbi et al., 2011; Zhou et al., 2011); (3) compound DEMATEL techniques, which is DEMATEL integrated with other methods of analysis (Wu, 2007; Tseng, 2009; Wu and Lee, 2007; Tsai and Chou, 2009; Yang and Tzeng, 2011; Wang and Tzeng, 2012); and (4) compound DEMATEL techniques used in combination with fuzzy theory (Tseng, 2010a; Tseng, 2010b; Tseng, 2011).

The analytical procedures could be depicted as follows:

1. Step 1 (confirming objectives of decisions): We explored the structuralizations of problems and the determinants contributing to mortgage defaults for the two analyzed groups (CBs and LBs). The differences between the two groups then were examined to identify the feasible solutions for each problem. We used DEMATEL analysis to identify the problem structuralizations and key factors, and the FDM to determine the differences in the two patterns of mortgage defaults for the two groups.
2. Step 2 (selecting evaluation criteria): The evaluation criteria were selected by referring to literature and expert interviews. We adopted a 5-point DEMATEL scale, which partitioned the level of influence into significant influence, high influence, moderate influence, minimal influence, and no influence, where the extents of influence were assigned scores of 4, 3, 2, 1, and 0, respectively.
3. Step 3 (identifying key factors): By using the DEMATEL questionnaire, expert opinions were collected and compiled

to obtain the elementary direct relationship matrix Z . The pairwise comparison was conducted in sequence on the n evaluation criteria (factors) on the basis of the level of inter-influence, producing an n -by- n matrix. In the matrix, entry z_{ij} denotes the level of influence that criterion (factor) i has on criterion (factor) j (indicating that z_{ij} is the result of the pairwise comparison of i and j as a result of i influencing j). The diagonal elements were set as 0 due to criteria being compared with themselves (e.g. $z_{ij}=0$, at $i=j$).

$$Z = \begin{bmatrix} z_{11} & z_{12} & \cdots & z_{1n} \\ z_{21} & z_{22} & \cdots & z_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ z_{n1} & z_{n2} & \cdots & z_{nn} \end{bmatrix} = \begin{bmatrix} 0 & z_{12} & \cdots & z_{1n} \\ z_{21} & 0 & \cdots & z_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ z_{n1} & z_{n2} & \cdots & 0 \end{bmatrix} \quad (1)$$

The normalized direct relationship matrix (X) could be formulated as;

$$X = s \cdot Z, \text{ where } s = 1 / \max_{1 \leq i \leq n} \sum_{j=1}^n z_{ij} \quad (2)$$

Then by adding the direct and indirect influence matrices, the total influence matrix (T_i) is;

$$T_i = \{t_{ijk}\} = X_i(I - X_i)^{-1} \quad (3)$$

The total influence relationship matrix (T) could be stated as $X_i(I - X_i)^{-1}$, where I is the identity matrix. The sum of its entries for each column in matrix T is D , while the sum of its entries for each row in matrix T is R . The sum ($D+R$) and the difference ($D-R$) of D and R stand for the prominence and relation between the criteria (factor), respectively. The causal diagram of the ordered pairs ($D+R$, $D-R$) is drawn on the coordinate plane, where the ($D+R$)-axis is taken to be horizontal and the ($D-R$)-axis is taken to be vertical. In the causal diagram, the positive coordinate ($D-R$) were categorized as the cause group and the negative value of ($D-R$) as the result group. Therefore, high ($D-R$) values in the cause group were considered the determinants.

4. CASE STUDY

Because of the global financial crisis resulting from the U.S. subprime mortgage crisis and the collapse of Lehman Brothers, the point about reducing the risk of mortgage defaults for banks is crucial. On the basis of involving different operational conditions for CBs and LBs, the factors contributing to their mortgage defaults might also differ. To investigate the structuralized problem and the key factors leading to mortgage defaults for CBs and LBs, we advanced the DEMATEL approach. The analytical procedure is as follows.

4.1. Step 1: Confirming the Objectives and Decisions

The problem structuralizations and the key factors of mortgage defaults for CBs and LBs were explored. Differences resulting in mortgage defaults between the two analyzed groups of banks were further probed and proposed the feasible solutions for each problem in order to effectively solve the intricate mortgage default problem.

4.2. Step 2: Selecting the Evaluation Criteria

The 41 evaluation factors (criteria) were first extracted from the related literature. Loan managers from CBs and LBs were also gathered to hold four symposiums during the periods of September 2016 to November 2016. Accordingly, three dimensions (borrower characteristics, lending contracts and macroeconomic factors) comprising 17 factors contributing to mortgage defaults were finally chosen as the evaluation factors (criteria).

As for dimension 1, borrower characteristics (D_1) consisted of eight factors, which were borrower's age (CB/LB1), employment duration (CB/LB2), education level (CB/LB3), occupation (CB/LB4), marital status (CB/LB5), family income (CB/LB6), credit balance (CB/LB7) and credit history (CB/LB8). For dimension 2, lending contract (D_2) comprised six factors, which were loan-to-value ratio (CB/LB9), loan period (CB/LB10), loan amount (CB/LB11), type of collateral (CB/LB12), location of residence (CB/LB13), and loan interest rate (CB/LB14). In dimension 3, macroeconomic factors (D_3) contained three factors, which were economic growth rate (CB/LB15), unemployment rate (CB/LB16) and changes in house prices (CB/LB17).

4.3. Step 3: Identifying the Key Factors

The present study explored the factor causing the mortgage defaults for the CBs and LBs located in central and southern Taiwan. Applying the DEMATEL questionnaire, we collected and compiled the opinions from experts in the financial industry. The analytical methods adopted were the expert decision model, which required only a small portion of samples to reflect the nature of the problems differed from the traditional econometrics model. We selected six CBs and six LBs. Two staffs from each

bank were then interviewed, and loan department managers were selected as the interviewees for CBs and credit department managers or staff members were chosen for LBs; 24 participants were instructed to complete the questionnaire and interview. The reasons why we recruited participants from central and southern Taiwan are as follows: (1) The number of banks operating in both commercial district and agricultural area was much higher in central and southern Taiwan, providing sufficient samples. In addition, these banks featured the structuralized problems leading to mortgage defaults that we intended to examine. (2) Prior to financial liberalization, loans were the primary source of operational income for LBs in central and southern Taiwan. However, the emergence of newly established banks has dramatically challenged the loan business of LBs. The new competitive loan situation fostered an environment similar to the one to be investigated in this study.

Tables 1 and 2 reported the total influence relationship (T) for CBs and LBs, respectively.

The intuitive and effective way to identify key factors leading to mortgage defaults is to refer to the causal diagram. The causal diagram could be drawn based on Tables 1 and 2, in the causal diagram, factors that are located in the first area (I) and the second area (II) are classified to the cause group; conversely, those that are located in the third area (III) and the fourth area (IV) are the effect group. Factors located in area I with a positive value of (D-R) and a value of (D+R) greater than its mean could thus be considered key factors. The analysis results for CBs are shown in Figure 1, where the factors located in area I are the major factors contributing to mortgage defaults of CBs, being CB14, CB16, CB7, CB4, CB1, and CB10. Based on (D+R),

Figure 1: Cause and effect relationships for commercial banks

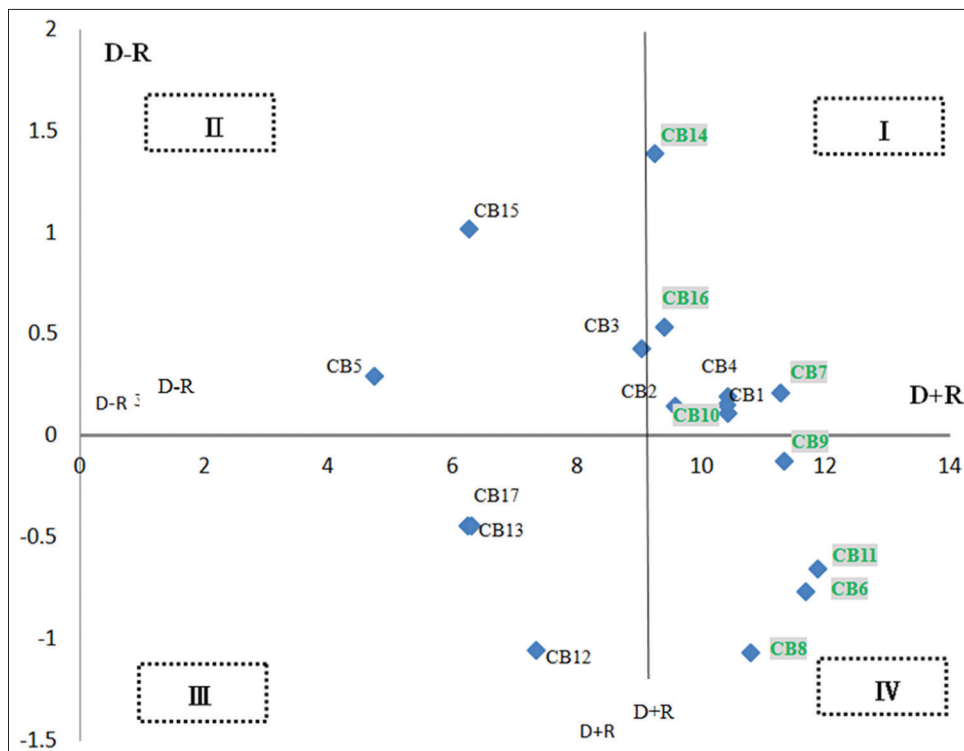


Table 1: Total influence relationship matrix (T) (commercial banks)

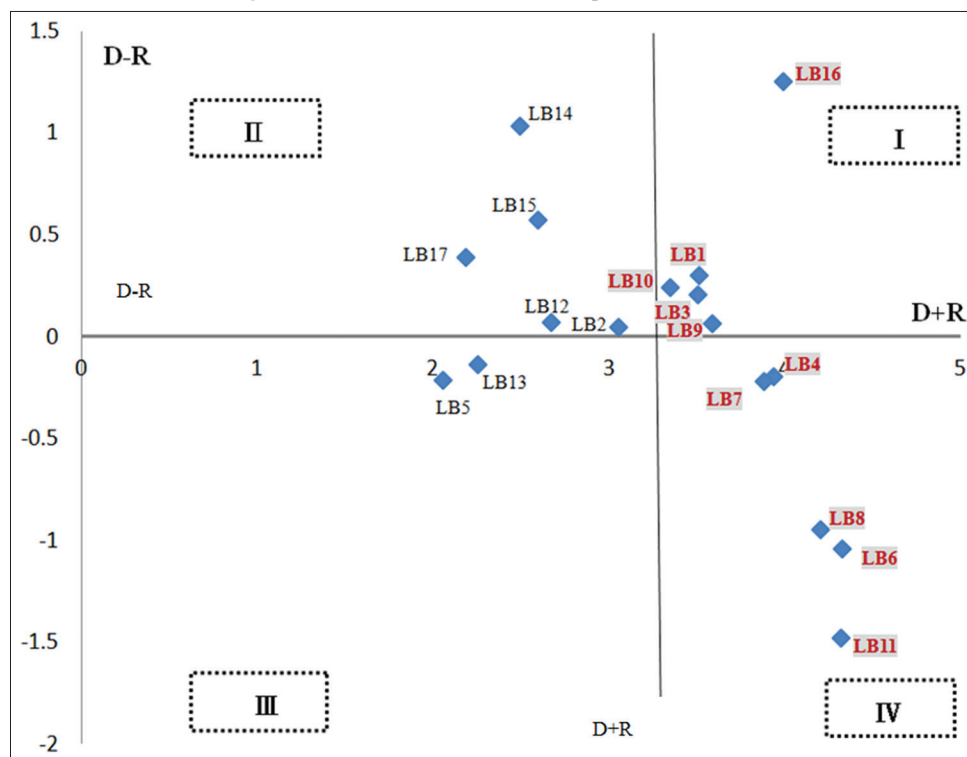
Dimension	Factor	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Sum of column (D)
Borrower characteristics	1	0.296	0.3448	0.316	0.3693	0.1314	0.4259	0.3893	0.4066	0.3786	0.3643	0.427	0.2598	0.2073	0.2467	0.1803	0.3113	0.2095	5.2641
	2	0.3328	0.2539	0.2993	0.3484	0.1349	0.3936	0.3658	0.3716	0.3548	0.3172	0.399	0.232	0.174	0.2334	0.1583	0.2892	0.201	4.8592
	3	0.3166	0.3108	0.2231	0.3373	0.134	0.3872	0.3498	0.3709	0.3536	0.3164	0.3745	0.2327	0.1897	0.2381	0.1654	0.2453	0.1895	4.7349
	4	0.3695	0.3498	0.3244	0.297	0.1449	0.4243	0.3873	0.412	0.3931	0.3508	0.4163	0.2614	0.2161	0.2623	0.1696	0.3137	0.2152	5.3077
	5	0.1641	0.1473	0.1336	0.154	0.0608	0.2289	0.1948	0.2033	0.1789	0.1825	0.195	0.1252	0.097	0.1126	0.0765	0.1585	0.1036	2.5166
	6	0.3787	0.3568	0.3329	0.3798	0.1588	0.3618	0.3865	0.406	0.409	0.3625	0.4389	0.2983	0.2239	0.2687	0.174	0.3149	0.1983	5.4498
	7	0.3874	0.3612	0.3219	0.3799	0.159	0.4542	0.3405	0.4408	0.4247	0.3871	0.4584	0.3282	0.2263	0.2806	0.1827	0.3301	0.2696	5.7396
	8	0.3244	0.2854	0.2355	0.2891	0.1326	0.3804	0.347	0.3081	0.3726	0.3399	0.4001	0.2957	0.2166	0.2641	0.1648	0.2903	0.2139	4.8605
	9	0.3751	0.3515	0.3264	0.3837	0.1679	0.4424	0.4052	0.4287	0.3431	0.3779	0.4503	0.292	0.2657	0.2857	0.1789	0.2917	0.2408	5.607
	10	0.3519	0.3284	0.287	0.3669	0.1351	0.4239	0.388	0.4104	0.3831	0.2913	0.428	0.2791	0.2367	0.2824	0.1797	0.2919	0.2167	5.2805
	11	0.3844	0.3504	0.3181	0.3806	0.1675	0.4445	0.4035	0.4285	0.3857	0.3572	0.3752	0.308	0.2579	0.2863	0.1793	0.3218	0.2613	5.6102
	12	0.1977	0.1739	0.1602	0.1842	0.0875	0.2204	0.2046	0.2552	0.2646	0.2041	0.2862	0.1448	0.1751	0.1939	0.1001	0.1593	0.133	3.1448
	13	0.1662	0.1467	0.1403	0.1759	0.0812	0.2494	0.1932	0.1891	0.2394	0.195	0.2631	0.1906	0.1075	0.1417	0.1043	0.1601	0.1525	2.8692
	14	0.3605	0.2703	0.261	0.3265	0.1467	0.4248	0.3844	0.4102	0.3977	0.3582	0.4149	0.318	0.2517	0.2248	0.2071	0.3074	0.2555	5.3197
	15	0.2314	0.202	0.184	0.2199	0.0953	0.2962	0.2368	0.2568	0.2652	0.2183	0.2875	0.2138	0.1694	0.2113	0.1025	0.2462	0.1995	3.6361
	16	0.3437	0.3173	0.2964	0.3513	0.1947	0.4059	0.3557	0.3764	0.3607	0.3129	0.395	0.2405	0.1792	0.2297	0.1707	0.2367	0.2029	4.9697
	17	0.1699	0.1601	0.1344	0.1646	0.0843	0.248	0.194	0.2468	0.2209	0.1858	0.2515	0.1775	0.1404	0.1637	0.1204	0.16	0.1067	2.929
Sum of row (R)		5.1503	4.7106	4.3015	5.1084	2.2166	6.2118	5.5264	5.9214	5.7257	5.1214	6.2609	4.1976	3.3345	3.926	2.6146	4.4284	3.3695	

The number in the second column and the first row denote as follows: As for dimension 1, borrower characteristics (D₁) consisted of eight factors, (1) age; (2) employment duration; (3) education level; (4) occupation; (5) marital status; (6) family income; (7) credit balance and (8) credit history; for dimension 2, lending contract (D₂) comprised six factors, (9) loan-to-value ratio, (10) loan period; (11) loan amount; (12) type of collateral; (13) location of residence; (14) loan interest rate; (15) macroeconomic factors (D₃) contained three factors, which were economic growth rate; (16) unemployment rate; (17) changes in house prices

Table 2: Total influence relationship matrix (T) (local banks)

Dimension	Factor	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Sum of column (D)
Borrower characteristics	1	0.296	0.3448	0.316	0.3693	0.1314	0.4259	0.3893	0.4066	0.3786	0.3643	0.427	0.2598	0.2073	0.2467	0.1803	0.3113	0.2095	5.2641
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	16	0.3437	0.3173	0.2964	0.3513	0.1947	0.4059	0.3557	0.3764	0.3607	0.3129	0.395	0.2405	0.1792	0.2297	0.1707	0.2367	0.2029	4.9697
	17	0.1699	0.1601	0.1344	0.1646	0.0843	0.248	0.194	0.2468	0.2209	0.1858	0.2515	0.1775	0.1404	0.1637	0.1204	0.16	0.1067	2.929
Sum of row (R)		5.1503	4.7106	4.3015	5.1084	2.2166	6.2118	5.5264	5.9214	5.7257	5.1214	6.2609	4.1976	3.3345	3.926	2.6146	4.4284	3.3695	

The number in the second column and the first row denote as follows: As for dimension 1, borrower characteristics (D₁) consisted of eight factors, (1) age; (2) employment duration; (3) education level; (4) occupation; (5) marital status; (6) family income; (7) credit balance and (8) credit history; for dimension 2, lending contract (D₂) comprised six factors, (9) loan-to-value ratio, (10) loan period; (11) loan amount; (12) type of collateral; (13) location of residence; (14) loan interest rate; (15) macroeconomic factors (D₃) contained three factors, which were economic growth rate; (16) unemployment rate; (17) changes in house prices

Figure: 2 Cause and effect relationships for local banks

CB7 (credit balance) exhibited the highest prominence. On the other hand, in terms of (D-R), loan interest rate (CB14) is the most crucial.

As shown in Figure 2, in which the factors situated in area I are the key factors contributing to mortgage defaults of LBs, being LB16, LB1, LB10, LB3, and LB9. On the basis of (D+R) and (D-R), LB16 (unemployment rate) is the most crucial factor.

5. CONCLUSION AND SUGGESTIONS

5.1. Conclusion

The prevalence of mortgage defaults in the late 1990s led to a sharp increase in the NPLR of banks, resulting in operational crises in the financial industry. After financial rebuilding spanning a period of 10 years, the NPLR has finally restored to normal levels, enabling bank operations to run efficiently. In spite of the financial crisis in 2008 creating a substantial decline in Taiwanese exports, banks did not endure a significant slump because their knowledge and ability for mitigating the negative shocks of mortgage defaults have been considerably improvement. However, differences leading to mortgage defaults remain between the different patterns of financial institutions regarding their understanding of mortgage and their requirements for issuing loans. Our results indicated that the CB's perception of the factor's prominence on mortgage defaults was greater than that perceived by LBs. CBs attached the highest prominence to the spillover effects of unemployment rates. CBs perceived the effects of the factors' prominence on mortgage defaults more than the LBs did. Nonetheless, whether this finding implies that CBs are superior to LBs in risk management and mortgage policies remains to be determined by subsequent studies.

5.2. Suggestions

By analyzing the direct and spillover effects, we systematically compared the problem structuralizations and the key factors contributing to mortgage defaults for the two analyzed groups (CBs and LBs). Furthermore, the differences in factor's prominence and relation were examined to promote decision-maker's formulating a feasible solution for each problem. Nevertheless, the limitation of this study is that the sample size could not reflect the increasingly globalized financial environment. Since the sample little illustrates actual financial market situations, not only should the CBs and LBs in Taiwan be analyzed, but also foreign banks with Taiwanese branches. We adopted three dimensions (borrower characteristics, lending contract, and macroeconomic factors) and 17 evaluation factors in this study, which allowed us to cover a great number of crucial factors; however, the large number of factors also made the problem structure highly complicate and the analysis considerably difficult.

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