

Project Report: MERTON DEBT MODEL

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1. Executive Summary

This project presents a redesigned capital structure using a new financial contract called the "New Deal." The main goal is to increase the total value of the firm (debt plus equity) by reducing losses that occur during financial distress, while still giving a new investor a required present value profit of \$10. The proposed New Deal removes all expected distress costs. As a result, the total firm value rises to \$84.33, compared to about \$67 in the original setup without the deal.

2. Design of the New Deal

The New Deal is a state-dependent contract whose payments depend on the firm's asset value at maturity. When the asset value is below the debt face value of \$80, the New Deal investor pays the firm exactly enough to cover the shortfall. This guarantees that bondholders are always repaid in full and removes default and bankruptcy.

When the asset value is at least \$80, the firm makes a payment left after paying debt till the assets are big enough(solved using goal seek) and then it pays fixed payment of \$60.02 to the New Deal investor. This amount is calibrated so that the investor earns a present value profit of \$10. Overall, the firm receives support in bad states and pays a fixed premium in good states.

3. Economic Intuition

In the Merton framework, firm value is significantly reduced by financial distress costs, especially given high asset volatility and a large distress penalty.

The New Deal works like insurance against bankruptcy. In low asset value states, the investor injects capital so the firm can repay its debt and avoid distress costs. In higher asset value states, the firm compensates the investor through a fixed payment. The value gained from avoiding bankruptcy losses is shared between the firm's existing claimholders and the new investor.

4. Results from the Simulation

Under risk-neutral valuation, the New Deal fully eliminates expected distress costs. The investor earns the required present value profit of \$10, while the firm's combined debt and equity value increases to \$84.33. Debt becomes effectively risk-free and is valued at \$76.10, which matches the discounted value of a risk-free bond with face value \$80. Equity value after introducing the deal is \$8.23.

5. Conclusion

The New Deal is an effective way to increase firm value by removing costly bankruptcy outcomes. By paying a fixed premium in good states, the firm avoids large distress losses in bad states, which significantly raises total firm value under the given parameters. The payoff diagram visually confirms this result. For low asset values, the

investor's payment rises just enough to eliminate default, while for high asset values the firm's payment is capped at a fixed level. This shape reflects downside protection with limited upside transfer.

Overall, the transaction benefits both shareholders and bondholders, satisfies the investor's required return, and remains consistent with the Merton framework and limited liability rules.