JOIM

BOOK REVIEWS

By Mark Kritzman

ASSET PRICING

By John H. Cochrane
(Reviewed by Craig W. French)

Given the innumerable finance books available, I find myself constantly trying to separate the wheat from the chaff (and, sadly, finding a whole lot more of the latter than the former). John Cochrane's "Asset Pricing" (2001, Princeton University Press) is not only wheat, but also perhaps the most finely milled flour baked to perfection into one's favorite dessert, served with a chilled glass of Château d'Yquem. Cochrane identifies his target audience as "economics and finance Ph.D. students, advanced MBA students, or professionals with similar background." Residing in the third camp, I can say from this point of view that *Asset Pricing* could have been subtitled, "the Practitioner's Portable Ph.D."

Academic researchers, students, and practitioners of finance should all value Cochrane's *Asset Pricing* enough to own a copy.

Asset Pricing is extremely readable, as Cochrane stresses economic intuition over formal proofs. The book is structured into four parts: (1) asset pricing theory; (2) asset pricing models; (3) options and interest rates; (4) an empirical survey. Cochrane begins powerfully, introducing us to the notion that the consumption-based asset pricing equation, given by an investor's first-order conditions, is the central formulation in asset pricing; market-based models simply consider the market returns specified in the consumption models to be exogenously determined free parameters. Cochrane emphasizes that *all* factor models are derived as specializations of

the consumption-based model, using extra variables to proxy marginal utility.

In Part 1, Cochrane covers the field from the Law of One Price, to the mean–variance frontier, to the CCAPM, the CAPM, ICAPM and APT, covering both discrete- and continuous-time, as well as market- and consumption-oriented approaches. Cochrane begins with a simple concept: that price equals discounted payoff, and claims that this is the core of all asset pricing theory. I found this section to neatly clarify my understanding and perspective of these models. Cochrane argues effectively for the use of contingent-claims budget constraints as our lens rather than the traditional mean–variance frontiers and beta models: "...it has seemed that there are several

different asset pricing theories: expected return-beta for stocks, yield-curve models for bonds, arbitrage models for options. In fact all three are just cases of $p = E(mx)$." Cochrane makes clear in his theorems of Chapter 4 that the Law of One Price guarantees the existence of a discount factor, and the lack of pure arbitrage implies that the discount factor must be positive. Furthermore, the absence of arbitrage is the result of a positive discount factor, which is the natural result of any sort of utility maximization. Cochrane provides proofs of these relationships for both complete and incomplete markets. I also learned something new (to me) in Chapter 8: in addition to the famous Roll (1977) critique, which states that testing the CAPM using empirical data is impossible because the wealth portfolio is not observable, there is another basic but profound critique due to Hansen and Richard (1987), regarding the conditional versus unconditional CAPMs, which asserts that tests of the CAPM are doomed since the conditioning information of the agents is not observable.

Part 2 introduces us to The Generalized Method of Moments (GMM) approach to free parameter selection, distribution estimation, and model evaluation. GMM is quite powerful and is becoming increasingly popular in empirical studies; one recent example of applied GMM can be found in Andrew Lo's 2002 paper "The Statistics of Sharpe Ratios" (*FAJ* **58**(4)). Cochrane provides the background and methodology for implementing the GMM approach of Hansen and Singleton (1982). Cochrane also covers time-series and cross-sectional (OLS and GLS) regressions for testing linear factor models, with a special emphasis on the Fama–MacBeth (1973) procedure, as well as Maximum Likelihood, which is a special case of GMM, and closes the section with examples of Monte Carlo and bootstrap simulations. Chapter 16, "Which Method?", highlights both Cochrane's pragmatism and masterful intuition of the subject (which is evident throughout the book); I especially enjoyed his brief commentary on statistical philosophy here.

In Part 3, Cochrane covers option pricing and term structure of interest rate models. Two chapters (17 and 18) are hardly enough to do justice to options pricing, which is better served by a complete text such as Cox and Rubinstein's "Options Markets" or Hull's "Options, Futures, and Other Derivatives"; but, given the limited space, Cochrane does an impressive job, using the Law of One Price to describe put-call parity, arbitrage bounds, early exercise rules for American options, and the Black–Scholes and Feynman–Kac solutions as well as real options. Chapter 19 is devoted to bond pricing. Cochrane covers bond basics, yield curves, and term structure models. The Cox–Ingersoll–Ross (1985) model and the Vasicek (1977) models are shown to be special cases of the affine class of term structure models, and Cochrane derives all three. He also provides a nice review of the literature of both affine and non-affine models, including Constantinides' 1992 closed-form solution and many others.

Part 4 provides a well-written survey of the empirical work in the field, specifically on time-series predictability, cross-sectional models, and equity premium puzzles, and new variations on the consumption-based models. Cochrane also provides an introduction to continuous-time stochastic processes in the Appendix, which succinctly covers Brownian motion, time-series diffusions and Ito's lemma. Most chapters include several problems at the end, a nice addition for readers who really want to dig in and explore asset pricing directly. Although solutions are not provided in the book, Cochrane's website, http://gsbwww.uchicago.edu/fac/john.cochrane/research/Papers/, offers them via e-mail to teachers using *Asset Pricing* as a class text.

The website also offers a preview of the book through page 50, which encompasses the Contents and Preface as well as Chapters 1 and 2 in their entirety.

Cochrane's experience as editor of the *Journal of Political Economy* shines through in his clear writing style, and his students at Chicago's GSB, where he is Theodore O. Yntema Professor of Finance, are lucky indeed if this book is any indication of his teaching ability. *Asset Pricing* is not a book to be missed.

CREDIT RISK
*By Darrell Duffie and
Kenneth Singleton
(Reviewed by Lisa R. Goldberg)*

What is credit risk? In a broad sense, it is the distribution of loss resulting from a broken financial agreement. Examples of such agreements are late mortgage payments, defaults on corporate bonds, and failures of swap counterparties to pay a spread. Because credit risk is embedded in all financial transactions, no investor can afford to ignore it.

Increasingly, traders, asset managers, and risk managers rely on quantitative, market-based methods to analyze credit risk. The first modern approach of this type is described in Merton

(1974). In his model, Merton posits that default occurs when debt is due if the value of the firm is less than the face value of the debt. He sets up a simplified capital structure in which equity can be viewed as a call option on firm value. With this insight, Merton applies the newly minted Black–Scholes formula to estimate the firm's default probability.

Since Merton's original work, credit markets, as well as the sophistication of methods to evaluate credit risk, have grown dramatically. There are two main quantitative approaches to estimating credit risk. The *structural* or *cause and effect* models, so named because they center around a model definition of default, descend from the Merton model. An alternative statistical approach is taken through *reduced form* models, which do not rely on a cause and effect definition of default. Rather, they model directly the conditional rate at which default occurs.

Of course, a credit model, in order to be useful, cannot deal exclusively with default probability. It must account for post-default recovery, complicated credit derivative securities, government regulations, market conventions, default contagion, the interplay between credit risk and other financial risks, and a host of other issues.

Credit risk modeling is the subject of a new book by Darrell Duffie and Kenneth Singleton of Stanford University. The authors are eminent researchers and teachers whose work includes substantial contributions to the subject of reduced form credit models. They begin by setting a goal of addressing "three complementary audiences" consisting of risk managers, securities traders, and academic researchers. This goal is ambitious because the interests, the needs, and even the vocabularies of these groups are quite disparate. Nevertheless, Duffie and Singleton do a good job discussing the diverse aspects of their topic in simple language.

Consider, for example, the timing and amount of post-default recovery, which are of course, uncertain. The authors present several recovery models, including their own fractional recovery of market value model, in a clear, informative, even-handed way. The section begins with an empirical discussion explaining the issues, moves to a "soft" mathematical discussion of the modeling techniques, and concludes with the results of tests that compare the different approaches.

Another well-developed subject is the mechanics of credit sensitive securities. The authors provide detailed descriptions of the workings of credit default

swaps, asset swaps, collateralized debt obligations, and other assets. They discuss simple models and algorithms for valuing these instruments. In at least one case, they illustrate some of the pitfalls that arise during implementation.

The strengths of Duffie and Singleton's book include its coverage of the empirical literature and the guidance it gives about specific modeling choices that can be made in different circumstances. These are of interest to experienced readers in all three groups that the authors seek to address.

However, as is inevitable, the book has limitations. *Credit Risk* is not suitable for rank beginners and experts need to go well beyond what Duffie and Singleton have written in order to implement or extend the models. Many subtle and elegant mathematical points are suppressed and in some cases even disparaged as "uninteresting" by the authors. Further, I was surprised to find that, in generalizing a model of forward default rates based on a diffusion process to include jumps, one could "extend the calculations easily." Whether or not the generalization turns out to be straightforward, its analysis rests on sophisticated material that can hardly be deemed "easy." Finally, while individual topics are well explained, the book does not provide a completely satisfying overview of its subject. The complex material addressed in this book would be easier to understand and to retain if readers were given a more conceptual view of how the different aspects of credit models fit together.

In summary, I enjoyed reading *Credit Risk*. Its usefulness vastly overshadows its limitations and I find it a valuable reference to have on my shelf.

References

Merton, R. C. (1974). "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates." *Journal of Finance* **29**, 449–470.