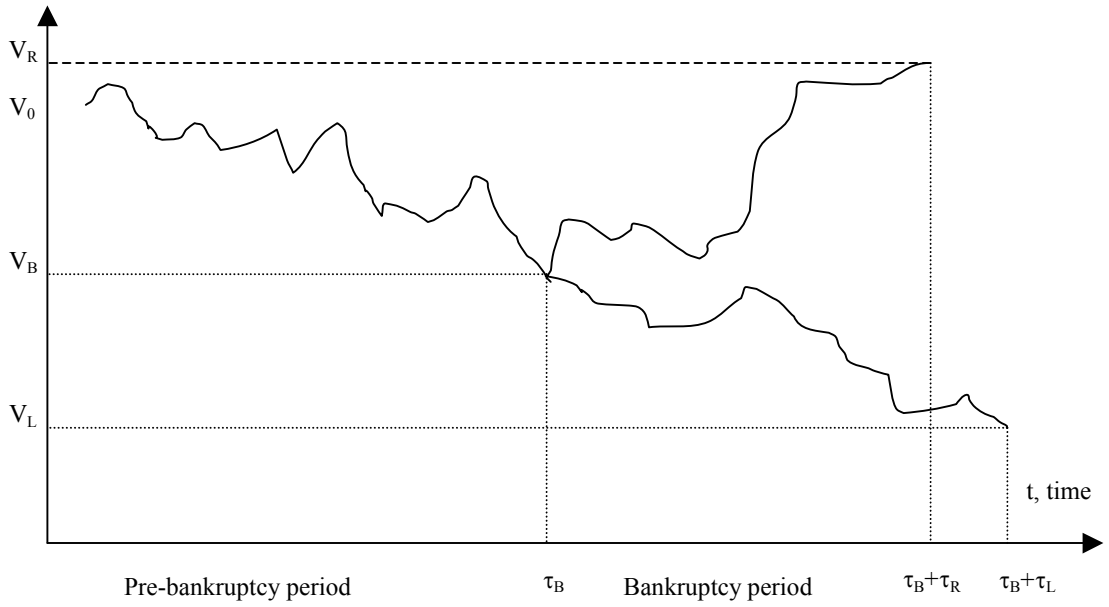

Figure 1.
The Time Line of the Model.

There are *two periods* in the model: the *pre-bankruptcy period* and *the bankruptcy period.* In the pre-bankruptcy period, normal operations continue until V drops to V_B in time $\tau=\tau_B$. In the bankruptcy period all payouts are frozen until either $V=V_L$ or $V=V_R$, whichever comes first. At $V=V_L$, which occurs τ_L years after default as long as $\tau_L<\tau_R$, the firm is liquidated with all the proceeds being given to the creditors. At $V=V_R$, which happens τ_R years after default as long as $\tau_R<\tau_L$, the reorganization plan is adopted, and the firm exits bankruptcy.

Table 1.
Notation and Definitions.

Parameter	Definition
V_0	Initial value of assets
P	Total principal amount
C	Coupon for the original issue
T	Maturity
δ	Payout rate in pre-bankruptcy period
r	Risk-free rate
σ	Volatility of the value in pre-bankruptcy period
b	Bankruptcy cost flow rate in bankruptcy period
ω	Volatility of the value in bankruptcy period
α	Liquidation costs
θ	V_L/V_B
K	Exit cost
τ	Corporate tax rate
V_B	Bankruptcy period trigger

Table 1 – Continued.
Notation and Definitions.

Parameter	Definition
V_R	The value of the assets at which the debtor proposes a reorganization plan
V_L	The value of the assets at which the firm is liquidated
μ^-	$\mu^- = \frac{r - \delta - .5\sigma^2}{\sigma^2}$
ν^-	$\nu^- = \sqrt{(\mu^-)^2 + \frac{2r}{\sigma^2}}$
λ	$\lambda_{1,2}(X) = \frac{\pm\sigma^2\nu^- t - X}{\sigma^2\sqrt{t}}$
γ^-	$\gamma^-_{1,2} = -\mu^- \pm \nu^-$
μ^+	$\mu^+ = \frac{r - b - .5\omega^2}{\omega^2}$
ν^+	$\nu^+ = \sqrt{(\mu^+)^2 + \frac{2r}{\omega^2}}$
γ^+	$\gamma^+_{1,2} = -\mu^+ \pm \nu^+$

Table 2.
Calibration Results.

Table 2 contains calibration results and implied credit spreads based on both the Leland and Toft (1996) model and our two-period endogenous bankruptcy model. Here we consider the case of a 10-year bond and use the exact default and reorganization triggers.
Panel A contains calibration results and implied credit spreads based on the Leland and Toft (1996) model. The implied asset volatility, σ, liquidation costs, α, the maximum debt maturity, T, and the asset risk premia for Leland and Toft's model are reported in columns 2-5 of Panels A.
Panel B contains calibration results and implied credit spreads based on our two-period model. For bonds of each credit rating category, model parameters, V_0, σ, b, T and θ are fitted to match the target initial leverage ratio, equity premium, cumulative default probability over a 10-year horizon, recovery rate, the average time firms spend in Chapter 11 and the frequency of successful reorganizations. The implied asset volatility in the pre-bankruptcy period, the flow of bankruptcy costs, b, the maximum debt maturity, T, the asset risk premium, θ and initial value of assets, V_0, are reported in columns 2-7of Panel B. The following values were used for α, K and ω: α=13%, K=.18P and ω=21%.
Panel C contains calibration results and implied credit spreads based on the Leland and Toft (1996) model. Here we present the calibration results for the LT model controlling for the time to maturity. In particular, when calibrating the LT model, we set the time to maturity to be equal to that implied by the calibration of our model (as reported in Panel B) in each case of different credit rating.

Panel A. Leland and Toft.

Credit Rating	Implied Parameters				Calculated Credit Spread (bp)	Avg. Yield Spread (bp)	% of Spread due to Default Risk
	Asset Vol., %	Liquid. Costs, α, %	Max. maturity, yrs	Asset Risk Prem., %			
Aaa	31.71	1.22	10.0	4.65	9.49	63	15.06
Aa	26.53	11.34	10.0	4.36	13.46	91	14.79
A	21.95	19.54	10.0	3.97	22.10	123	17.97
Baa	20.34	22.25	10.0	3.54	51.57	194	26.58
Ba	25.92	12.47	10.0	3.33	167.63	320	52.38
B	30.94	2.79	10.0	3.19	338.36	470	71.99

Table 2 - Continued.
Calibration Results.

Panel B. Our Two-Period Model

Credit Rating	Implied Parameters						Calculated Credit Spread (bp)	Avg. Yield Spread (bp)	% of Spread due to Default Risk
	Asset Vol., %	Flow of Bankr. Costs, b, %	Max. maturity, yrs	Asset Risk Prem., %	θ	V_0			
Aaa	20.25	.609	10.28	4.62	.760	759.51	16.95	63	26.91
Aa	15.38	.609	15.34	4.31	.760	463.17	28.69	91	31.53
A	10.79	.609	26.76	3.98	.760	299.17	63.76	123	51.84
Baa	8.22	.741	46.38	3.86	.780	202.59	180.65	194	93.12
Ba	11.31	1.17	28.13	3.63	.831	153.61	319.99	320	100.00
B	15.91	1.81	17.35	3.46	.886	118.65	469.99	470	100.00

Table 2 - Continued.
Calibration Results.

Panel C. Leland and Toft

Credit Rating	Implied				Calculated Credit Spread (bp)	Avg. Yield Spread (bp)	% of Spread due to Default Risk
	Asset Vol., %	Liquid. Costs, α, %	Max. maturity, yrs	Asset Risk Prem., %			
Aaa	31.41	0.97	10.28	4.65	9.40	63	14.92
Aa	23. 45	6.74	15.34	4.38	12.10	91	13.30
A	17.90	8.52	26.76	4.04	17.52	123	14.24
Baa	16.18	6.22	46.38	3.71	29.79	194	15.36
Ba	20.71	1.50	28.13	3.42	91.10	320	28.47
B	26.50	-2.72	17.35	3.20	231.54	470	49.26

Table 3.
Relationship Between the Mean Duration of Bankruptcy Period and Liquidation Cost, α.

The probability of the event $\tau_R<\tau_L$ (V_R is reached sooner than V_L) is denoted as $P(\tau_R<\tau_L)$. The values of parameters ω and K are equal to .21 and .18P, respectively. The values of the remaining parameters are fixed at their values obtained in calibration.

Credit Spread, basis points	Mean Time in Bankruptcy, years	$P(\tau_R<\tau_L)$, %	α
44.89	4.06	80.93	0.02
47.15	3.88	80.96	0.04
49.58	3.66	81.04	0.06
52.23	3.41	81.14	0.08
55.18	3.08	81.31	0.10
58.63	2.63	81.64	0.12
63.76	1.7	82.98	0.14

Table 4.
Relationship Between the Mean Duration of Bankruptcy Period and Pre-Bankruptcy Volatility, σ.

The probability of the event $\tau_R<\tau_L$ (V_R is reached sooner than V_L) is denoted as $P(\tau_R<\tau_L)$. The values of parameters ω, α and K are equal to .21, .14 and .18P, respectively. The values of the remaining parameters are fixed at their values obtained in calibration.

Credit Spread, basis points	Mean Time in Bankruptcy, years	$P(\tau_R<\tau_L)$, %	σ
53.41	1.20	84.52	0.1
111.93	2.69	81.58	0.14
175.77	3.55	81.09	0.18
240.75	4.28	80.88	0.22
306.32	4.97	80.77	0.26
372.60	5.62	80.71	0.3
439.85	6.26	80.68	0.34
508.32	6.88	80.66	0.38
543.08	7.19	80.65	0.4

Table 5.
Relationship Between the Mean Duration of Bankruptcy Period and Maturity at Origination, T.

The probability of the event $\tau_R<\tau_L$ (V_R is reached sooner than V_L) is denoted as $P(\tau_R<\tau_L)$. The values of parameters ω, α and K are equal to .21, .14 and .18P, respectively. The values of the remaining parameters are fixed at their values obtained in calibration.

Mean Time in Bankruptcy, years	$P(\tau_R<\tau_L)$, %	T, years
1.47	83.57	25
1.61	83.19	26
1.73	82.92	27
1.82	82.72	28
1.90	82.56	29
1.98	82.43	30
2.05	82.33	31
2.11	82.23	32
2.16	82.15	33
2.21	82.08	34
2.26	82.02	35

Table 6.
Relationship Between the Mean Duration of Bankruptcy Period and Bankruptcy Period Volatility, ω.

The probability of the event $\tau_R<\tau_L$ (V_R is reached sooner than V_L) is denoted as $P(\tau_R<\tau_L)$. The values of parameters α and K are equal to .14 and .18P, respectively. The values of the remaining parameters are fixed at their values obtained in calibration.

Credit Spread, basis points	Mean Time in Bankruptcy, years	$P(\tau_R<\tau_L)$, %	ω
63.76	1.7	82.98	0.21
41.05	2.64	78.41	0.22
27.85	3.23	74.55	0.23
19.60	3.68	70.82	0.24
14.23	4.06	67.19	0.25
10.62	4.36	63.64	0.26
8.12	4.62	60.21	0.27
6.35	4.84	56.90	0.28
5.07	5.02	53.72	0.29
4.11	5.17	50.69	0.30