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Contingent Claims Analysis of Corporate Capital Structures: An Empirical Investigation: Discussion

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DISCUSSION

LAWRENCE FISHER*: “Contingent Claims Analysis of Corporate Capital Structures: An Empirical Investigation” by E. Philip Jones, Scott P. Mason, and Eric Rosenfeld (“JMR”) is an ambitious project that shows substantial use of formal analytical skills. First, JMR extend Merton’s [5] contingent claims analysis (CCA) of a firm that has a single, callable debt issue to the case where the firm may have many such issues and where each issue may have sinking-fund requirements and be callable for redemption as a whole or for the sinking fund. Then they attempt to test the implications of their model for the prices of publicly traded debt securities against an alternative “naive” model that assumes there is no risk of default.

It seems to me that there are three crucial assumptions at the heart of Merton’s CCA—three assumptions that may be required to make the model tractable but which may not be sufficiently true for the model to provide useful estimates of security prices. These are

1. Perfect liquidity (and irrelevance of firm size—cf. Fisher [3, 4])
2. Irrelevance of taxes
3. Nonstochastic interest rates

I had hoped that JMR would test one or more of these assumptions. If taken at face value, their empirical results would suggest that CCA takes account of risk in only a very rough and unsatisfactory manner. However, both the particular form of CCA model that JMR have used and their empirical methods are ill-suited for testing the three crucial assumptions. Hence, the applicability of Merton’s CCA to corporate bond markets remains untested.

Formal Model

One of the so-called “standard” assumptions that the authors use—indeed, they show that it implies strange behavior by the firm because the value of a bond does not increase monotonically with the value of the firm—is needlessly unrealistic.¹ That is assumption A8, “Perfect [sic] anti-dilution protection,” which

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¹ The assumption may have been entirely satisfactory in the study from which JMR took it.

requires that no new debt securities be issued until all existing nonequity claims have been extinguished. Another implication, which JMR do not notice, is that, under A8, capital structures with multiple bond issues and a realistic variety of coupon rates—the topic under consideration—cannot come into existence. Moreover, actual indentures seldom contain such provisions. Instead, they are likely to impose an upper limit on the ratio of debt to equity, a lower limit on the ratio of operating income to fixed charges, or restrictions on dividend payments and the sale of assets. Before proceeding further, JMR should replace assumption A8 by another provision that would prevent dilution, allow reasonable behavior by the firm, and still let the model be tractable. Perhaps allowing refunding subject to a limitation on the debt/equity ratio (in market-value terms) and a requirement that the new issue not reduce the duration of liabilities would be a suitably realistic and tractable alternative.

Taking full account of the tax structure would be very complicated. For example, Brick and Fisher [1, 2] have analyzed effects of asymmetries in personal income taxes similar to those noted by JMR with and without corporate income taxes and have derived a number of theoretical propositions. One proposition is that issuing risky debt and valuable equity is not value-maximizing behavior *unless* there is a corporate income tax. However, our formal analysis, which some readers find very difficult and complex, uses a single, discrete time period and does not (and cannot) look at callability.

Either of the following approximate methods might be a feasible way to test the effects of personal taxes on bond prices in the context of CCA. Method one would take cash flows and the riskless rate of interest on alternative before-tax and after-tax bases. Method two would use only before-tax cash flows but would take the yield on a government with the same price or coupon and maturity or duration as the alternative riskless rate. Then the test of the relevance of personal income taxes would be to see which set of interest rates provided the better set of estimated bond valuations.

Moreover, JMR's "naive" model ignores the literature of the last few decades. For example, the CCA model may be tested in the context of Fisher [3], as modified by Tambini [6, p. 221], by seeing whether the yield spreads implied by the CCA valuations replace my instrumental estimators of risk of default and whether the CCA's assumption that liquidity is irrelevant is correct.

Empirical Methods

I have misgivings about most aspects of JMR's empirical analysis. Space permits little more than listing the topics.

1. Sampling procedures: Selection of firms (random samples?) and time periods (why only the most recent five years?)
2. Methods of measurement: Imputation of the value of nonmarketable liabilities (errors in this variable affect the estimated risk of default); confounding of stock-price fluctuations that might indicate risk of default with direct effects of interest-rate fluctuations (to a first-order approximation, the latter do not affect risk of default if the duration of the firm is equal to the duration of the liabilities)

3. Data sources for Corporate and Government bond prices and yields: Some of the *S & P Bond Guide's* "prices" are Standard & Poor's own valuations rather than actual quotations; the *Wall Street Journal's* quotations have been received by telephone and contain frequent errors—machine-readable sources of government bond data are available.
4. Analysis of errors: There are at most 135 independent observations available (27 firms times 5 years), not 305; relative price errors tend to be heteroscedastic with respect to duration; the multiple regression contains two sets of mutually determined "independent" variables

The problems with the empirical analysis further reinforce my conclusion that Merton's contingent claims analysis of risky bonds remains to be tested.

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