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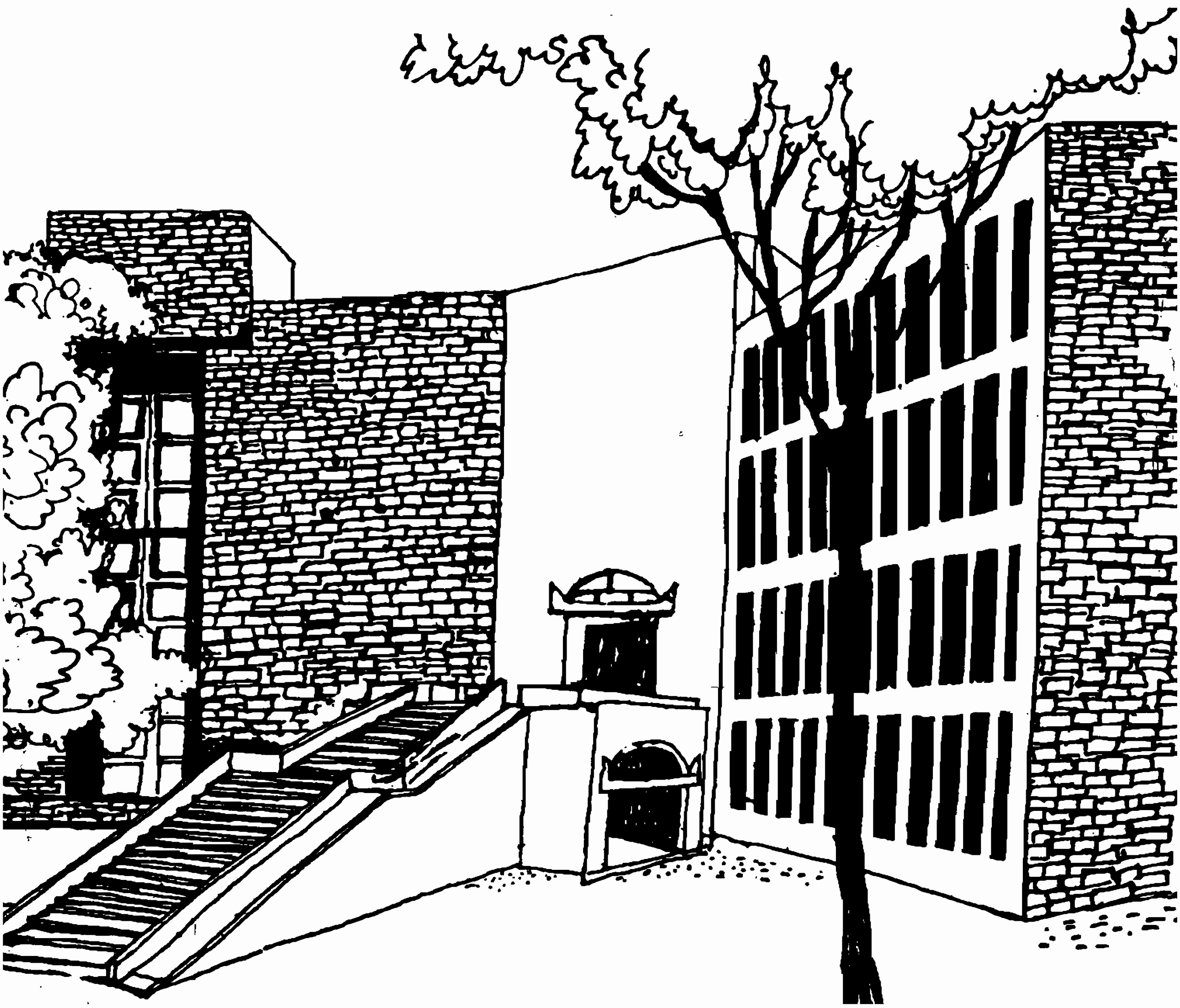

RELATIONSHIP BETWEEN RISK AND RETURN: AN EMPIRICAL TEST OF THE CAPITAL ASSET PRICING MODEL FOR MALAYSIA

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ABSTRACT

This paper uses weekly return data for the period January 1990 through December 1996 for a sample of 224 stocks listed on the main board of Kuala Lumpur Stock Exchange to estimate the Capital Asset Pricing Model, CAPM. Both the Fama and MacBeth (1973) procedure and its refined version by Pettengill, Sundaram and Mathur (1995) are adopted, yielding results that suggest no significant relationship between return and beta

1 INTRODUCTION

Finance academics and practitioners have long been concerned with the relation between return and risk. Since the development by Sharpe (1964) and Lintner (1965) of the capital asset pricing model (CAPM), a lot of theoretical and empirical work has been done to determine the relation between return and risk. In its most basic form, the CAPM predicts that apart from the market risk as measured by beta, no other variable could explain the stock return. The model has undergone a series of empirical tests but little attempt has been made to investigate its empirical relevance for a developing stock exchange such as the Kuala Lumpur Stock Exchange. The paper is motivated also by the observation by Pettengill, Sundaram and Mathur [1995), PSM, that most earlier studies not supportive of the theory have been based upon a wrong methodology that assumes that the positive relation between return and risk should hold without condition. PSM's methodology applied to the US data produced results consistent with theory. We ask, is this also the case with Malaysian data?

The paper is organized as follows. Section two is the literature review followed by in section three the research methodology. Section four presents the results while section five provides a discussion. Section six concludes.

2 LITERATURE REVIEW

The capital asset pricing model was developed independently by Sharpe (1964) and Lintner (1965). The model relates the return of a security to a market index. It states that the ex ante (expected) return of an asset i. $E[R_i]$, is related to the ex ante (expected) return of the market, $E[R_m]$. The theory is based on a number of restrictive assumptions, the most important being:

a. Investors evaluate portfolios by looking at the expected returns and standard deviations of the portfolios over a one-period horizon;

b. Investors could borrow/lend at risk-free rate.

c. Investors have homogenous expectation. meaning that they have the same perceptions in regard to the expected returns, standard deviations, and covariances of securities.

d. All securities are infinitely divisible.

e. There are no transaction costs.

For several years, the works of Sharpe (1964), Lintner (1965) and Black (1972) (or SLB, in short) on the two-parameter capital asset pricing model constituted the corner stone of finance theory. An empirical investigation of the validity of the CAPM has been based on three hypotheses. namely:

a. a positive relation between return and risk.

b. a linear relation between return and risk. and

c. non-systematic risk is not priced by the market

Fama and MacBeth (1973) employed a two-step procedure using data for the New York Stock Exchange common stocks for the period January 1926 through January 1968. They did not reject the hypothesis that "no measure of risk, in addition to β, systematically affects expected returns." and also found that "the results ... do not reject [the hypothesis] that the relationship between expected return and β is linear." They therefore concluded that there is a statistically observable positive relationship between return and risk. Lintner (1965) obtained results which did not conform totally to the predictions of the model. In particular, he found the coefficient of non-systematic risk to be statistically significant and positive. Douglas (1969) employed similar methodology and found results similar to Lintner's. Black, Jensen and Scholes (1972) found that the relation between realized return and beta appears to be linear as predicted by the CAPM. However, the intercept was different from its predicted value.

A large body of empirical evidence has questioned the validity of the CAPM [Blume and Friend (1973), Chan, Hamao and Lakonishok (1991), Corhay, Hawawini and Michel (1987), Dowen and Bauman (1986), Fama and French (1992), Jordan and Jordan (1991), Kraus and Litzenberger (1976), Livingston (1977). and Tinic and West (1984)].

Blume and Friend (1973) present empirical evidence to show that the relationship between rate of return and risk implied by the CAPM is unable to explain the differential returns in the stock market. As a result, the risk-adjusted measures of portfolio performance based on the CAPM yield seriously biased estimates of portfolio performance. According to them, a major reason for this weakness of the theory lies in the inability of investors to borrow large amounts of money at the same risk-free interest rate, contrary to one of the theory's major assumptions. Also questioning the validity of the CAPM is a study by Chan, Hamao, and Lakonishok (1991). They applied a seemingly unrelated regression technique for monthly data for Japan for the period January 1971 to December 1988, and found that the book to market ratio, cash flow yield, and earnings yield had predictive influences on expected return. They also found evidence of the "size effect", casting doubt on the validity of the CAPM. Roll (1981) attempts to provide explanation for the small firm effect. He suggests that the incidence of infrequent trading for small firms causes the problem of serial correlation, which in turn causes a bias in risk assessment of small firms.

Corhay, Hawawini and Michel (1987), CHM, estimate the relationship between return and risk using 1591 monthly common stocks data for the United States, the United Kingdom, France and Belgium for the period January 1969 to December 1983. They used the Fama and MacBeth methodology to estimate each month's risk premium. They run the regression:

$$\tilde{R}_{pt} = \gamma_{pt} + \gamma_{1t}\beta_{p,t-1} + u_{pt} \qquad (1)$$

Corhay, Hawawini and Michel's sample comprises the world's largest exchange, the NYSE, and one of the smallest exchanges, the Brussels Stock Exchange. Despite the difference in the level of activity in the sample exchanges, CHM find strong evidence of April seasonal for the UK and January seasonal for the US, Belgium and France. Their results also question the validity of the CAPM not only because they find no positive relationship between return and risk for the

US but also because for the three European countries, when January is excluded, the rest of the year is characterized by a negative relationship between return and risk.

The seasonality aspect of the CAPM anomaly has also been studied by Jordan and Jordan (1991) who compare daily bond and stock returns in the United States for the period 1963-1986. They find evidence of January and week-of-the-month effects for the bond market; and of turn-of-the-month and day-of-the-week effects for the S & P 500 stock index. Andrew (1984) adopts the Fama-MacBeth procedure for a number of US firms and finds evidence of "neglected firm effect". Dowen and Bauman (1986) estimate a multi factor CAPM by including three additional variables [P/E ratio, corporate capitalization, and institutional investor popularity] to the two-factor model. They found that "special effect factors, particularly the P/E ratio factor and the small capitalization factor, can have a positive effect on portfolio returns over an extended period of years. However, their effects on individual stocks and on returns in individual years are much less certain."

Tinic and West (1984) also reject the validity of the SLB model based on intertemporal inconsistencies. Using monthly data, they find a positive and significant slope when regressing portfolio returns on portfolio betas when return data for the entire year are included. Tinic and West are, however, unable to reject the null hypothesis of no difference in returns across portfolios if return data from the month of January are excluded. Further, for several months of the year, negative slope coefficients are observed. This inconsistent support for the

SLB model across months of the year led them to conclude that their results "...cast serious doubt on the validity of the two-parameter model..." and "... to the extent that the risk-return trade off shows up only in January, much of what now constitutes the received version of modern finance is brought into question" [Tinic and West (1984), p. 573].

Several other studies stress that the ability of beta to explain changes in return is weak relative to other variables. Lakonishok and Shapiro (1984) find an insignificant relationship between return and beta. Further, Lakonishok and Shapiro find a significant relationship between returns and market capitalization values. From these tests, they conclude that "... individual security's return did not appear to be specifically related to its degree of systematic risk" [(1984), p. 36]. Fama and French (1992) study monthly returns and find an insignificant relationship between average returns and beta. In contrast, market capitalization and the ratio of book to market value have significant explanatory power for portfolio returns. Fama and French state "we are forced to conclude that the SLB model does not describe the last 50 years of average stock returns" [p. 464].

Kraus and Litzenberger (1976) argue that the observed anomalies of the CAPM are due largely to model misspecification. They show that previous studies have ignored the importance of skewness and that this exclusion probably accounts for the reported anomalies. With the inclusion of skewness as the third parameter, Kraus and Litzenberger obtained results that confirmed the prediction of a significant price of systematic skewness. Another evidence of model misspecification comes from the works of Keim and Stambaugh (1984) who find evidence of Monday effect and Tinic and West (1984) who use annual data for the period 1935-82 and report evidence of nonlinearity, violating the CAPM's assumption of linearity between return and risk. To see whether this violation was due to CAPM anomalies, they controlled for size and January effects and still obtained the same result.

Other researchers have identified another source of misspecification. Under the market model, securities are assumed to be correlated only because they are related to the market and once this correlation with the market is removed, the resulting residuals will be uncorrelated with one another, implying the absence of any non-market factor. The work of Meyers (1973) seems to support this line of argument. Some studies [such as Livingston (1977)] challenge the idea that the market is the sole factor accounting for the correlation between security returns. Using monthly data from the Compustat tapes for 734 companies from over 100 US industries for the period 1966 to 1970, Livingston reports evidence of industry factors, casting doubt on the works of Meyers (1973). He argues that the evidence supporting the single market-factor idea is due largely to faulty method of analysis. According to Livingston, the factor analysis approach is highly sensitive to changes in the sample and that the extracted factors do not necessarily correspond to factors generated by the underlying model.

Errunza and Losq (1985) have extended the CAPM to international setting. They were motivated to investigate whether or not international markets were integrated or segmented. According to them, if markets were integrated assets of equivalent risk would have equal returns. Errunza and Losq used data of heavily traded securities from nine developing countries [Argentina, Brazil, Chile, Greece, India, Korea, Mexico, Thailand and Zimbabwe] and a random sample of US securities. Their results "are not statistically inconsistent with theoretical expectations and thus lend tentative support to the mild segmentation hypothesis." The authors themselves recognize that their data was small and so elicited for further research "based on a richer data set with longer time period and larger sample size...to improve the power of the test."

The plethora of evidence against the CAPM served as a stimulus to the development of a new alternative theory, the arbitrage pricing theory. While an alternative has been developed, the CAPM is not dead, after all. For, contrary to Fama and French (1992) and a host of other authors, recent evidence by PSM suggests a systematic relation between expected return and beta, as predicted by the theory. Previous studies on the CAPM have always proxied expected market return by realised market return. PSM point out that this proxy has caused a severe flaw in such studies and has led them to arrive at misleading results that question the validity of the CAPM. The argument of PSM runs as follows. Expected market return is always greater than the risk free rate (positive excess return), while realised market return can be greater or less than the risk free rate. When realised market return is negative low beta firms will perform better than high beta firms. When the realised market return is positive, high beta firms will outperform low beta ones. Thus. the positive relation between expected return and beta of an asset is conditional on the realised return being positive. Previous studies, PSM argue, have ignored this conditional relation and have therefore arrived at misleading results such as those reported by Fama and French (1992). PSM therefore take into account of this conditional relation by modifying the model so that it is possible for beta to be estimated separately for periods of positive and periods of negative realised excess market return. With this modification they obtain results that reject the hypothesis of no relation between expected return and beta of an asset. They also find no evidence of seasonality in risk-return relation.

3 METHODOLOGY

Weekly return data for a sample of 224 stocks listed on the main board of the KLSE for the period January 1990 through December 1996 was used in this study to obtain empirical estimates of the Fama and MacBeth version of the Capital Asset Pricing Model, CAPM. For a stock to be included in the sample, it must have been listed since January, 1990. The capital asset pricing model investigated by Fama and MacBeth (1973) is of the form:

$$\tilde{R}_{it} = \gamma_{0t} + \gamma_{1t}\beta_i + \gamma_{2t}\beta_i^2 + \gamma_{3t}s_i + \eta_{it} \qquad (2)$$

where R_{it} = return on stock i on week t

β_i = beta of stock i

s_i = unsystematic risk on stock i.

$\gamma_{i's}$ = parameters to be estimated

η = random error term, assumed to be white noise.

The CAPM's three hypotheses of section 2 above are tested through the t-test. If the coefficient γ_2 is not significantly different from zero, the linearity is upheld; if γ_3 is not different from zero, then the non-systematic risk is not priced; and if γ_1 is positive and significantly different from zero, then return is a positive function of systematic risk. Fama and MacBeth (1973) realize that testing the CAPM in this form presents an unavoidable "errors-in-variable" problem. This is because the expected return-risk relationship is in terms of true values of the relative risk measure, β_i, but in empirical tests estimates, ($\hat{\beta}_i$) must be used.

This errors-in-variables problem is greatly reduced under certain conditions as pointed out by Blume (1970). Blume shows that for any portfolio p, defined by the weights x_{ip}, i= 1,2, ..., N, β_p is given by:

$$\beta_p = \sum_{i=1}^{N} x_{ip}\beta_i \qquad (3)$$

If the errors in the β_i are substantially less than perfectly positively correlated, the β's of portfolios can be much more precise estimates of true β's than the β's for individual securities. Thus, Fama and MacBeth take comfort from Blume's findings and utilize the portfolio formation technique to ameliorate the errors in variables problem. Despite the advantage of portfolio formation technique pointed out by Blume, Fama and MacBeth maintain that the technique can lead to loss of information in the risk-return tests. They suggest that in order to get around this problem of loss of information, portfolios should be formed on the basis of ranked betas of individual securities. But even this also, according to them can pose a regression problem arising from the tendency for large portfolio β_p to tend to overstate the true β_p, while low portfolio β_p to tend to be an underestimate. They circumvent this problem by forming portfolios on the basis of ranked β_i computed from data for one time period but then using a subsequent period to obtain the β_p for these portfolios that are used to test the two-parameter model. Fama and MacBeth observe that with "fresh data, within a portfolio errors in the individual security, β_i are to a large extent random across securities, so that in a portfolio β_p the effects of the regression phenomenon are, it is hoped, minimized" (p. 615).

This paper uses the Fama-MacBeth (1973) approach to estimation of the CAPM. Fama and MacBeth adopted three stages. The first stage is the portfolio formation stage. The second is the estimation of portfolio beta, and the third stage is cross sectional regression. The table below describes the sample periods for each of the three stages:

Table 1: Sample Periods for Portfolio Formation, Estimation, and Testing

	PERIODS				
	I	II	III	IV	V
Portfolio formation period	Weeks 1-48	Weeks 13-96	Weeks 61-144	weeks 109-192	Weeks 157-240
Initial estimation period	Weeks 49-108	Weeks 97-158	Weeks 145-208	Weeks 193-258	Weeks 241-308
Testing period	Weeks 109-158	Weeks 159-208	Weeks 209-258	Weeks 259-308	Weeks 309-358

Following Fama and MacBeth's procedure, this study adopts the following steps to test the two parameter model:

3.1 Portfolio Formation Stage:

This is achieved through three steps:

One, estimating β for each of the 224 stocks using data for weeks shown in the first row of Table 1 above to estimate the model (R_m = return on KLSE - Composite Index).

$$R_i = \alpha_i + \beta_i R_m + e_i \qquad (4)$$

Two, ranking all 224 stocks by ascending order of β. Three, dividing the 224 stocks into 20 portfolios, each having 224/20 = 11 stocks so that:

Portfolio I contains 11 stocks with the lowest β

Portfolio II contains 11 stocks with the 2nd lowest β

....

Portfolio XIX contains 11 stocks with the 2nd highest β

Portfolio XX contains 15 stocks with the highest β

The portfolios are revised fifty times so that the second round for period I uses weeks 2-49; the third uses weeks 3-50 etc until the fiftieth which uses data for weeks 50-97. The same is applied to the other four periods, giving a total of 56,000 regressions (5 x 50 x 224) for the portfolio formation alone.

3.2 Estimation Stage

This proceeds in two steps. First, use equation (4) again to estimate β for each of 224 stocks using data for week 49 to 108 (i.e. the initial estimation period). Use weeks 50-109 for the second set of estimates, weeks 51-110 for the third, etc, until the fiftieth set using weeks 98 to 157. Thus, for period I, this step involves running 11,200 regressions (i.e. 50 x 224) to obtain individual betas. Repeating the step for the other four periods gives a total of 56,000 regressions to obtain individual stock betas. The second step computes β_p and s_{ep} for each portfolio with β_p being an equally weighted average of the betas obtained in the first step. s_{ep} is an equally weighted average of the standard deviation of the residuals of the stocks of the portfolio obtained the first step. This will give 20 portfolio β's and 20 s_{ep} for each of the 50 moving windows for each of the 5 periods I to V.

3.3 Testing Stage

This consists of three steps. The first step involves using data for each of the weeks 109-158 to obtain portfolio returns, each portfolio being an equally weighted average of the returns of its component stocks. The second step involves running for each week a cross sectional regression to estimate the parameters of Equation (2), giving 50 estimates for each of the parameter. The third step therefore computes a t-statistic for each of the parameters of the equation, using the formula:

$$t = \frac{\overline{\hat{\gamma}_i}}{\frac{\sigma_{\hat{\gamma}_i}}{\sqrt{n}}} \qquad (5)$$

4 RESULTS

The results are divided into two parts: the first focuses on the Fama-MacBeth's approach while the second on the PSM's approach.

4.1 The Fama-MacBeth's Approach

In testing the CAPM, Equation 2 was estimated. The estimates of the parameters of the equation were used to conduct tests reported in Table 2 below. For each of the Periods I to V, 50 estimates of each of the γ's were then used to compute the t-statistic using Equation (5). The results are reported in Table 2. From the table it is clear that:

a) For period I, none of the parameters of the model in Equation 5 is significant at the 5 per cent level. This suggests that for this period, there is no evidence of nonlinearity in the relationship between return and risk; that the residual standard deviation is not significant, implying that variables other than beta do not appear to be significantly related to returns; and that there is no significant relationship between return and beta.

TABLE 2: TESTING THE CAPM: ALL PERIODS

PERIOD	PARA-METER	NUMBER OF ESTIMATES (N)	MEAN OF THE ESTIMATES	STANDARD DEVIATION	T-RATIO
I	γ1	50	0.0072	0.0660	0.7722
	γ2	50	-0.0053	0.0382	-0.9859
	γ3	50	0.1800	0.7572	1.6809
	γ0	50	-0.0039	0.0205	-1.3303
II	γ1	50	-0.0117	0.1678	-0.4951
	γ2	50	0.0016	0.0890	0.1267
	γ3	50	0.1225	0.7598	1.1403
	γ0	50	0.0264	0.0880	2.1220*
III	γ1	50	-0.2871	0.6816	-2.9788**
	γ2	50	0.1469	0.3369	3.0828**
	γ3	50	-0.0357	0.8966	-0.2813
	γ0	50	0.1428	0.3248	3.1094**
IV	γ1	50	0.0256	0.2491	0.7259
	γ2	50	-0.0168	0.1123	-1.0572
	γ3	50	0.0793	0.7798	0.7188
	γ0	50	-0.0054	0.1393	-0.2751
V	γ1	50	-0.0092	0.1678	-0.3877
	γ2	50	-0.0134	0.0890	-1.0646
	γ3	50	-0.0038	0.7598	-0.0354
	γ0	50	-0.0123	0.0880	-0.9883

* Significant at 5% level; ** Significant at 1% level

b) For period II, there are three aspects of the results worth mentioning: First, there is a negative, but insignificant relation between return and risk (t=-0.4951). This runs counter to expectation because the theory suggests a positive tradeoff between return and beta. Second, no evidence of any quadratic relationship as the t-ratio for γ_2 is not significant (t=0.1267); This suggests that the relationship between return and risk is linear for this period. Finally, no significant residual effect given a low t-ratio for γ_3 (t=1.14). The absence of any residual effect implies that variables other than beta do not have any systematic effect on returns.

c) For period III, the results also require three observations. First, a significantly negative relation between return and risk (t=-2.97). This finding is in direct contrast to the expectations of a positive tradeoff between return and risk. Fama and MacBeth (1973) found a significant positive relationship. Thus, for period III, the hypothesis of positive tradeoff is soundly rejected. The second aspect of the results for period III is that there is evidence of nonlinearity given that the t-ratio for γ_2 is high (t=3.08). This means that the relationship between return and risk is nonlinear, which is in line with theoretical expectations. Finally, no significant residual effect as the t-ratio for γ_3 is low (t=-0.2813), implying that no variables other than beta have any significant effect on return. The findings for period III are therefore mixed. On the one hand, we see the one of the three coefficients conforming to theoretical expectation; on the other hand we see the central hypothesis of the CAPM - a positive relationship between return and risk - being soundly rejected.

d) As before, there are three aspects of the results for period IV, that are worthy of note. The t-ratio for γ_1 is low (t=0.7259) suggesting a positive but insignificant relation between return and risk. This is similar to the finding for periods I and II in that no significant relationship is found between return and risk. Again, this is out of tune with the proposition posited by Fama and MacBeth that investors are compensated for bearing risk. However, with respect to the other two hypotheses - nonlinear relationship and absence of any residual effects - the results are in line with theoretical expectations. In particular, there is no evidence of non linearity as the t-ratio for γ_2 is low (t=-1.0572); and there is no residual effect as the t-ratio for γ_3 (t=0.7188), implying that variables other than beta do not exhibit any systematic relationship with beta.

e) For period V, the results are also divided into three aspects (just as the hypotheses are). First, unlike the theoretical expectations there is no significant relation between return and risk as the t-ratio for γ_1 is low (t=-0.3877). Again, this runs counter to positive tradeoff that is expected to hold between return and risk. The second feature of the results for period V is that there is no evidence of non-linearity given that the t-ratio of γ_2 below the critical value (t=-1.0646), suggesting a linear relationship between return and risk. Finally, for period V, as for all other periods there is no evidence of any residual effect given that the t-ratio for γ_3 is low (t=-0.0354).

The discussion thus far has revealed important deviations of the results from those of Fama and MacBeth. In none of the five periods was a positive tradeoff found between return and risk. In fact, in one particular case, the results were found to exhibit a significant negative tradeoff. Thus, the CAPM model of the form: $\tilde{R}_{it} = \gamma_{0t} + \gamma_{1t}\beta_i + \gamma_{2t}\beta_i^2 + \gamma_{3t}s_i + \eta_{it}$ does not produce results that are in tandem with Fama and MacBeth's expectations.

What may have accounted for this decisive rejection of the central plank of the CAPM? In 1995, Pettengill, Sundaram and Mathur argued that most of the anomalies reported in the literature to bedevil the CAPM were the results of model misspecification. The authors argued that the relationship between return and risk is conditional upon the excess market return being positive. If the excess market return was negative, a negative tradeoff is expected. Thus, this paper also investigates whether this approach provides better results than the ones just presented.

4.2 The Pettengill, Sundaram and Mathur's Approach

In section two, it was pointed out that unlike Fama and French (1992) and a host of other authors, recent evidence [Pettengill, Sundaram and Mathur (1995), [PSM]] suggests a systematic relation between expected return and beta, as predicted by the theory. Previous studies on the CAPM have always proxied expected market return by realized market return. PSM point out that this proxy has caused a severe flaw in such studies and has led them to arrive at misleading results that question the validity of the CAPM. The argument by PSM has been outlined in section two. This section presents PSM's approach to the verification of the CAPM. The results are divided into two parts. The first part (in Table 3), presents the test results for periods when the excess market rate of return is less than zero; and the second part (in Table 4) for periods when the excess market return is greater than or equal to zero.

TABLE 3: TESTING THE CAPM (FOR WEEKS WHEN RM < RFR)

PARAMETER	NUMBER OF ESTIMATES (N)	MEAN ESTIMATE	STANDARD DEVIATION	T-RATIO
Period I				
γ1	28	-0.0220	0.0543	-2.1483*
γ2	28	0.0089	0.0355	1.3282
γ3	28	0.0819	0.7593	0.5705
γ0	28	0.0014	0.0177	0.4124
Period II				
γ1	19	-0.3166	0.7288	-1.8937
γ2	19	0.1567	0.3585	1.9055
γ3	19	-0.0069	0.8084	-0 0372
γ0	19	0 1565	0.3395	2 0088*
Period III				
γ1	16	-0.0259	0.1261	-0.8216
γ2	16	0.0117	0.0748	0.6257
γ3	16	0.0815	0.6961	0 4683
γ0	16	0.0271	0.0501	2 1637*
Period IV				
γ1	30	0.0538	0.2683	1 0985
γ2	30	-0.0274	0.1184	-1 2691
γ3	30	0.0503	0.5169	0 5328
γ0	30	-0.0222	0.1443	-0.8407
Period V				
γ1	26	-0.0194	0.1346	-0 7330
γ2	26	0.0028	0.0820	0.1716
γ3	26	-0.0516	0.7860	-0.3350
γ0	26	0.0311	0.0593	2.6736*

* Significant at 5%

TABLE 4 TESTING THE CAPM (FOR WEEKS WHEN RM RFR)

PARAMETER	NUMBER OF ESTIMATES (N)	MEAN OF THE ESTIMATES	STANDARD DEVIATION	T-RATIO
Period I				
γ1	22	0.0444	0.0616	3.3812**
γ2	22	-0.0234	0.0342	-3.2148**
γ3	22	0.3049	0.7532	1.8986
γ0	22	-0.0105	0.0223	-2.2125*
Period II				
γ1	31	-0.2691	0.6627	-2.2604*
γ2	31	0.1408	0.3289	2.3843*
γ3	31	-0.0533	0.9592	-0.3093
γ0	31	0.1345	0.3209	2.3333*
Period III				
γ1	34	-0.0051	0.1856	-0.1595
γ2	34	-0.0031	0.0957	-0.1912
γ3	34	0.1418	0.7973	1.0372
γ0	34	0.0261	0.1018	1.4936
Period IV				
γ1	20	-0.0168	0.2169	-0.3457
γ2	20	-0.0008	0.1033	-0.0355
γ3	20	0.1228	1.0757	0.5104
γ0	20	0.0197	0.1311	0.6712
Period V				
γ1	24	-0.0035	0.2004	-0.0859
γ2	24	0.0003	0.0978	0.0167
γ3	24	0.3112	0.6978	2.1848*
γ0	24	0.0213	0.1124	0.9304

* Significant at 5% level; **Significant at 1% level

From the results in Table 3, a number of points emerge. First, a number of significant results were found for all the periods except for period IV for which none is found. The PSM's approach predicts that the coefficient of beta should be negative during periods when excess market return is less than 0. Thus, the second point that emerges from the results is that even when the parameter estimates are significant their signs do not tally with the predictions of the model. Only one out of the five coefficient estimates of risk was found to be significant and of the right sign. (When the market return is negative, high beta stocks suffer more than low beta stocks. Thus, under this situation, a negative relationship is expected between return and risk). The third aspect of the results is that the insignificant values of γ_2 and γ_3 for all five periods upheld the first two hypotheses of CAPM.

The second aspect of the PSM's approach involves repeating the tests for data for which the market return is less than zero. For periods when the market returns are greater than zero, PSM predict a positive relationship between return and risk. The results from such tests are given in Table 4 above. From Table 4, it is evident that only in one case was the coefficient of beta found to be significant and of the right positive sign. The vast majority of betas have coefficients that are either insignificant or with negative sign. Thus, the PSM's approach to the testing of the CAPM does not provide better results than does the conventional, Fama-MacBeth approach.

5 DISCUSSION

This paper has attempted to provide empirical estimates of the capital asset pricing model using two approaches: the traditional Fama-MacBeth (1973) approach, and the more recently developed alternative of Pettengill, Sundaram and Mathur (1995). With minor exceptions, the results in both cases are a decisive rejection of the hypothesis that investors are compensated for bearing systematic risk, although the second and third hypotheses are not rejected. How do these findings compare with earlier works on the CAPM?

Fama and MacBeth (1973) obtained empirical estimates of the parameters of the CAPM. The authors therefore concluded that the t-ratios "achieve values supportive of the conclusion that on average there is a statistically observable positive relationship between return and risk" (p. 624). Our findings here contradict this. Similar results to those reported here were found by Tinic and West (1984), Lakonishok and Shapiro (1984) and Fama and French (1992). However, all these but our study had the limitations of serious "errors in variables" problem as well as the problem pointed out by PSM. What could have accounted for this decisive rejection of the model despite the fact that the PSM's approach has the advantage of coming to the rescue of the CAPM in the face of the so-called anomalies? The explanation could be that the assumptions of the CAPM are probably too stringent for a developing emerging market where the development of financial institutions is still at a nascent stage compared to what obtains in the advanced stock exchanges. In section two, the assumptions underlying the CAPM were enumerated. How realistic are those assumptions? The fourth assumption is probably too stringent especially for an emerging stock market like the KLSE where shares are traded largely in multiples of 1000. If shares are sold in multiples of 1000 as is the case of many developing stock exchanges, is it conceivable that "an individual could buy a fraction of shares he or she so desires"? Definitely this assumption is hard to take given the realities of share trading in KLSE and other emerging markets. Also, Malaysian investors are perhaps much less knowledgeable than their western counterparts to be able to form any close to homogenous expectations about the stock market, and these economies do have significant transaction costs as well as spreads between borrowing and lending rates.

6 CONCLUDING REMARKS

This paper has presented the results obtained from testing the CAPM using both the Fama-MacBeth and the PSM approaches. The test has been quite involving, requiring the running of more than a hundred thousand regressions, the results of which constituted data for regression in the testing stage. In both cases, the evidence rejects the predicted positive relationship between return and risk, though the other two hypotheses of CAPM, viz linearity and non-pricing of the unsystematic risk, are upheld. What do we learn from these findings? The results offer the obvious conclusion that investors are not compensated for bearing even the systematic risk. This conclusion holds, however, only when the market is used as the sole source of risks, and it is proxied through the KLSE-composite index. There may well be several other non-market risk sources, which this paper does not address. This presents a major challenge for research on the KLSE in the future.

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