APPENDIX 6A: Simple monoline formula.

Consider an institution has bought protection from a counterparty on a contract with a payoff defined by a binary event B (B is 0 if the event has not occurred and 1 otherwise). The counterparty will not post collateral against the position. Denote the current time by t and the maturity date of the contract as T. Assuming zero interest rates, the value of this contract is just the expected payoff $V(t) = E[B] = q$. Denoting the counterparty default time by τ and assuming zero recovery, the risky value is:

$$\tilde{V}(t) = E[I(\tau > T)B] = V(t) - E[I(\tau \leq T)B],$$

where $I(\tau \leq T) = p$ is the default probability of the credit insurer in the period of interest. Now assume a simple Gaussian relationship between the counterparty default and payoff. The last term in the above equation, which is identified as a CVA, can be written as:

$$E[I(\tau \leq T)B] = \Phi_{2d}\left(\Phi^{-1}(q), \Phi^{-1}(p); \rho\right),$$

where $\Phi_{2d}(.)$ is a cumulative Gaussian distribution function and ρ is a correlation parameter. This formula is illustrated in Spreadsheet 6.1.