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Editor's foreword to the special issue: "On the predictability of asset returns"

This issue collects seven articles, some of which date back to the 1980s, some to the early 1990s. These articles have not been published before for a variety of reasons that most of us, familiar with often capricious refereeing or shifting research agendas, can easily imagine. Deservedly, the articles in this collection already enjoy a wide readership in working paper format, which this issue hopefully will further expand.

Although the articles are relevant for a number of subfields in asset pricing, the theme that unifies them is return predictability, be it in equity markets (Campbell, Daniel, Epstein and Zin, Harvey), foreign exchange markets (Tauchen) or fixed income (Melino, Schotman). Although return predictability has been widely documented, there is less consensus on what drives the predictability. There are three possibilities: it may reflect time-varying risk premiums (the RISK VIEW), it may reflect irrational behavior on the part of market participants (and may, therefore, be exploitable; the BEHAVIORAL VIEW) or it may be a statistical fluke due to poor statistical inference (the STATISTICAL VIEW).[1] Recently, much work has focused on the second possibility, but fortunately, many researchers are no longer content with simply assuming irrational behavior but attempt to carefully motivate and specify the departure of rationality, for example, the bounded rationality in Hong and Stein (1999), or the ingrained behavioral biases that affect preferences in Benartzi and Thaler (1995) and Barberis et al. (2001). The risk view has been discredited because the empirical evidence suggests substantial time variation in risk premiums that cannot be delivered by standard models of risk. In my opinion, this conclusion has been drawn prematurely: statistical problems imply that we probably overestimate the variability of risk premiums based on the data whereas at the same time our models of risk are still extremely stylized and potentially underpredict the true variability of endogenous risk premiums. Through my own work, I have come to believe that a

[1] Frictions, such as transactions costs, short-sell constraints, agency problems, etc., have also been suggested as an explanation for the persistence of pricing anomalies, including predictability.

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combination of time-varying risk premiums and healthy skepticism about most empirical findings because of the presence of peso problems and other small sample inference problems can potentially account for most of the evidence on predictability we see in the data (see Bekaert et al., 2001a for an example of such an analysis applied to term structure anomalies).

Most of the papers in this issue are actually most relevant for the statistical view, whereas Epstein and Zin propose an elegant framework to merge the behavioral and risk view, and Harvey documents the type of time variation in expected returns and risk that fundamental models of risk should capture. In what follows, I provide a short guide to the various papers and how they relate to some of the current literature. This account is highly personalized and I apologize for not giving all the results in the papers due credit.

1. The nonlinearity of risk

Harvey's paper uses nonparametric methods to study conditional expected equity returns and conditional variances of returns. One interesting finding is that expected return estimates are very sensitive to the instrument set. Another, perhaps the most interesting, finding in the paper is the strong countercyclical variation in the ratio of conditional mean to conditional variance (and in the Sharpe ratio). Whereas this result is by now well known, Harvey's working paper back in 1989 was the first explicit examination of time variation in the Sharpe ratio. He shows this empirical regularity to be remarkably robust to the specification of conditional mean and variance, including a nonparametric formulation. This result has, for example, played a major role in making time-varying prices of risk become the norm in recent parameterizations of the CAPM (see, for example, DeSantis and Gerard, 1997). In dynamic asset pricing models, countercyclical Sharpe ratios have become a salient empirical fact that must be matched. Campbell and Cochrane (1999) propose an equilibrium pricing model with an external habit process chosen very deliberately to deliver such a countercyclical Sharpe ratio. Bekaert and Grenadier (2001) propose a related, quite tractable model with preference shocks where risk aversion goes up in recessions, driving up the variability of the pricing kernel and the Sharpe ratio on the available assets.

Barberis et al. (2001) not only incorporate time-varying risk aversion in their model, but also loss aversion, as documented by Kahneman and Tversky (1979). Whereas their attempt to merge the behavioral and risk views is valuable, the preferences they specify remain somewhat ad hoc and are not motivated by a formal decision theoretic framework. This is a pity because such frameworks do exist. Gul's (1991) work on disappointment aversion keeps the standard axioms that deliver expected utility intact but weakens the independence axiom to accommodate the Allais paradox. The resulting preferences exhibit loss aversion. Ang et al. (2001) demonstrate that Gul's utility function generates interesting portfolio allocation results (including stock market nonparticipation), without leading to the mathematical problems ad hoc loss aversion utility functions generate.

Such a utility function can also be incorporated in an infinite horizon consumption-based asset pricing model, which is exactly what Epstein and Zin accomplish. Their preference framework accommodates, apart from standard expected utility, Kreps–Porteus preferences and disappointment aversion, also the weighted utility from Chew (1983). Nevertheless, Epstein and Zin's empirical work clearly points to disappointment aversion as the most successful model. Using U.S. stock and T-bill returns, this model satisfies the Hansen and Jagannathan (1991) bounds and survives an Euler equation test. The data seem to reveal strong disappointment aversion that leads to an intertemporal marginal rate of substitution that is strongly bimodal and exhibits strong negative serial correlation.

Interestingly, Epstein and Zin point out that similar results could obtain in an expected utility model where consumption growth follows a regime-switching process. Whitelaw (2000), apparently unaware of Epstein and Zin's result, produces exactly such a model and finds interesting switching behavior in monthly consumption growth that Epstein and Zin do not. However, the different properties of monthly and quarterly consumption growth might make the results quite specific to the assumed sampling frequency. Epstein and Zin's work has inspired a number of articles that have examined the performance of this model (or extensions of the model) in different contexts (see, for example, Bekaert et al., 1997a and Bonomo and Garcia, 1993).

2. Expectations hypotheses (EH) tests

According to the EH of the term structure of interest rates, the long rate is a weighted average of expected future short rates. Melino builds on the work by Sargent (1979) to test the restrictions imposed by the EH of the term structure on a vector autoregressive (VAR) representation of short and long rates, and (potentially) other variables in the information set. Whereas this is trivial to do using a Wald test, a likelihood ratio test requires estimation under the null which is entirely non-trivial since the restrictions imposed by the EH are nonlinear. Sargent (1979) had failed to impose all restrictions imposed by the EH and had also focused on a model formulation in first differences. Melino shows how the Jordan canonical form of the parameter matrix can be used to write the EH restrictions in terms of the eigenvalues and eigenvectors of the parameter matrix and describes a maximum likelihood method to estimate the parameters under the restrictions of the EH. He also motivates a specification in levels carefully describing how the difference specification is inconsistent because it assumes two separate unit roots in short rates and long rates, which is inconsistent with the null of the EH. This discussion predates by 4 years the publication of the Engle and Granger (1987) cointegration paper and Campbell and Shiller's (1987) discussion of the implications of cointegration for present value models including the EH!

My recent work with Hodrick (2001) on the EH was very much inspired by Melino's work, although we opted for a different method to impose the restrictions of the EH on the VAR. Nevertheless, our empirical results provide another motivation for Melino's work. We show that the Wald test of the EH restrictions, which can be constructed without estimating under the null, has quite awful small sample properties making its use in samples of standard length all but impossible.

Schotman also focuses on the EH of the term structure, precisely examining the role that assumptions about unit roots and cointegration play in excess volatility tests of the EH. That is, under the null of the EH, the weighted average of future interest rates should be more variable than the long rate. Under stationarity (of interest rates), Schotman finds excess volatility whereas in models where interest rates have unit roots, there is no excess volatility. Schotman finds that long rates in the data seem to consistently overreact to transitory shocks and underreact to permanent shocks. Importantly, Schotman also recognizes the importance of statistical inference problems with near-unit root processes in small samples and considers a Monte Carlo integration technique to help circumvent them. Schotman's paper also contains some nice results about variance decompositions in VARs where some variables may contain unit roots.

Personally, I strongly believe that short rates should be modeled as stationary. In equilibrium, they are a function of the expected intertemporal marginal rate of substitution, which in turn tends to depend on variables such as consumption growth and inflation. It is hard to imagine these variables literally having unit roots and the empirical evidence suggests these variables are stationary. Of course, interest rates exhibit near nonstationary behavior, but this is well-captured by stationary regime switching models where interest rates are near random walks in normal times but exhibit strong mean reversion when they move higher (see Gray, 1996 and Ang and Bekaert, 2001b). Nevertheless, the presence of near unit roots does affect statistical inference and the standard regression-based inference regarding the EH does no longer seem trustworthy. Apart from the Lagrange multiplier test proposed in Bekaert and Hodrick (2001), the local to-unit-root inference proposed by Valkanov (1998) offers a potential solution.

Apart from the EH in the term structure, the foreign exchange EH has also been tested extensively in the literature. Whereas the foreign exchange EH (or uncovered interest rate parity, or the unbiasedness hypothesis) predicts that high yield currencies should be expected to depreciate relative to low yield currencies, the empirical results seem to systematically contradict this prediction. After a decade of fruitlessly looking for risk factors to explain the forward premium anomaly, Baillie and Bollerslev (2000) and Bekaert and Hodrick (2001) have recently proposed small sample inference problems as possible explanations for the strong rejections typically found.

The strong rejections of the foreign exchange EH date back to the early work of Bilson (1981) and Fama (1984), which was carried out with vary small data sets. Tauchen's 1987(!) article points out, contemporaneously to a working paper by Stambaugh (1999) that recently appeared as part of a broader *Journal of Financial Economics* publication, that these regressions should have strong small sample biases because of the autocorrelation in the explanatory variable (the forward premium) and the lack of strict exogeneity of the regressor. Tauchen finds an upward bias of the slope coefficient concluding that small sample corrections make the rejections even more severe. Interestingly, an application of this small sample bias intuition to tests of the EH of the term structure does lead to an upward bias in the regression slope coefficients (see Bekaert et al., 1997b). However, recent work by Bekaert et al. (2001b) suggests that the bias in the foreign exchange regression is not always upward and that the dispersion of the small sample coefficients can be quite large unlike Tauchen's results. It would be interesting to explore what accounts for the differences in results, one candidate being the assumption of a near unit root in the exchange rate (stationary exchange rate levels) in Tauchen's work instead of a unit root in the exchange rate (stationary exchange rate differences) in Bekaert et al. (2001b).

3. The power of predictability tests

The predictability of stock returns has been studied extensively. However, studies of the power of various tests have been relatively rare. As John Campbell notes, this is surprising since most of the predictability is found at longer horizons, suggesting that either long-run tests have more substantial size distortions (a fact confirmed in many studies, most recently by Kirby (1997) and Ang and Bekaert (2001a)) or more power. We publish two such power studies here.

Daniel focuses on mean reversion tests, in other words, tests of the serial correlation of returns. His results are asymptotically valid under local alternatives. Daniel sets out to find the optimal test (that is the most powerful test) as a function of the alternative. He shows that all mean reversion tests are asymptotically equivalent to weighted autocorrelation tests and that for the optimal test the weights are proportional to the expected autocorrelation under the alternative hypothesis. This makes it possible to determine for which alternative hypothesis standard tests will have power and to better interpret the various empirical results in the literature.

An interesting side result is that the joint tests (across different horizons) advocated by Richardson (1993) may have low power and Daniel proposes to use the most significant test statistic instead. This informally is what researchers tend to do in their discussion of various tests across horizons but their discussion typically fails to correct for the proper size of the maximum statistic. The maximum *t*-statistic also has the advantage that it is easy to compute and that no observations are lost in constructing a joint test. In fact, Bauer (2001) uses such a test in a study of long-horizon predictability in the foreign exchange market relying on a Monte Carlo analysis to determine the correct critical value.

Recently, the focus of the predictability literature has shifted more to other variables, especially yield variables, as candidate predictors for stock returns. The evidence here also suggests strong long-horizon predictability. Campbell considers a set-up where returns are predictable by a state variable, proxying for the expected return. Campbell shows that when expected returns have persistent components, predictability as measured by R^2 will increase with horizon and that asymptotic power is increasing over some interval with horizon. Asymptotic power is measured using the approximate slope concept from Bahadur (1960) and Geweke (1981). Hence, Campbell's set up and results are quite different from Daniel's. Campbell is careful to check whether these asymptotic results hold up in small samples, as it is well known that long-horizon tests are subject to severe small sample biases. An unweighted long-run regression, prevalent in empirical work, does appear to lose its power advantages in small samples but a weighted regression is still more powerful than short horizon tests. This is an interesting result that deserves further scrutiny.

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