



Facultad de Ciencias Económicas y Empresariales
Universidad de Navarra

Working Paper nº 03/03

The explaining role of the Earning-Price Ratio in the Spanish Stock Market

Francisco Javier De Peña
Luis A. Gil-Alaña

Facultad de Ciencias Económicas y Empresariales
Universidad de Navarra

The explaining role of the Earning-Price Ratio in the Spanish Stock Market
Francisco Javier De Peña and Luis A. Gil-Alaña
Working Paper No.03/03
January 2003
JEL Codes: G12

ABSTRACT

In this paper we study the suitability of the CAPM to the Spanish Stock Market Interconnection System (SIBE) for the period 1988-2000, by means of time series and cross-section multivariate tests. Even though there is no enough empirical evidence to reject this model, it is shown that the relation between risk beta and stock returns is weak. Therefore, we look for several fundamental variables –using Fama and MacBeth OLS (Ordinary Least Squares) and LTS (Least Trimmed Squares) estimators– which could explain, with or without beta, the cross-section of stock returns. We conclude that there is a strong earning-price ratio effect in the Spanish Stock Market and that beta is able to explain the cross-section of expected returns, not solely, but jointly with earning-price ratio. On the other hand, there is neither size nor book-to-market ratio effects. However, there is evidence of turn-of-the year effect, which suggests tax-loss selling and window-dressing phenomena.

Keywords: CAPM, anomalies, tax-loss selling, window-dressing.

Francisco Javier De Peña
Universidad de Navarra
Departamento de Métodos Cuantitativos
Campus Universitario
31080 Pamplona
jdepena@unav.es

Luis A. Gil-Alaña
Universidad de Navarra
Departamento de Economía
Campus Universitario
31080 Pamplona
alana@unav.es

1 Introduction

Since Sharpe (1964), Lintner (1965) and Black (1972) formulated the Capital Asset Pricing Model (CAPM), this model has become one of the most used in financial modeling either by academics as by practitioners. However, in the seventies and eighties some anomalies in the stock market were discovered. In particular, stock return characteristics seem to contradict the CAPM principle that risk beta is able solely to explain the cross-section of expected returns. Some of these anomalies are the size effect (Banz, 1981), the January effect (Rozeff and Kidney, 1976; and Keim, 1983), the earning-price ratio effect (Basu, 1977, 1983), the book-to-market ratio effect (Stattman, 1980; Rosenberg et al., 1985), the momentum effect (Jegadeesh, 1990; Jegadeesh and Titman, 1993) and the overreaction effect (DeBondt and Thaler, 1985, 1987).

Fama and French (1992) showed that beta could not explain –neither alone nor joined with other fundamental variables– the differences between stock returns for NYSE and AMEX stocks during the period 1963-1990. Firm size and book-to-market ratio were statistically significant instead. By contrast, Kothari et al. (1995) pointed out that beta keep explaining power when is estimated using annual instead of monthly returns.

In the Spanish Stock Market, Rubio (1988), using multivariate tests, rejects –taking into account that the CAPM is untestable *per se*– the mean-variance efficiency of the value-weighted stock market index for the period 1963–1982. Moreover, he finds size effect which is especially pronounced in January. Marhuenda (1997) also concludes that there is size effect in Spain using 1963-1991 monthly securities returns. Gómez-Bezares et al. (1995) test the CAPM in the Spanish Stock Market as well. However, none of these studies go beyond 1993 and they do not consider earning-price ratio and book-to-market ratio as possible explaining variables of cross-section of expected returns. In this paper, we study the CAPM and some of its potential anomalies in the Spanish Stock Market for the time-period 1988-2000.

The paper is organized as follow: In Section 2 we describe the data sample. In Section 3 we test the CAPM by means of both time-series and cross-section multivariate tests; in

Section 4 the main characteristics of portfolios formed by size, price-earning ratio and market-to-book ratio are studied. In Section 5, we test the significance of beta and fundamental variables by Fama and MacBeth OLS regressions and other techniques. Finally, Section 6 provides some concluding comments.

2 Data

The sample consists of 130 stock monthly returns that quote or have been quoted in the Spanish Stock Market Interconnection System (SIBE) during the period January 1986 and March 2000. The first two years until March 31st 1988 are only used to compute the first security risk betas. These are calculated regressing the last 60 IGBM (Indice General de la Bolsa de Madrid) monthly returns –a value-weighted index by market capitalization which includes most of the SIBE securities– on the monthly returns of each stock, although for the first sample periods we start to compute risk betas when there are, at least, 24 lagged observations. We take the 12-months Spanish Treasury Bills interest rate as the risk free rate.

The firm size or market value is measured every year like the number of outstanding shares times the stock close price in the last March trading day. In the same way, the price-earning ratio and the market-to-book ratio are also measured every year at March 31st, using the close price of each firm in the last March trading day. The accounting data used in order to compute these ratios are the earnings before taxes and the equity values at the latest fiscal year end before March 31st (usually December 31st), and are taken from “Informes semestrales de las sociedades cotizadas”, published by the Security Exchange National Commission (Comisión Nacional del Mercado de Valores, CNMV). We have available accounting data since 1991.

We form and update portfolios by risk beta, by size, by price-earning ratio and by market-to-book ratio every 31st of March. We choose the date of March 31st because the majority of the firms close its previous fiscal year on December and they present its annual accounts and send them to the CNMV during the next three months; thus, by the end of March

the accounting information of the firms should be available for all investors in the market and they could take their investment decisions based on that.

3 CAPM tests

In this section, we present several time series and cross-sectional multivariate tests and apply them to test the mean-variance efficiency of the IGBM value-weighted index. In doing so, and assuming that this index replicates the market portfolio, we are also able to test the CAPM.

3.1 Multivariate Time Series Tests

In order to test the CAPM we consider the following matrix form equation:

$$r_t = \alpha + \beta \cdot r_{mt} + u_t, \quad t = 1, 2, \dots, T, \quad (1)$$

where r_t , α , β and u_t are $N \times 1$ vectors which contain the risk free asset excess portfolio returns, the intercepts, the betas and the residuals of the portfolios formed on beta respectively, r_{mt} is IGBM excess return, N is the number of portfolios and T is the number of sample periods. If the CAPM holds, the portfolio intercepts should be zero. Therefore, our objective is to test:

$$H_0: \alpha = 0 \text{ vs. } H_1: \alpha \neq 0. \quad (2)$$

We assume that $E(u_t) = 0$, $E(u_t u_t') = \Sigma$,¹ $\text{cov}(r_{mt}, u_t) = 0$, and normality. Then, the Wald test statistic is:

¹ This assumption allows for contemporaneous correlation –i.e., for each period of time– between residuals, although it supposes they are serially independent.

$$W = \hat{\alpha}' \cdot \text{Var}(\hat{\alpha}) \cdot \hat{\alpha} = T \left(1 + \frac{\bar{r}_m^2}{\hat{\sigma}_m^2} \right)^{-1} \hat{\alpha}' \Sigma^{-1} \hat{\alpha}, \quad (3)$$

where $\hat{\alpha}$ contains the OLS intercept estimators of each portfolio, \bar{r}_m is the excess market return average, $\hat{\sigma}_m^2$ is the excess market return variance and Σ is the residual covariance matrix that can be replaced by a consistent estimator like its MLE, $\hat{\Sigma}$. With $\hat{\Sigma}$ and under the null hypothesis (2), W follows asymptotically a chi-square with N degrees of freedom.

We can also derive a finite-sample test statistic. If the null hypothesis is certain, it can be shown that (see Gibbons et al., 1989):

$$F = \left(\frac{T - N - 1}{N} \right) \left(1 + \frac{\bar{r}_m^2}{\hat{\sigma}_m^2} \right)^{-1} \hat{\alpha}' \hat{\Sigma}^{-1} \hat{\alpha}, \quad (4)$$

is distributed as a central F with degrees of freedom N and $T - N - 1$ where T is the number of periods in the sample.

Finally, we develop a third test, the likelihood ratio test (LRT), which compares the unrestricted model (1) and the restricted one:

$$r_t = \beta \cdot r_{mt} + u_t, \quad t = 1, 2, \dots, T, \quad (5)$$

when the null hypothesis holds. The finite-sample likelihood ratio test statistic, provided by Jobson and Korkie (1982), takes the form:

$$LRT = \left(T - \frac{N}{2} - 2 \right) \left[\ln |\hat{\Sigma}_R| - \ln |\hat{\Sigma}| \right], \quad (6)$$

where $\hat{\Sigma}_R$ is the residual covariance matrix MLE in the restricted model. LRT converges asymptotically to a chi-square with N degrees of freedom, under the null hypothesis (2).

3.2 Multivariate Cross-sectional Tests

One of the main conclusions of the CAPM is that beta itself is able to explain (linearly) the stock expected returns. So, if this model is adequate, we would hope:

$$H_0: E = XC = [1; \beta] \cdot \begin{bmatrix} c_0 \\ c_1 \end{bmatrix}, \quad (7)$$

where E is an $N \times 1$ vector of expected portfolio returns, X an $N \times 2$ matrix with a first column of ones and a second of portfolio betas, and C is a vector which contains the intercept and the slope of the linear relation. In order to test the model, we consider the next equation in each month t :

$$R_t = X_t C_t + e_t, \quad (8)$$

where R_t and e_t are the realized portfolio returns and the residuals $N \times 1$ vectors respectively. Equation (8) has to be estimated in two steps: first, we have to obtain the beta estimators and then we estimate C_t . We allow for contemporaneous correlation between residuals, i.e., $E(e_t e_t') = \Omega$. Under this assumption, the most efficient estimator of C_t is the GLS (Generalized Least Squares) one. If we compute the portfolios betas –called post-ranking betas– using all the time series portfolio and IGBM returns instead of the 60 last observations, we obtain a unique beta estimator for each portfolio and X becomes time invariant. Assuming stationarity, it can be obtained a unique C estimator:²

$$\hat{C} = (\hat{X}' \hat{\Sigma}^{-1} \hat{X})^{-1} \hat{X}' \hat{\Sigma}^{-1} \bar{R}, \quad (9)$$

² See, e.g., Marín and Rubio (2001), pp.436 ss.

where Ω has been replaced by the residual covariance MLE (Maximum Likelihood Estimator) matrix, $\hat{\Sigma}$, in the market model. The cross-sectional Wald test statistic is:

$$W_A = \frac{T}{\left(1 + \frac{\hat{\sigma}_1^2}{\hat{\sigma}_m^2}\right)} e' \hat{\Sigma}^{-1} e, \quad (10)$$

where $e = \bar{R} - \hat{X}\hat{C}$. The distribution of W_A is asymptotically a chi-square with $N-2$ degrees of freedom.

Finally, we have the finite-sample test statistic:

$$F_A = \frac{(T-N+1)}{(N-2)(T-2)} \cdot \frac{T}{\left(1 + \frac{\hat{\sigma}_1^2}{\hat{\sigma}_m^2}\right)} e' \hat{\Sigma}^{-1} e. \quad (11)$$

The last two statistics are adjusted to avoid the *error in variables* problem due to the two steps estimation. F_A follows approximately a central F distribution with degrees of freedom $N-2$ and $T-N+1$ under the null hypothesis (7).

In order to implement these tests, each year since 1988, at March 31st, we rank the sample securities from the lowest beta to the highest, and form five portfolios with approximately the same number of stocks. Then, we calculate equally-weighted monthly returns for those portfolios until the next March 31st, where we again rank the stocks by its betas and assign each quintile to the five portfolios. After that, we compute equally-weighted monthly returns until the next March 31st, and so on. Finally, we have monthly returns since April 1988 until March 2000 (hereforth 88-00) for five portfolios formed by beta.

(Insert Table 1 about here)

Table 1 reports the results of the tests for this sample and for the subsamples April 1988-March 1994 (hereforth 88-94) and April 1994-March 2000 (hereforth 94-00). We see that we cannot reject the null hypothesis neither in the subperiods 88-94 and 94-00 nor in the period 88-00 for both time series and cross-sectional tests. Note that the results substantially differ from time series to cross-sectional tests because of the different nature which they are involved.

(Insert Table 2 about here)

It could be thought that the CAPM (if we suppose that the IGBM is the market portfolio) is a good model for the Spanish Stock Market. However, if we study the regression results of IGBM monthly results on each portfolio (formed by beta) monthly returns, the portfolio average returns do not monotonically increase as we should expect. Thus, there is no positive linear relation between beta and portfolio returns, which contradicts one of the CAPM principles. In fact, the two highest beta portfolios (4 and 5) experience the lowest average returns.³ Therefore, the conclusion of this section could be that even though there is not enough empirical evidence to reject the CAPM model, it does not seem to be an adequate model specification to explain the differences between the stock returns in the Spanish Stock Market.⁴ So, in the next section, we try to find other fundamental variables which may better explain the cross-section of the stock returns.

4 Anomalies

As we have already mentioned in Section 1, during the last twenty years, it has been discovered certain characteristics of securities –called anomalies– that lead to statistical significant differences between the realized average returns and the returns that are predicted by a particular asset pricing model, mainly, the CAPM. In this section, we analyze three of

³ Note that regression residuals exhibit normality, homocedasticity and absence of serial autocorrelations for all portfolios.

these characteristics: the firm size or market value for the 88-00 period; and, the price-earning ratio and the market-to-book ratio for the 92-00 period in the Spanish Stock Market.

4.1 Size Effect and its seasonality

The size effect states that firms with low market values achieve systematically higher returns than high market value ones, even after account for beta. Banz (1981) is the first that shows this effect for the securities which quotes in the NYSE during the period 1926-1975. This anomaly has also been documented in many countries (see Hawawini and Keim, 2000). In the Spanish Stock Market, Rubio (1988) found size effect for the period 1963-1982 using a sample of 160 stocks. Marhuenda (1997) confirms the results of Rubio (1988) for the years 1963-1991.

To check if the size effect has been maintained during this last decade, at every March 31st, since 1988 to 1999, we form and update five portfolios, with approximately the same number of stocks, based on their market values, and calculate equally-weighted monthly returns during the next twelve months until the next March 31st, when we resort the stocks based on their market values and update the size portfolios. The firm size or market value is measured as the number of outstanding stocks times the stock close price in the last March trading day. Security risk betas are computed using the last 60 IGBM and security monthly returns and portfolio risk betas are an equally-weighted average of security risk betas that form the portfolio each month. The results are displayed in Table 3. Portfolio 1 contains the biggest firms and Portfolio 5 the smallest ones.

(Insert Table 3 about here)

Looking at the results in this table, we see that the size effect seems to have disappeared since we would have expected the returns increase from Portfolio 1 to Portfolio 5. Moreover, the portfolio which contains the largest firms has reached the highest average

⁴ This lack of empirical evidence could be in large part due to a high variability of the residuals measured by the covariance residual matrix, Σ .

monthly return, 1.01% (12.82% annual) against the smallest firm portfolio monthly return of 0.80% (10.30% annual). We also observe that market beta is not able to explain the last differences give that, for example, Portfolio 1 has the highest return and the lowest market beta.

Keim (1983) discovered that the size effect and the January effect –the stocks returns are significant higher in January than in the rest of the year– are highly correlated. Near half of the size effect is due to the securities returns performance in the first month of the year, specially in the first five trading days. Rubio (1988) concludes that 47% of the size effect is due to January in the Spanish Stock Market for the period 1963-1982.

If we separate the 88-00 IGBM returns by months, although the IGBM January monthly returns are relatively high (3.09% on average), they are not the highest ones (February and May returns achieve, for example, 3.30% and 3.34% respectively). On the other hand, if we compare IGBM January average returns (3.09%) against IGBM February-December monthly average returns (0.97%), the difference is not statistically significant. (The results are not shown but they are available from the authors). The difference between IGBM January return (3.09%) and IGBM December return (1.89%) is not significance neither.

(Insert Table 4 about here)

By contrast, if we focus in the size portfolio returns behavior around the turn-of-the-year, we obtain results which are displayed in Table 4, where we have divided the market securities into ten size portfolios to highlight the differences between them. First, we note that the differences between January and December monthly returns are statistically significant (at the 5% significance level) for the four portfolios which contain the lowest market value stocks. The January returns of these portfolios dramatically increase, specially Portfolio 10 with a January average monthly return of 9.69% (203.39% annual), while the December returns are extremely low –in fact, negative–, achieving -4.54% (-42.74% annual) in Portfolio 10. For the two biggest portfolios, the December returns are higher than the January returns. This empirical evidence leads us to think that the *tax-loss selling* (Roll, 1981) and the *window-*

*dress*ing (Lakonishok et al., 1991) phenomena can take place in the Spanish Stock Market. (This issue requires a further investigation beyond the scope of this paper).

4.2 Price-Earning Ratio Effect

The price-earning ratio (PER) effect states that firms with low ratios between stock price and stock earning consistently provide higher returns than those with high price-earning ratios. Nicholson (1960) documented this effect for the US Stock Market. Basu (1977) showed that this effect remains even after the stock returns are adjusted by beta risk for the NYSE during the period 1957-1971. Fama and French (1992) conclude that the earning-price ratio is significant when is the unique explaining variable for the cross-section of stock returns, but its significance disappears when book-to-market ratio is also taken into account, for NYSE and AMEX stocks during 1963-1990.

In order to check if there is price-earning ratio effect in the Spanish Stock Market during the period April 1992-March 2000, we form five portfolios based on positive PER, at March 31st, in the same way as we constructed the size portfolios before. The PER numerator for each security is the ratio between its last March trading day close price. The denominator is the firm earning before taxes in the last fiscal year end before March 31st (usually December 31st) divided by the number of firm outstanding shares. A sixth portfolio is reserved for negative PER stocks, i.e., firms that have experienced losses in the last fiscal year. The positive PER stocks are split every March 31st into five portfolios with approximately the same number of stocks, and equally-weighted monthly portfolio returns are computed until the next March 31st, date which the stock PERs are updated and the portfolios are rebalanced in, and so on. The number of securities in each positive PER portfolio fluctuates between 14 and 22, depending on the year. The number of securities in the negative PER portfolios is different from the rest of the portfolios and oscillates between 4 in 1999 and 20 in 1994.

(Insert Table 5 about here)

The results, showed in Table 5, suggest that there is a decreasing relation between positive price-earning ratios and portfolio returns. The difference between Portfolio 5 and Portfolio 1 monthly returns is 0.69%, i.e., 9.31% annual. The portfolio return differences cannot be explained by risk beta. Furthermore, Portfolio 5, which is the most profitable and contains the positive low PERs, has also the lowest beta, 0.84. Regarding the negative PER portfolio, it gets an average monthly return of 1.08%, being its market beta the highest, 1.22.

In short, it seems that there is rice-earning ratio effect in the Spanish Stock Market, and an investor who had invested in function of PER, could have achieved systematically higher returns. Then, the PER can be a suitable fundamental variable to explain the cross-section of returns in the Spanish Stock Market, at least, for the period 92-00. Finally, PER could be highly correlated with market-to-book ratio because this decreases jointly with PER from Portfolio 1 to Portfolio 5.

4.3 Market-to-Book Ratio Effect

The market-to-book ratio (MB) effect states that securities with high ratios between its market value and its book or equity value, persistently obtain lower returns than those with low ratios. Stattman (1980) and Rosenberg et al. (1985) find this negative relation in US Stock Market; and Chan et al. (1991) for the Tokyo Stock Exchange. Fama and French (1992) document that the market-to-book ratio effect is even stronger than the size effect for a sample of NYSE, AMEX and NASDAQ stocks during the period 1963-1990. Capaul et al. (1993) confirm the MB effect in Great Britain, France, German and Switzerland.

In order to check if there is MB effect in the Spanish Stock Market, we form and update at March 31st, six portfolios based on MB in the same way as we have done to test PER effect. We again reserved the sixth portfolio for negative MB, which corresponds to the distressed firms. The stock number of this portfolio is small –never more than 4– and it cannot be constructed in 1992, 1993 and 1999 because all the sample firms show positive MB. Portfolios 1 to 5 contain between 20 and 24 securities depending on the year. The MB is

computed as the firm market value at March 31st divided by the book value –taken from the “Informes semestrales de las sociedades cotizadas” (CNMV)– in the latest fiscal year end before March 31st.

(Insert Table 6 about here)

In Table 6, the positive MB portfolio returns exhibit U-shaped form, reaching their lowest value in Portfolio 3, with 0.93%. The average monthly returns of Portfolios 1 and 5 are 1.20% (15.39% annual) and 1.33% (17.8% annual) respectively. This 1.79% annual difference does not seem enough to support the MB effect. In this case, returns and market betas are very similar from Portfolios 1 to 5. Again, MB and PER decrease jointly. On the other hand, Portfolio 6 reaches a 2.74% monthly return (38.32% annual), although as we have noted before, it contains a few stocks and could have been computed only in 5 out of 8 years.

5 Fama and MacBeth Regressions

Once we have studied the main characteristics of portfolios formed by beta, size, PER and MB, we test in this section, the explanatory power of these variables by means of Fama and MacBeth (1973) regressions. We estimate the average coefficients of beta and the other fundamental variables by OLS (Ordinary Least Squares) and by LTS (Least Trimmed Squares) –used in Knez and Ready (1997) among others–.

5.1 OLS Estimators

Following Fama and French (1992), we change slightly the form of measure the fundamental variables. Thus, we consider the logarithm of size instead of size, the earning-price ratio (EPR) instead of PER, and the logarithm of book-to–market ratio (BM) instead of MB. We also split the EPR into two variables: a dummy variable which separate EPR positive from negative –called EPD (Earning-Price ratio Dummy)– assigning the value 0 to positive EPRs and 1 to negative EPRs; and another variable –called EPP (Earning-Price ratio Positive) which

assign 0 to negative EPRs and their values to positive EPRs. The market stock beta is the post-ranking portfolio beta, i.e., in each period of time is assigned to each stock the post-ranking portfolio beta which the stock belongs to. In order to avoid the non-synchronous trading effect, we estimate post-ranking portfolio betas by Dimson (1979) procedure, i.e., regressing each portfolio return on contemporaneous and a lagged IGBM returns.⁵ The Dimson beta is the sum of the two last coefficients in the regression equation. We run cross-sectional regressions each month from April 1988 to March 2000. When the variables EPD, EPP and BM come into play, the sample period begins in April 1992. Securities beta, size, EP and BM remain constant from April to March each year. Once we have coefficient estimators each month, we test their significance by t-statistics.

(Insert Table 7 about here)

The average coefficients and their correspondent t-statistics are shown in Table 7. When portfolio beta post-ranking is the unique explanatory variable, the relation between it and portfolio returns has the opposite sign as the CAPM states and is statistically insignificant, which indicates that beta is not able to explain the cross-section of expected return. The average size logarithm coefficient is positive (0.05563), i.e., the relation between firm market values and stock returns has been generally positive between April 1988 and March 2000. Nevertheless, this coefficient is not statistically different from zero and we can conclude that there is no size effect in the Spanish Stock Market. The average coefficient of the logarithm of BM is also opposite (-0.1411) to what book-to-market effect dictates –namely, that returns and BM are positively related–, although is not significant again. However, there is strong empirical evidence to support the earning-price ratio effect in the Spanish Stock Market during the sample period April 1992-March 2000. If we consider the two variables that represent the earning-price ratio –EPD and EPP–, jointly, the second one is statistically significant at 1% level–with t-statistics 2.674– and its average coefficient is 5.5634, i.e., for the positive EPR securities, the higher EPR the higher realized return. The negative EPR securities have on

⁵ We choose one lag because this is the only one statistically significant. Longer lag coefficients are very low and not significant.

average higher returns than the positive EPR ones because the average EPD coefficient is 0.5239; however, it is not significant.

When we consider more than one fundamental variables jointly, we show that, in all cases, EPP remains statistically significant at 1% level and their coefficients are approximately equals regardless the rest of variables considered in the equations. Thus, there is a strong evidence of earning-price ratio effect for the positive EPR stocks during the period 92–00. EPD remains positive but not significant in all equations.

On the other hand, beta becomes positive when is considered jointly with EPD and EPP, or BM. In the first case, although is not significant, its t-statistic (1.470) is the largest of the non EPP variables. The average adjusted R-square is higher than in the EPD-EPP model. In all cases, the ME and BM t-statistics are low. Thus, these variables are not able to explain the cross-section of stock returns for this sample period. Finally, the highest average adjusted R-square is achieved when all the variables are considered together, but the non-EPP t-statistics are small. Thus, we can conclude that the two most adequate models seem to include EPD and EPP variables, without or with beta.

5.2 LTS Estimators

One of the disadvantages of the OLS procedure is its high sensitivity to outliers and leverage points in the sample. The *breakdown point* of an estimator, θ , is defined as:

$$bp(\theta, S) = \min \left\{ \frac{m}{N} : b(m, \theta, S) = \infty \right\}, \quad (12)$$

where $b(m, \theta, S) = \sup_{S'} \|\theta(S) - \theta(S')\|$ is the supreme of the differences between the sample estimator and the estimator that results from convert the original N -size sample (S) into a

sample (S') by substituting m sample values by arbitrary ones.⁶ The breakdown point of an estimator has been used to deal with errors in data base or corrupted data. In fact, an estimator breakdown point measures the smallest proportion of corrupted data in the sample that can lead to arbitrarily large changes in the estimation. The OLS estimator breakdown point is $1/N$, i.e., only one corrupted data is enough to provoke OLS estimator values arbitrarily far from the free-error sample OLS estimator.

It is possible that our sample contains errors. Thus, we run again the Fama-MacBeth regressions, for the two most adequate models from the last subsection, by means of using a more robust procedure against outliers and leverage points rather than the OLS one. This procedure is the LTS estimation process. The LTS estimator fits the regression equation ignoring (trimming) the highest squared residual observations. The LTS estimator breakdown point is approximately equal to the sample trimmed proportion, and reach the highest value in 50%. However, we trim the 10% of the sample, which seems to be a reasonable and enough bound for corrupted data.

(Insert Table 8 about here)

Table 8 shows that EPP is even more significant when we trim the highest squared-residual 10% observations. EPD average coefficients are now negative, which means that the conclusion “the negative EPR securities have on average higher returns than the positive EPR ones” is driven by the most extreme values; however, for the majority of firms (90%), positive EPR securities achieve higher returns than negative EPR ones. By contrast, earning-price ratio effect for the EPR positive stocks are driven by the media values more than by extreme ones. Regarding the beta coefficient, it remains positive but its t-statistic is lower than before. Logically, the average adjusted R-square are larger than in the OLS procedure.

⁶ In Fama-MacBeth Regressions, N represents the regression stock number in each period of time.

6 Conclusions

In the first part of the paper we test the CAPM for 130 Spanish SIBE stocks during the period April 1988-March 2000, by means of time-series and cross-sectional multivariate tests. We do not have enough empirical evidence to reject the model neither for the sample period 88-00 nor for the subperiods 88-94 and 94-00. However, we note that constructing five portfolios based on risk beta, there is no positive relation between beta and portfolio returns. Thus, beta does not seem to be solely able to explain the cross-section of stock returns and the multivariate test results can be due to low test sizes. Therefore, we need to find other fundamental variables that may be able to explain the differences between stock returns.

We have also studied the main characteristics of portfolios formed by size, price-earning ratio and market-to-book ratio. Even though there is no evidence neither of size effect nor the January effect, we find a strong turn-of-the-year effect in the Spanish Stock Market for the period 88-00 that could be due to tax-loss selling or window-dressing phenomena. At a first sight, price-earning ratio (or its inverse) seems to explain the portfolio returns but market-to-book (or its inverse) does not. We run the Fama and MacBeth OLS regressions and confirm the previous suspects: there is strong evidence of earning-price ratio effect in the Spanish Stock Market during the period 92-00. The positive stock earning-price ratios are always significant at 1% level and their coefficients and approximately equals regardless the rest of variables in the regression equation. Beta takes the CAPM expected sign when is considered jointly with earning-price ratio and is the least non-significant variable among the non-EPP ones. The more robust Fama and MacBeth LTS 10% procedure supports these statements: positive stock EPRs are even more significant than before and the beta sign remains positive. In short, EPR is the most adequate variable to describe the cross-section of stock returns in the Spanish stock market during the period 92-00 and the explaining role of beta can be saved when is jointly considered with EPR.

References

- Banz, R.W. (1981), “The relationship between return and market value of common stocks”, *Journal of Financial Economics* 9, 3-18.
- Basu, S. (1977), “Investment performance of common stocks in relation to their price-earnings ratios: A test of the efficient market hypothesis”, *Journal of Finance* 32, 663-682.
- Basu, S. (1983), “The relationship between earnings yield, market value, and return for NYSE common stocks: Further evidence”, *Journal of Financial Economics* 12, 129-156.
- Black, F. (1972), “Capital market equilibrium with restricted borrowing”, *Journal of Business* 45, 444-455.
- Capaul, C., Rowley, I., and W. Sharpe (1993), “International value and growth stock returns”, *Financial Analysts Journal* 49, 27–36.
- Chan, L.K., Hamao, Y., and J. Lakonishok (1991), “Fundamentals and stock returns in Japan”, *Journal of Finance* 46, 1739–1789.
- Comisión Nacional del Mercado de Valores (1991-1998), “Informes semestrales de las sociedades cotizadas”, *CNMV*.
- DeBondt, W.F.M., and R.H. Thaler (1985), “Does the stock market overreact?”, *Journal of Finance* 40, 793-805.
- DeBondt, W.F.M., and R.H. Thaler (1987), “Further evidence on investor overreaction and stock market seasonality”, *Journal of Finance* 42, 557-581.
- Dimson, E. (1979), “Risk measurement when shares are subject to infrequent trading”, *Journal of Financial Economics* 7, 197-226.
- Fama, E.F., and J. MacBeth (1973), “Risk, return and equilibrium: Empirical tests”, *Journal of Political Economy* 71, 607-636.
- Fama, E.F., and K.R. French (1992), “The cross-section of expected stock returns”, *Journal of Finance* 47, 427-465.
- Gibbons, M.R., Ross, S.A., and J. Shanken (1989), “A test of the efficiency of a given portfolio”, *Econometrica* 57, 1121-1152.
- Gómez-Bezares, F., Madariaga, J.A., and J. Santibáñez (1995), “Valoración de acciones en la bolsa española”, Bilbao, DDB.

- Hawawini, G., and D.B. Keim (2000), “The cross-section of common stock returns: a review of the evidence and some new findings”, *Security Market Imperfections in World Wide Equity Markets*, D.B. Keim and W.T. Ziemba, Cambridge University Press.
- Jegadeesh, N. (1990), “Evidence of predictable behavior of security returns”, *Journal of Finance* 45, 881-898.
- Jegadeesh, N., and S. Titman (1993), “Returns to buying winners and selling losers: Implications for stock market efficiency”, *Journal of Finance* 48, 65-92.
- Jobson, D., and R. Korkie (1982), “Potential performance and tests of portfolio efficiency”, *Journal of Financial Economics* 11, 433-466.
- Keim, D.B. (1983), “Size-related anomalies and stock return seasonality”, *Journal of Financial Economics* 12, 13-32.
- Knez, P.J., and M.J. Ready (1997), “On the robustness of size and book-to-market in cross-sectional regressions”, *Journal of Finance* 52, 1355-1382.
- Kothari, S.P., Shanken, J., and R.G. Sloan (1995), “Another look at the cross-section of expected stock returns”, *Journal of Finance* 50, 185-224.
- Lakonishok, J., Schleifer, A., Thaler, R., and R. Vishny (1991), “Window dressing by pension fund managers”, *American Economic Review* 81, 227–231.
- Lintner, J. (1965), “The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets”, *Review of Economics and Statistics* 47, 13-37.
- Marhuenda, J. (1997), “Anomalías en los modelos de valoración de activos”, Alicante, *Universidad de Alicante*.
- Marín, J.M., and G. Rubio (2001), “Economía Financiera”, Barcelona, *Ed. Antoni Bosch*.
- Nicholson, F. (1960), “Price-earnings ratios”, *Financial Analysts Journal* 43-50.
- Roll, R. (1981), “A possible explanation of the small firm effect”, *Journal of Finance* 36, 879-888.
- Rosenberg, B., K. Reid, and R. Lanstein (1985), “Persuasive evidence of market inefficiency”, *Journal of Portfolio Management* 11, 9-17.
- Rozeff, M.S., and W.R. Kinney (1976), “Capital market seasonality: The case of stock returns”, *Journal of Financial Economics* 3, 379-402.

- Rubio, G. (1988), “Further international evidence on asset pricing: The case of the Spanish capital market”, *Journal of Banking and Finance* 12, 221-242.
- Sharpe, W.F. (1964), “Capital asset prices: A theory of market equilibrium under conditions of risk”, *Journal of Finance* 19, 425-442.
- Stattman, D. (1980), “Book values and expected stock returns”, *Unpublished MBA Honors Paper*, University of Chicago.

Table 1
CAPM Multivariate Tests

Test statistics and corresponding p-values (in parenthesis) for the Time Series Multivariate Tests (W, F and LRT) and for the Cross-sectional Multivariate Tests (W_A and F_A) in the subsamples 88-94 and 94-00, and in the sample period 88-00.

Time Series Multivariate Tests

	88-94	94-00	88-00
W	4.7076 (0.4526)	10.1056 (0.0723)	10.8477 (0.0545)
F	0.8631 (0.5077)	1.8527 (0.1066)	2.0791 (0.0716)
LRT	4.5606 (0.4718)	7.8947 (0.1621)	8.9933 (0.1093)

Cross-sectional Multivariate Tests

	88-94	94-00	88-00
W_A	6.2777 (0.0989)	2.3367 (0.5055)	5.3418 (0.1484)
F_A	2,0328 (0.1121)	0,7566 (0.5203)	1,7555 (0.1585)

Table 2
Market Model Results for 5 portfolios formed on beta (88-00)

Average return, standard deviation (in percentage), regression coefficients, R squared and normality (Jarque-Bera), heterostedasticity (White) and autocorrelation (Durbin-Watson) tests of portfolio returns formed on beta (April 1988 to March 2000). The returns are provided in monthly percentage. P-values appear in brackets.

Portfolio	\bar{R}_i	σ_i	$\hat{\alpha}_i$	$\hat{\beta}_i$	R^2	J-B	White	D-W
1	0.8667	5.8350	-0.2385 [0.330]	0.6563 [0.000]	0.7636	0.1130 [0.945]	3.8533 [0.050]	1.7603
2	1.2485	5.4494	0.1131 [0.558]	0.8263 [0.000]	0.8320	4.8039 [0.091]	3.1664 [0.075]	1.7571
3	0.9798	5.9268	-0.0234 [0.898]	0.9259 [0.000]	0.8699	4.9939 [0.082]	1.0288 [0.310]	1.7950
4	0.6275	7.2534	-0.4688 [0.044]	1.0721 [0.000]	0.8613	0.2940 [0.863]	2.4272 [0.119]	2.0021
5	0.6685	8.8822	-0.8744 [0.027]	1.1672 [0.000]	0.7339	0.6057 [0.739]	0.9480 [0.330]	1.7558

Table 3
Size Portfolios (April 1988-March 2000)

Monthly average returns in percentage, market betas, size, price-earning ratio and market-to-book ratio for SIBE securities equally-weighted portfolios based on size (April 1988 to March 2000). The portfolios are created on March 31st and their composition remain constant until the next March 31st, date which are updated in. The risk betas are estimated in relation to IGBM value-weighted index. The size or market capitalization is measured in thousands of euros. Price-earning ratios are market-to-book ratio are only available since 1992.

Portfolio	1	2	3	4	5
Return	1.01	0.7	0.69	0.82	0.80
Beta	0.90	1.02	0.94	1.06	1.05
Size	4,342,664	745,791	315,037	140,560	43,607
P/E Ratio	13.26	14.87	13.65	12.59	9.13
M/B Ratio	2.06	2.28	1.88	1.59	1.44

Table 4**December and January Size Portfolio Monthly Returns**

January and December average return, standard deviation, t-statistic and p-value for 10 portfolios formed on size for the period April 1988 to March 2000. It is also provided t-statistics and p-values for the January-December average return difference tests.

Portfolio	Month	\bar{R}	S.D.	t-statistic	p-value	Difference (1-12)	
						t-statistic	p-value
1	January	2.11	6.03	1.214	0.250	-0.063	0.95
	December	2.25	4.58	1.703	0.117		
2	January	0.41	6.30	0.227	0.824	-0.956	0.349
	December	3.02	7.05	1.485	0.166		
3	January	3.12	6.64	1.630	0.131	0.584	0.565
	December	1.53	6.77	0.781	0.451		
4	January	2.44	5.37	1.572	0.144	1.611	0.121
	December	-1.09	5.36	-0.706	0.495		
5	January	2.45	2.89	2.937	0.014	0.152	0.880
	December	2.22	4.19	1.838	0.093		
6	January	3.01	6.75	1.547	0.150	0.776	0.446
	December	1.16	4.83	0.830	0.424		
7	January	5.82	8.38	2.404	0.035	2.263	0.034
	December	-0.67	5.33	-0.436	0.671		
8	January	6.52	5.99	3.772	0.003	3.758	0.001
	December	-1.28	3.98	-1.114	0.289		
9	January	6.11	10.34	2.048	0.065	2.218	0.037
	December	-1.54	6.00	-0.891	0.392		
10	January	9.69	11.20	2.998	0.012	3.833	0.001
	December	-4.54	6.34	-2.484	0.030		

Table 5**Price-Earning Ratio Portfolios (April 1992-March 2000)**

Monthly average returns in percentage, market betas, size, price-earning ratio and market-to-book ratio for SIBE securities equally-weighted portfolios based on price-earning ratio (April 1992 to March 2000). The portfolios are created on March 31st and their composition remain constant until the next March 31st, date which are updated in. The risk betas are estimated in relation to IGBM value-weighted index. The size or market capitalization is measured in thousands of euros. The sixth portfolio contains the negative price-earning ratio stocks.

Portfolio	1	2	3	4	5	6
Return	0.72	0.87	1.26	1.39	1.41	1.08
Beta	0.91	0.93	0.85	0.88	0.84	1.22
Size	692,879	1,532,869	2,579,648	1,520,238	680,043	100,973
P/E Ratio	41.15	15.02	11.03	8.51	5.81	-8.46
M/B Ratio	2.47	2.19	1.96	1.45	1.36	1.44

Table 6**Market-to-Book Portfolios (April 1992-March 2000)**

Monthly average returns in percentage, market betas, size, price-earning ratio and market-to-book ratio for SIBE securities equally-weighted portfolios based on size (April 1992 to March 2000). The portfolios are created on March 31st and their composition remain constant until the next March 31st, date which are updated in. The risk betas are estimated in relation to IGBM value-weighted index. The size or market capitalization is measured in thousands of euros. The sixth portfolio contains the negative market-to-book ratio stocks.

Portfolio	1	2	3	4	5	6
Return	1.20	1.19	0.93	1.20	1.33	2.74
Beta	0.95	0.89	0.95	0.97	0.94	1.18
Size	2,020,082	1,808,896	1,209,244	899,101	356,781	57,815
P/E Ratio	14.87	14.71	12.86	10.66	11.75	2.54
M/B Ratio	4.20	2.49	1.47	1.10	0.68	-0.92

Table 7
Fama and MacBeth OLS Regressions

Average coefficients, their correspond t-statistics and average R-square adjusted for the cross-section regressions of the SIBE stock returns on the fundamental variables for each month, since April 1988 to March 2000. When the variables book-to-market ratio –Ln(BM)– or earning-price ratio –EPD or EPP– are involved, the sample period begins in April 1992. Coefficients that are statistically different from zero at 5% significance level are in bold.

	Intercept	β	Ln(ME)	Ln(BM)	EPD	EPP	R²-Adj.
Average	1.0516	-0.2414					0.026
t-statistic	(1.678)	(-0.269)					
Average	0.02478		0.0556				0.032
t-statistic	(0.015)		(0.502)				
Average	0.6615			-0.1411			0.008
t-statistic	(1.247)			(-0.679)			
Average	0.5122				0.5239	5.5575	0,047
t-statistic	(0.883)				(0.707)	(2.712)	
Average	-0.9710	1.4744			0.4173	5.5634	0,064
t-statistic	(-1.286)	(1.470)			(0.580)	(2.674)	
Average	0.1346		0.0783	0.1059			0.046
t-statistic	(0.064)		(0.536)	(0.477)			
Average	-0.4117		0.0678		0.7342	5.5619	0.070
t-statistic	(-0.237)		(0.549)		(1.138)	(2.673)	
Average	0.4804			-0.0269	0.4051	5.7001	0.051
t-statistic	(0.832)			(-0.124)	(0.583)	(2.819)	
Average	-0.5803		0.0836	0.0325	0.6417	5.5997	0.073
t-statistic	(0.341)		(0.685)	(0.147)	(1.038)	(2.725)	
Average	-1.8044	1.3763	0.0718	0.0274	0.5420	5.6103	0.091
t-statistic	(-1.060)	(1.408)	(0.584)	(0.126)	(0.904)	(2.696)	

Table 8
Fama and MacBeth LTS 10% Regressions

Average coefficients, their correspond t-statistics and average R-square adjusted for the cross-section regressions of the SIBE stock returns on some of the fundamental variables for each month, since April 1988 to March 2000. When the variables book-to-market ratio $-\text{Ln}(\text{BM})$ – or earning-price ratio $-\text{EPD}$ or EPP – are involved, the sample period begins in April 1992. Coefficients that are statistically different from zero at 5% significance level are in bold.

	Intercept	β	Ln(ME)	Ln(BM)	EPD	EPP	R²-Adj.
Average	-0.1178				-0.0577	6.9995	0.102
t-statistic	(-0.221)				(-0.087)	(3.381)	
Average	-1.1617	1.1799			-0.2083	6.0985	0.147
t-statistic	(-1.575)	(1.161)			(-0.320)	(3.271)	