The Conditional Relation between Risk and Return in the Colombo Stock Market

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Abstract

Using the approach of Pettengill, Sundaram, and Mathur (1995), we analyze the conditional cross-sectional Capital Asset Pricing Model (CAPM) relationship between portfolio beta and return in the Colombo Stock Exchange (CSE). The results show that the conditional CAPM is a dominant approach for testing a risk and return relationship. Statistically significant results can be found in the risks and returns between up and down markets; however, in down markets there is a steeper negative slope, and this steeper negative relationship seems to have played a significant role in the negative relationship in average portfolio returns of the CSE. We could therefore conclude that in general the conditional relationship is a better fit than the unconditional test in the CSE. The study findings suggest that market beta still has a valid role to play as a measure of market risk.

Keywords: conditional CAPM, up markets, down markets

I Introduction

Many analysts have empirically investigated the performance of the standard version of the Capital Asset Pricing Model (CAPM) in explaining the cross-section of realized average return. The results reported in these studies revealed low empirical support of the CAPM. At the same time, the usefulness of beta as the only measure of risk for a stock has been challenged. Some researchers have pointed out that several macroeconomic variables were significantly better at explaining expected stock returns than was beta (for example, Chen, et al. (1986)), while other researchers have explored the influence of several measures of unsystematic risk on stock returns (for example, Lakonishok and Shapiro (1986)). Similar to findings in other markets, Sriyalatha (2009) revealed that the empirical findings of the risk and return relationship in the Colombo stock market were not supportive of CAPM predictions.[1] The central prediction of the CAPM is that

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1 The overall period slope coefficient ($\hat{\gamma}_{1t}$) was approximately −0.002, while those for the subperiods were approximately −0.003 and −0.002, respectively. The T value for the slope coefficient $t(\hat{\gamma}_1)$ for the full sample period was −0.843, and those for the subsamples were −0.710 and −0.421, respectively.

high beta securities are more risky than low beta securities and therefore should offer investors a higher expected return.

These unsuccessful empirical results of the CAPM caused researchers to cast doubts on the model. Recent studies suggest that the association between risk and returns on portfolios is better explained by a conditional beta relation. To improve the power of the CAPM test, Pettengill, Sundaram, and Mathur (1995) developed a conditional test of the CAPM, suggesting that the disaggregation of positive and negative relationships during up and down markets[2] has contributed to the acceptance of beta as a useful measure of market risk. They investigated the systematic, conditional relationship between beta and realized returns for the sample period 1926-1990 using the modified version of the three-step portfolio approach, with the third step, used by Fama and MacBeth (1973), revised to account for the conditional relationship between the variables. As seen in previous studies (e.g., Reinganum (1981), Schwert (1983)), they obtained contradictory results from the analysis. When they neglected the conditional nature of the risk-return relationship, they found a significant relationship for the total sample period only, but the results varied among subsamples. A different picture can be identified when the conditional CAPM test is applied. The observed results are consistent for the total sample period as well as subsample periods.

They found a positive risk-return tradeoff, when excess market return was positive and otherwise a negative risk-return tradeoff.

Following Pettengill, Sundaram, and Mathur (1995), several researchers investigated the conditional nature of risk and return relationship in several stock markets. Lau et al. (2002) studied the relationship between stock returns and beta, size, the earnings-to-price ratio, the cash flow-to-price ratio, the book-to-market ratio, and sales growth using data from Singapore and Malaysia for the period 1988-1996. They found that there is a conditional relationship between beta and stock returns for both countries. During months with positive market excess returns, there is a significant positive relationship. They also found a negative relationship between beta and returns during months with negative market excess returns.

Fletcher (1997) showed the CAPM does not provide a valid framework for predicting an unconditional relationship between risk and return in the U. K. When the sample is divided into two parts, that is, the excess market return is positive and negative, different pictures emerge: the relationship between risk and return is positive for positive excess market return and n negative for negative excess market return. However, the relationship is stronger in the case of a negative excess market return. Further, Fletcher (2000) examined the conditional relationship between risk and return in monthly international stock returns from January 1970 to July 1998. The sample consisted of 18 developed markets, and the study design incorporated the approach of

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[2] Up markets are the months with positive excess market return (positive risk premium), and down markets are the months with negative excess market return (negative risk premium).

Pettengill, Sundaram, and Mathur (1995). Fletcher found that, similar to early studies, there was a flat unconditional relationship between risk and return in international stock returns during the sample period. Under the conditional approach, the test results demonstrated a strong conditional positive and negative risk-return tradeoff.

Elsas et al. (2003) compared the unconditional and conditional risk-return relationship in the German stock market for the period 1968–1995 and found a statistically significant relation between beta and return under the conditional test. Their results support the hypothesis that the market risk of a stock that is measured by its beta adequately explains the systematic risk of the asset. Hodoshima et al. (2000) investigated the conditional relationship between risk and return for the Japanese stock market and found that after taking into consideration the difference between positive and negative market excess returns, there is a significant conditional relationship between risk and return.

Lam (2001) used the traditional Fama and MacBeth (1973) approach as modified by Pettengill, Sundaram, and Mathur (1995) to examine the risk-return relationship in the Hong Kong stock market and found that there is a strong positive as well as a negative relationship between risk and return in up markets and down markets, respectively. Huang and Hueng (2008) examined the systematic risk-return relationship using the time-varying beta model. They employed daily data of the stocks listed in the Standard & Poor 500 from November 1987 to December 2003 and found a positive risk-return relationship in the up market and a negative relationship in the down market.

Tang and Shum (2004) examined the risk-return relationship in the Singapore stock market for the period from April 1986 to December 1998. They showed that although there was a significant relationship between risk and realized returns, the explanatory power was low. However, when they applied the conditional model based on up and down markets, the explanatory power increased more than 100-fold and there was a significant positive (negative) relation between risk and returns when the market excess returns were positive (negative).

Sandoval and Saens (2004) investigated the unconditional versus conditional relationship between beta and return between January 1995 and December 2002. They employed the framework of Pettengill, Sundaram, and Mathur (1995), and analyzed the unconditional versus conditional cross-sectional CAPM relationship between portfolio beta and return in the Argentinean, Brazilian, Chilean, and Mexican stock markets after controlling for additional risk factors that have been pointed out in the literature as anomalies of the CAPM model. In this study, they controlled for risk factors such as: size, book-to-market value, and momentum. The results showed that the conditional CAPM is a dominant procedure even after controlling for additional risk factors other than beta.

We could not find published empirical research of the risk and return relationship in the Colombo stock exchange (CSE) after Samarakoon (1997). In particular, the conditional relationship on beta and return has not been employed in an examination of the CSE data. Therefore, the objective of this study was to examine whether this conditional relationship between risk and return is observable in the CSE stock returns. We used the Pettengill, Sundaram, and Mathur (1995) conditional approach for testing the risk and return relationship in the CSE.

Interestingly, our results yield strong support for the necessity to consider the conditional nature of the relationship between risk and return. Applying the unconditional test approach, we did not find a statistically significant relationship between risk and returns for either the total sample period or the two subsample periods (Sriyalatha (2009)),[3] while the conditional risk and return relationship test procedure provided remarkably different results. We found that the portfolio betas were significantly positively related with portfolio returns during up markets and significantly negatively related during down markets. The slope coefficient of the down market was much larger than that of the up market. Thus, consistent with other markets, our results proved that the conditional CAPM is a very useful equilibrium pricing model in the Colombo stock market and beta is an important measure of securities market risk in the CSE.

This paper is organized as follows. The data and methodology is presented in Section II. Our empirical results are described in Section III. Section IV concludes the paper.

Ⅱ　Data and Methodology of the Study

A) Data

Our sample for the research was monthly data from the CSE for the period from February 1994 to December 2006 (131 monthly observations). The closing price of stocks came from a standardized database obtained from the CSE. The number of firms in the sample varied from a minimum of 201 to a maximum of 237, depending on the delisting of firms and new listing of firms on the CSE. These 237 stocks are classified into 20 industries based on their nature of business. The market return was positive in 79 monthly observations, accounting for 55% of the total observations for the entire sample period. The total sample period was divided into two sub-periods of 1996-2000 and 2001-2006. The choice of subperiods reflects the desire to keep separate the pre-and post-new century data.

We used the value-weighed market return index (All Share Price Index-ASPI) as the proxy for the market return.

B) Methodology

We employed a modified version of the three-step portfolio approach of Fama and MacBeth (1973) that is a two-step method developed by Kunimura (2008).[4] The two-step approach, with

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[3] See page 99

[4] In the two-step approach to testing the risk-return relationship, the first step is the beta estimation and portfolio formation period and the second step is the testing period.

modifications suggested by Pettengill, Sundaram, and Mathur (1995), was used in the conditional risk and return relationship test. We applied the market model to estimate the beta coefficients for individual stocks (Sriyalatha (2008)). In this model, stock betas are estimated by regressing stock returns against the market return.

We ranked the stocks on the basis of the estimated betas and assigned each stock to one of ten portfolios. Portfolio 1 contained stocks with the highest betas, the next highest were in portfolio 2, and so on, with portfolio 10 containing stocks with the lowest betas.

The model used to estimate the portfolio return and beta is a two-parameter portfolio model, and it is described as follows:

$$R_{p,t}=\gamma_0+\gamma_{1t}\beta_{p,t-1}+\mu_{p,t} \qquad P=1,\cdots,N\ ;\ t=1,\cdots,T \tag{1}$$

where γ_0, γ_1, β_p, and R_p denote the constant term, systematic risk premium, beta coefficient of portfolio p, and monthly return on portfolio p, respectively. μ_p denotes an error term of the portfolio at time t. N and T are the number of portfolios and observations, respectively.

$R_{p,t}$ is the return of the portfolio at time t, and $\beta_{p,t-1}$ is the portfolio beta of the previous month. The estimated portfolio beta ($\beta_{p,t-1}$) and portfolio return ($R_{p,t}$) are regressed to test the risk-return relationship in each month. $R_{p,t}$ is calculated by taking the arithmetic mean of returns of the individual firms belonging to each portfolio in each month. The portfolio beta ($\beta_{p,t-1}$) is obtained by averaging the portfolio betas in each month.

Equation (1) shows the unconditional relationship between portfolio risk and return. Thereafter, we define two conditional relationships when the market return is positive or negative, respectively. To improve the power of the CAPM test, Pettengill, Sundaram, and Mathur (1995) followed a conditional test of the CAPM in their research and recommended that the data be split into two parts and tested by running cross-sectional regressions. The model (1) can be extended for the conditional relationship as follows:

$$R_{p,t}=\gamma_0+\gamma_1\delta_t\beta_p+\gamma_2(1-\delta_t)\beta_p+\varepsilon_{p,t} \qquad P=1,\cdots,N\ ;\ t=1,\cdots,T \tag{2}$$

where δ_t denotes a dummy variable that takes 1 and 0 when the market is up and down, respectively. Since γ_1 is estimated in periods with positive market returns, the expected sign of this coefficient is positive. γ_2 is represented in periods with negative market returns, and its expected sign is negative. The slope coefficient γ_1 and γ_2 capture the relationship between beta and return, conditional on the market return being positive and negative, respectively. The test of the null hypotheses that the means of these slope coefficients are zero is given as follows:

$H_0 : \bar{\gamma}_1=0, \qquad H_1 : \bar{\gamma}_1>0.$

$H_0 : \bar{\gamma}_2=0, \qquad H_1 : \bar{\gamma}_2<0.$

If on both sides the null hypothesis is rejected instead of the alternative, the results can be confirmed, as there is a systematic conditional relationship between beta and realized returns. The simple t-test can be used to test the above hypotheses. The t-statistics for testing these hypotheses can be expressed as follows:

$$t(\bar{\hat{\gamma}}_j)=\frac{\bar{\hat{\gamma}}_j}{s(\bar{\hat{\gamma}}_j)/\sqrt{n},} \qquad (3)$$

where n is the number of months in the up and down markets and $s(\bar{\hat{\gamma}}_j)$ is the standard error of the regression estimates.

Ⅲ Empirical Results

A) Conditional Risk-Return Relationship

Previous study (Sriyalatha (2009)) of testing the risk-return relationship did not take into account the conditional nature of the relationship between risk and return. We therefore re-estimated the conditional relationship between beta and return using Equation (2). As mentioned in Section II, if realized market return is positive, portfolio betas and returns should be positively related, and if realized market return is negative, portfolio betas and returns should be inversely related.

To test for the conditional relationship between these two variables, we modified the model and introduced a dummy variable to account for the conditional relationship. Table 1 shows that there are a substantial number of up market months over the whole sample period, 72 for the ASPI proxy. A comparison of Figure 1 in traditional risk and return relationship (Sriyalatha (2009))[5] and conditional risk and return relationship (see Figure 1) forces us to differentiate the market as up or down in empirical examinations of the relationship between risk and return. Before starting to recalculate the regression coefficient for a conditional test, we conducted an independence test for the sample data. In this test, $\chi^2=35.76$, and it is significant at the 1% level (Sriyalatha (2009)).[6] This value indicates that the sample data are not independent from each other. Thereafter, new regression coefficients are estimated. Table 2 gives the cross-sectional regression results for the conditional relationships of Equation (2). SE refers to the standard error of the regression equation. The results of the independent test indicate that in periods of up market, as well as down market, there is a significant relationship between beta and return. As expected, there is a positive relationship in up market returns and an inverse relationship in the down market returns in the period 1996-2006.

In Table 2, the slope coefficients of the regression output ($\hat{\gamma}_1=0.017$, $\hat{\gamma}_2=-0.023$) and their *t*-statistics ($t(\hat{\gamma}_1)=3.559$, $t(\hat{\gamma}_2)=-3.639$) are evidence that the slope of down markets is greater than that of up markets. The slope coefficient means have the expected sign, and both are significant at the 1% level.

Therefore, null hypotheses are rejected. The slope estimate is always positive in up markets and negative in down markets in all subsample periods. The estimated R^2 value for the total

[5] See page 99

[6] See page 97

Table 1 Number of months based on market condition

If the market return is positive, the market is defined as an up market. If the market return is negative, the market is defined as a down market. The sample period is from January 1996 to December 2006.

Sample period	Up market return months	Down market return months
1996-2006	72	59
1996-2000	27	32
2001-2006	45	27
1996	5	6
1997	6	6
1998	7	5
1999	5	7
2000	4	8
2001	6	6
2002	7	5
2003	6	6
2004	9	3
2005	9	3
2006	8	4

Source: Research data in 2009

sample period is 0.37. The R^2 values of the main subsample periods 1996-2000 and 2001-2006 are 0.39 and 0.36, respectively. The standard error of the equation in the cross-sectional regression approach is better in up markets than in down markets for the total sample period and the main subsample periods. As can be seen in Table 2, for the period during which tests were conducted, the conditional relationship is better in down markets than in up markets. This result confirms that during up markets, high beta portfolios earn a positive return, and during down markets, high beta portfolios incur lower returns. Further, it shows that as expected, high beta portfolios incur lower returns during down markets than those of low beta portfolios. Figure 1 shows the relationship between the portfolio average returns and average betas when the difference between up and down markets is introduced.

With small differences, Figure 1 provides substantial illustration of the expected relationship between risk and returns. The results of the conditional test thus support the conclusion that the portfolio betas are connected with realized portfolios returns as predicted by the two-parameter portfolio model in the CSE.

Table 2　Cross-section regression estimates for the conditional relationships

The two-parameter portfolio model (1), which is used to test the risk-return relationship, is modified to account for the conditional relationship between beta and return on the Colombo stock exchange (Equation (2)). According to Equation (2), if the market return is positive, portfolio betas and returns should be positively related, but if the market return is negative, portfolio betas and returns should be inversely related. This relationship is examined for each year in the sample period by estimating either $\hat{\gamma}_1$ or $\hat{\gamma}_2$, depending on the sign for market returns. Since $\hat{\gamma}_1$ is estimated in periods with positive (up) market returns, the expected sign of this coefficient is positive. On the other hand, $\hat{\gamma}_2$ is estimated in periods with negative (down) market returns, and the expected sign is negative.

Period	$\hat{\gamma}_1$ and $\hat{\gamma}_2$	SE	$t(\hat{\gamma}_1)$ and $t(\hat{\gamma}_2)$	$P(\hat{\gamma}_1)$ and $P(\hat{\gamma}_2)$
1996-2006				
Up	0.017***	0.005	3.559	0.000
Down	−0.023***	0.006	−3.639	0.000
Subsample-up				
	$\hat{\gamma}_1$	SE	$t(\hat{\gamma}_1)$	$P(\hat{\gamma}_1)$
1996-2000	0.024***	0.006	3.803	0.000
2001-2006	0.012*	0.007	1.808	0.071
1996	0.023**	0.012	1.955	0.053
1997	0.018	0.015	1.218	0.226
1998	0.023	0.015	1.488	0.139
1999	0.029**	0.013	2.243	0.027
2000	0.022**	0.012	1.955	0.053
2001	0.048***	0.014	3.572	0.001
2002	0.003	0.012	0.228	0.820
2003	0.003	0.018	0.174	0.862
2004	0.016	0.019	0.858	0.393
2005	0.003	0.011	0.269	0.788
2006	0.011	0.014	0.740	0.461
Subsample-down				
	$\hat{\gamma}_2$	SE	$t(\hat{\gamma}_2)$	$P(\hat{\gamma}_2)$
1996-2000	−0.029***	0.006	−5.006	0.000
2001-2006	−0.026**	0.011	−2.422	0.016
1996	−0.015	0.012	−1.267	0.208
1997	−0.032**	0.013	−2.376	0.019
1998	−0.025	0.018	−1.401	0.164
1999	−0.046***	0.012	−3.966	0.000
2000	−0.025***	0.009	−2.926	0.004
2001	−0.019	0.015	−1.266	0.208

2002	−0.019	0.014	−1.343	0.182
2003	−0.025	0.019	−1.347	0.181
2004	−0.049	0.034	−1.427	0.156
2005	−0.053***	0.019	−2.742	0.007
2006	−0.004	0.020	−0.172	0.864

Source: Research data in 2009
*** Significant at the 1% level, ** Significant at the 5% level, and * Significant at the 10% level.

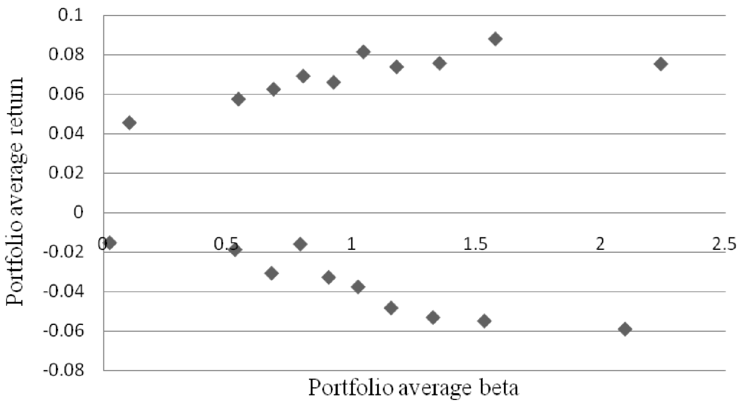

Figure 1 Conditional relationships between average beta and return of the 10 portfolios

Source: Research data in 2009

In the cross-sectional regression Equation (2) of the conditional relationships, the goodness of fit measures obtained by R^2 represent a better fit in the sample period (see Table 3) than do the results of the unconditional risk and return test (see Sriyalatha (2009)).[7] The early studies such as that by Pettengill, Sundaram, and Mathur (1995) do not involve such a measure. In the present research we felt that such a measure was given too much weight in the regression analysis. We believe the strength of the relationship between risk and return can be more accurately measured by R^2. The obtained R^2 value indicates that changes in portfolio beta explain more than 35% of the variation in average portfolio returns. Thus, the results of the traditional risk and return test suggest that the aggregation of positive and negative relationships during up and down markets have contributed to the rejection of beta as a useful measure of market risk. Table 4 shows the conditional test results of previous research in different capital markets.

The results on the bottom line of Table 4 are the current research findings of the CSE, which show that the conditional test results the CSE are consistent with those of the other developed capital markets. Therefore, it is clear that the conditional risk and return test provides more

[7] See page 101

Table 3 R^2 values of cross-sectional Equation (2)

Sample period	R^2	Sample perio	R^2
1996-2006	0.373	2000	0.432
1996-2000	0.388	2001	0.433
2001-2006	0.364	2002	0.369
1996	0.274	2003	0.377
1997	0.410	2004	0.254
1998	0.498	2005	0.681
1999	0.424	2006	0.369

Source: Research data in 2009

Table 4 Conditional test results of different capital markets

Researcher/s[8]	Model	Result
Pettengill, Sundaram, and Mathur (1995)	$R_{it}=\hat{\gamma}_0+\hat{\gamma}_1^*\delta^*\beta_i+\hat{\gamma}_2^*(1-\delta)^*\beta_i+\varepsilon_{it}$	$\hat{\gamma}_1=0.0336^{***}$ $\hat{\gamma}_2=-0.0337^{***}$
Fletcher J. (1997)	$R_{it}=\hat{\gamma}_{0t}+\hat{\gamma}_{1t}\beta_i+u_{it}$	$\bar{\gamma}_2=0.0318^{**}$ $\bar{\gamma}_3=-0.0546^{**}$
Elsas et al. (1999)	$r_{i,t}=\gamma_{0t}+\gamma_{1,t}D_t\beta_i+\gamma_{2,t}(1-D)\beta_i+\varepsilon_{i,t}$	$\bar{\hat{\gamma}}_1=2.79\%^{***}$ $\bar{\hat{\gamma}}_2=-2.71\%^{***}$
Hodoshima et al. (2000)	$R_{pt}=\gamma_{0t}+\gamma_{1t}\beta_{pt}+\varepsilon_{pt}$	$\gamma_{1up}=0.021^{**}$ $\gamma_1 down=-0.030^{**}$
Sriyalatha M.A.K (2009)	$R_{pt}=\gamma_0+\gamma_1\delta_t\beta_p+\gamma_2(1-\delta_t)\beta_p+\varepsilon_{pt}$	$\hat{\gamma}_1=0.017^{***}$ $\hat{\gamma}_2=-0.023^{***}$

*** Significant at the 1% level, and ** Significant at the 5% level.

information to the investors than does the traditional risk-return relationship test.

B) Seasonality in the Risk and Return Relationship

In financial markets, seasonal effects can affect the equity returns. Seasonality means a tendency to repeat a pattern of behavior over a seasonal period, generally one year. Seasonality in capital asset returns means that the distribution of ex ante returns differs for specified periods of the year. This seasonal effect results in higher or lower equity returns than the asset's fundamental value. This is an anomaly, because it is difficult to explain using the existing theories. The existence anomaly is affected by several factors, such as firm's characteristics and calendar anomaly.

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[8] Many researchers have applied the Pettengill, Sundaram, and Mathur (1995) approach to various markets, including Hung et al. (2004) for the U. K. market, Lam (2001) and Ho et al. (2006) for the Hong Kong market, and Faff (2001) for the Australian market.

Many researchers have performed studies on the calendar anomaly, including the day of the week effects, January effects, and the month of the year effects. For example, Gibbon and Hess (1981), using data from the period 1962-1978, found that stock returns in the U. S. market are significantly lower on Mondays and higher on Fridays. Jaffe and Westerfield (1985) examined the day of the week effect in four international stock markets (U. K., Japan, Canada, and Australia). They found that in the U. K. and Canada, the lowest return was reported on Monday, while in Japan and Australia the lowest return was on Tuesday. They documented new evidence of the negative Tuesday effect.

Lakonishok and Smidt (1988) documented a negative Monday return in the U. S. capital market. Brooks and Persand (2001) examined the day-of-the-week effect in emerging markets (Taiwan, South Korea, Philippines, Malaysia, and Thailand) and found a significant positive return on Monday and negative return on Tuesday in Thailand and Malaysia. In Taiwan, there was a negative return on Wednesday. Two of the stock return series, those of South Korea and the Philippines, showed no significant evidence of this calendar anomaly. Tinic and West (1984) examined seasonality in the basic relationship between expected return and risk during the period 1935-1982. The results revealed that the positive relationship between risk and return was unique to January. The risk premiums during the remaining months of the year were not significantly different from zero. They then extended their investigation and reported that the average value of the estimated systematic risk premium is generally negative in January and positive the rest of the year (Tinic and West (1986)). Further, they showed that the average value of the estimated unsystematic risk premium is positive in January. This implies that investors receive a compensation for bearing unsystematic (diversifiable) risk during that month of the year.

Hawawini and Viallet (1987) re-examined the empirical relationship between the average return and the risk of a sample of French common stocks from January 1969 to December 1983. They applied the methodology of Fama and MacBeth (1973) to the monthly returns of 20 portfolios ranked according to size and beta. They reported that there was no significant relationship between risk and return when all months of the year were considered, but a month-by-month analysis revealed an entirely different picture. In January the risk and return relationship was positive and concave, and unsystematic risk was not priced, but there was a significant size effect. The rest of the year the risk and return relationship was negative and linear, and unsystematic risk was not priced, but there was no size effect.

Keim (1983) reported that small firm returns during the month of January are significantly higher than large firm returns. Furthermore, he discovered that over 50% of the January effect occurs during the first week of January. Kato and Schallheim (1985) examined the seasonal and size anomalies in the Japanese stock market for the period 1952-1980. The effects of both the seasonal and size anomalies can be indentified in the Japanese stock market. However, they pointed out that the January and size effects are sensitive to the type of market index used in the analysis. They showed that the January average return for the Equally Weighted Index (EWI) was higher than that for the Value Weighted Index (VWI). In addition to the January effect, they described a possible June seasonal effect in the Japanese stock market.

The authors of a number of empirical studies have found that the relationship between risk and return depends on the monthly behavior of returns. This means that seasonality has been shown to affect the estimated risk-returns tradeoff in equity markets.

We tested for seasonality in the risk-return relationship by dividing the data by months and reestimating Equation (2). When the conditional test was applied to the data, that is, the month of positive market return and its opposite side, another picture emerged: the relationship between average portfolio returns and estimated beta coefficient was always positive in all up markets and always negative otherwise. Table 5 shows the cross-sectional regression coefficient from Equation (2) with data segmented by months.

In Table 5, all 24 slope coefficients have the expected sign. The results show that when the market return is positive, there is a significant positive relationship between beta and return for the months of January, March, April, June, July, September, and October. In January and October, the null hypothesis of no relationship between risk and return is rejected at the 1% level. The January effect has a significant impact on the conditional relationship between risk and return. In the month of January, there is a strong positive relationship in up markets but a weak relationship in down markets. Most of the research shows that the stock market's behavior in January is different from the rest of the year.[9] As is readily apparent, the relatively high t value of $\hat{\gamma}_1$ is found in January. Further, seven out of 12 months support a positive risk-return relationship in up markets. When the market return is negative, a significant negative relationship is indicated between risk and return for six months.

The negative relationship is strong for the month of February and November. These results again confirm that there is a conditional relationship between risk and return when the seasonality of returns is considered.

In terms of goodness of fit measures, provided in Table 6, the conditional relationship for Equation (2) is consistently a better fit in January, April, June, and November than in other months of the sample period. R^2 ranges from 0.248 in February to 0.616 in January. On average, changes in beta explain 42% of the variation in average portfolio returns in up and down markets simultaneously.

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[9] See, for example, Tinic and West (1984). They found a significant positive relationship between risk and return in the month of January.

Table 5 Estimates of slope coefficients for up markets return and down markets return

We examined seasonality in the risk-return relation by dividing the data according to calendar months of the year and re-estimating Equation (2) with data segmented by market condition. Up markets (down markets) are periods of positive (negative) market returns.

Period	Up markets returns			Down markets returns		
	$\hat{\gamma}_1$	$t(\hat{\gamma}_1)$	$P(\hat{\gamma}_1)$	$\hat{\gamma}_2$	$t(\hat{\gamma}_2)$	$P(\hat{\gamma}_2)$
All months	0.017	3.559	0.000***	−0.023	−3.639	0.000***
January	0.083	4.873	0.000***	−0.022	−1.851	0.067*
February	0.000	0.040	0.968	−0.035	−2.801	0.006***
March	0.017	1.794	0.076*	−0.017	−1.432	0.155
April	0.026	2.163	0.033**	−0.015	−1.488	0.140
May	0.005	0.282	0.779	−0.009	−0.336	0.738
June	0.021	2.011	0.047**	−0.027	−1.660	0.100*
July	0.037	1.858	0.066*	−0.030	−1.472	0.144
August	0.000	0.041	0.968	−0.023	−1.930	0.056**
September	0.031	2.027	0.045**	−0.024	−0.802	0.424
October	0.044	2.584	0.011***	−0.027	−1.467	0.145
November	0.000	0.013	0.990	−0.036	−2.622	0.010***
December	0.017	1.215	0.227	−0.050	−2.352	0.021**

Source: Research data in 2009

*** Significant at the 1% level, ** Significant at the 5% level, and * Significant at the 10% level.

Table 6 R^2 values of cross-sectional regression Equation (2) when the monthly seasonal effect is considered

Month	R^2	Month	R^2
January	0.616	July	0.262
February	0.248	August	0.413
March	0.332	September	0.280
April	0.583	October	0.413
May	0.259	November	0.612
June	0.613	December	0.416

Source: Research data in 2009

Ⅳ　Conclusion

A number of recent studies failed to reveal the relation between beta and returns predicted by the CAPM. Pettengill, Sundaram, and Mathur (1995) introduced a conditional test approach that focuses on testing the two hypotheses of there existing a positive relation between beta and returns during periods of positive market excess returns and a negative relation during periods of negative market excess returns. The conditional test procedure allows identifying use of an ex-post positive and negative linear relationship between risk and return when the market is up and down.

We applied the conditional test to a specific set of data and revealed a statistically significant conditional relation between risk and return. As seen in Figure 1, there is a steeper negative slope in down markets, and this steeper negative relationship during down markets seems to have played a significant role in the negative relationship found in average portfolio returns of the CSE. We could therefore conclude that in general the conditional relationship is a better fit than the unconditional test in the CSE. The findings of the study suggest that market beta still has a valid role to play as a measure of market risk.

Table 5 reports the cross-sectional regression coefficient from Equation (2) with data segmented by months. All 24 slope coefficient have the expected sign. The results show that when the market return is positive, there is a significant positive relationship between beta and return for the months of January, March, April, June, July, September, and October. Among them, in January and October, the null hypothesis of no relationship between risk and return is rejected at the 1% level. The January effect has a significant impact on the conditional relationship between risk and return. In the month of January, there is a strong positive relationship in up markets but a weak relationship in down markets. Most of the research shows that the stock market's behavior in January is different from that during the rest of the year. As is readily apparent, the relatively high t value of $\hat{\gamma}_1$ is found in January. These results again confirm that there is a conditional relationship between risk and return when the seasonality of returns is considered.

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