

Evaluating a non-linear asset pricing model on international data[☆]

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Abstract

The paper analyses the ability of a non-linear asset pricing model suggested by Dittmar [Dittmar, R.F., 2002. Non-linear pricing kernels, kurtosis preference, and the cross-section of equity returns. *Journal of Finance* 57, 369–403] to explain the returns on international value and growth portfolios. For comparison we use competing pricing models such as the ICAPM, the exchange rate risk augmented ICAPM and the international two-factor model proposed by Fama and French [Fama, E.F., French, K. R., 1998. Value versus growth: The international evidence. *Journal of Finance* 53, 1975–1999]. All models are evaluated both unconditionally and conditionally. The models are evaluated by applying the Hansen and Jagannathan distance measure, and we also employ several alternative measures to ensure a robust comparison of the models. We find support for the model of Dittmar [Dittmar, R.F., 2002. Non-linear pricing kernels, kurtosis preference, and the cross-section of equity returns. *Journal of Finance* 57, 369–403]. Evaluated conditionally, this model successfully passes all the different diagnostic tests performed in the analysis.

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1. Introduction

If international financial markets are integrated, then only global systematic risk variables should affect expected returns. A central, but still unsolved problem is the identification of these global risk variables.

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The International Capital Asset Pricing Model (ICAPM) assumes that the world market portfolio is the only factor that drives the return generating process of all assets, and at the same time restricts the risk-return trade-off to the first two moments of the market portfolio return (see for example Adler & Dumas, 1983; Karolyi & Stulz, 2002; Solnik, 1983). The poor empirical performance of the model has cast doubt on the validity of the model (see for instance Fama & French, 1998). This has usually been interpreted as an evidence for a necessity to include additional factors in the model building. Consequently, the original model has been extended to a range of multifactor models in order to take into consideration other potential common risk factors (see for example Cavaglia, Hodrick, Vadim, & Zhang, 2002; Dahlquist & Sällström, 2002; Fama & French, 1998; Griffin, 2002; Zhang, 2006).

Fama and French (1998) perform an unconditional asset pricing test for a large number of countries and suggest a two-factor model, in which the world market portfolio is augmented by a global value portfolio, in order to capture the international growth/value effect. In contrast, Zhang (2006) adopts a conditional approach that relates the time-varying risk premiums to the world business cycle. She finds that the world CAPM augmented with exchange rate risk factors is the best performing model. This result is also supported by Dahlquist and Sällström (2002).

However, it is possible that the poor performance of the ICAPM is not due to insufficient information content of the world market portfolio return, but to the restrictive assumptions regarding the relationship between marginal utility and asset returns, i.e. the assumptions of normally distributed returns and/or a quadratic utility function. Dittmar (2002) introduces a model that takes into account higher co-moments between asset returns and marginal utility growth. He finds that this model can successfully price a set of US industry portfolios. In addition, the paper shows that by including the higher co-moment components in the pricing model, the Fama and French factors add no significant information. It is interesting to see if this model performs well even in an international context. There are two possible benefits if this model is successful in pricing international assets. From a practical point of view, it would be unnecessary to construct additional potential risk factors. This is particularly convenient when the candidate factors are constructed based on firm characteristics. From a theoretical point of view, this model is more consistent with a microeconomic modeling of the risk and return relationship compared to the anomaly based factor models and offers an economic explanation of the failure of the canonical ICAPM.

The purpose of this paper is to test the pricing ability of the non-linear model suggested by Dittmar (2002) and to compare the model with some competing asset pricing models; such as the ICAPM, the exchange rate risk augmented ICAPM and the international two-factor model proposed by Fama and French (1998).

To be able to evaluate the pricing ability of different models we need a quantitative measure of the degree of mispricing of each model. Hansen and Jagannathan (1997) propose such a measure, now known as the Hansen and Jagannathan distance, (HJD), which gauges the distance between each suggested asset pricing model and the set of true pricing kernels. Since the parameters of the suggested pricing model can be determined by minimizing this distance, the HJD methodology is suitable both for model estimation and for model evaluation. Therefore, we employ this methodology for comparing the different models. However, to protect against possible problems with this evaluation method we also use some alternative measures, e.g. the ability of the models to predict the expected returns and if the models are positioned in the admissible region given by the Hansen and Jagannathan bounds (Hansen & Jagannathan, 1991).

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