From Decisions to Results

Connecting the dots

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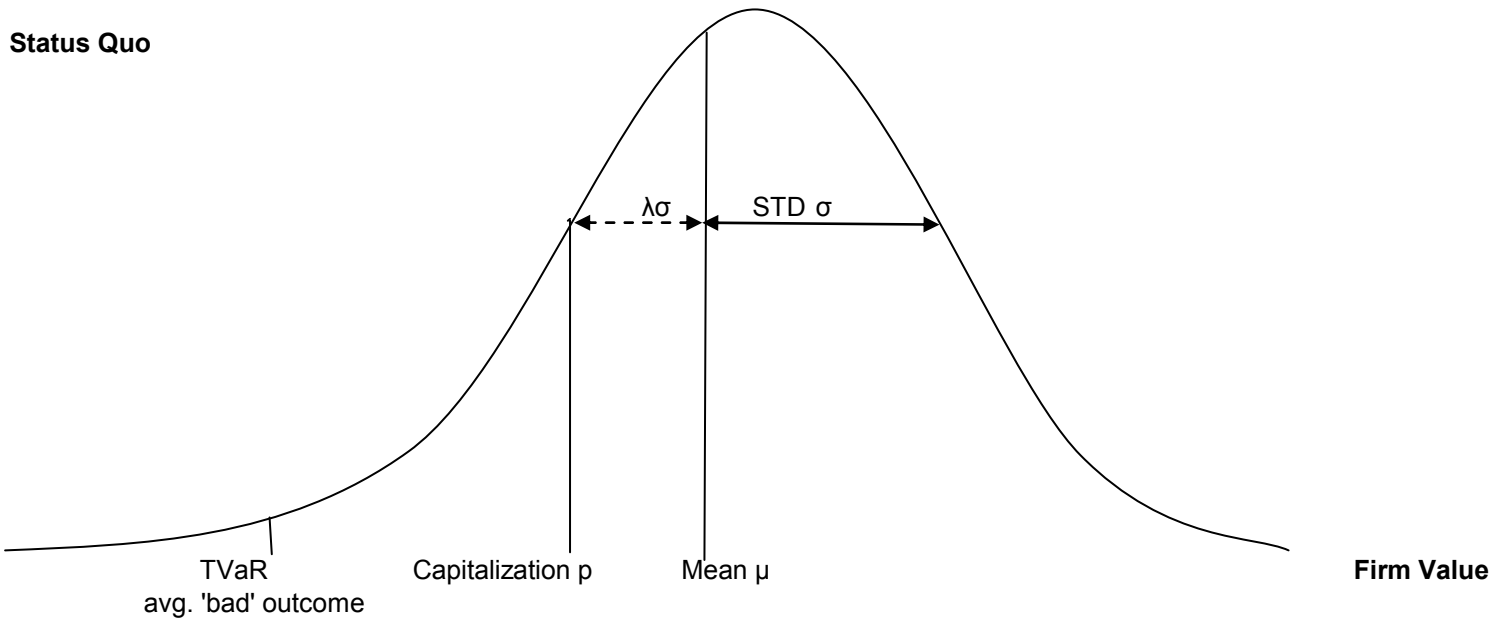
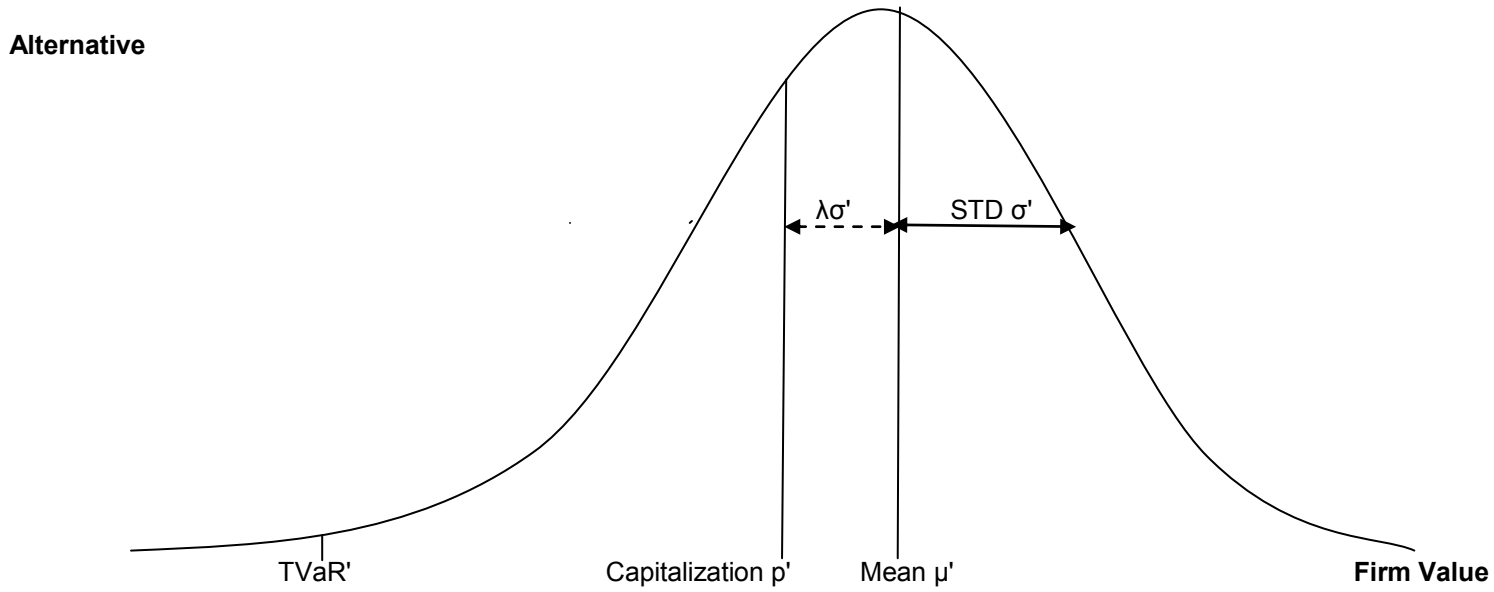


Capital change premiums + investment income – expenses - losses



Alternative better than status quo if p' > p and TVaR' is acceptable.

- Why should companies care about risk? After all the Miller-Modigliani irrelevance theorems (1958) used the law of one price and arbitrage considerations to show that the value of a firm is independent of corporate financial decisions. The answer is markets are not frictionless. Frictions such as bankruptcy costs, agency distortions, tax effects, cost of holding capital and costly access to external capital violate their assumptions. So to the extent a firm is exposed to such frictions, corporate financial decisions may affect firm value.

- For example, if a firm is subject to financial price induced volatility in it's pre-tax income and the firm's effective tax function is convex (say a progressive schedule) then hedging will reduce the firm's expected taxes (as a result of Jensen's inequality).

- For insurers, changes in underwriting, reinsurance, and investments result in changes of aggregate capital, but how does a change in capital affect a firm's stock price and solvency?

- It can be shown that market capitalization (stock prices time shares outstanding) can be decomposed into the expected net present value of future cash flows and a market risk premium.

- The point is management can effect change in future cash flows (as above) as well as influence the market risk premium through the volatility of such future cash flows.

- Technology today allows us to simulate future cash flows under potential capital changes and analyze the resultant implied change in stock price and solvency.

Technical Appendix
The consumption based price p of a payoff x is given by:

$p_t = E_t [m_{t+1} x_{t+1}]$

where $m_{t+1} = \beta u'(c_{t+1}) / u'(c_t)$ is a stochastic discount factor, and
u a utility for consumption.

Suppose an investor can purchase a cash flow stream $\{ d_{t+j} \}$ at price p_t.
(Here the payoff is: $x_{t+1} = p_{t+1} + d_{t+1}$)

$p_t = E_t [m_{t+1} (p_{t+1} + d_{t+1})]$

implies $p_t = E_t \sum_j m_{t, t+j} d_{t+j} = \sum_j E_t [d_{t+j}] / r_{t, t+j} + \sum_j cov_t(d_{t+j}, m_{t, t+j})$ (*)

where $r_{t, t+j} = 1 / E_t [m_{t, t+j}]$ is the jth period risk-free interest rate.

The first term of the right hand side of (*) is the time value of money while the second term is the market risk premium.

Let $V = \sum_j d_{t+j} / r_{t, t+j}$ and $\mu_t = E_t [V]$ and $\sigma_t = (Var_t V)^{1/2}$

Using the standard deviation premium principle, model the market risk premium term as being proportional to σ_t, then from (*) we have:

$\mathbf{p_t = \mu_t - \lambda \sigma_t}$, for some $\lambda > 0$. (**)

So in the case { d } is a firm's net future cash flows, this says p, the firm's market capitalization (share price times shares outstanding), is the mean net present value of a firm's future cash flows, less a multiple of the standard deviation of such. **This is how capital decisions relate to stock price.**

We observe a firm's current stock price from the market and use the current firm capital structure to simulate the firm's future net cash flows, so as to back out the scalar λ. The upshot is that for a property-casualty firm we can posit different capital allocations, reinsurance treaties, asset allocations, share repurchases, dividend policies, debt levels, or essentially any change in capital structure, to then simulate the distribution of resultant cash flows of these 'What if?' alternatives to the status quo. From such distributions we estimate their new means μ' and standard deviations σ' and apply (**) to impute a new capitalizations p' under these alternatives. *Those alternative capital structures for which p' > p are preferred as they increase model share price.* One still needs to examine risk measures (for example expected shortfall) of these desired distributions to see if they are in accord with one's risk appetite.

Alternative capital structure preferred ⇔ p' > p (and shortfall is acceptable).