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Modeling common volatility characteristics and dynamic risk premia in European equity markets

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Abstract

The paper applies a Factor-GARCH model to evaluate the impact of the market portfolio, as a single common dynamic risk factor, on conditional volatility and risk premia for the returns on size-based equity portfolios of three major European markets; France, Germany and the United Kingdom. The results show that for the size-based portfolios the factor loading for the dynamic market factor is significant and positive but the association between the risk premia and the conditional market volatility is weak. However, the dynamic market factor is shown to explain common characteristics in the conditional variance such as asymmetry and persistence. This finding is consistent across markets and portfolio sizes.

JEL classification: C1

Keywords: Factor-GARCH; European markets; Dynamic risk premia; Common volatility

1. Introduction

This paper contributes to the discussion of common volatility characteristics and the risk-return tradeoff. More specifically, the paper extends the findings of Ng, Engle, and Rothschild (1992)

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to size-based European stock portfolios, using stock returns from the three major European stock exchanges namely, France, Germany and the United Kingdom.

Modeling common volatility in the presence of a common factor provides important insights regarding the proper risk management and the pricing of derivative assets. Equally important, modeling premia using a common factor offers new ways of thinking about the time variation in the risk premia of equities. The econometric model used is an adaptation of the Factor-GARCH model suggested by Engle, Ng, and Rothschild (1990) and Ng et al. (1992). This particular model offers a convenient framework for the study of the volatility dynamics of returns as well as the possibility of time-varying risk premia linked to a common risk factor. A new additional aspect, not examined by the aforementioned studies, is the role of the dynamic market factor in explaining asymmetries and persistence in the conditional variance of individual assets. It turns out that the market portfolio is more successfully explaining asymmetries and persistence than it is in explaining time-varying risk premia.

The issue of the conditional risk-return tradeoff has been investigated mostly via GARCH-M type models, where the conditional mean is linearly related to the conditional variance (see for example, Bollerslev, Engle, & Wooldridge, 1988; Campbell & Hentschel, 1992; French, Schwert, & Stambaugh, 1987; Glosten, Jagannathan, & Runkle, 1993; Scruggs, 1998). The results have been mixed with some papers reporting significant positive relationships and some reporting significant negative relationships. Very often the results suggest no relationship at all. More recently, Brandt and Kang (2004) find that in the context of a latent VAR process there is a robust negative correlation between the conditional moments of returns. On the contrary, Ghysels, Santa-Clara, and Valkanov (2005) using a mixed data sampling approach (MIDAS) for the calculation of the variance, report a significant positive relationship between risk and return. Bekaert and Wu (2000) find support for the "volatility feedback hypothesis" which implies a positive relation between the conditional mean and the conditional variance and a negative relation between realized returns and conditional volatility. The latter makes it difficult to detect the conditional risk-return tradeoff.

The notion of a set of common factors driving asset returns forms the basis of the Arbitrage Pricing Theory (APT) advanced by Ross (1976) and the Intertemporal Capital Asset Pricing Model (ICAPM) of Merton (1973) whereby, the vector of asset risk premia is related to a set of factor risk premia. The early interpretation and empirical tests of the APT and the ICAPM were based on the assumption that first and second moments of asset returns were time invariant. As such, empirical investigation focused primarily on the cross-sectional variations in asset risk premia. Recent evidence, however, decisively indicates time variation in first and second order moments of asset returns e.g., Bollerslev, Chou, and Kroner (1992), Conrad and Kaul (1988) and Fama and French (1988) to mention but a few. In light of this evidence the question arises as to whether some factors, particularly the market portfolio, are dynamic factors in the sense that they possess a time-varying risk premia which in turn influences individual portfolio risk premia.

Several researchers have used Factor-ARCH models to provide a plausible and parsimonious parameterization of the time-varying variance–covariance structure of asset returns. Engle and Ng (1993) apply such structures to model the pricing of Treasury bills. A similar model is used by Engle et al. (1990) to study the dynamic behavior of the term structure of interest rates. Diebold and Nerlove (1988) use a latent factor ARCH model to describe the dynamics of exchange rate volatility. Engle and Susmel (1993) use the factor ARCH to test for common volatility in international equity markets. Alternative estimation procedures for such models are investigated by Lin (1992) on the basis of Monte Carlo comparisons. In the majority of cases the focus is on the market portfolio and the data used are from the US stock market. Ng et al. (1992), however, supports the notion that the market portfolio is a dynamic factor. They use monthly excess returns