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How to Gauge the Default Risk? An Empirical Application of Structural-form Models

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Abstract

To estimate expected default probabilities of firms, this article tests three structural-form models: Leland and Toft (1996), Ericsson and Reneby (1998) and Fan and Sundaresan (2000). We implement these models using a sample of 628 Taiwanese firms with capital structures during the period 1995-2006 to predict default risk of failed companies. Empirical results show that the predictabilities of all three models exceed 50 percent. The accuracy of predictions for Leland and Toft (1996), Ericsson and Reneby (1998) and Fan and Sundaresan (2000) are 66.07%, 82.14% and 75%, respectively. Therefore, we conclude that the model of Ericsson and Reneby (1998) performs best in predicting the default risk of a firm.

Keywords: Structural-form model, expected default probability
JEL Classification Codes: G10, G21

I. Introduction

The existing literatures show two competing approaches to valuation of risky debt: the structural-form approach and the reduced-form approach. Both approaches have advantages and limitations in valuing risky debt and estimating expected default probabilities (EDP). Although the reduced-form approach has the advantage of tractability and empirical fit, it does not impose assumptions on the evolution of the value of the firm's underlying assets. On the other hand, the inputs of reduced-form models cannot be directly related to observable fundamentals of a company such as the determinants of default. [1] The structural-form model takes credit events as a function of a company's value relative to a credit-event-triggering threshold (or barrier). This approach has the advantage of linking directly the value of the firm when evaluating the default risk.

The structural-form models include the original work of Black and Scholes (1973) and Merton (1974). In such a framework, the securities issued by a firm as contingent claims on its own value and

[1] The reduced-form approach, which is developed by Jarrow and Turnbull (1995) and Duffie and Singleton (1999), is not the focus of this article. See also Das and Tufano (1996), Duffie et al. (1996), Jarrow et al. (1997), Madan and Unal (1998), and Jarrow (2001).

the credit risk is thus driven by the value of the company's assets. The basic intuition behind the Merton model is that default occurs when the value of a firm's asset is lower than that of its liabilities. Furthermore, the basic Merton model has subsequently been extended by removing one or more of Merton's assumptions. Black and Cox (1976) suggest that bondholders can force the reorganization or the bankruptcy of the firm if its value falls to a specific value. Kim et al. (1989) and Collin-Dufresne and Goldstein (2001) propose a model similar to the Black and Cox (1976) model, suggesting that capital structure is explicitly considered and default occurs if the value of total assets is low enough to reach a trigger value, which is assumed to be exogenous. Leland (1994) endogenizes bankruptcy while accounting for taxes and bankruptcy costs.

On the other hand, some studies argue that structural-form models provide prices to those derivatives coherent to the ones observed in the markets. Longstaff and Schwartz (1995) develop a two-factor model for valuing risky debt and a semi-closed form solution, assuming that interest rates follow a mean-reverting stochastic process and that there are deviations from strict absolute priority. Anderson and Sundaresan (1996) and Mella-Barral and Perraudin (1997) study the importance of strategic debt service on risky debt spreads. Leland (2002) examines how well two structural-form models, one with an exogenous and the other with an endogenous default barrier, capture actual default probabilities. Both models fits reasonably well the actual default probabilities, especially for longer time horizons. Janosi et al. (2003) find that equity returns can be employed to predict default probabilities. Patel and Vlamis (2004) estimate the distance to default and the risk neutral default probabilities for a sample of the UK real estate companies using Black and Scholes (1973), Merton (1974) and the KMV (1993) framework. Although these models can predict the corporate failure, 10 percent of the non-failed companies are incorrectly classified as failed because the chosen measure of volatility is very sensitive. Bharath and Shumway (2004) and Ericsson, Reneby and Wang (2005) use credit default swaps as a proxy to default risk of companies.

Given the economic and intuitive appeal of the structural-form approach, this study analyzes the performance of three structural models: Leland and Toft (1996), Ericsson and Reneby (1998) and Fan and Sundaresan (2000). For the sake of brevity, henceforth we refer to them as LT, ER, and FS models, respectively. Indeed, only a few studies implement a structural-form model to evaluate its ability to predict default risk. Our results show that the EDPs obtained from different models are close to the actual phenomenon. The three structural-form models are generally accurate in predicting default risk of failed companies in our sample. We observe that these models can predict the bankruptcy of companies at least three quarters in advance of credit events. However, the accuracy rate for LT, ER and FS models are 66.07%, 82.14% and 75%, respectively. Thus, we conclude that the ER model performs best in predicting the default risk of a firm.

The rest of this paper is structured as follows. The following section introduces the theoretical framework. Section III then draws out the implications of the results; and finally, Section IV concludes.

II. Theoretical Framework

1. LT. model

Leland and Toft (1996) extend the model of Leland (1994) by assuming that debt has finite life. They analyze corporate debt value and optimal capital structure in a unified framework, assuming taxes and bankruptcy costs. They argue that the debt value is dependent on a company's capital structure once it has an effect on default and bankruptcy; however, the optimization of capital structure depends on knowing the effect of leverage on debt value. They consider that a firm sells continuously a constant amount of new debt p, with maturity T, and pays continuously coupons c. The total debt principal P, and the total coupon payment C, will be constant at a level P = pT and C = cT, respectively. Therefore, the default boundary, V_{LT}, is derived endogenously and is given by

$$V_{LT} = \frac{(C/r)[A/(rT) - B] - AP/(rT) - \tau C_x / r}{1 + \alpha x - (1-\alpha)B} \tag{1}$$

with

$$A = 2ae^{-rT}N(a\sigma\sqrt{T}) - 2zN(z\sigma\sqrt{T}) - 2/(\sigma\sqrt{T})n(z\sigma\sqrt{T}) + (2e^{-rT})/(\sigma\sqrt{T})n(a\sigma\sqrt{T}) + (z-a)$$

$$B = -[2z + 2/(z\sigma^2 T)]N\left(z\sigma\sqrt{T}\right) - 2/(\sigma\sqrt{T})n(z\sigma\sqrt{T}) + (z-a) + 1/(z\sigma^2 T)$$

$$a \; \frac{r - \delta - (\sigma^2/2)}{\sigma^2} \; z \; \frac{\sqrt{(a\sigma^2)^2 + 2r\sigma^2}}{\sigma^2}, \; x = a + z$$

where α is the fraction of asset value lost in bankruptcy, $n(\cdot)$ and $N(\cdot)$ denote the standard and cumulative normal density functions, respectively. On the other hand, τ is the corporate tax rate, σ is the firm's volatility, r is the risk-free rate, and δ is the payout rate. Note that if $T \to \infty$, the model will converge to the Leland (1994) model.

The first passage time cumulative probability of a company's default up to the time t is given by

$$EDP_{LT} = N\left(\frac{-\ln(V/V_{LT}) - (\mu - \delta - 0.5\sigma^2)t}{\sigma\sqrt{t}}\right) +$$

$$\exp(-2\ln(V/V_{LT})(\mu - \delta - 0.5\sigma^2)/\sigma^2)N\left(\frac{-\ln(V/V_{LT}) + (\mu - \delta - 0.5\sigma^2)t}{\sigma\sqrt{t}}\right) \tag{2}$$

where V is the value of the firm. The performance of equation (2) depends on the endogenously defined bankruptcy threshold. We can see that there is a parameter t in this model. It is not limited to the assumption that firms can only default at maturity. In the LT model, companies are allowed to default at any time before maturity. Consequently, Leland and Toft (1996) propose a Barrier option model, suggesting that expected default probabilities depend on the endogenously defined bankruptcy threshold.

2. ER model

Ericsson and Reneby (1998) demonstrate that corporate securities can be expressed as combinations of three basic claims: a down-and-out call option, a down-and-out binary option and a unit down-and-in option. [2] They model discrete coupon payments as a portfolio of binary options.

The default is triggered if the company's value falls below the reorganization barrier V_{ER} at any time prior to maturity of the firm. The time of default is denoted as t. The price of a unit down-and-in option that matures at T is one monetary unit if bankruptcy happens before T and zero otherwise. The payoff to a unit down-and-in claim with expiration T is

$$\Phi\left\{G^{V_{ER}}\{V_t, t \mid t \le T\}\right\} \equiv \begin{cases} 1 \; \textit{if} \;\; t \le T \\ 0 \; \textit{if} \;\; t > T \end{cases} \tag{3}$$

In the typical situation where V_{ER} represents a default barrier, this claim can be thought of as one that pays off a dollar in the event of default – a "dollar in default" claim. Thus, it gives us a quantitative measure of investors' appreciation of the risk of default.

The expected default probability of ER model is

$$EDP_{ER} = G^K\{V_t, t \mid \tau \le T\} = G^K\{V_t \mid \tau \le \infty\}(1 - Q^G\{\tau > T, V_t > V_{ER}\}) \tag{4}$$

with

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[2] According to Ericsson and Reneby (1998), a down-and-out claim is one that expires if the underlying variable hits a given lower boundary prior to the expiration date. A unit down-and-in claim pays off one currency unit the first time the underlying variable reaches a lower boundary.

$$G^{K}\{V_t \mid \tau \le \infty\} = \left(\frac{V_t}{V_{ER}}\right)^{-\theta};$$

$$Q^{G}\{\tau > T, V_t > V_{ER}\} = N\left\{d_T^G\left(\frac{V}{V_{ER}}\right)\right\} - \left\{\frac{V}{V_{ER}}\right\}^{-2/\sigma_V \mu_X^G} N\left\{d_T^G\left(\frac{V_{ER}^2}{V \cdot V_{ER}}\right)\right\}$$

$$d_T^G(x) = \frac{\ln x}{\sigma\sqrt{t}} + \mu_x^G \sqrt{t}\ ;\ \mu_x^B = \frac{r - \delta - 0.5\sigma^2}{\sigma}$$

$$\mu_x^G = \mu_x^B - \theta\sigma\ ;\ \theta = \frac{\sqrt{(\mu_x^B)^2 + 2r} + \mu_x^B}{\sigma}$$

where V is the value of the firm, σ is the firm's volatility, δ denotes the payout ratio, and r is the risk-free rate.

3. FS model

Fan and Sundaresan (2000) model strategic interactions between debt holders and equality holders in a game-theoretic setting that accommodate varying bargaining powers to the two claims. Two formulations of reorganization are presented: debt-equity swaps and strategic debt service resulting from negotiated debt service reductions. The trigger point of strategic debt service V_{FS} is

$$V_{FS} = \frac{C(1-\tau)}{r}\frac{-\lambda_-}{1-\lambda_-}\frac{1}{1-\eta\alpha} \tag{5}$$

where

$$\lambda_- = \left[0.5 - \frac{(r-\delta)}{\sigma^2}\right] - \sqrt{\left[0.5 - \frac{(r-\delta)}{\sigma^2}\right]^2 + \frac{2r}{\sigma^2}} < 0$$

The parameter λ_- is the elasticity of the probability of default with respect to the value of the firm's asset. As a result, λ_- is negative and increasing with the volatility of the assets of the firm. They suggest that equality holders can service debt strategically, and the bargaining power of shareholders is captured by the parameter η. Similarly, $1-\eta$ denotes debt holders' bargaining power. Furthermore, C denotes coupons, r is the risk-free rate, δ is the payout ratio and α is the financial-distress cost.

Thus, the equity value is given by

$$E(V) = V - \frac{c(1-\tau)}{r}(1 - EDP_{FS}) + \eta\alpha V_{FS} EDP_{FS} - V_{FS} EDP_{FS}$$

where V is the value of the firm and the risk-neutral expected default probability is given by

$$EDP_{FS} = \left(\frac{V}{V_{FS}}\right)^{\lambda_-} \tag{6}$$

If the bargaining power is nil, no strategic debt service takes place and the model will converge to the Leland (1994) model.

III. Data and empirical results

1. Data and calibration

For our empirical analysis of EDPs, we use a sample of 628 companies listed on the Taiwan Stock Exchange during the period 1995-2006. The sample data come from the Taiwan Economic Journal (TEJ). The sample contains 56 companies that have financial distress during this period, and 572 companies that are still in business. The 56 financial-distress companies during the sample period are shown in Table A of the Appendix.

The government bond yield is taken as a proxy for the risk-free rate, which is published by the Central Bank in Taiwan. Furthermore, we use Black and Scholes (1973) to estimate the value of the firm and the volatility of asset. [3] Regarding the payout ratio, we use the assumption of Huang and Huang (2003) and set it to be 6%. For the costs of financial distress, we follow Ericsson and Reneby (2005) and set it to be 15%. Finally, the bargaining power of shareholders is set to be 50% as suggested by Fan and Sundaresan (2000).

2. Empirical results

Table 1 shows the EDPs of every industry from 1995 to 2006. From Table 1, we find that Building & Construction as well as Iron & Steel industries have higher EDPs because there are 12 and 8 companies of these industries having financial distress during the sample period. However, the EDP of Iron & Steel industry estimated by the LT model is lower than that estimated by ER and FS models and we conjecture that the LT model may underestimate EDPs. On the other hand, there are no companies from Biotech & Medical as well as Tourism industries in financial distress, and therefore, the EDPs of these industries are relatively lower.

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[3] In general, the asset of the firm and the volatility of the asset cannot be estimated directly and we estimate these variables by the Black-Scholes option model as follows:

$V_E = VN(d_1) - Ke^{-rt}N(d_2)$

$$V_E = VN(d_1) - Ke^{-rt}N(d_2) \quad \text{(f1)}$$

with $d_1 = \frac{\ln(\frac{V}{K}) + (r + \frac{\sigma^2}{2})t}{\sigma\sqrt{t}}$ $d_2 = d_1 - \sigma\sqrt{t}$

According to Ito's Lemma, the relationship between equality value, V_E, and equality volatility, σ_E, is given by

$$\sigma_E = \frac{V}{V_E} N(d_1)\sigma \quad \text{(f2)}$$

Therefore, we can assess the company's asset value and volatility using equations (f1) and (f2).

Table 1: The EDPs of every industry, 1995-2006

Model industry	LT		ER		FS	
	EDP	Standard error	EDP	Standard error	EDP	Standard error
Cement	0.0443	0.1971	0.1998	0.2488	0.1057	0.1796
Foods	0.0701	0.2469	0.2265	0.2452	0.1593	0.2258
Plastics	0.0677	0.2457	0.2013	0.2427	0.1060	0.1555
Textiles	0.1450	0.3418	0.2474	0.2601	0.1710	0.2867
Electric Machinery	0.0697	0.2487	0.2294	0.2545	0.1386	0.2110
Electric and Cable	0.1064	0.3046	0.2392	0.2552	0.1780	0.2511
Chemical	0.0426	0.1947	0.1755	0.2449	0.0804	0.1387
Biotech and Medical	0.0233	0.1462	0.1126	0.2027	0.0371	0.0724
Glass and Ceramic	0.1254	0.3179	0.2216	0.2730	0.1784	0.2174
Paper and Pulp	0.1298	0.3221	0.3388	0.2445	0.1813	0.2261
Iron and Steel	0.0976	0.2931	0.3089	0.2471	0.2344	0.3050
Rubber	0.0418	0.1914	0.1740	0.2374	0.0664	0.1026
Automobile	0.0239	0.1517	0.1724	0.2296	0.0672	0.1801
Electronics	0.0465	0.2065	0.2069	0.2380	0.0629	0.1076
Semiconductor	0.0653	0.2417	0.2075	0.2889	0.0785	0.1727
Computer and Peripheral	0.1447	0.3454	0.2285	0.2526	0.0991	0.1561
Optoelectronic	0.0759	0.2599	0.2566	0.2588	0.1086	0.1447
Communication and Internet	0.0840	0.2716	0.1694	0.2214	0.0543	0.1060
Elec. Product Dist.	0.1100	0.3084	0.3855	0.3894	0.1168	0.1917
Information Service	0.0951	0.2821	0.2369	0.2419	0.0804	0.1150
Other Electronic	0.0688	0.2458	0.1567	0.2293	0.0460	0.0777
Building and Cons.	0.3108	0.4423	0.3050	0.2609	0.2016	0.2920
Shipping and Trans.	0.0500	0.1954	0.2087	0.2474	0.1375	0.2942
Tourism	0.0138	0.1066	0.1226	0.2140	0.0766	0.2405
Trading and Consume	0.1508	0.3501	0.2157	0.2498	0.1548	0.1983
Oil, Gas and Elec.	0.0090	0.0908	0.2091	0.2487	0.0636	0.1342
Others	0.0744	0.2570	0.1389	0.2206	0.1167	0.2001

Crouhy et al. (2000) suggest that KMV has analyzed more than 2000 US companies that have defaulted or entered into bankruptcy over the last 20 years. In all cases, KMV has shown a sharp increase in the slopes of the EDP between 1 and 2 years prior to default. Patel and Pereira (2005) estimate EDPs for a sample of failed and non-failed UK real estate companies using structural-form models. They observe a steep increase in EDP at least 1 year in advance of the event for failed companies. Thus, we compare EDPs estimated by LT, ER and FS models whether the EDPs of financial-distress companies increase sharply at least six quarters in advance of the event.

Let n be the time of default event and n-1 be one quarter prior to the event. If the EDP increases sharply, we consider the model capable of detecting the default risk in advance. Table 2 shows the numbers of financial-distress companies whose default risk are accurately predicted by the three structural-form models. From Table 2 and Figure 1, we find that all three models can provide warning at three quarters in advance of the events. However the ER model shows greater reliability in predicting the default risk relative to the other two models.

Table 2: The ability of prediction for three structural-form models

	ER	LT	FS
n-6	0	1	0
n-5	1	0	2
n-4	1	3	2
n-3	13	8	10
n-2	12	9	11
n-1	19	16	17

Note-1.Numbers of columns 2-4 are financial-distress companies that are predicted default risk accurately by the structural-form model.

2.n is the time of the credit event and n-k denotes k quarter prior of the event, k=1, 2,…, 6.

Figure 1: Comparison of the predictions' ability for three structural-form models

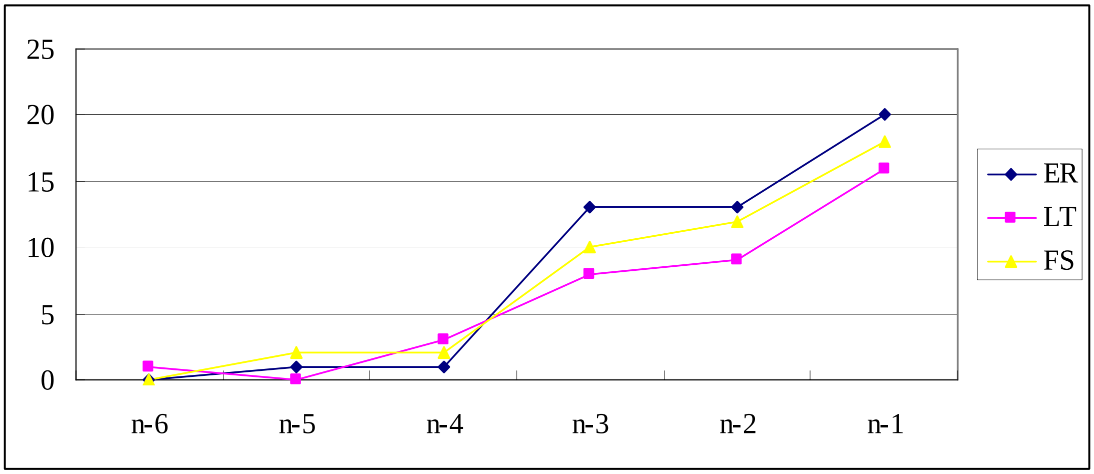


Table 3 shows the codes of financial-distress companies whose default risk are accurately predicted by the structural-form model. As can be seen, the ER model can detect default risk of 46 companies from 56 financial-distress companies; that is, the accuracy rate is 82.14%. Similarly, FS and LT models can accurately detect default risk of 42 and 37 financial companies, respectively. In other words, the accuracy rate of LT and FS models in predicting the default risk are 66.07% and 75%, respectively. Therefore, we conclude that the model of Ericsson and Reneby (1998) performs best in predicting the default risk of a firm.

Table 3: Financial-distress companies' codes that are predicted default risk accurately by the structural-form model

Model	Firm's code
LT model (66.07%)	1414, 1438, 1449, 1314, 2328, 2429, 2101, 2007, 2014, 2527, 2506, 1808, 1442, 2613, 2904, 9902, 2528, 2538, 2540, 2841, 2350, 2354, 3004, 2025, 2028, 1805, 3021, 2348, 2494, 2496, 2331, 2329, 2342, 1440, 2024, 2613, 2530
ER model (75%)	1414, 1438, 1440, 1459, 1314, 2328, 2206, 2101, 2017, 2020, 2023, 2024, 2527, 1808, 1442, 2613, 9922, 9906, 9902, 2904, 2530, 2537, 2538, 2539, 2540, 2354, 3004, 2025, 2028, 1805, 1707, 1722, 1506, 2348, 2494, 2491, 2358, 2342, 1432, 2429, 2528, 1718, 2496, 3021, 2496, 2329
FS model (82.14%)	1314, 1466, 1449, 1441, 1438, 1414, 2328, 2429, 2101, 2007, 2014, 2017, 2020, 2023, 2024, 2904, 9902, 9906, 9922, 2613, 1442, 1808, 2527, 2530, 2537, 2540, 3004, 2025, 1805, 1506, 3021, 2348, 2496, 2491, 2329, 2342, 2506, 2354, 2028, 1718, 1613, 2358

Note: 1.Numbers in parentheses denote accurate rate of prediction.
2.For the sake of brevity, this table only show firms' code and firm's name can refer Table A of appendix.

Finally, we compare the predictability of three structural-form models. These financial-distress companies are Taiwan Fertilizer, Nankang Tire and Grape King, and their credit events happened on October 13, 1999, September 6, 2000 and October 26, 2000, respectively. If the EDPs estimated by the LT, ER or FS models increase sharply prior to the credit event date, we conclude that the model can predict the default risk. The EDPs of the three companies are shown in Figures 2, 3 and 4. As seen in Figure 2, the credit event happened in Quarter 4, 1999 and only the ER model has predicted this default risk of Taiwan Fertilizer. However, all three models can detect the default risk of Nankang Tire and EDPs increase sharply before the credit event date (Quarter 3, 2000). Figure 4 shows the EDP of Grape King, whose credit event happened in Quarter 4, 2000. According to Figure 4, only the ER model offers warning of default risk while both LT and FS models fail to detect this default risk. Consequently, the ER model is better at predicting the default risk of companies in financial distress.

Figure 2: The EDPs of Taiwan Fertilizer

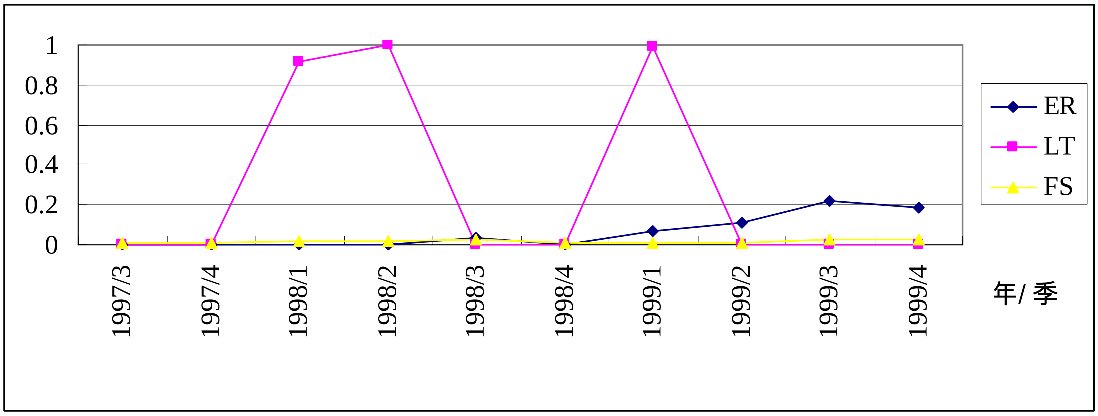


Figure 3: The EDPs of Nankang Tire

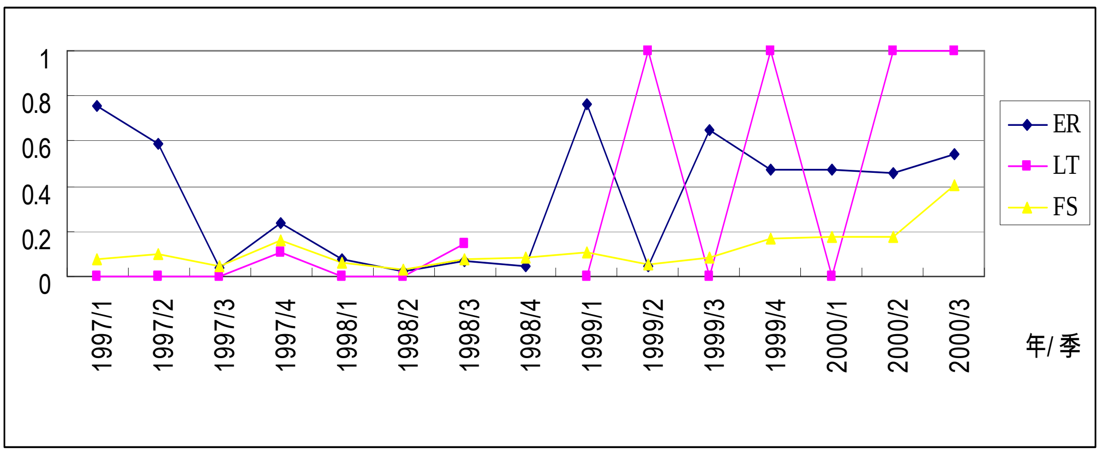
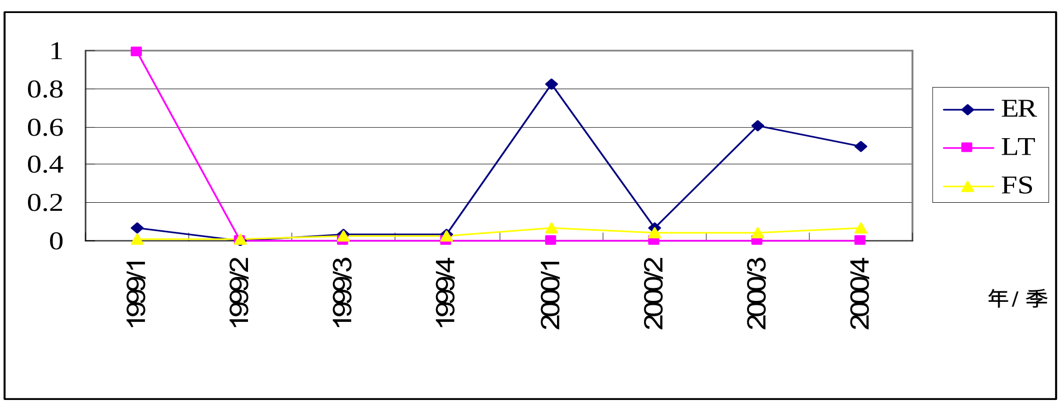


Figure 4: The EDPs of Grape King



IV. Conclusions

The New Basel Capital Accord (Basel II) permits a bank to build its internal credit scoring model, which is the key to reflect more clearly the circumstances of the bank. The structural-form model has the advantage of linking directly the value of the firm to the value of its securities and pricing the credit risk. This study employs three structural-form models, namely LT, ER and FS models, to assess expected default probability of Taiwanese firms and compare their ability in predicting the default risk.

In general, the EDPs estimated by all three models are reliable. Although their accuracy rates in predicting the default risk exceed 50 percent, the ER model is superior to the other two models. The accuracy rate of the ER model is about 82.14 percent indicating that the ER model can reliably offer warnings of default risk. Consequently, we expect that these models can detect the default risk in advance and our findings have meaningful implications for credit risk management in Taiwan.

Appendix

Table A: The financial-distress companies during the period 1995-2006

Industry	**Firm's name, code and date of credit event**
Plastics	1314 China(2001/04/16)
Textiles	1440 Tainan Spinning (1995/10/12), 1441 Tah Tong Textile (2000/03/28), 1466 Acelon C&F (2001/02/20), 1438 Yu Foong (2001/08/10), 1414 Tung Ho Spinning (2001/12/07), 1464 De Licacy (2004/06/25), 1432 Taroko (2005/04/04), 1449 Chia Her (2005/08/30), 1459 Lan Fa Textile (2005/11/25)
Electric Machinery	1506 Right Way (1999/01/16), 4532 Rechi Precision (2005/01/10)
Electric and Cable	1613 Tai-I Electric (2001/10/22)
Chemical	1722 Taiwan Fertilizer (1999/10/13), 1718 China Man-Made Fiber (2001/04/24)
Biotech. and Medical	1707 Grape King (2000/10/26)
Glass and Ceramic	1806 Champion Bldg (2000/04/19), 1805 KPT Industries (2002/06/02)
Iron and Steel	2020 Mayer Steel (1999/01/23), 2017 Quintain Steel (2000/07/27), 2028 Wei Chih Steel (2000/10/31), 2014 Chung Hung Steel (2001/07/05), 2007 Yieh Hsing (2001/07/05), 2023 Yieh Phui (2001/07/05), 2025 Chien Shing Stainles (2001/10/24), 2024 Chih Lien (2001/11/09)
Rubber	2101 Nan Kang Tire (2000/09/06)
Automobile	2206 Sanyang (2000/05/31)
Electronics	2328 Pan International (1998/11/09), 2429 Qualitek Electronics (2006/08/30)
Semiconductor	2342 Mosel Vitelic (2003/04/18), 2329 Orient Semi (2003/06/30), 6145 Power Quotient (2003/08/15)
Computer and Peripheral	2331 Elitegroup (1998/10/20), 2358 Mag Tech (2001/07/28)
Optoelectronic	2491 Infodisc (2004/08/23)
Elec. Products Dist	2348 Veutron (2000/09/07), 2494 Turbocomm (2004/04/15), 2496 Prime Optical Fiber (2005/10/28)
Information Service	3021 Welltend (2004/07/26)
Other Electronic	2350 Universal Scientific (1999/01/23), 2354 Foxconn Technology (1999/04/03), 3004 NAFCO (2004/09/23)
Building and Cons.	1442 Advancetek Ent. (1999/02/02), 2505 Kuo Yang Const. (1999/03/20), 2539 Sakura Development (1999/03/22), 1808 Kobin (1999/05/24), 2528 Crowell Development (2000/04/28), 2841 Crowell Development (2000/05/14), 2540 Jin Shang Chang (2000/11/10), 2527 Hung Ching (2000/12/27), 2537 Ezplace (2001/01/12), 2530 Delpha Const. (2001/06/02), 2506 Pacific Construction (2001/10/16), 2538 Kee Tai Properties (2002/04/29)
Shipping and Trans.	2613 China Container (2000/11/07)
Others	9911 Taiwan Sakura (1999/01/26), 9922 UB Office Systems (1999/10/05), 9906 Corner (2000/10/27), 2904 Pan Overseas Corp. (2001/08/03), 9902 Tidehold (2003/08/06)

Note- 1 Numbers in parentheses denote date of credit event.
2. The front of the firm's name is the firm's code.

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