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Re-examining risk premiums in the Fama–French model: The role of investor sentiment

Po-Chin Wu*, Shiao-Yen Liu[1], Che-Ying Chen[1]

Department of International Business, Chung Yuan Christian University, No. 200, Chung Pei Rd., Chung Li 320, Taiwan, ROC

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ABSTRACT

This paper reconstructs the Fama–French three-factor (F–F) model as a panel smooth transition regression (PSTR) framework to investigate the differentiated effects of investor sentiment proxies-the volatility index (VIX), credit default swap (CDS), and TED spread-on the three risk premiums. Sample period spans from 2003: 1Q to 2013: 4Q. Sample objects are 58 semiconductor companies listed on Taiwan Security Exchange Corporation. The empirical results report that stock returns display a nonlinear path, and the three risk premiums are time-varying, depending on different proxies of investor sentiment in different regimes. Market premiums fall as investors in stock markets show extreme optimism or extreme pessimism. Except in rare situations, the size premium is significant and decreases with the increase in the VIX. Returns in holding growth stocks dominate holding value stocks when the investors show extreme pessimism or optimism. However, in normal sentiment of investment, value stocks earn more returns than growth stocks.

* Corresponding author. Tel.: +886 2 2937 6566; fax: +886 3 265 5299.
E-mail addresses: pochin@cycu.edu.tw (P.-C. Wu), yenyen320@cycu.org.tw (S.-Y. Liu), apply1128@hotmail.com (C.-Y. Chen).
[1] Tel.: +886 3 265 5206; fax: +886 3 265 5299.

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1. Introduction

Equity valuation is important for investors to measure a firm's value and make investment strategies. The capital asset pricing model (CAPM), proposed by Sharpe (1964) and Lintner (1965), states that market risk has a positive effect on the risk premium of a financial asset. However, the model was found to be insufficient in explaining the expected stock returns (e.g., Reinganum, 1981; Rosenberg, Reid, & Lanstein, 1985). In 1993, Fama and French developed a well-known model to evaluate the asset return, named the Fama–French three-factor model (hereafter F–F model), by adding the firm size and book-to-market factors into the traditional CAPM. They find evidence in the US stock markets that small capitalization stocks and high book-to-market stocks have higher returns than those calculated by the CAPM. Since then, a substantial body of empirical work has examined the validity of the F–F model (e.g., Lawrence, Geppert, & Prakash, 2007; Simpson & Ramchander, 2008).

Several previous studies found that the F–F model leads to a low forecasting performance of asset returns (e.g., Aleati, Gottardo, & Murgia, 2000; Faff, 2004). To resolve this problem, a branch of research adds new factors into the F–F model. For example, Carhart (1997) adds a fourth factor – momentum and shows that the momentum factor makes a large contribution to the explanatory power of the factor model. More recently, Fama and French (2014) introduce a five-factor asset pricing model (beta, size, value, investment, and profitability) to investigate whether these new factors – profitability and investment – improve explanatory power.

Meese and Rogoff (1983) indicate that specifying a more appropriate model is another method to improve the forecasting performance of a specific estimation model. In practice, structural changes in stock returns (or stock prices) may occur as stock markets encounter considerable impacts originated from adjustments in economic environment and public policy. For example, the Subprime Mortgage Crisis in 2007 and the European sovereign debt crisis in 2008 have made stock prices display a non-linear dynamic process, which may further lead to non-linear risk premiums. The traditional F–F model describes a linear path of stock returns and constant risk premiums; therefore, it is unable to capture this regime-switching process. To resolve this problem, reconstructing the F–F model as a non-linear regime-switching one is necessary.

Several famous regime-switching models have been developed to describe the non-linear dynamics of economic variables, such as the Markov switching (MS) model, the threshold autoregressive (TAR) model, the smooth transition autoregressive (STAR) model, and the panel smooth transition regression (PSTR) model. In essence, the switching process of series in MS or TAR model is radical and discrete, which scarcely satisfies its actual movement. The estimation result of the STAR model ignores the heterogeneity among cross-sectional units. Taylor and Peel (2000) point out that transaction costs, policy disturbance, and non-synchronous adjustment by heterogeneous agents, all likely lead to series exhibits smooth regime switching, rather than discrete switching. In contrast, the PSTR model, recently developed by Fok, van Dijk, and Franses (2004) and González, Teräsvirta, and van Dijk (2005), considers the heterogeneity among cross-sectional units and allows for smooth rather than discrete switching between regimes, especially for low-frequency data.

This study rewrites the F–F model as a panel smooth transition regression (PSTR) one.[2] A simple PSTR model consists of two linear parts linked by a non-linear transition function, and it allows the series under investigation to change smoothly within two different regimes depending on the value of a transition variable. Bessec and Fouquau (2008) summarize the three main advantages of the PSTR model. First, it captures the heterogeneity in the dataset, since it allows for a smooth transition between the extreme regimes. Second, the threshold value of transition variable is not given a priori, but it is estimated in the model. Finally, it offers a parametric method to examine the individual heterogeneity and time variability of the effects of regressors on the dependent variable.

[2] Fouquau et al. (2008), Cheng and Wu (2013), and Wu, Liu, and Pan (2014) all verify that PSTR models can precisely capture the non-linear adjustment of economic variables within different regimes.