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Evaluating asset pricing models in the Korean stock market ☆

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ABSTRACT

This paper evaluates and compares asset pricing models in the Korean stock market. The asset pricing models considered are the CAPM, APT-motivated models, the Consumption-based CAPM, Intertemporal CAPM-motivated models, and the Jagannathan and Wang conditional CAPM model. By using various test portfolios as well as individual stocks, we conduct time-series tests and cross-sectional regression tests based on individual *t*-tests, the joint *F*-tests, the Hansen and Jagannathan (1997) distance, and R-squares. Overall, the Fama and French (1993) five-factor model performs most satisfactorily among the asset pricing models considered in explaining the intertemporal and cross-sectional behavior of stock returns in Korea. The Fama and French (1993) three-factor model, the Chen et al. (2010) three-factor model, and the Campbell (1996) model are the next. The results indicate that the two bond portfolios, term spread and default spread, play an important role in explaining stock returns in Korea.

1. Introduction

Since the introduction of the Capital Asset Pricing Model (CAPM) of Sharpe (1964), Lintner (1965), and Black (1972), it has long been a major paradigm in financial economics. The CAPM is still widely used in estimating cost of capital for firms, measuring abnormal returns, and evaluating the performance of managed portfolios, etc. The prediction by the CAPM is that the expected return on a risky asset is linearly proportional to its beta only. In other words, the cross-sectional differences in average returns are determined solely by the beta, not by other variables. However, the validity of the CAPM has been seriously challenged. Empirical research has uncovered a number of anomalies that the CAPM could not explain. A systematic pattern in beta-adjusted returns across some firm characteristic variables is observed, which is dubbed anomaly. Many anomalies have been reported in the literature. Such anomalies are firm size (Banz, 1981; Reinganum,

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1981), book-to-market (Fama and French, 1992), short-term price continuation (or momentum) (Jegadeesh and Titman, 1993), long-term price reversal (DeBondt and Thaler, 1985), earnings information uncertainty (Kim, 2006, 2010), liquidity (Amihud and Mendelson, 1986; Pastor and Stambaugh, 2003), post-earnings-announcement-drift (PEAD) (Ball and Brown, 1968; Foster et al., 1984; Bernard and Thomas, 1989), and asset growth (Cochrane, 1996; Cooper et al., 2008; Chen et al., 2010; Yao et al., 2011).[1]

The inability of the CAPM to explain the cross-sectional spread in average returns has led to the development of alternative asset pricing models. As an alternative model, Ross (1976) suggests the arbitrage pricing theory (APT). However, the theory contains no clue about the number of factors and the identification of the factors. Researchers have therefore suggested empirical factors which are based on the pricing errors by the CAPM or the anomalies. Among the APT-motivated models containing those empirical factors, the most prominent are Fama and French (1993). They suggest a three-factor model containing the market factor, SMB, and HML, and a five-factor model containing the above-mentioned three factors plus two bond factor portfolios; term spread (TERM) and default spread (DEF). Kim (2006) suggests a two-factor model containing the market factor and the earnings information uncertainty risk factor and shows that his two-factor model performs well in explaining the firm size effect and the January effect.[2] Chen et al. (2010) suggest a three-factor model containing the market factor, an investment factor (INVEST), and a return on asset factor (ROA) and argue that their model outperforms traditional asset pricing models in explaining anomalies associated with short-term price continuation, PEAD, accruals, and stock valuation ratios.

Since the failure of the CAPM in explaining the cross-section of average returns could be attributed to its static single-period nature, multi-period or continuous time models are also emerged as alternative models. Such models are the Consumption-based CAPM (CCAPM) of Rubinstein (1976), Lucas (1978), and Breeden (1979) and the Intertemporal CAPM (ICAPM) of Merton (1973). In particular, the ICAPM requires risk factors additional to the market factor. Merton argues that when there is stochastic variation in investment opportunities, there will be risk associated with innovations in the state variables that describe the investment opportunities. Since there is no theory to specify the exact form of the state variables, several ICAPM-motivated models, like APT-motivated models, are suggested according to the choice of the state variables. Among several such models, Campbell (1996) uses the relative Treasury-bill rate, the dividend yield, the growth rate in real labor income, and the term spread, Vassalou (2003) suggests future GDP growth, and Kim et al. (2011) suggest future labor income growth as the state variables.

As mentioned above, many asset pricing models are suggested in the literature. The purpose of this paper is to comprehensively evaluate and compare these asset pricing models in the Korean stock market. Basically, we consider unconditional asset pricing models only with one exception. Conditional models depending on instrumental variables are not considered, since the choice of instrumental variables for conditioning information is somewhat arbitrary and there can be many conditional models according to a combination of instrumental variables. The (unconditional) asset pricing models we consider are (i) CAPM, (ii) APT-motivated models, (iii) CCAPM, and (iv) ICAPM-motivated models. The exception is the Jagannathan and Wang (1996) conditional CAPM, since it does not depend on instrumental variables and, thus, is different from typical conditional models. APT-motivated models considered are Fama and French's (1993) three-factor model (FF3) and five-factor model (FF5), Chen et al.'s (2010) three-factor model (CNZ3), and Kim's (2006) two-factor model. In addition to these models, we also consider two-factor APT-motivated models; the market factor plus the liquidity factor, and the market factor plus the long-term reversal factor.[3] ICAPM-motivated models considered are Campbell's (1996) five-factor model, a two-factor model containing the market factor and the GDP factor, and another two-factor model containing the market factor and the labor factor.

To evaluate and compare the asset pricing models, we perform time-series tests and cross-sectional tests based on individual *t*-tests, the Gibbons et al. (1989) (GRS) *F*-tests, the Hansen and Jagannathan (1997) (HJ distance), and R-squares. Since test results could be sensitive to the test portfolio formation, we use various

[1] Chui and Wei (1998) examines book-to-market, firm size, and the turn-of-the-year effect for Pacific-Basin emerging markets.

[2] Chen and Chien (2011) explain the January effect in Taiwan with the Chinese culture bonus hypothesis within behavioral finance framework.

[3] Since the momentum effect is not observed in Korea, we do not consider any factor models containing the momentum factor in the comparison.