THE PRICING OF RISKY ASSETS ON THE BELGIAN STOCK MARKET

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This paper presents the first empirical examination of the relationship between the average return and the risk of a comprehensive sample of 200 securities which traded continuously from 1966 to 1980 on the Brussels Stock Exchange, a relatively thin equity market. Based on our empirical findings, we <u>cannot</u> reject the hypothesis that the pricing of common stocks on the Brussels Stock Exchange conforms to the Capital Asset Pricing Model.

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1. Introduction

This paper tests the relationship between the average return and the risk of a comprehensive sample of 200 securities which traded continuously from December 1966 to December 1980 on the Brussels Stock Exchange, a relatively thin equity market. To our knowledge, this is the first major empirical examination of the risk-return tradeoff on the Belgian equity market[1]. The theoretical models upon which the tests are designed are the Sharpe (1964) - Lintner (1965) standard Capital Asset Pricing Model (CAPM), Black's (1972) zero-beta version of the CAPM, and Levy's (1978) generalized CAPM. Based on our empirical findings covering the 14-year sample period we cannot reject the hypothesis that the pricing of common stocks on the Brussels Stock Market conforms to the CAPM.

The Sharpe-Lintner and the Black pricing models assume that the financial markets are perfect in the sense that investors are price-takers, securities are infinitely divisible, and there are no transactions and information costs and no taxes. The one-period percentage returns on risky securities are assumed to be normally distributed with known expected value and variance or to conform to some other two parameter symmetric stable distribution. Investors are assumed to be risk averse and to behave as if they are maximizing their one-period expected utility of portfolio returns. This set of assumptions leads to a simple equilibrium relationship between the expected return $E(\tilde{r}_j)$ on the j-th risky asset and the risk of this asset measured by its beta coefficient β_{jm}:

$$E(\tilde{r}_j) = E(\tilde{r}_o) + \left[E(\tilde{r}_m) - E(\tilde{r}_o)\right] \beta_{jm} \qquad (1)$$

where $\beta_{jm} = \dfrac{\text{covariance } (\tilde{r}_j, \tilde{r}_m)}{\text{variance } (\tilde{r}_m)}$

and $E(\tilde{r}_m)$ is the expected return on the market portfolio, a portfolio consisting of all available risky assets held in proportion to their market value[2].

The beta coefficient β_{jm} is the relevant measure of risk. It is defined as the covariance between the returns of the risky asset and those of the market protfolio per unit of market variance and is also referred to as systematic or market risk. It is the only relevant measure of risk because risk averse investors can costlessly eliminate any non-market related or unsystematic portion of the total risk of a risky portfolio[3]. This is any portfolio combining the market portfolio (m) and a zero-beta asset. A zero-beta asset is an asset whose returns are uncorrelated with the market portfolio and whose expected return is $E(\tilde{r}_o)$. In a portfolio context, a zero-beta asset is considered riskless although the variance of the distribution of its returns - its total risk - is not equal to zero.

The equilibrium equation (1) has several testable propositions[4]:

P1) The relationship between the expected return on a risky asset (an individual security or any combination of individual securities) and its systematic risk is linear.

P2) Systematic risk is the only relevant measure of risk in the sense that investors are assumed to hold efficiently diversified portfolios in which unsystematic risk has been completely eliminated. Since this elimination can be achieved at no costs, investors are not compensated for bearing non-market related or unsystematic risk.

P3) The higher the level of systematic risk borne by investors, the higher the corresponding return they should expect, that is, the slope of equation (1), $E(\tilde{r}_m) - E(\tilde{r}_o)$, is positive. This slope is the market price of risk reduction.

P4) Investors choose among alternative portfolios as if the distributions of asset returns are symmetrical.

P5) In the Sharpe-Lintner version of the CAPM it is assumed that there exists unrestricted riskless borrowing and lending at a common known rate r_F. In this world the expected return on the zero-β asset, $E(\tilde{r}_o)$, is equal to r_F. Otherwise $E(\tilde{r}_m) > E(\tilde{r}_o) > r_F$ and the Black version of the CAPM holds.

P6) Levy's generalized CAPM relaxes the assumption of perfect financial markets and hence investors do not hold the market portfolio. Instead, the k-th investor holds n_k securities where n_k is much smaller than n, the total number of outstanding risky securities. Levy then shows that in this world the beta-coefficient is not the relevant measure of risk; actually if n_k is very small (say n_k equals 1, 2, 3,...) the variance of the distribution or returns, the security's total risk, emerges as the dominant risk-measure and β_{jk}'s contribution to a security's expected return becomes negligible. In this world the equilibrium equation (1) does not hold. When the assumption of perfect markets is imposed and investors are allowed to hold the market portfolio Levy's model collapses to the standard form of the CAPM.

In the following sections we test the alternative pricing models and their implications for the price behavior of Belgian securities. The next section describes the sample properties. Section 3 discusses the methodology employed to test the six propositions implied by equation (1). The design of our empirical tests follows a method similar to that developed by Fama and McBeth (1973). In section 4, we present the empirical findings. We show that the Sharpe-Lintner version of the CAPM provides a good description of the price behavior of the 200 common stocks which traded on the Brussels Stock Exchange over the 14-year sample period. The return-risk relationship is generally linear, positive, and systematic risk appears to be the only relevant measure of risk in pricing risky assets. The last section of the paper contains concluding remarks on the limitations of empirical studies of the pricing of risky assets based on the CAPM.

2. Sample Properties

The sample consists of all the securities which were listed continuously on the Brussels Stock Exchange spot market over the 14-year period starting in December 1966 and ending in December 1980. There were 200 securities meeting this criterion. About a hundred securities were excluded from the sample because of partial trading over the 14-year sample period due to either a delisting prior to December 1980 or to a listing at a data following December 1966. The exclusion of delisted securities which were dissolved or taken over may introduce a slight "survivalship" bias since the sample contains only the securities of those firms which were successful as of December 1980.

For each of the 200 securities in our sample we collected 169 end-of-month price observations (p_t) - from December 30, 1966 to December 30, 1980 - as well as cash dividends (d_t) whenever paid. After adjusting the price series for stock splits and stock dividends we computed 168 monthly total excess returns for each security as:

$$R_{j,t} = r_{j,t} - r_{F,t} = \frac{P_{j,t} + d_{j,t} - P_{j,t-1}}{P_{j,t-1}} - r_{F,t}$$

where $r_{F,t}$ is the monthly riskfree rate of return. For this we took the rate of return of short term Belgian Government bonds which are comparable to US Treasury bills. In this paper, we consistently use lower case letters for total returns and capital letters for excess returns.

The monthly total excess returns on the proxy market portfolio were generated by assuming an equal investment in each one of the 200 securities in out sample:

$$R_{m,t} = \sum_{j=1}^{200} R_{j,t} / 200$$

Note that the choice of a value weighted index would be more appropriate since it would be consistent with a notion of market equilibrium in the context of the CAPM. However, a recent contribution by Schallheim and De Magistris (1980) has shown that the results of the Fama-McBeth (1973) study are not affected by the nature of the index: an equally weighted index or a value-weighted index would yield the same results.

There exist several published market indexes for the Brussels Stock Exchange but they are usually constructed from a subsample of the universe of securities traded on this exchange and they generally exclude dividend payments, two undesirable features for a proxy market portfolio. There is evidence indicating that for stocks trading on the Brussels Stock Exchange a substantial portion of total returns is in the form of dividend yields[5]. Under these circumstances, omitting cash dividends would underestimate the returns realized by investors and overestimate the corresponding risk since dividend yields are usually less volatile than changes in stock prices.

For these reasons, we have constructed our own market index.

3. Methodology

3.1 Stochastic processes that generate returns

The equilibrium relationship given by equation (1) is stated in terms of expected returns. In order to test its implications for the ex post behavior of securities using historical price returns we must assume a stochastic model of the generation of returns. We suggest the following stochastic return-generating process of equation (1) which is a generalization of the generating process proposed by Fama and McBeth (1973):

$$\tilde{R}_{jt} = \tilde{\gamma}_{ot} + \tilde{\gamma}_{1t}\beta_{jm} + \tilde{\gamma}_{2t}\beta^2_{jm} + \tilde{\gamma}_{3t}\sigma(e_j) + \tilde{\gamma}_{4t}\,SKW_j + \tilde{\gamma}_{5t}\sigma^2_j + \tilde{u}_{jt} \tag{2}$$

where $\sigma(e_j)$ is a measure of the j-th security's unsystematic risk; SKW_j is the relative skewness coefficient of the j-th security's distribution of returns defined as the ratio of the distribution's third moment around its mean to the distribution's standard deviation cubed; σ^2_j is the j-th security's total risk measured by the variance of the distribution of the j-th security's returns; and $\tilde{u}_j$ is a disturbance term assumed to have zero mean and to be uncorrelated with all the other variables in euqation (2).

The j-th security's beta-coefficient and unsystematic risk are generated by the well-known market model[6]:

$$\tilde{R}_{jt} = \alpha_j + \beta_{jm}\tilde{R}_{mt} + \tilde{e}_j$$

from which we get:

$$\hat{\beta}_{jm} = \frac{\hat{cov}(\tilde{R}_j,\tilde{R}_m)}{\hat{var}(\tilde{R}_m)}$$

$$\hat{\alpha}_j = \bar{R}_j - \hat{\beta}_{jm}\bar{R}_m$$

and $\hat{\sigma}(e_j) = \sqrt{\text{var}\ (R_{jt} - \hat{\alpha}_j - \hat{\beta}_{jm}R_{mt})}$

where hats signify least square estimates.

3.2 Statistical tests of the six propositions

The six propositions implied by the equilibrium equation (1) can now be restated in terms of six corresponding testable hypotheses implied by the stochastic-generating process summarized in equation (2). We have:

(H1) The return-risk relationship is linear. This implies that in the random-coefficient regressions:

$$\tilde{R}_{jt} = \tilde{\gamma}_{ot} + \tilde{\gamma}_{2t}\beta_{jm}^2$$

$$\tilde{R}_{jt} = \tilde{\gamma}_{ot} + \tilde{\gamma}_{1t}\beta_{jm} + \tilde{\gamma}_{2t}\beta_{jm}^2$$

the expected value of the random coefficient $\tilde{\gamma}_{2t}$ is zero, that is, $E(\tilde{\gamma}_{2t}) = 0$.

(H2) Unsystematic risk plays no role in the pricing of risky assets. This implies that in the random-coefficient regressions:

$$\tilde{R}_{jt} = \tilde{\gamma}_{ot} + \tilde{\gamma}_{3t}\ \sigma(e_j)$$

$$\tilde{R}_{jt} = \tilde{\gamma}_{ot} + \tilde{\gamma}_{1t}\beta_{jm} + \tilde{\gamma}_{3t}\ \sigma(e_j)$$

the expected value of the random coefficients $\hat{\gamma}_{3t}$ is zero, that is, $E(\tilde{\gamma}_{3t}) = 0$.

(H3) The market price of risk is positive and equals the average (excess) return on the proxy market portfolio. This implies that:

$$E(\tilde{\gamma}_{1t}) = E(\tilde{R}_{mt}) > 0$$

(H4) Investors choose among assets as if the distributions of asset returns are symmetrical. This implies that in the random-coefficient regressions:

$$\tilde{R}_{jt} = \tilde{\gamma}_{ot} + \tilde{\gamma}_{5t} SKW_j$$

$$\tilde{R}_{jt} = \tilde{\gamma}_{ot} + \tilde{\gamma}_{1t}\beta_{jm} + \tilde{\gamma}_{5t} SKW_j$$

the expected value of the random coefficient $\tilde{\gamma}_{5t}$ is zero, that is, $E(\tilde{\gamma}_{5t}) = 0$.

(H5) The Sharpe-Lintner hypothesis: there is unrestricted borrowing and lending at a unique known riskfree rate. This implies that the expected value of $\tilde{\gamma}_{ot}$ is zero, that is, $E(\tilde{\gamma}_{ot}) = 0$, since the riskfree rate is deducted from securities' total returns.

(H6) The Levy hypothesis: financial markets are not perfect in the sense that investors hold a few securities. This implies that in the random-coefficient regressions:

$$\tilde{R}_{jt} = \tilde{\gamma}_{ot} + \tilde{\gamma}_{4t}\sigma_j^2$$

$$\tilde{R}_{jt} = \tilde{\gamma}_{ot} + \tilde{\gamma}_{1t}\beta_{jm} + \tilde{\gamma}_{4t}\sigma_j^2$$

the expected value of the random coefficient $\tilde{\gamma}_{4t}$ is positive, that is, $E(\tilde{\gamma}_{4t}) > 0$. We can reject Levy's generalized CAPM if $E(\tilde{\gamma}_{4t}) = 0$.

3.2 <u>Construction of portfolios and the problems of measurement errors</u>

Because the estimated beta-coefficients of individual securities are subject to measurement errors, empirical tests of the CAPM are usually performed on portfolios of securities in order to reduce the effect of these errors. In this paper we present empirical findings based on twenty overlapping portfolios of ten securities.

The construction of portfolios cannot be random because the beta-coefficients of randomly selected portfolios will be bunched around the value of one. Portfolios should be formed so that the range of beta-coefficients be the widest possible. We proceeded as follows. Using the first 3 years of monthly returns we estimated the beta-coefficients of the 200 securities in the sample and ranked the securities from the highest to the lowest beta-coefficient. We then constructed 20 equally weighted portfolios of 10 securities. The first portfolio included the first 10 securities, the second portfolio the next 10 securities, and so on until every security is assigned to a portfolio. Monthly excess returns on the portfolios were obtained by computing the arithmetic average of the monthly excess returns of the 10 securities included in each portfolio.

3.4 Estimation of the independent variables

The first 3 years of data were used to construct the 20 overlapping portfolios of 10 securities. This is referred to as the construction period. The following 3 years were employed to estimate the set of independent variables which make up the right-hand side of equation (2). This is referred to as the estimation period. It will be followed by a test period of 8 years. In order to estimate the set of independent or explanatory variables, that is, portfolios' beta coefficients (denoted β_p), portfolios' unsystematic risk (denoted $\sigma(e_p)$, portfolios' total risk (denoted σ_p^2) and portfolios' relative skewness coefficient (denoted SKW_p), we employed the procedure presented in section 3-1. Specifically, we used the market model expressed in equation (3) with portfolios' returns rather than securities' returns.

3.5 Specification of the cross sectional regressions as predictive tests

The last 8 years of monthly data were used to test the CAPM according to the set of random-coefficient regressions specified in section 3.2. This constitutes the test period. We proceeded as follows: for the first month of the 8-year test period we calculated the realized excess-monthly return on each of the 20 portfolios in our sample. These portfolios' returns were then cross-sectionally regressed against different sets of corresponding independent variables according to the regressions specified in section 3.2. Recall that these independent variables were estimated over the preceding 3 year estimation period. Consequently, all the tests of the CAPM performed in this study are predictive tests since the set of independent or explanatory variables were estimated over a period that precedes the month over which the portfolios' returns were calculated.

The procedure just described was then repeated for the second month of the 8 year test period. The independent variables were re-estimated after dropping the first month of the 3 year estimation period and adding the first month of the 8 year testing period. Hence, the set of independent variables was continually updated by dropping the first monthly data of the estimation period and adding the first monthly data of the test period. The length of the estimation period remains constant but it extends into the test period with continuous monthly updating of the independent variables. The procedure is again repeated for the third and the following months up to the last month of the 8 year test period.

We can finally test the validity of the various hypotheses presented in section 3.2 by simply computing the average of the monthly cross-sectional estimates of the regressions' coefficients, that is, the average of the $\hat{\gamma}_{ot}$, the average of the $\hat{\gamma}_{1t}$, the average of the $\hat{\gamma}_{2t}$, etc.

4. Empirical Findings

4.1 Length of the test periods

The average values of the coefficients of the regressions specified in section 3.2 are presented in table 1 through table 5. Average values are denoted by a bar above the relevant variables. The first column of these tables indicates the length of the test period employed. The 8 year test period goes from December 1972 to November 1980 and hence covers 96 months. Average regression coefficients were calculated for 2 subperiods of 48 months and 4 subperiods of 24 months.

The methodology employed in this study does not permit the use of all the available 14 years of monthly data because the first 6 years of monthly data are used to construct the portfolios and estimate the set of explanatory variables. In order to make full use of the data available, we also tested the six hypotheses over the first 8 years of data (from December 1966 to November 1974). In this case, we took as the construction period the last 3 years of monthly data and for the estimation period we took the preceding 3 years of monthly data. This backward testing procedure was first suggested by Guy (1977) as a remedy to the lack of extensive data on smaller, European stock markets. Average values of the coefficients of the regressions for the first 96 monthly observations are presented in the first row of tables 1 to 5.

4.2 Statistical significance of the means of the estimated regression coefficients

In table 1 through 4 we also give t-statistics for testing the hypothesis that $\bar{\hat{\gamma}}_j = 0$. These t-statistics are calculated as:

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

where $s(\bar{\hat{\gamma}}_j)$ is the standard deviation of the monthly estimates of the regression coefficient $\hat{\gamma}_j$ and n is the number of monthly observations in the test period.

Other variables are reported in table 1 to 5: the serial correlation coefficient of the $\hat{\gamma}_{jt}$ and the mean ($\bar{r}^2$) and standard deviation ($s(r^2)$) of the month-by-month coefficient of determination (the R-square of the cross-sectional regression).

4.3 Interpretation of the statistical results

A look at table 1 through table 5 indicates that, except for the second subperiod of 24 observations, the mean values of the regressions' intercepts $\bar{\hat{\gamma}}_0$ are not statistically different from zero. This result constitutes evidence in favor of the Sharpe-Lintner hypothesis. See hypothesis (H5) in section 3.2.

More important, however, is the statistical significance and the positive sign of the mean values of $\hat{\gamma}_i$ in table 1, table 2 (hypothesis 1), table 3 (hypothesis 2), table 4 (hypothesis 4) and table 5 (hypothesis 6). Over the period stretching from December 1966 to November 1976, only systematic risk appears to play a significant role in the pricing of risky assets on the Brussels Stock Exchange. The values and the signs of the $t(\bar{\hat{\gamma}}_1)$ are supportive of the conclusion that, on average, there exists a generally positive and linear relationship between the return on securities and their corresponding level of systematic risk.

Results for the last 4 years of data (from December 1976 to November 1980) indicate that although systematic risk affected security prices, the relationships were negative. This may simply be due to the poor *ex post* market performance of the Belgian equity market in the second half of the seventies following the oil crisis.

Finally, referring to table 1 through table 5, we observe that the serial correlation coefficients of the $\hat{\gamma}_{jt}$ are statistically close to zero. The critical value (ρ_c) of the serial correlation coefficient at the 5 percent level of significance was calculated as $\rho_c = (2/\sqrt{n-1})$ where n is the number of monthly observations. Thus, the behavior through time of $\hat{\gamma}_{jt}$ is consistent with the notion of an efficient capital market.

4.4 The behavior of the market portfolio

We now turn to the examination of the ex post behavior of the proxy market portfolio. The results are summarized in table 6. The lengths of testing periods are the same as those presented in the first five tables.

Only over the first 8 years of monthly observations was the average market excess returns positive and significantly different from zero. Furthermore, the value of the t-statistics for the difference between $\bar{\hat{\gamma}}_1$ (the estimated market price of risk) and $\bar{R}_M$ (the "theoretical" market price of risk) indicates that these two mean values are not statistically significantly different from each other. This is evidence in support of hypothesis 3: the market price of risk over the 8 year period from December 1966 to November 1974 was positive and statistically equal to the average excess return on the proxy market portfolio. Investors have, on average, earned a return of .9 percent per month (or 10.8 percent per annum) for each unit of systematic risk borne.

Results for the 6-year period from December 1974 to November 1980 are not as conclusive as for the preceding 8 years. Excess returns on the proxy market portfolio were close to zero. However, the values of the $t(\bar{\hat{\gamma}}_1 - \bar{R}_M)$, when positive, indicate that hypothesis 3 is supported by the data.

5. Concluding Remarks

We conclude this study with a few words of caution. First, our results are only valid for the 14-year period over which the empirical analysis was performed. Tests covering a longer estimation period may have to be carried out before drawing any final conclusion as to the validity of the Capital Asset Pricing Model on the Brussels Stock Exchange. Second, we should mention the recent criticisms raised by Roll (1977, 1978) regarding tests of the CAPM. This author shows that if any ex post mean-variance efficient portfolio M is selected as the proxy market portfolio and used to estimate beta-coefficients, then the linear relationship $\bar{R}_j = \bar{R}_o + (\bar{R}_M - \bar{R}_o)\, \beta_{jM}$ necessarily holds. If portfolio M is not efficient, then returns do not conform to this relationship. Hence, according to Roll, tests performed with any portfolio other than the true market portfolio are not tests of the CAPM but tests of whether the proxy market portfolio is efficient or not. In order to test the CAPM we must determine the exact composition of the true market portfolio, a practically impossible task.

Roll's critiques are well taken. But they should not, in our opinion, diminish the contribution of empirical findings such as those presented in this study[7]. We have shown that over our 14 year sample period investors holding stocks quoted on the Brussels Stock Exchange were in general rewarded only for taking systematic or market risk; that the reward they received was proportional to the risk borne; and that no reward was received for bearing unsystematic or non-market related risk. This, we believe, is in itself a valuable and relevant finding. It has shed some light on the process of price formation on the Brussels Stock Exchange and shown that despite the relative thinness of this market the price behavior of Belgian common stocks does not differ significantly from observed price behavior on larger and more active equity markets.

Table 1

Regressions: $R_{pt} = \hat{\gamma}_{ot} + \hat{\gamma}_{1t}\,\hat{\beta}_{pt}$

Period	Number of observations	$\bar{\hat{\gamma}}_o$	$t(\bar{\hat{\gamma}}_o)$	$\rho(\hat{\gamma}_o)$	$\bar{\hat{\gamma}}_1$	$t(\bar{\hat{\gamma}}_1)$	$\rho(\hat{\gamma}_1)$	$\overline{r}^2$	$s(r^2)$
12/66 - 11/74	96	-.0025	-.42	-.048	.0090	2.21	.085	.2752	.1915
12/72 - 11/76	48	-.0168	-2.87**	-.073	.0037	1.98*	-.158	.2862	.2007
12/76 - 11/80	48	.0039	.93	.074	-.0076	1.87*	.027	.2832	.1862
12/72 - 11/74	24	-.0025	-.42	-.189	.0018	.39	-.039	.1637	.1727
12/74 - 11/76	24	-.0260	-3.67*	-.084	.0056	2.41**	-.260	.2663	.2066
12/76 - 11/78	24	.0067	1.04	.172	-.0041	-.80	-.099	.1775	.1669
12/78 - 11/80	24	.0010	.191	-.080	-.0111	-1.85*	.012	.2888	.2030

* Statistically significant at the 10% level.

** Statistically significant at the 5% level.

Table 2 (Hypothesis 1)

Regressions: $R_{Pt} = \hat{\gamma}_{ot} + \hat{\gamma}_{2t}\beta^2_{Pt}$ and $R_{Pt} = \hat{\gamma}_{ot} + \hat{\gamma}_{1t}\beta_{Pt} + \hat{\gamma}_{2t}\beta^2_{Pt}$

Period	Number of observations	$\bar{\bar{\gamma}}_0$	$t(\bar{\bar{\gamma}}_0)$	$\rho(\hat{\gamma}_0)$	$\bar{\bar{\gamma}}_1$	$t(\bar{\bar{\gamma}}_1)$	$\rho(\hat{\gamma}_1)$	$\bar{\bar{\gamma}}_2$	$t(\bar{\bar{\gamma}}_2)$	$\rho(\hat{\gamma}_2)$	$\bar{r}^2$	$s(r^2)$
12/66-11/74	96	.0021	.76	.188	-----	-----	-----	.0037	2.15**	.073	.2735	.1921
		-.0078	-.76	-.151	.0189	1.00	-.149	-.0043	- .52	-.189	.3850	.3065
12/72-11/76	48	-.0119	-2.73**	.213	-----	-----	-----	.0038	1.29	-.080	.2911	.2092
		-.0201	-2.66**	-.197	.0165	1.09	-.111	-.0031	- .46	-.030	.3949	.3033
12/76-11/80	48	.0009	.28	.177	-----	-----	-----	-.0034	-2.02**	-.039	.2810	.2793
		.0010	.16	.190	-.0005	- .04	.016	-.0032	- .70	-.026	.3452	.3153
12/72-11/74	24	-.0083	-1.17	.118	-----	-----	-----	-.0016	- .38	-.161	.2272	.3256
		-.0137	-1.23	-.145	.0100	.42	.062	-.0053	- .49	.016	.3152	.2953
12/74-11/76	24	-.0156	-3.01**	.427	-----	-----	-----	.0093	2.43**	-.127	.1550	.1767
		-.0266	-2.59**	-.224	.0231	1.20	-.239	-.0008	- .10	-.033	.2650	.2703
12/76-11/78	24	.0048	1.03	.241	-----	-----	-----	-.0018	- .87	-.127	.1763	.1644
		.0039	.34	.242	.0019	.10	.052	-.0025	- .35	.027	.29852	.2951
12/78-11/80	24	-.0030	- .69	.045	-----	-----	-----	-.0051	-1.86 *	-.012	.1856	.1931
		-.0018	- .28	.019	-.0029	- .21	-.052	-.0039	- .68	-.115	.2832	.2959

** statistically significant at the 5% level

* statistically significant at the 10% level

Table 3 (Hypothesis 2)

Regressions: $R_{Pt} = \hat{\gamma}_{ot} + \hat{\gamma}_{3t}\hat{\sigma}(e_{Pt})$ and $R_{Pt} = \hat{\gamma}_{ot} + \hat{\gamma}_{1t}\hat{\beta}_{Pt} + \hat{\gamma}_{3t}\hat{\sigma}(e_{Pt})$

Period	Number of observations	$\bar{\hat{\gamma}}_o$	$t(\bar{\hat{\gamma}}_o)$	$\rho(\hat{\gamma}_o)$	$\bar{\hat{\gamma}}_1$	$t(\bar{\hat{\gamma}}_1)$	$\rho(\bar{\hat{\gamma}}_1)$	$\bar{\hat{\gamma}}_3$	$t(\hat{\gamma}_3)$	$\rho(\hat{\gamma}_3)$	$\bar{r}^2$	$s(r^2)$
11/66-11/74	96	-.0023	- .47	.137	-----	-----	-----	.1316	1.56	.208*	.0583	.0735
		-.0027	- .23	.055	.0086	1.99**	-.128	.0070	.08	-.083	.2208	.1986
11/72-11/76	48	-.0063	- .98	.148	-----	-----	-----	-.0162	- .21	-.100	.0926	.1333
		-.0129	-2.13**	-.011	.0091	1.78*	-.079	-.0507	- .58	-.079	.2725	.2626
11/76-11/80	48	-.0036	- .73	-.046	-----	-----	-----	-.0019	- .03	-.118	.0375	.0385
		-.0007	- .14	-.072	-.0091	-2.08**	-.018	.0951	1.24	-.099	.3195	.2128
11/72-11/74	24	-.0117	-1.33	.003	-----	-----	-----	.0211	.17	-.299	.1378	.1735
		-.0075	- .84	-.158	-.0071	- .75	-.114	.0683	.51	-.324	.3846	.2925
11/74-11/76	24	-.0008	- .09	.419	-----	-----	-----	-.0537	- .56	.219	.0473	.0439
		-.0183	-2.24**	.137	.0253	2.55**	-.244	-.1698	-1.54	.234	.2203	.2062
11/76-11/78	24	-.0004	- .07	.165	-----	-----	-----	.0461	.58	-.010	.0285	.0323
		.0014	.22	.121	-.0060	-1.03	-.048	.1104	1.23	.114	.2063	.2823
11/78-11/80	24	-.0068	- .84	-.154	-----	-----	-----	-.0450	- .41	-.179	.0466	.0425
		-.0028	- .35	-.179	-.0123	-1.84*	-.002	.0797	.64	-.214	.3328	.3022

** statistically significant at the 5% level

* statistically significant at the 10% level

Table 4 (Hypothesis 4)

Regressions: $R_{Pt} = \hat{\gamma}_{ot} + \hat{\gamma}_{5t} SKW_{Pt}$ and $R_{Pt} = \hat{\gamma}_{ot} + \hat{\gamma}_{1t} \hat{\beta}_{Pt} + \hat{\gamma}_{5t} SKW_{Pt}$

Period	Number of observations	$\bar{\hat{\gamma}}_o$	$t(\bar{\hat{\gamma}}_o)$	$\rho(\hat{\gamma}_o)$	$\bar{\hat{\gamma}}_1$	$t(\bar{\hat{\gamma}}_1)$	$\rho(\hat{\gamma}_1)$	$\bar{\hat{\gamma}}_5$	$t(\bar{\hat{\gamma}}_5)$	$\rho(\hat{\gamma}_5)$	$\bar{r}^2$	$s(r^2)$
11/66-11/74	96	.0064	1.93*	.308*	-----	-----	-----	.0034	.17	.114	.0672	.0572
		-.0018	- .50	-.098	.0084	2.00**	.103	.0003	.01	.122	.2078	.1956
11/72-11/76	48	-.0079	-1.52	.197	-----	-----	-----	-.0044	- .22	-.194	.0962	.0950
		-.0185	-3.03**	-.079	.0106	1.49	-.099	-.0090	- .44	-.132	.1772	.2033
11/76-11/80	48	-.0036	- .98	.339*	-----	-----	-----	.0000	.00	-.084	.0562	.0752
		.0058	1.38	.090	-.0112	-2.40**	-.170	.0237	1.18	-.185	.2905	.2735
11/72-11/74	24	-.0310	-1.67	.179	-----	-----	-----	.0259	.74	-.339	.0872	.0973
		-.0083	- .88	-.155	-.0053	- .57	-.134	.0317	.98	-.338	.2876	.2942
11/74-11/76	24	-.0029	- .41	.345	-----	-----	-----	-.0348	-1.69	-.061	.0982	.1042
		-.0268	-3.94**	-.177	.0264	2.65*	-.267	-.0497	-1.16	-.086	.2985	.2888
11/76-11/78	24	.0018	.37	.313	-----	-----	-----	.0104	.44	-.022	.0879	.0952
		.0101	1.59	.020	-.0114	-1.64	-.269	.0528	1.68	-.227	.1963	.2079
11/78-11/80	24	-.0091	-1.69	.314	-----	-----	-----	-.0103	- .44	-.331	.0752	.0853
		.0014	.26	.148	-.0109	-1.72*	-.020	-.0053	- .22	-.220	.2153	.2089

** significant at the 5% level

* significant at the 10% level

Table 5 (Hypothesis 6)

Regressions: $R_{pt} = \hat{\gamma}_{ot} + \hat{\gamma}_{4t}\,\sigma^2_{pt}$ and $R_{pt} = \hat{\gamma}_{ot} + \hat{\gamma}_{1t}\,\beta_{pt} + \hat{\gamma}_{4t}\,\sigma^2_{pt}$

Period	Number of observations	$\bar{\hat{\gamma}}_o$	$t(\bar{\hat{\gamma}}_o)$	$\rho(\hat{\gamma}_o)$	$\bar{\hat{\gamma}}_1$	$t(\bar{\hat{\gamma}}_1)$	$\rho(\hat{\gamma}_1)$	$\bar{\hat{\gamma}}_4$	$t(\bar{\hat{\gamma}}_4)$	$\rho(\hat{\gamma}_4)$	$\bar{r}^2$	$s(r^2)$
11/66 - 11/74	96	.0010	.36	.222*	-----	------	-----	.8914	1.04	.212*	.0621	.0747
		-.0019	-.51	-.060	.0060	1.73*	-.168	.3706	.68	-.081	.2225	.1975
11/72 - 11/76	48	-.0073	-1.50	.184	-----	------	-----	-.0140	-.03	-.182	.0885	.1343
		-.0153	-2.84**	-.087	.0102	1.42	-.111	-.3058	-.62	-.173	.2665	.2615
11/76 - 11/80	48	-.0025	-.72	.117	-----	------	-----	-.2213	-.55	-.128	.0441	.0423
		.0031	.73	.026	-.0096	-2.07**	.001	.4759	1.06	-.965	.2217	.1948
11/72 - 11/74	24	-.0108	-1.54	.188	-----	-----	-----	.0814	.11	-.276	.1377	.1737
		-.0058	-.73	.232	-.0064	-.68	-.144	.3411	.42	-.309	.3217	.2896
11/74 - 11/76	24	-.0037	-.55	.338	-----	-----	-----	-.1094	-.24	.060	.0392	.0405
		-.0249	-3.54**	-.069	.0268	2.67**	-.282	-.953	-1.27	.037	.3114	.3049
11/76 - 11/78	24	.0021	.47	.205	-----	-----	-----	-.0822	.17	-.094	.0425	.0458
		.0059	.94	.153	-.0073	-1.12	-.003	.6573	1.08	.085	.3149	.2925
11/78 - 11/80	24	-.0071	-1.33	.002	-----	-----	-----	-.5248	-.80	-.160	.0454	.0394
		.0003	.05	-.133	-.0120	-1.76**	.007	.2946	.44	-.197	.3284	.2985

* Statistically significant at the 5% level.

** Statistically significant at the 10% level.

Table 6 (Hypothesis 3)

Behavior of the Proxy Market Portfolio

Period	$\bar{r}_M$	$\rho(r_M)$	$\bar{r}_F$	$\bar{R}_M=\overline{r_M-r_F}$	$t(\bar{R}_M)$	$\bar{\hat{\gamma}}_1$	$t(\bar{\hat{\gamma}}_1)$	$t(\bar{\hat{\gamma}}_1-\bar{R}_M)$	$\bar{\hat{\gamma}}_o$	$t(\bar{\hat{\gamma}}_o)$
12/66 - 11/74	.0108	.330*	.0046	.0062	1.98**	.0090	2.21*	.69	-.0025	-.42
12/72 - 11/76	-.0008	.167	.0066	-.0074	-1.54	.0037	1.98*	1.63	-.0168	-2.87**
12/76 - 11/80	.0042	.284	.0079	-.0037	-1.11	-.0076	-1.87**	-.96	.0039	.93
12/72 - 11/74	-.0039	.157	.0065	-.0104	-1.49	.0018	.39	1.24	-.0025	-.42
12/74 - 11/76	.0022	.339	.0066	-.0044	-.66	.0056	2.41**	1.27	-.0260	-3.67**
12/76 - 11/78	.0082	.254	.0056	.0026	.60	-.0041	-.80	-1.30	.0067	1.04
12/78 - 11/80	.0002	.293	.0102	-.0100	-2.03**	-.0111	-1.85*	-.20	.0010	.19

* Statistically significant at the 10% level.

** Statistically significant at the 5% level.

FOOTNOTES

1) The first and only test of the risk-return tradeoff for Belgian common stocks is by Modigliani, Pogue and Solnik (1972) based on a sample of 17 issues.

2) Specifically, the proportion in which the j-th asset is held is equal to the ratio of the total market value of all units of the j-th asset to the total market value of all outstanding assets.

3) If we assume that the returns on the j-th asset are generated by the well-known market model - see equation (3) in the text and Blume (1971) - then total risk measured by the variance of returns can be partitioned into systematic risk (β^2_{jm} var($\tilde{R}_m$)) and unsystematic risk (var ($\tilde{e}_j$)).

4) See Black, Jensen and Scholes (1972) and Fama and MacBeth (1973).

5) In this respect see Hawawini and Michel (1978, 1979).

6) This model was initially presented by Sharpe (1963, 1964).

For a discussion of the assumptions of this model, see Beja (1972) and Fama (1971, 1973). For an application to European data see Pogue and Solnik (1974).

7) See also the recent study by Mayers and Rice (1979) who argue that the criticisms raised by Roll are vastly overstated.

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