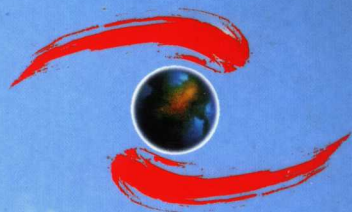


经济与金融高级研究丛书

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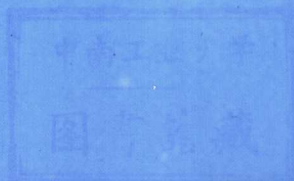


# 金融计量学： 资产定价实证分析

Financial Econometrics: Empirical Analysis of Asset Pricing

周国富 著

Guofu Zhou



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# 经济与金融高级研究丛书

## 出版前言

中国的经济学和金融学研究如何走向世界?这是一个值得探讨的问题。中国经济学者素以刻苦求知、真诚报国为荣。在国内,自改革开放以来经济学者的突出贡献已深得国人认同;在海外,中国的经济学者同样做出了可喜的成绩。但是,国内经济学者的学术成果得到国际上认可的为数寥寥,而海外中国经济学者所取得的学术成果在国内也鲜为人知。同时,国际经济学者的学术成果在国内的传播也很有限。凡此种种,原因当然是多方面的,其中之一是学术传播与交流上的障碍。这些障碍的存在造成彼不知我,我亦不知彼,国内经济学者的学术研究难以走向世界,国际经济学家和海外中国经济学者的学术研究难以走进中国这样一种尴尬的局面。不言而喻,在全球经济一体化趋势主导世界潮流的今天,这种状况不利于中国经济和中国经济学的发展。

随着改革开放的一步步深化,中国经济与世界经济日益接轨。世界各国经济学家对中国经济发展和中国经济研究的兴趣和热情有增无减。海内外中国经济学者的拳拳报国之心也日益高涨。科学无国界,学术交流也无国界。我们相信,学者们的热情与努力将冰释学术交流中的所有障碍。因此,在经济全球化的今天,在经济腾飞指日可待的中国,这套《经济与金融高级研究丛书》的出版是时代的要求,更是我们的历史使命。

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本套丛书将尽可能全面地收录国际经济学者特别是中国经济学者在国际上已获得公认的学术成果。每部著作将基本保留其最初发表在国际刊物上的原貌(或其创作的原貌),由作者按研究专题编纂成书。此举一方面是为了让更多的国人了解这些学者的研究成果,或者至少感知一下国际经济学者和海内外中国经济学者在国际主流经济学发展进程中所迈出的坚实的步伐,从而激励更多的青年学子求知问道;另一方面也是为了使世界各国的经济学者对中国经济学者的研究成果有更多和更全面的了解,或者至少感知到中国的经济学研究并非固步自封置身世界之外,而是与世界同步与潮流并进的。知己知彼,互相交流,这对于繁荣学术是有百利而无一弊的。北京大学出版社真诚地希望更多的海内外学者向我们赐稿,并给我们批评、建议,以助于这项造福世人的学术文化传播事业。

北京大学出版社

# 经济和金融高级研究丛书

## 编者说明

本丛书收录世界各国经济学者特别是海内外中国经济学者从事当代经济学和金融学理论研究和实际研究的前沿成果。就某一专题或者多个专题,作者既可以把已经发表的论文收集成册,也可以编辑整理成一部或多部专著。收集成册的公开发表的论文一律保持其发表时的各刊物排版印制的原貌,以方便读者查寻援引;尚未公开发表的论文则一律保持其创作原貌,以供读者参考。

本丛书主编同时还与海内外众多学者合作主办英文学术刊物 *Annals of Economics and Finance*。此刊物出版尚未发表的至少具有一些原创性的经济学和金融学(英文)论文。如有兴趣借此刊物宣布自己学术思想的学人,敬请寄论文给:

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但愿此丛书和杂志能促进中国经济学者与世界各国经济学者的学术交流,促进中国经济学和金融学研究走向世界主流。

邹恒甫  
于北京大学

## 作者自述

我 1960 年 5 月生于四川成都。始学于成都解北一小,继入八中,然后转入十六中完成初、高中学习。1978 年考入成都理工大学(原成都地质学院)数学师资班。以数学为主,兼修少许地质学。1982 年被中国科学院成都分院数理研究室录取为硕士研究生,学习计算数学,尤其是偏微分方程的差分、有限元方法。1985 年毕业后自费公派到美国杜克大学(Duke University)攻读数学博士学位。1986 年转入经济系,改修计量经济学并兼修国际经济学和发展经济学,1990 年获博士学位。旋即在密苏里州圣路易市的华盛顿大学商学院从事金融学的教学与研究工作。主要研究方向为实证金融学,侧重于资本定价理论、期货和买权模型的实用性、合理性、可行性及实证效果。

饮水思源。借此论文集出版之际,我衷心感谢曾经帮助过我的许许多多的前辈和朋友。特别应当提到的是:伍玉楼老师给予我难忘的小学启蒙;康继鼎教授为我打开了大学知识的大门;吕涛、林群导师为我指出了数学研究的途径;John Geweke 和 Lawrence Moore 教授使我从数学转入经济学变成现实;尤其 Geweke 导师在四年内把一个对经济学一无所知的我推到了世界一流的研究前沿;Campbell Harvey 教授的巨大影响和帮助使丰富多彩的金融学成为我的研究课题。同时,我的成绩也得益于华盛顿大学商学院十年来对我研究课题的巨大资助,更得益于和同事 Phil Dybvig、Kerry Back、Chris Lamoureux 及 Raymond Kan 的富有启发性的讨论和合作。柳长翥、万大庆和汪坚强等朋友们的巨大帮助使许多事情变得容易。我自己的工作如果说算有一点成绩的话,这也是和妻子李惠霞的理解与支持分不开的。

邹恒甫教授的宝贵建议和梁鸿飞先生出色的编辑工作使得此集能与读者见面,特此致谢。并感谢 Elsevier Science Publishers、the Oxford University Press 和 Blackwell Publishers 转让版权,让这些论文能由北京大学出版社出版。

最后,如我在本书英文前言所说,这些论文只是抛砖引玉。希望读者能受到一点启发、激励,能为中国以至世界金融计量学理论及其应用做出杰出的贡献。

周国富

2000 年 8 月 30 日于华盛顿大学 Olin 商学院

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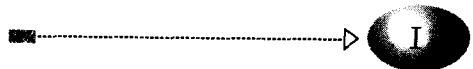
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Blackwell Publishers for articles: 'Asset-Pricing Tests under Alternative Distributions', *The Journal of Finance*, **XL VIII**(5): 1927 – 1942, 1993; 'A Critique of the Stochastic Discount Factor Methodology', *The Journal of Finance*, **LIV**(4): 1221 – 1248, 1999.

The Oxford University Press for articles: 'Analytical GMM Tests: Asset Pricing with Time-Varying Risk Premiums', *The Review of Financial Studies*, **7**(4): 687 – 709, 1994; 'Measuring the Pricing Error of the Arbitrage Pricing Theory', *The Review of Financial Studies*, **9**(2): 557 – 587, 1996; 'Temporary Components of Stock Returns: What Do the Data Tell Us?', *The Review of Financial Studies*, **9**(4): 1033 – 1059, 1996.





# Introduction

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At the invitation of Professor Heng-fu Zou, I collect in this volume papers of empirical finance that are written at least partly by me. To help interested readers toward a better understanding of the issues, I summarize briefly below the main motivations of the papers and point out their potential extensions and relevance for further research.

While empirical finance should include both asset pricing and corporate, the collected papers only focus on the former. If the big picture is desired, survey articles in Jarrow, Maksimovich, and Ziemba (1992) and Maddala and Rao (1996) should provide a good starting point. Of course, constant readings of recent research articles are essential for both learning and making new contributions. Even in empirical asset pricing, there are enormous interesting problems to solve and many (potentially profitable) applications to explore. Some of these problems are reviewed in the well-known PhD text book by Campbell, Lo, and MacKinlay (1997). In contrast, the papers here are more focused, mainly on testing the implications of theoretical asset pricing models.

In testing an asset pricing model or conducting research in empirical finance in general, there are two important skills. The first is a deep appreciation of the theory so that the problem under study can be chosen as an important one. The second is the implementation skill that requires a mastery of statistical tools. Standard PhD texts such as Ingersoll (1987), Huang and Litzenberger (1988), and Duffie (1996), should help build the foundation for the first skill, while Amemiya (1985) and Hamilton (1994) provide some of the basic knowledge of the second. Since many interested finance problems are multivariate in nature, a grasp of Anderson (1984) and Muirhead (1982) will be useful. It never seems too much to stress the importance of reading recent papers in both areas to get both the ideas for significant problems and the right tools for their solutions. In some sense, the job of an empirical finance researcher likes that of a doctor. A correct diagnosis of the illness is of the first importance. But incorrect treatment can make the diagnosis useless. This seems rampant in

the current finance literature. Readers with developed skills in statistics may make a difference in the future research in empirical finance.

Now let me go over the collected papers and examine their relevance in the literature. A fundamental problem in finance is to find out whether or not a particular portfolio is efficient. The efficiency problem has been of concern not only to individual investors and financial managers with respect to portfolio choice, but also to researchers in finance with respect to the validity of various equilibrium asset pricing models. Markowitz's (1952) seminal contribution to modern portfolio theory leads to the well-known capital asset pricing model (CAPM) of Sharpe (1964) and Lintner (1965) (Markowitz and Sharpe won Nobel Prize in 1990), which rely on the efficiency of the market portfolio. Because of its intrinsic importance, the efficiency of a portfolio has been studied and tested extensively in the finance literature. In the classical framework when there exists a riskless asset, the exact test of a portfolio's efficiency is a problem nicely solved by Gibbons, Ross, and Shanken (1989). In the absence of a risk-free asset, the problem is more complex. Gibbons (1982) is one of the many earlier examples attacking the problem, Zhou (1991, the first paper) provides the first exact test and also explores its economic interpretations. Velu and Zhou (1999, the second paper) extends this result to multibeta models, bridges risk-free and zero-beta models, and proposes a new version of linear factor models that generalizes the famous Fama and French's (1993) three-factor model. Zhou (1995, the third paper) extends the analysis from a rank test perspective that can be applied to analyze hypotheses that are closely related to the standard linear pricing rules. The factors in these models are mostly observable. But it seems that the job of much of the empirical asset pricing research is to find factors to explain security returns and the associated risk premiums. There are basically two schools of thoughts about the factors. The first takes the stand that the factors are inherently latent and unobservable directly from market data. Models, such as Ross's (1976) arbitrage pricing theory (APT), provide theoretical justification for the use of latent factors. The second school of thought on security factors takes a more pragmatic stand. Rather than identifying (either observable or unobservable) factors by using any asset pricing theory, this school treats factors as pre-specified economic or financial variables that appear to be related to asset returns by simple financial reasoning or plain intuition. Zhou (1999, the fourth paper) proposes a new framework that ties both schools together.

In testing the CAPM, almost all studies, such as Gibbons, Ross, and Shanken (1989), assume multivariate-normality. Zhou (1993, the fifth paper) provides exact

tests for this assumption and rejects it, but finds some distributions of the elliptical class fit the data well. By Chamberlain (1983), in the case of elliptical returns, the capital asset pricing model (CAPM) of Sharpe (1964) and Lintner (1965) and multi-beta models will remain valid theoretically. Therefore, it is important to test asset pricing models for the case where the returns are elliptically distributed. The paper provides such an exact test and indicates that, due to the multivariate-normality assumption, existing tests tend to be biased toward over-rejection. Many studies rely on beta and  $R^2$  for economic interpretations and practical applications, but this paper points out that the accuracy of estimated beta and  $R^2$  are usually overstated. Harvey and Zhou (1993, the sixth paper) and Zhou (1994, the seventh paper) may be viewed as further robustness studies on asset pricing tests. These papers emphasize the use of Hansen's (1982) GMM procedure which is at least theoretical robust to conditional heteroskedasticity of the stock returns. In addition, the robustness of the theory is also examined in some sense because the risk-premiums can be time-varying similar to Harvey (1989). In terms of methodology, the second paper shows how to perform a GMM test with an arbitrary weighting matrix, which is equivalent to Cochrane's (1996). Moreover, the explicit GMM rank test is also useful for cointegration tests in macroeconomics.

All of the above are multivariate approaches for examining the linear pricing rule. Traditionally, the two-pass regression procedure developed by Black, Jensen and Scholes (1972), and Fama and MacBeth (1973), forms the foundation of many influential studies. While Shanken (1992) provides its asymptotic theory, Roll and Ross (1994), Kandel and Stambaugh (1995), and Kan and Zhang (1999) point out some of its problems. Given a linear factor model, there are these well-established approaches for estimating and testing. But many important questions remain. First, how to incorporate the problems in estimating and testing the models into their use? For example, what are the impacts on estimating the cost of capital to a firm, the capital budgeting decision, investment management, and performance measures? Second, what are the factors? Are the parameters stable? Model stable? Fama and French (1992) seem to suggest that we still have a long way to go for the right factors. Harvey and Zhou (1999) explore assessing pricing errors of a model with time-varying beta parameters.

Since Hansen and Jagannathan (1991), among others, the stochastic discount factor (SDF) method has become extremely popular. How to interpret a given factor that fits the SDF? How does the SDF perform in estimating the risk premiums? And

especially how does it compare with traditional methods? Kan and Zhou (1999, the eighth paper) explore such issues. By constructing theoretical examples, the paper points out that there may be “wrong” factors that can satisfy the SDF moment conditions so that it may be dangerous to attach any economic meaning to the test outcome of the SDF moment conditions. By using asymptotic theory and simulations, it shows that as current practice of the SDF methodology ignores a fully specified model for asset returns, it suffers from two potential problems. The first problem is that the standard error can be quite large, and the second is that the SDF methodology may have very low power against misspecified models. Given that the SDF is widely used, it is of interest to see how the SDF performs in a variety of contexts as compared with traditional methods.

Harvey and Zhou (1990, the ninth paper) take a Bayesian approach to the CAPM. The advantage is that it answers the question: given the data (and prior beliefs), what is the probability that the model’s restrictions are valid? By using Monte Carlo integration technique that accurately evaluates high dimensional integral problems, the paper provides both the Bayesian confidence intervals for functions of economic interest and posterior odds ratios for the efficiency hypothesis. The probability that the CRSP index is mean-variance efficient is found to be small. While Connor and Korajczyk (1995) provide an extensive survey of approaches for testing Ross’ (1976) arbitrage pricing theory, Geweke and Zhou (1996, the tenth paper) perform one of the few available Bayesian studies. In contrast to classical studies, the Bayesian analysis usually allows exact assessment of both the pricing errors and any general functions of economic interest. Because of this, Lamoureux and Zhou (the eleventh paper) take a Bayesian view to study the predictability in stock returns at horizons of 3 to 6 years. Contrary to many studies that use potentially inadequate methodologies, the paper finds that, for all intents and purposes, stock prices follow a random walk, i. e., there is little predictability. The Bayesian framework is particularly convenient from a decisionmaking perspective, and hence it has the potential to offer nice solutions to investment (Kandel and Stambaugh, 1996), risk management, and other decision problems that require incorporating estimation risk and model risk into consideration. For the Bayesian approach, Zellner (1971) provides a good start and Chib and Greenberg (1996) survey some recent important advances.

Guofu Zhou  
February 2, 2000



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6. International Asset Pricing with Alternative Distributional Specifications, <i>Journal of Empirical Finance</i> , <b>1</b> : 107 – 131, 1993	125
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