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

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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

\[ V_T = V_0 \exp\left\{ \left( \mu - \frac{\sigma^2}{2} \right) T + \sigma \sqrt{T} Z_T \right\} \]

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)
    \[ d_2 = \frac{\ln \left( \frac{V_0}{F} \right) + \left( \mu - \sigma^2 / 2 \right) T}{\sigma \sqrt{T}} \]
Estimating Value and Volatility

- What are the unknowns?
  1. $V_0$: as book values of assets are unreliable;
  2. $\sigma$: the volatility of assets
  3. $F$: The default point.

- Example: $F = \text{Short Term Debt} + \frac{1}{2} \text{Long Term Debt}$

- The last two items are $V_0$ and $\sigma$.

- 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 \( \sigma \).
Using the Results

- Probability of default:
  - Depends of $V_0, \sigma, F, \mu$
  - Risk-neutral valuation doesn’t identify $\mu$
  - Risk-neutral probabilities versus risk-natural probabilities
  - Take a stand on $\mu$.
  - 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.