

Discussion of “What We Can Learn from Contingent Claims Analysis”

John Heaton
University of Chicago and NBER

September 13, 2012

Basic Issues:

- Identifying important risks:
 - ▶ Bankruptcy
 - ▶ Tail risks
 - ▶ Systematic risks
 - ▶ Systemic risks
- Signals:
 - ▶ Firm level, industry level, macro level quantities
 - ▶ Security prices:
 - ▶ Equity
 - ▶ Bond prices
 - ▶ CDS
 - ▶ Option prices
 - ▶ ...

Market Prices

- Help to identify shocks
- Prices and contracts
 - ▶ Feedback loops from collateral restrictions, . . .
 - ▶ . . .
- Market prices and capital requirements
 - ▶ Impact on stability of markets
 - ▶ Impact on incentives
 - ▶ Variation in risk premia (risk-aversion) impacts required capital
- Useful prices may not be observable: e.g. corporate bonds

Contingent Claim Approach

- Many “standard” securities have contingent claims imbedded in them:
 - ▶ Equity: call option on the firm where the strike price is the promised payments to bond holders
 - ▶ Government guarantees
 - ▶ CDS
 - ▶ ...

Example: default probabilities

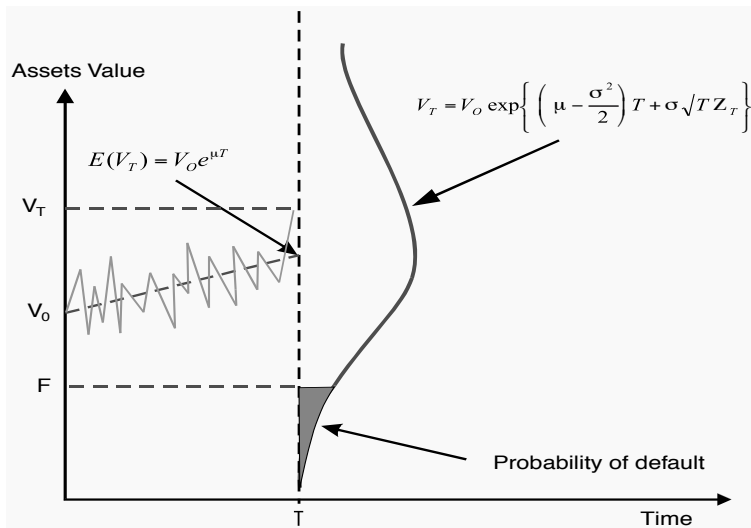


Fig. 7. Distribution of the firm's assets value at maturity of the debt obligation.

Default characteristics

- Obtain

- ▶ Expected Default Frequency:

$$p_T = \Pr[V_T < F | V_0] = N(-d_2)$$

- ▶ Distance to Default (DD)

$$d_2 = \frac{\ln\left(\frac{V_0}{F}\right) + (\mu - \sigma^2/2) T}{\sigma\sqrt{T}}$$

Estimating Value and Volatility

- What are the unknowns?
 1. V_0 : as book values of assets are unreliable;
 2. σ : the volatility of assets
 3. F : The default point.
- Example: $F = \text{Short Term Debt} + 1/2 \text{ Long Term Debt}$
- The last two items are V_0 and σ .
- What can we observe about a firm?
 - ▶ The market value of equity;
 - ▶ The volatility of equity.

BSM Valuation:

- Equity is a call option on the firm:

$$E_0 = \text{Call}(V_0, K, T, r, \delta, \sigma) = N(d_1) V_0 - Ke^{-r(T-t)} N(d_2)$$

- From here, we can also compute the volatility of equity

$$\sigma_E = N(d_1) \left(\frac{V_0}{E_0} \right) \sigma$$

- Therefore, we set

$$E_0 = \text{Market Value of Equity}; \quad \sigma_E = \text{Volatility of Equity}$$

- We solve two equations in the two unknown V_0 and σ .

Using the Results

- Probability of default:
 - ▶ Depends of V_0, σ, F, μ
 - ▶ Risk-neutral valuation doesn't identify μ
 - ▶ Risk-neutral probabilities versus risk-natural probabilities
 - ▶ Take a stand on μ .
 - ▶ Generic problem: going from risk-neutral to risk-natural probabilities
 - ▶ Use model and/or other information about underlying cash flows

Contingent Claims Approach

- Great to use information from other assets
- Information in covariance structure of returns, prices and cash flows
- Mixing information from all financial markets should prove useful
- Financial markets can provide important signals
- But assumptions/models are needed
- This research represents a very good attempt to use the wide variety of information available.