The explanatory power of higher moment capital asset pricing model in the Karachi stock exchange

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A B S T R A C T

The study investigates the empirical validity of the higher-moment capital asset pricing model in the Karachi stock exchange. The sample consists of 313 stocks listed on the KSE over the sample period from July 2000 to June 2011. The findings suggest that covariance, co-skewness and co-kurtosis risks are mostly insignificantly priced in conditional and unconditional form over the full and sub-sample periods. However, over the sub-sample period of June 2007 to July 2009, the unconditional co-skewness risk is negatively and statistically significantly priced (white heteroskedasticity-consistent standard errors and covariance matrix). Co-skewness risk is marginally statistically significantly (at 10%) and correctly priced over the full sample period using the three-moment specification using white heteroskedasticity-consistent standard errors and covariance matrix. Furthermore, co-kurtosis risk is positively and statistically significantly priced over the sub-sample periods of July 2003 to February 2006 and July 2003 to June 2005 using Generalized Least Squares as estimation technique for the cross sectional regression.

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1. Introduction

The capital asset pricing model (CAPM) is grounded on quadratic utility function, which assumes that investors choose investments based on expected returns and the variance of expected returns. However, it requires that (i) probability distribution of investment returns is normally distributed; and (ii) investors utility functions are of quadratic form. The subsequent tests of the CAPM assume that returns are normally distributed, which is empirically an implausible assumption (Arditti, 1967; Harvey, 1995). The higher-order moment based capital asset pricing models acknowledge the non-normal returns distribution and extends the standard CAPM with co-skewness and co-kurtosis as measures of systematic risk (Rubinstein, 1973; Harvey and Siddique, 1999). The propositions in the higher-order CAPM indicate that higher-order moments are significantly priced in investors' required rate of returns, which will be empirically investigated in this study under the context of the equity market of Pakistan (i.e. the KSE). The current literature suggests that positive co-skewness should be negatively priced and vice versa, negative co-skewness should be positively priced (Wolfe and Fuss, 2010). On the other hand, positive co-kurtosis should be positively priced and negative co-kurtosis should be negatively priced in the investors' required rate of return.

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Table 1
Sample description.

S. no	Sector name	Total	Sample	%age
1	Automobile and parts	19	13	68
2	Banks	24	16	67
3	Beverages	4	2	50
4	Chemicals	36	23	64
5	Construction and materials	38	24	63
6	Electricity	16	10	63
7	Electronic and electrical equipment	3	3	100
8	Equity investment instruments	50	18	36
9	Financial services	43	11	26
10	Fixed line telecommunication	5	3	60
11	Food producers	64	32	50
12	Forestry and paper	4	3	75
13	Gas water and multi-utilities	2	2	100
14	General industrials	13	10	77
15	Health care equipment and services	2	1	50
16	Household goods	15	5	33
17	Industrial engineering	11	9	82
18	Industrial metals and mining	8	3	38
19	Industrial transportation	4	2	50
20	Leisure goods	1	0	0
21	Life insurance	4	3	75
22	Media	4	0	0
23	Non-life insurance	35	14	40
24	Oil and gas	12	12	100
25	Personal goods	213	78	37
26	Pharma and biotech	9	7	78
27	Real estate investment and services	2	1	50
28	Software and computer services	1	1	100
29	Support services	1	1	100
30	Technology hardware and equipment	1	1	100
31	Tobacco	3	2	67
32	Travel and leisure	5	3	60
	Total	652	313	48

Kraus and Litzenberger (1976) proposed a three-movement CAPM including co-skewness to explain the variations in stock returns. Homaifar and Graddy (1988) extended the Kraus and Litzenberger (1976) three-moment CAPM. They developed a four-movement CAPM, adding co-kurtosis together with covariance and co-skewness to examine the variations in stock returns. Consistent with the results of Kraus and Litzenberger (1976), Harvey and Siddique (1999, 2000) extensively investigated the inclusion of co-skewness as an explanatory variable and reported support for the three-movement CAPM.

In the case of Pakistan, Harvey (1995) and Hussain and Uppal (1998) investigated the distribution of stock returns and found that stock returns in the Karachi stock exchange (KSE) are not normally distributed. Iqbal and Brooks (2007) claimed that beta and co-skewness are correctly priced in the KSE. They showed the risk-return relationship to be non-linear in the KSE and that relationship was strong only in the recent past as the KSE became more liquid and the trading activity increased. Additionally, Javid and Ahmad (2008) and Javid (2009) empirically investigated the Sharpe-Lintner CAPM (Sharpe, 1964; Lintner, 1965). They found some empirical supports for the conditional higher-moment CAPM.

Given the financial deregulations of the early 1990s, the KSE has become an attractive investment opportunity for international investors too. It offers diversification benefits due to lower correlation (non-integration) with the developed equity markets such as the New York Stock Exchange and the London Stock Exchange. In addition the recent performance of the KSE is quite commendable as the annualized return on the KSE100 is over 40%. Both these reasons who been the main underlying drivers of ever increasing foreign portfolio investments in stocks listed on the KSE. In fact over the recent period, foreign portfolio investment has been identified as the main determinant of the overall price level at the KSE. These developments have significantly influenced the market microstructure and liquidity, which have been observed to be increasing over time.

2. Literature review

Kraus and Litzenberger (1976), following the study of Rubinstein (1973), estimated a three-moment CAPM including co-skewness as the third moment. The estimated coefficient for both beta risk premium and co-skewness risk premium are statistical significant and carry the appropriate sign to confirm the theory backing higher-moment CAPM. Lim (1989)