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Dynamic factors and asset pricing: International and further U.S. evidence ☆

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ABSTRACT

The Fama–French pricing model with dynamic factors (DFPM) extracted via the Kalman filter from the six size and book-to-market portfolios has a good performance in understanding stock returns. Using international stock market data, we find that the DFPM significantly improves the cross-sectional explanatory power of the Fama–French three-factor model. In the out-of-sample exercise, we find that the DFPM predicts portfolio returns more accurately than other competing models. The good forecasting performance of the DFPM is economically meaningful because the DFPM generally delivers significant utility gains in asset allocation.

1. Introduction

The Fama and French (1993, 1996; FF hereafter) three-factor model posits that expected returns can be explained by a market factor, a size factor, and a value factor. To date, the FF three-factor model has become

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an important empirical benchmark in the asset pricing literature, and many studies have provided an economic interpretation for the SMB and HML factors.[1] However, several studies have identified empirical deficiencies in the FF three-factor model, challenging its preeminence. The most challenging arguments, among others, include Ferson and Harvey (1999) and Simin (2008). While Ferson and Harvey (1999) suggest that the FF three-factor model is rejected as a pricing model, Simin (2008) finds that existing asset pricing models produce poor one-step-ahead forecasts compared to a simple benchmark.

One response to the empirical deficiencies in the FF three-factor model is to build a dynamic FF three-factor model. He et al. (2010, HHL hereafter) recognize that the FF three-factor model is essentially static and thus lacks dynamic features. The static FF model may rule out some potentially important information for understanding the behavior of stock returns over time. Consider, for example, economic shocks that simultaneously and equally raise returns on the FF portfolios. These shocks exert a contemporaneous impact on the static FF factors. Put it differently, the static FF factors do not contain information about these shocks over time. However, if these shocks are persistent and related to time-varying investment opportunities or time-varying risk aversion, they are economically important for understanding stock returns. In contrast, dynamic factors may capture the effect of these shocks. The intuition is straightforward: these shocks exert time-varying and somewhat persistent impact on the FF portfolios, so the dynamics of portfolio returns should contain information about these shocks. In this spirit, HHL develop a dynamic factor pricing model (DFPM) that incorporates features of price dynamics across assets as well as through time. With latent dynamic factors extracted via the Kalman filter, HHL find that the DFPM improves upon the explanatory and predictive power of the FF three-factor model.

This paper examines the dynamics of international stock returns. We contribute to the literature in two aspects. First, we provide evidence on the performance of the DFPM in international stock markets. Given the empirical validity of the FF three-factor model in understanding stock returns (see, for example, Chan et al., 1991; Fama and French, 1998, 2012), it is important to examine the empirical validity of dynamic factors in international markets. Second, given that statistical significance in an out-of-sample forecasting exercise does not mechanically imply economic significance (e.g., Campbell and Thompson, 2008; Welch and Goyal, 2008), we assess the economic value of the DFPM by investigating the utility gains accrued to investors in international stock markets. In addition, we also assess the economic value of the DFPM in the U.S. market, which has not been examined by HHL.

Consistent with Fama and French (2012), we apply the DFPM to four regional stock markets: Asia Pacific (excluding Japan), Europe, Japan, and North America. In the spirit of Hou et al. (2011) and Fama and French (2012), we also apply the DFPM to the global stock market to shed light on the issue of which factors are important for explaining the time-series and cross-sectional variation in global stock returns. As emphasized by Fama and French (2012), an important feature of the data is that the sample covers all size groups. This contrasts to most prior work on international markets focusing on large stocks. Since tiny stocks often produce challenging results, our analysis based on the Fama and French (2012) data can sharpen our understanding on the behavior of stock returns. Instead of directly using country level data, we use regional (except Japan) data.[2] In doing so, we apply empirical asset pricing models to the broadest region in which pricing is integrated.[3] As such, our empirical tests are likely to have good power (e.g., Fama and French, 2012).

Our analysis proceeds in three steps. First, using the 25 FF portfolios of each international sample, we conduct in-sample asset-pricing tests using the two-pass regression procedure along the lines of Brennan et al. (2004), Cochrane (2005), and HHL. We compare the empirical performance of the DFPM against other models, including the CAPM, the FF three-factor model (FF3), the Carhart (1997) four-factor model (Carhart4), and the conditional FF three-factor model (CFF3). We find that the DFPM explains cross-sectional returns much better than these competing models in terms of more significant factor risk premiums, higher explanatory power, and lower pricing error statistics. Our findings are largely robust to various

[1] Examples include Liew and Vassalou (2000), Lettau and Ludvigson (2001), Vassalou (2003), Petkova and Zhang (2005), Hahn and Lee (2006), and Petkova (2006). These studies reveal that the SMB and HML factors are related to economic activity. However, there is still controversy on the interpretation of these two factors. See, for example, Lakonishok et al. (1994), Berk et al. (1999), and Gomes et al. (2003).

[2] Fama and French (2012) suggest that the Japanese stock market is weakly integrated with other Asian Pacific markets.

[3] Griffin (2002) and Fama and French (2012) reveal that domestic factor models explain much more time-series variations in returns than global factor models. Hence, our empirical analysis is based on local factor models.