# Book Review

**Asset Pricing, John H. Cochrane.** Princeton, NJ: Princeton University Press, 2001. 530 pp. ISBN 0-691-07498-4.

This is a sparkling, intuitive, makes-it-look-easier-than-it-really-is, gem of a book. It is aimed at advanced students in finance and professionals who would estimate, implement, or test asset pricing models. No swishy behavioral finance here. Cochrane's focus is the classical asset pricing models of frictionless markets and rational expectations. No international asset pricing, either. But the lessons learned are relevant in many empirical contexts.

I have used the book since 1998—shortly after it started circulating in note form—with second-year doctoral students at the University of Washington. Students have typically very much enjoyed it. Cochrane's clever intuition and easy, informal writing style make the book a joy to read. My students also like the summary boxes, which collect and emphasize the main points. I found that the book approaches the material the same way that I had been teaching it, but better.

The book is organized in five parts. The first two, the core of the book, are roughly theory and empirical methods. These account for almost 60% of the page length. Shorter subsequent sections include primers on derivatives and term structure, continuous time models, and a selective empirical survey. I won't say much about the latter sections, except that if you have been a student of Cochrane's published papers you won't be surprised by this material.

Part I uses the stochastic discount factor (SDF) representation of asset pricing models as a unifying theme. Here, $p = E(mx)$, where $p$ is the price, $x$ is the payoff, and $m$ is the stochastic discount factor. The various asset pricing models are just statements identifying $m$. The first part of the book views the consumption-based model, CAPM, APT, and state pricing through the lens of the SDF. There is an interesting Chapter 5 that you could call "modern" mean variance analysis. It explores the Hansen and Richard (1987) representation of mean variance efficiency, relating it to the traditional analysis, and ending with the Hansen and Jagannathan (1991) bounds. Much of the intuition about the models is developed algebraically and with regression. This works for me, and I don't find the graphical representations as helpful. Perhaps those who think better geometrically will have a different response.

Included in Chapter 6 is a nice discussion of the equivalence between the three main paradigms of empirical asset pricing: stochastic discount factor pricing, beta pricing models, and mean variance efficiency. This brings together insights developed in various articles over the last two decades. Watch out here, or your students will be citing Cochrane in their own research, for ideas that should be attributed to earlier authors. In fairness, it is difficult to do the attribution properly without disturbing the flow, and the easy flow is one of the delightful aspects of the book.

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The brief discussion of conditioning information in Chapter 8 expands upon Cochrane (1996), revealing the aptly named "Hansen–Richard" critique. This is the idea that, if the asset pricing model says a portfolio is minimum variance efficient given an unobservable "market" information set, then we have a problem analogous to the famous Roll (1977) critique. We can't infer from a subset that a portfolio is inefficient, conditional on the larger information set. This is a dirty little secret of the conditional asset pricing literature, which few authors dare confront directly.[1]

I predict that one day the "standard" approach to teaching introductory graduate econometrics, especially financial econometrics, will be to start with the generalized method of moments (GMM) and then view everything as a special case. Part II of Cochrane's book is a great example of why this is so appealing. The approach is fundamental, unifying, and once you get the hang of it, everything seems much easier. There is enough GMM here to serve as a handbook for applied researchers. It comes with plenty of pithy, thoughtful advice. The kind of intuitions that, once clearly stated, become obvious. But few would have thought to state them so clearly. Here is where the writing achieves nothing short of brilliance.

Part II provides an insightful discussion of the relations between maximum likelihood (MLE), GMM, cross-sectional regression, and the Fama and MacBeth method in particular. The Fama–MacBeth method is widely used in finance, but somewhat idiosyncratic to the field. Cochrane's treatment integrates these approaches better than anything I have seen written. For example, by casting the two-pass regression approach as a GMM problem, Cochrane shows how the Fama–MacBeth method delivers standard errors that properly account for the cross-sectional dependence in stock returns, and derives and generalizes Shanken's (1992) asymptotic correction for the standard errors. [Following Black, Jensen, and Scholes (1972) and others, he simplifies this part by assuming that the betas come from a time-series regression over the whole sample period, and the same betas are used in each cross-sectional regression.]

Much of the analysis that relates beta pricing to stochastic discount factors, and GMM to maximum likelihood and regression, is conducted using returns, $r$, measured in excess of a risk-free rate. With $E(mr) = 0$, you can't identify the scale of $m$, so beta pricing models using factors, $f$, say that $m_t = 1 - b' f_t$. Some of this is a refined version of Cochrane (1996), also using excess returns and a normalization, and the insights are often beautiful in their simplicity. Here is where the book makes it look easier than it is.

You could forget that the simplification to excess returns is not without some loss of generality, and you don't actually want to estimate your models that way. Limiting the focus to excess returns, you normalize $m_t = 1 - b' f_t$,

[1] A courageous counterexample being Dumas and Solnik (1995).

while in general the model implies $m_t = [1+\delta\mu/\sigma^2]/\delta_0 - [\delta/\delta_0\sigma^2]f_t$, where $\delta_0$ is the expected zero beta rate, $\delta$ is the expected factor premium, $\mu$ is the mean of the factor, and $\sigma^2$ is the variance of the factor [see Ferson and Jagannathan (1996)]. Farnsworth et al. (2000) find that identifying the mean of the SDF by using raw returns and requiring $E(mR_f) = 1$ is important for the empirical performance of SDF models. Using excess returns, and leaving out the moment condition for the zero beta rate, the models won't work as well. Cochrane briefly points out, in the context of cross-sectional regression (p. 281), that it is better to include a risk-free asset as a test asset. He also finds, both analytically and by simulation, that the various methods deliver similar results, once the same moments are involved. Following this logic, it should matter for each method that you work with raw, not excess returns. That, however, is a topic for future research.

Chapters 13–16, which integrate GMM, MLE, and regression approaches, contain several relatively new insights. Chapter 15, in particular, was added shortly before publication, as an outlet for one of John's unpublished working papers. As a result, these chapters are a little choppy. There are some great insights in these chapters, but you have to work to get them organized. If he writes a second edition some day, it should be possible to improve the flow and the clarity of this material. I for one expect to enjoy the second edition as much as I have the first.

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