Continent debt and performance pricing in an optimal capital structure model*

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* The views expressed herein are those of the authors and not necessarily those of the Federal Reserve Bank of Richmond or the Federal Reserve System.
Motivation: financial reorganization of firms

- In the U.S., corporate financial reorganization (Chapter 11) is much more common than liquidation (Chapter 7).
  - In a large sample of filings from 1995-2001, Bris et al (2006) find that 80% of cases were Chapter 11 reorganizations.
  - In Copustat data 1980-2014, Corbea and D’Erazmo (2017) find that 80% of bankruptcy exists were Chapter 11.

- Chapter 7 and 11 filers have different capital structures:
  - e.g., Corbea and D’Erazmo (2017) show that
    - Chapter 7 filers have lower income/assets,
    - Chapter 11 filers have higher leverage (debt/assets).

- Chapter 7 and 11 filers have different recovery rates and security values

- The choice of Chapter 7 and/or 11 bankruptcy is endogenous.

- Models needed to study positive and normative questions on reorganization vs liquidation.
Our model: optimal contract with agency frictions

- We build a model on the trade-off between agency costs and monitoring cost.
  - in the spirit of Jensen (1986) static analysis
  - we add monitoring to DeMarzo and Sannikov (2006) dynamic model
- Monitoring trade-off:
  - when monitored, no information frictions → no risk of liquidation
  - but monitoring entails direct costs (legal, operational, etc.)
- Key assumption: monitoring cannot be applied instantaneously, but only after a spell of search (of an uncertain duration)
  - filing preparation delay, search for debtor-in-possession financing
  - reorganization time, search for new agent needed to re-emerge
  - thus, monitoring and agency are states, not actions
  - search for a transition between agency and monitoring is an action
- Capital structure implementation with:
  - equity, long-term debt, revolving credit line (as in DS)
  - plus: contingent debt
  - plus: performance pricing on the credit line
Some related models

• Papers in the “structural” tradition of Merton and Leland, where debt is issued for its tax advantage:
  • Antill and Grenadier (2018) study leverage and debt pricing allowing for Chapter 11 and 7.
  • Manso et al. (2010) introduce performance-sensitive debt as a screening device for high-growth firms.

• Corbae and D’Erasmo (2017) estimate a GE model with Chapter 11 and 7, and evaluate a “fresh start” policy reform.

• Piskorski and Westerfield (2016) add monitoring to DS as a signal of diversion, which affects performance-based compensation but remains off equilibrium.

• Tchistyi (2016) shows that performance-pricing is a part of an optimal capital structure with correlated cashflows, as the incentive to divert increases when liquidation is nearer.
Outline

• Baseline model of DeMarzo and Sannikov.
• Extension with monitoring.
• Capital structure with contingent debt and performance pricing.
• Market values of securities.
• Comparative statics.
• Recap and next steps
Baseline model: DeMarzo-Sannikov

- A dynamic agency friction
  → liquidation becomes necessary (despite being ex-post inefficient)
- A firm’s cumulative cashflow up to date $t$, $Y_t$, follows

$$dY_t = \mu dt + \sigma dZ_t,$$

$\mu, \sigma > 0$ and $Z_t$ is standard Brownian motion on $(\Omega, \mathcal{F}, P)$.
- A manager with limited liability is hired to run the firm
  - cumulative compensation process $I_t$ is non-decreasing,
  - manager can divert cashflow to private use: $1$ diverted $\rightarrow$ private benefit of $\lambda$, where $0 < \lambda \leq 1$.  
- Firm liquidation value: $L \geq 0$.
- Manager outside option value: $R \geq 0$.
- Contract: $(\tau, I_t)$, where
  - $\tau$ is the firm liquidation date (a stopping time)
  $\rightarrow$ the manager is dismissed with outside option $R$. 
Baseline model: payoffs

- Agent chooses a reporting process $d\hat{Y}_t \leq dY_t$ to maximize

$$\mathbb{E} \left[ \int_0^\tau e^{-\gamma t} \left( dI_t + \lambda (dY_t - d\hat{Y}_t) \right) + e^{-\gamma \tau} R \right]$$

where $\gamma > 0$ is the time preference rate.

- Under an IC contract, $d\hat{Y}_t = dY_t$ at all $t$.

- The firm’s payoff is

$$\mathbb{E} \left[ \int_0^\tau e^{-rt} (\mu dt - dI_t) + e^{-r\tau} L \right].$$

- The agent is impatient: $\gamma > r > 0$. 
Baseline model: recursive representation

- State variable: the agent's continuation value: $W_t$.
- Representation:
  \[ dW_t = \gamma W_t dt - dI_t + \beta_t (d\hat{Y}_t - \mu dt), \]
  where $\beta_t$ is the sensitivity to the reported cash flow.
- Firm's profit function with just liquidation: $b_L(W_t)$.
- The contract is IC if $\beta_t \geq \lambda$ at all $t$.
- With $b_L(W_t)$ concave, $\beta_t = \lambda$.
- State variable dynamics under IC:
  \[ dW_t = \gamma W_t dt - dI_t + \lambda \sigma dZ_t. \]
Baseline model: HJB and boundary conditions

- The option to pay the agent implies
  
  \[ b'_L(W) \geq -1 \text{ for all } W. \]

- Agent payment threshold:
  
  \[ W^1 \text{ defined as the lowest } W \text{ such that } b'_L(W) = -1. \]

- The HJB equation for \( b_L \):
  
  \[ rb_L(W) = \mu + \gamma W b'_L(W) + \frac{1}{2} \lambda^2 \sigma^2 b''_L(W). \]

- Agent payment boundary:
  
  \[ rb = \mu - \gamma W. \]

- Boundary conditions for \( b_L \)
  
  \[ rb_L(W^1) = \mu - \gamma W^1, \quad b_L(W^1) = -1 \quad \text{and} \quad b_L(R) = L, \quad b'_L(R) = ? \]
Forward shooting
The profit curve with just liquidation
Model with monitoring: agency stage

- A firm’s cumulative cashflow up to date $t$, $Y_t$, follows

$$dY_t = \mu dt + \sigma dZ_t,$$

$\mu, \sigma > 0$ and $Z_t$ is standard Brownian motion on $(\Omega, \mathcal{F}, P)$.

- A manager with limited liability is hired to run the firm
  - cumulative compensation process $I_t$ is non-decreasing,
  - manager can divert cashflow to private use:
    $\$1$ diverted $\rightarrow$ private benefit of $\$\lambda$, where $0 < \lambda \leq 1$.

- The firm can pay the flow cost $\kappa \geq 0$ to search for a transition to the monitoring stage:
  - when $\kappa$ is being paid, transition to monitoring arrives with Poisson intensity $\rho > 0$,
  - if transition arrives, the manager is forced out, possibly with severance $S_t$.

- Contract: $(\tau, I_t, s_t, S_t)$, where
  - $\tau$ is the manager’s dismissal date,
  - $s_t \in \{0, 1\}$ is the indicator of searching.
Payoffs: agency stage

- Dismissal of the agent can be due to liquidation or transition to monitoring:
  \[
  \tau = \min\{\tau_M, \tau_L\}.
  \]

- Agent chooses a reporting process \(d\hat{Y}_t \leq dY_t\) to maximize
  \[
  \mathbb{E}\left[\int_0^\tau e^{-\gamma t} \left( dI_t + \lambda (dY_t - d\hat{Y}_t) \right) + 1_{\tau=\tau_L} e^{-\gamma \tau} R + 1_{\tau=\tau_M} e^{-r \tau} (R + S_t) \right]
  \]
  where \(\gamma > 0\) is the time preference rate, \(R > 0\) is outside option.

- Under an IC contract, \(d\hat{Y}_t = dY_t\) at all \(t\).

- The firm’s payoff is
  \[
  \mathbb{E}\left[\int_0^\tau e^{-rt} \left( (\mu - s_t \kappa) dt - dI_t \right) + 1_{\tau=\tau_L} e^{-r \tau} L + 1_{\tau=\tau_M} e^{-r \tau_M} (M - S_t) \right]
  \]
  where \(M\) is the value of the firm entering the monitoring state.
Monitoring stage

- Firm run by expert/trustee → no agency frictions.
- Flow cost of monitoring and search for exit: $\kappa_B dt$.
- Firm finds a new agent and transitions back to the agency stage with Poisson intensity $\phi > 0$.
- Firm value in monitoring:

$$M = \mathbb{E} \left[ \int_0^{\hat{\tau}} e^{-rt} (\mu - \kappa_B) dt + e^{-r\hat{\tau}} b_0 \right],$$

where $\hat{\tau}$ is the time of exit from monitoring, $r$ is the discount rate, and $b_0$ is the value of starting out in agency with a new agent.

Integrating:

$$(r + \phi) M = \mu - \kappa_B + \phi b_0.$$

- Assumption: $\kappa_B \geq \mu$.
  Implication: $M < b_0$, i.e., monitoring is a costly state.
Recursive representation in the agency state

- State variable: the agent’s continuation value $W_t$.
- Representation:

$$dW_t = \gamma W_t dt - dI_t + \beta_t (d\hat{Y}_t - \mu dt) + s_t \Delta_t (dN_t - \rho dt),$$

where $\beta_t$ is the sensitivity to the reported cash flow, $\Delta_t$ is the sensitivity to the switch to the monitoring state, $N_t$ is a Poisson process with arrival rate $\rho > 0$.

- Firm’s profit function: $b(W_t)$.
- The contract is IC if $\beta_t \geq \lambda$ at all $t$. With $b(W_t)$ concave, $\beta_t = \lambda$. 
State variable dynamics and HJB

- At all $t < \tau$ we have $dN_t = 0$ and $\Delta_t = R + S_t - W_t$, so
  
  $$dW_t = \gamma W_t dt - dI_t + \lambda \sigma dB_t + s_t(R + S_t - W_t)(0 - \rho dt),$$
  
i.e.,
  
  $$dW_t = ((\gamma + s_t \rho)W_t - s_t \rho (R + S_t))dt - dI_t + \lambda \sigma dB_t.$$

- The new terms are due to the risk of jump at dismissal.
  - changes to the slope and the level of the drift term

- The HJB equation for the firm’s value $b$ is
  
  $$rb(W) = \max_{s, S} \left( \mu - s \kappa + ((\gamma + s \rho)W - s \rho (R + S))b'(W) + \frac{1}{2} \lambda^2 \sigma^2 b''(W) + s \rho (M - S - b(W)) \right).$$
Condition for search to be used

- Recall $b_L(W)$ as the value of the firm when liquidation is the only option, as in DS:

$$rb_L(W) = \mu + \gamma W b'_L(W) + \frac{1}{2} \lambda^2 \sigma^2 b''_L(W).$$

- Let $b_{L,0} = \max_W b_L(W)$.

- Let $M_L$ be the value in the monitoring state if a transition to agency is followed by liquidation:

$$M_L = \frac{\mu - \kappa B}{r + \phi} + \frac{\phi}{r + \phi} b_{L,0}.$$

- Searching for a transition to monitoring will be chosen at least in some states iff

$$-\kappa + \rho (M_L - L) > 0.$$
LEMMA 1
Optimal severance is $S_t = 0$ at all $t$.

- Optimal $S$ maximizes $-s \rho S b'(W) - s \rho S = (-b'(W) - 1)s \rho S$, but $b'(W) > -1$ at all $W < W^1$.

LEMMA 2
The region of search for monitoring is an interval $(R, \tilde{W}]$, where $\tilde{W} < W_0 := \arg\max b(W)$.

- The gain from searching, $-\kappa + \rho(W - R)b'(W) + \rho(M - b(W))$, is monotone in $W$.
- The search costs, $\kappa$ and $\kappa_B$, imply no search at $W > W_0$.
- The contract starts out in the no-search region.
Verification

**Theorem**

The unique solution \( b \) of the HJB equation

\[
rb(W) = \mu - \kappa 1_{W \leq \tilde{W}} + (\gamma W + 1_{W \leq \tilde{W}} \rho(W - R)) b'(W)
\]

\[
+ \frac{1}{2} \lambda^2 \sigma^2 b''(W) + 1_{W \leq \tilde{W}} \rho(M - b(W)),
\]

where

\[
 rM = \frac{r}{r + \phi} (\mu - \kappa_B) + \frac{\phi}{r + \phi} rb_0,
\]

with boundary conditions

\( b'(W^1) = -1 \) at a point \( W^1 \) such that \( rb(W^1) + \gamma W^1 = \mu \),

\( b(R) = L \)

is the true value function for the firm under the optimal contract.
Summary of optimal contract dynamics

- Starts out at $W_0$ with drift $\gamma W_t > 0$ and volatility $\lambda > 0$.
- Compensation is paid when $W_t$ hits the payment threshold $W^1$, so $W_t \leq W^1$ at all $t$.
- When $W_t$ drops below the threshold $\tilde{W} < W^1$, the firm searches for a transition from agency to monitoring:
  - the drift of $W_t$ jumps to $\gamma W_t + \rho (W_t - R) > \gamma W_t$,
  - the firm pays the search cost $\kappa dt$.
- The firm is liquidated if $W_t$ hits the agent’s outside option value $R < \tilde{W}$.
- If a transition to monitoring arrives before $W_t$ hits $R$:
  - the agent is dismissed with severance $S_t = 0$,
  - firm pays monitoring costs $\kappa_B dt$ and searches for a new agent.
- Reorganization and liquidation are both possible exits from agency.
Computation of the solution

\[ b(W) = \max\{b_{NS}(W), b_S(W)\}, \]

where we define

\[ rb_{NS}(W) = \mu + \gamma W b'_{NS}(W) + \frac{1}{2} \lambda^2 \sigma^2 b''_{NS}(W), \]

\[ rb_S(W) = \mu - \kappa + ((\gamma + \rho) W - \rho R) b'_S(W) + \frac{1}{2} \lambda^2 \sigma^2 b''_S(W) + \rho (M - b_S(W)). \]

- **Backward-shooting** from the payoff boundary point \( W^1 \).
- Splicing point \( \tilde{W} \) found by smooth pasting and super-contact:
  \[ \kappa = \rho (W - R) b'_{NS}(W) + \rho (M - b_{NS}(W)). \]
- \( M \) known from just \( b_{NS} \): model solvable in a single pass.
Solution with liquidation or monitoring
Capital structure implementation

- The owners set up the following capital structure:
  - credit line with balance $B_t$, limit $C^L$, and interest rate $i(B_t)$,
  - long-term consol debt with coupon payment flow $x_d$ at all $t$,
  - contingent long-term debt with coupon payment $x_{cd}$ suspended when $B_t > \tilde{C}^L$,
  - equity

- Manager’s compensation: share $\lambda$ of equity.

- The manager controls the cashflow, makes payments to debt-holders, and chooses a dividend policy to maximize her own payoff.
  - Cumulative dividend payment process: $Div_t$.

- Credit line balance dynamics:
  
  $$dB_t = i(B_t)B_t dt + x(B_t)dt + dDiv_t - d\hat{Y}_t$$
Capital structure implementation

Proposition
Let $C^L = \frac{W^1 - R}{\lambda}$ and $\tilde{C}^L = \frac{W^1 - \tilde{W}}{\lambda}$, where $\tilde{W}$ and $W^1$ are determined in the optimal contract. Set:

$$i(B_t) = \begin{cases} 
\gamma & \text{if } B_t < \tilde{C}^L, \\
\gamma + \rho & \text{if } B_t \geq \tilde{C}^L,
\end{cases}$$

$$x_d = \mu - \frac{\gamma}{\lambda} W^1 - \frac{\rho}{\lambda} (W^1 - R),$$

and

$$x_{cd} = \frac{\rho}{\lambda} (W^1 - R).$$

Then the dividend process $Div_t = \frac{I_t}{\lambda}$, the deposit process $\hat{Y}_t = Y_t$, and the balance process $B_t = \frac{W^1 - W_t}{\lambda}$, solve the agent’s optimization problem.
Debt service costs: relief in distress
Market value of securities

\[ V_e(B_t) = \mathbb{E}_t \left[ \int_0^\tau e^{-rt} d\text{Div}_t + e^{-r\tau} \left( 1_{\tau=\tau_L} F_{L,e} + 1_{\tau=\tau_M} F_{M,e} \right) \right], \]

\[ V_d(B_t) = \mathbb{E}_t \left[ \int_0^\tau e^{-rt} x_d dt + e^{-r\tau} \left( 1_{\tau=\tau_L} F_{L,d} + 1_{\tau=\tau_M} F_{M,d} \right) \right], \]

\[ V_{cd}(B_t) = \mathbb{E}_t \left[ \int_0^\tau e^{-rt} 1_{B_t \leq \tilde{C}_L} x_{cd} dt + e^{-r\tau} \left( 1_{\tau=\tau_L} F_{L,cd} + 1_{\tau=\tau_M} F_{M,cd} \right) \right], \]

\[ V_{cl}(B_t) = \mathbb{E}_t \left[ \int_0^\tau e^{-rt} d(Y_t - \text{Div}_t) \right. \]

\[ \left. - \int_0^\tau e^{-rt} \left( x_d + 1_{B_t \leq \tilde{C}_L} x_{cd} + 1_{B_t > \tilde{C}_L} \kappa \right) dt \right. \]

\[ + e^{-r\tau} \left( 1_{\tau=\tau_L} F_{L,cl} + 1_{\tau=\tau_M} F_{M,cl} \right) \],

where the constants \( F_{L,sec} \) and \( F_{M,sec} \) follow some seniority rule.
A tool: Feynman-Kac formula

**Lemma 3**

Let $W_t$ follow the equilibrium law of motion for the manager’s continuation value until a stopping time $\tau = \min\{\tau_L, \tau_M\}$. Let $g$ be a function defined on $[R, W^1]$. Let $k, F_L, F_M$ be constant. Then the same function $G$ defined on $[R, W^1]$ solves both

$$G(W_0) = \mathbb{E} \left[ \int_0^\tau e^{-rt} g(W_t) dt - k \int_0^\tau e^{-rt} dI_t ight. \\
\left. + e^{-r\tau} (1_{\tau=\tau_L} F_L + 1_{\tau=\tau_M} F_M) \right]$$

and

$$rG(W) = g(W) + \left( \gamma W + 1_{W \leq \tilde{W}} \rho (W - R) \right) G'(W) \\
+ \frac{1}{2} \lambda^2 \sigma^2 G''(W) + 1_{W \leq \tilde{W}} \rho (F_M - G(W))$$

with boundary conditions $G(R) = F_L$ and $G'(W^1) = -k$. 
Value of securities: a seniority rule

- Example seniority rule:
  1. long-term debt,
  2. contingent debt,
  3. revolving credit line,
  4. equity.

- Flow and terminal payoffs:
  1. \[ F_{L,d} = \min\{D, L\}, \]
     \[ F_{M,d} = \min\{D, M\}, \]
  2. \[ F_{L,cd} = \min\{D_{cd}, L - F_{L,d}\}, \]
     \[ F_{M,cd} = \min\{D_{cd}, M - F_{M,d}\}, \]
  3. \[ F_{L,cl} = \min\{B_\tau, L - F_{L,d} - F_{L,cd}\}, \]
     \[ F_{M,cl} = \min\{B_\tau, M - F_{M,d} - F_{M,cd}\}, \]
  4. nothing.
Value of securities

The graph represents the value of securities as a function of $B$. The graph shows different curves for $V_{el}$, $V_{cd}$, $D_{cd}$, $V_d = D$, and $V_{eq}$. The $x$-axis represents $B$, and the $y$-axis represents the market values of securities.

- $V_{el}$: Black curve.
- $V_{cd}$: Blue curve.
- $D_{cd}$: Dotted blue curve.
- $V_d = D$: Green curve.
- $V_{eq}$: Red curve.
## Comparative Statics

**Table:** Comparative statics for the capital structure.

<table>
<thead>
<tr>
<th></th>
<th>$dC^L$</th>
<th>$dD$</th>
<th>$dD_{cd}$</th>
<th>$dW_0$</th>
<th>$db_0$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$d\rho$</td>
<td>$-$</td>
<td>$+$</td>
<td>$+$</td>
<td>$-$</td>
<td>$+$</td>
</tr>
<tr>
<td>$d\kappa$</td>
<td>$+$</td>
<td>$-$</td>
<td>$-$</td>
<td>$+$</td>
<td>$-$</td>
</tr>
<tr>
<td>$d\phi$</td>
<td>$-$</td>
<td>$+$</td>
<td>$+$</td>
<td>$-$</td>
<td>$+$</td>
</tr>
<tr>
<td>$d\kappa_B$</td>
<td>$+$</td>
<td>$-$</td>
<td>$-$</td>
<td>$+$</td>
<td>$-$</td>
</tr>
<tr>
<td>$dL$</td>
<td>$-$</td>
<td>$+$</td>
<td>$+$</td>
<td>$-$</td>
<td>$+$</td>
</tr>
<tr>
<td>$dR$</td>
<td>$-$</td>
<td>$-$</td>
<td>$-$</td>
<td>$+$</td>
<td>$-$</td>
</tr>
<tr>
<td>$d\gamma$</td>
<td>$-$</td>
<td>$\pm$</td>
<td>$\pm$</td>
<td>$-$</td>
<td>$-$</td>
</tr>
<tr>
<td>$d\sigma^2$</td>
<td>$+$</td>
<td>$-$</td>
<td>$-$</td>
<td>$\pm$</td>
<td>$-$</td>
</tr>
</tbody>
</table>
Recap and next steps

- We extend the DS model of optimal capital structure to allow for financial restructuring as an exit, in addition to liquidation.

- We assume transitions to and out of restructuring are slow.
  - a definition of financial distress

- In an optimal contract, in distress, the manager’s faces a risk of dismissal and, correspondingly, a higher drift in her continuation value.

- An optimal capital structure has contingent debt and performance pricing.

- Next steps:
  - testing the perditions,
  - relaxing the assumption of creditor commitment,
  - GE effects.
Table 1: Balance Sheet and Corporate Bankruptcies 1980 to 2014

<table>
<thead>
<tr>
<th>Moment</th>
<th>Non-Bankrupt</th>
<th>Chapter 11</th>
<th>Chapter 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of Exit (%)</td>
<td>1.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fraction of Exit by Chapter 7 (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fraction of Chapter 11 Bankruptcy (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital (millions 1983$)</td>
<td>953.18</td>
<td>35.61</td>
<td>408.78***</td>
</tr>
<tr>
<td>Cash (millions 1983$)</td>
<td>125.77</td>
<td>9.87</td>
<td>52.84***</td>
</tr>
<tr>
<td>Assets (millions 1983$)</td>
<td>1371.17</td>
<td>95.59</td>
<td>503.79***</td>
</tr>
<tr>
<td>Op. Income (EBITDA) / Assets (%)</td>
<td>5.49</td>
<td>10.90</td>
<td>-8.34*</td>
</tr>
<tr>
<td>Net Debt / Assets (%)</td>
<td>9.11</td>
<td>11.30</td>
<td>29.61***</td>
</tr>
<tr>
<td>Total Debt / Assets (%)</td>
<td>28.31</td>
<td>24.45</td>
<td>41.99***</td>
</tr>
<tr>
<td>Frac. Firms with Negative Net Debt (%)</td>
<td>36.07</td>
<td>-</td>
<td>21.88*</td>
</tr>
<tr>
<td>Secured Debt / Total Debt (%)</td>
<td>43.90</td>
<td>40.77</td>
<td>47.63*</td>
</tr>
<tr>
<td>Interest Coverage (EBITDA/Interest)</td>
<td>14.01</td>
<td>4.89</td>
<td>-0.22*</td>
</tr>
<tr>
<td>Equity Issuance / Assets (%)</td>
<td>4.70</td>
<td>0.06</td>
<td>2.84*</td>
</tr>
<tr>
<td>Fraction Firms Issuing Equity (%)</td>
<td>22.04</td>
<td>-</td>
<td>13.14*</td>
</tr>
<tr>
<td>Net Investment / Assets (%)</td>
<td>1.16</td>
<td>0.34</td>
<td>-2.94*</td>
</tr>
<tr>
<td>Dividend / Assets (%)</td>
<td>3.49</td>
<td>2.03</td>
<td>1.80*</td>
</tr>
<tr>
<td>Z-score</td>
<td>3.74</td>
<td>3.20</td>
<td>-1.36***</td>
</tr>
<tr>
<td>DD Prob. of Default (%)</td>
<td>2.13</td>
<td>0.01</td>
<td>3.60*</td>
</tr>
</tbody>
</table>

Note: See Appendix A1 for a detailed definition of variables and the construction of bankruptcy and exit indicators. Medians (average) reported in the table correspond to the time series average of the cross-sectional median (mean) obtained for every year in our sample. Test for differences in means at 10% level of significance: * denotes Chapter 11 different from non-bankrupt, ** denotes Chapter 7 different from Non-bankrupt, *** denotes Chapter 11 different from Chapter 7. DD, distance to default, EBITDA, earnings before interest, tax, depreciation and authorization.