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Working Paper

ON THE INSTABILITY OF BETAS:
THE CASE OF SPAIN

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Abstract

It is a big mistake to use betas calculated from historical data to compute the required return to equity. It is a mistake for seven reasons: because betas calculated from historical data change considerably from one day to the next; because calculated betas depend very much on which stock index is used as the market reference; because calculated betas depend very much on which historical period is used to calculate them; because calculated betas depend on what returns (monthly, daily,…) are used to calculate them; because very often we do not know if the beta of one company is lower or higher than the beta of another; because calculated betas have little correlation with stock returns; and because the correlation coefficients of the regressions used to calculate the betas are very small.

For these seven reasons we can say either that the beta calculated from historical data is not a good approximation to the company's beta, or that the CAPM does not work (the required return is affected by other factors, besides the covariance of the company's return with the market return, the risk-free rate and the market risk premium), or both things at once.

ON THE INSTABILITY OF BETAS:
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Introduction

In this paper we show that it is a big mistake to use betas calculated from historical data to compute the required return to equity. It is a mistake for seven reasons:

1. because betas calculated from historical data change considerably from one day to the next[1].
2. because calculated betas depend very much on which stock index is used as the market reference.
3. because calculated betas depend very much on which historical period (5 years, 3 years…) is used to calculate them[2].
4. because calculated betas depend on what returns (monthly, yearly…) are used to calculate them.
5. because very often we do not know if the beta of one company is lower or higher than the beta of another.
6. because calculated betas have little correlation with stock returns.
7. because the correlation coefficients (and the R^2) of the regressions used to calculate the betas are very small.

For these seven reasons we can say that:

- the beta calculated from historical data is not a good approximation to the company's beta, or
- the CAPM does not work (the required return is affected by other factors, besides the co-variance of the company's return with the market return, the risk-free rate and the market risk premium), or
- both things at once.

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[1] Some authors, such as Damodaran (2001, p. 72), acknowledge that company betas vary considerably, but claim that industry betas (the beta of the portfolio composed of the companies in a given industry) vary very little. They therefore recommend using the calculated beta of an industry. However, we can see from Table 2 and Exhibit 2 that although industry betas vary less than company betas, they still vary significantly and using them can lead to serious errors.

[2] Brigham and Gapenski (1977, p. 354, footnote 9) report an illustrative anecdote in this respect: "A company that supplied betas told the authors that their company, and others, did not know what was the most appropriate period to use, but that they had decided to use 5 years in order to eliminate apparent differences between the betas provided by different companies, because big differences undermined the credibility of all of them"!

Also, betas calculated from historical data often make very little sense: companies with high risk often have lower calculated betas than companies with lower risk. A practical consequence of this analysis of betas is that using a historical beta to value a stock, without analyzing the stock and the company's future prospects, is very risky (and generally is a source of huge errors).

1. Betas calculated from historical data vary considerably from one day to the next

Figure 1 and **Exhibit 1** show the variation, with respect to the Madrid Stock Exchange General Index (IGBM), of the calculated betas of 106 Spanish companies each day of December 2001. The betas were calculated using monthly data from the previous 5 years[3]. It can be seen that the betas vary dramatically depending on the day for which they are calculated. The average daily change (in absolute value) was 9.8%, and the average weekly change, 24%. The average daily change of the volatilities (in absolute value) was 4%. On the average, the maximum beta of a company (the highest of the 31 calculated betas in December 2001) was 2.4 times its minimum beta. The average (unweighted) beta of all the companies was 0.71 (see **Exhibit 1**), well below 1, because the large companies had betas greater than 1. The three largest companies (Telefónica, BBVA and BSCH) represented 43.7% of the total market capitalization and had average betas significantly above 1 (1.42; 1.42; and 1.39). Naturally, the average beta weighted for market capitalization was 1.

Table 1 shows that only 11 of the 106 companies had an average beta (in the 31 days of December) with respect to the IBEX higher than 1, and that only 3 (Telefónica, BBVA and BSCH) had all 31 betas with respect to the IBEX higher than one[4]. For 89 of the 106 companies, the maximum beta in December was more than 1.5 times the minimum beta.

Figure 1. Historical betas of 106 companies in the continuous market in December 2001

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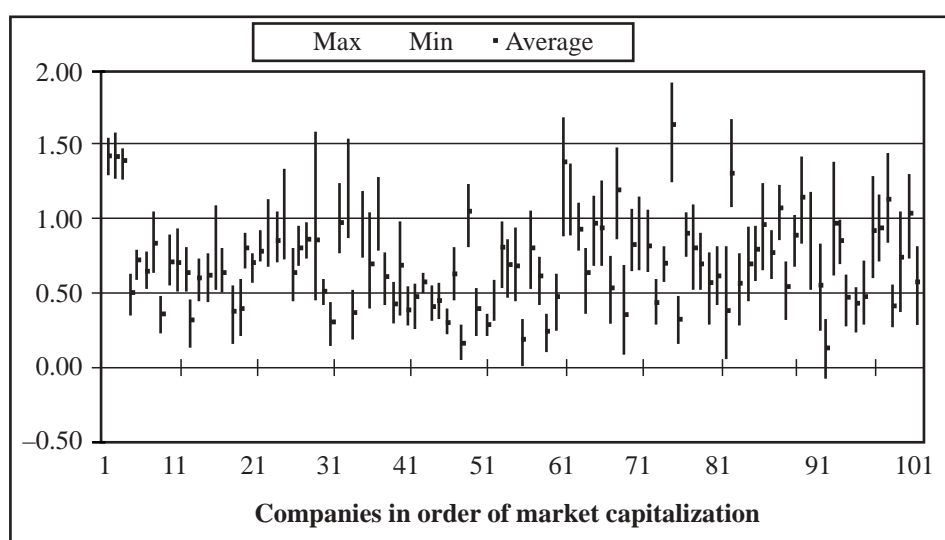
[3] The most common procedure for calculating the beta is to use 5 years of monthly data. This is the most usual procedure in academic research and also is used by providers of betas such as Merrill Lynch, or Ibbotson and Associates.

[4] Five companies (Telefónica, BBVA, BSCH, Picking Pack and Amper) had the 31 calculated betas with respect to the IGBM greater than 1.

The betas are calculated on each day of December 2001 with respect to the IGBM using monthly data of the previous 5 years. For example, the beta on December 18, 2001 is calculated by means of a regression of 60 monthly returns of the company on 60 monthly returns of the IGBM. The monthly returns are calculated on the 18th of each month. The figure shows the maximum beta, the minimum beta, and the average beta of the 31 calculated betas for each company. The companies are shown in decreasing order of market capitalization, as they appear in **Exhibit 1**: company number 1 is Telefónica.

Table 1. Betas of 106 Spanish companies calculated in December 2001
Some results

Number of companies	Beta with respect to:	
	IBEX	IGBM
Average beta > 1	11	15
All 31 betas > 1	3	5
Average beta < 0.5	36	33
Max. beta > 2 Min. beta	43	38
Max. beta > 1.75 Min. beta	68	59
Max. beta > 1.5 Min. beta	89	88

Figure 2 shows historical betas of Telefónica, BSCH and BBVA on the 31 days of December 2001 with respect to the IGBM. Telefónica's beta varies between 1.31 and 1.54, that of BSCH between 1.28 and 1.58, and that of BBVA between 1.29 and 1.50. Telefónica's beta is higher than that of BSCH on 58% of the days, and higher than that of BBVA on 39% of the days. BSCH's beta is higher than that of BBVA on 45% of the days. Telefónica had the highest beta of the 3 companies on 42% of the days, and the lowest on 35% of the days. BSCH had the highest beta of the 3 companies on 19% of the days, and the lowest on 35% of the days. BBVA had the highest beta of the 3 companies on 39% of the days, and the lowest on 30% of the days. The combined market capitalization of these three companies was 43.7% of the total market capitalization of the 106 companies.

Figure 2. Historical betas of Telefónica, BSCH and BBVA in December 2001
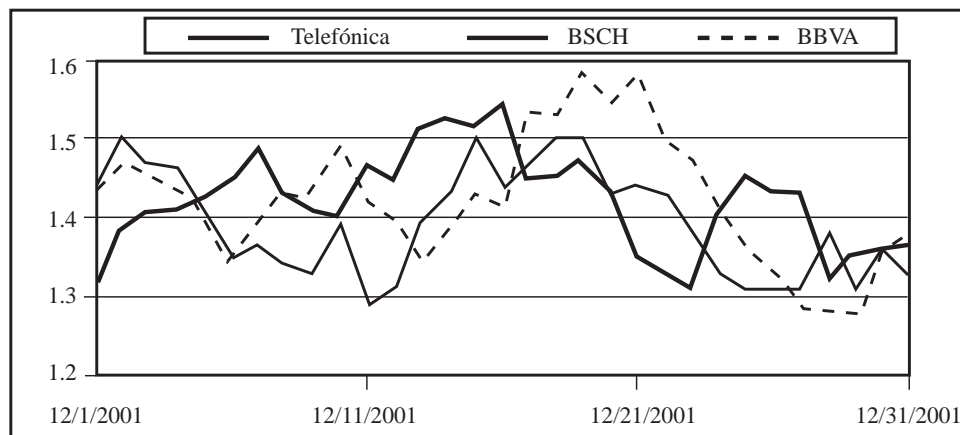With respect to the IGBM using monthly data of the previous 5 years

Table 2 shows a summary of the study we carried out at IESE on 3,813 United States companies. We selected the companies that had data available from December 1995[5] and calculated their beta on each day of December 2001 using monthly data of the previous 5 years. The table shows the enormous dispersion of the 31 calculated betas of each company. For the total sample, the average difference between the maximum beta and the minimum beta was 1.05. For the companies that belonged to the S&P 500, the average difference was 0.68, and for the 30 companies in the Dow Jones Industrial Average, 0.53. The difference between the maximum beta and the minimum beta was greater than 1 for more than 1,500 companies!

We also calculated the industry betas of the 101 industries to which the 3,813 companies belonged. The variability of the industry betas was lower due to the laws of statistics. Even so, the average difference between the maximum industry beta and the minimum industry beta was 0.45 (if the industry beta was calculated weighting the company betas by market capitalization)[6] and 0.38 (if the industry beta was calculated without weighting the company betas by market capitalization).

Table 2. Betas of 3,813 United States companies calculated in December 2001

With respect to the S&P 500 using monthly data of the previous 5 years. Some results

No. of companies		Maximum Beta – Minimum Beta						
		3 – 3.99	2 – 2.99	1 – 1.99	0.5 – 0.99	0.2 – 0.49	< 0.2	average
3,813	Complete sample	65	268	1.246	1.574	653	7	1.05
450	S&P 500 companies	0	1	56	250	143	0	0.68
3,363	Non-S&P 500	65	267	1.190	1.324	510	7	1.10
30	DJIA companies	0	0	6	16	8	0	0.53
No. of industries								
101	Weighted by market capitalization	0	0	1	37	59	4	0.45
101	Unweighted (simple average)	0	0	1	15	77	8	0.38

Table 3 provides data on the correlation coefficient of the return of the 3,813 companies with the S&P 500. The table shows the percentage of days and months that the share price and the index moved in the same direction (both rose or both fell) over the five-year period 1/1/1997 to 31/12/2001. Over this period, 2,037 companies moved in the same direction as the index in between 50% and 60% of the months; and 1,138 companies moved in the same direction as the index on between 40% and 50% of the days. On the average, the companies moved in the same direction as the index in only 58% of the months and on 48.7% of the days (or 68.3% and 65%, respectively, if we consider only the 30 Dow Jones companies).

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[5] Six years prior to December 2001 (that is why only 450 companies appear in the S&P 500).

[6] **Exhibit 2** gives details of the betas of different industries.

**Table 3. Percent of days and months in which the return of the shares of the 3,813 companies
and the return of the S&P 500 had the same sign (1/1/1997-31/12/2001)**

	All the companies (3,813)		30 companies in the DJIA	
Percent	Monthly data	Daily data	Monthly data	Daily data
0 - 10%	0	10		
10% - 20%	4	32		
20% - 30%	7	126		
30% - 40%	23	598		
40% - 50%	404	1,138		
50% - 60%	2,037	1,406	2	
60% - 70%	1,227	474	16	24
70% - 80%	107	29	11	6
80% - 90%	4	0	1	
90% - 100%	0	0		
	3.813	3.813	30	30
Average	58.0%	48.7%	68.3%	65.9%
Median	58.1%	50.0%	66.9%	64.5%

Source: Fernández (2004).

Figure 3 shows the betas of Coca-Cola, AT&T and Merck on the 31 days of December 2001 with respect to the S&P 500. Again, the great variability of the calculated betas can be seen. Which company does the reader think had the best beta?

Figure 3. Historical betas of Coca-Cola, AT&T and Merck on each day of December 2001
With respect to the S&P 500 using monthly data of the previous 5 years
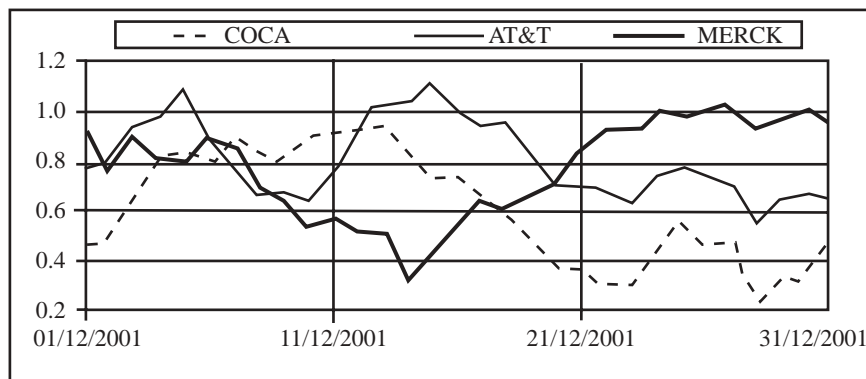
2. The calculated betas depend on which stock market index is taken as a reference

Figure 4 shows the calculated betas of Coca-Cola with respect to three stock market indexes in December 2001. The beta with respect to the Dow Jones Industrial Average was higher than the beta with respect to the S&P 500, which in turn was higher than the beta with respect to the Wilshire 5000 index. The calculated betas (just in December!) varied between 0.44 and 1.18. In other words, based on the betas we have calculated, we haven't the faintest idea what was the beta of Coca-Cola in December 2001.

Figure 4. Historical betas of Coca-Cola with respect to 3 stock market indexes each day of December 2001
With respect to the S&P 500, the Dow Jones Industrial Average, and the Wilshire 5000,
using monthly data of the previous 5 years
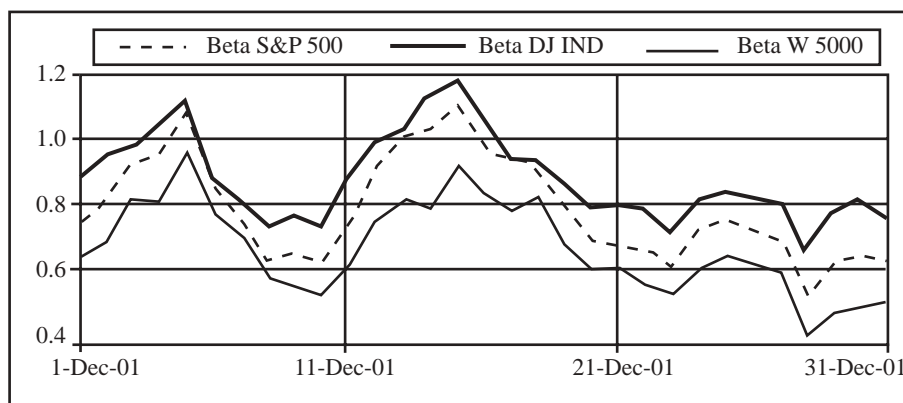
Figure 5 shows the calculated betas of AT&T with respect to three stock market indexes in December 2001. In this case, the beta with respect to the Dow Jones Industrial Average was lower than the betas with respect to the S&P 500 and the Wilshire 5000, which were practically identical. The calculated betas (just in December 2001!) varied between 0.17 and 1.03. The conclusion is much the same as with Coca-Cola. What beta does the reader think would be reasonable for AT&T?

Figure 5. Historical betas of AT&T with respect to 3 stock market indexes each day of December 2001
With respect to the S&P 500, the Dow Jones Industrial Average,
and the Wilshire 5000, using monthly data of the previous 5 years.
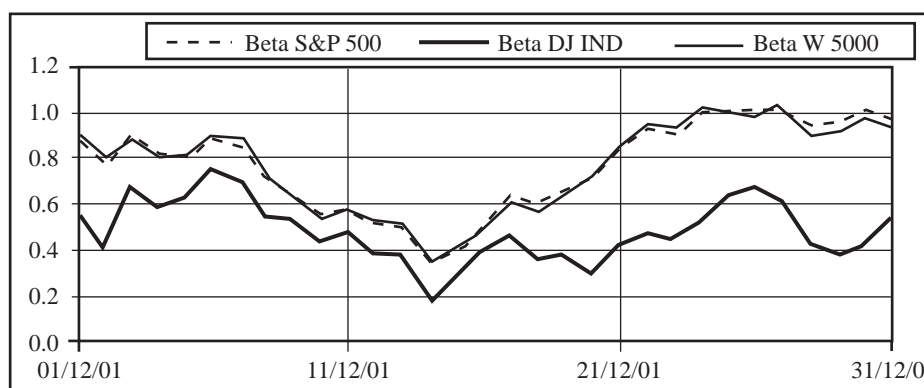
Source: Fernández (2004).

In the case of Spain, in December 2001 the average beta of our sample of 106 Spanish companies with respect to the IGBM was higher (by 0.07) than the same companies' average beta with respect to the IBEX. Of the 3,286 calculated betas with respect to each index (106 companies by 31 days), only 17 betas with respect to the IBEX were higher than the betas with respect to the IGBM. The average beta of the 106 companies with respect to the IBEX was 0.6, and with respect to the IGBM, 0.71. The average beta was much smaller than 1 because, as we saw in Figure 2 and Table 1, only eleven companies had an average beta with respect to the IBEX greater than 1 (15 of the 106 companies had an average beta with respect to the IGBM greater than 1).

3. The calculated betas depend on what historical period is used

Table 4 shows how a company's calculated beta changes depending on the period used to calculate it. For example, the calculated beta of Coca-Cola on September 30, 2003 was 0.29 using monthly data of the previous 5 years, and 0.69 using monthly data of the previous 6 months.

Table 4. Betas of Coca-Cola, PepsiCo, AT&T and Merck, calculated on September 30, 2003 and December 31, 2000, using monthly data of different historical periods

	September 30, 2003				December 31, 2000			
Beta with respect to S&P 500	Coca-Cola	PepsiCo	AT&T	Merck	Coca-Cola	PepsiCo	AT&T	Merck
Monthly data of 5 years	0.29	0.52	1.11	0.35	0.71	1.09	1.10	0.57
Monthly data of 1 year	0.39	0.89	1.96	1.07	–0.61	0.31	1.21	–0.43
Monthly data of 6 months	0.69	0.64	1.12	0.35	–1.25	–0.13	0.82	–0.33

Source: Fernández (2004).

Figure 6. Betas of Endesa, Repsol and Prosegur calculated on September 30, 2003 using monthly data
The beta changes depending on the number of months used to calculate it
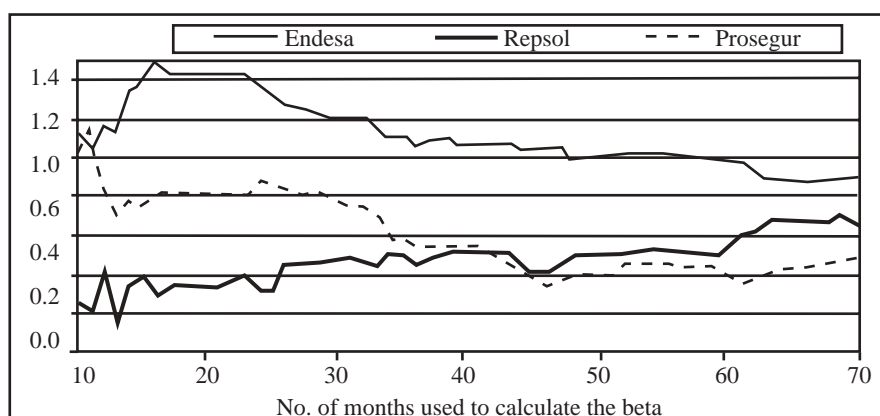
Other authors have mentioned this effect. For example, Damodaran (2001, p. 72) shows different betas for Cisco with respect to the S&P 500 depending on the period used to calculate the beta:

Betas of Cisco with respect to the S&P 500

	Daily data	Weekly data	Monthly data	Quarterly data
2 years	1.72	1.74	1.82	2.70
5 years	1.63	1.70	1.45	1.78

Source: Damodaran (2001, p. 72).

Damodaran (1994) also illustrates this effect by calculating the beta of Disney. Using three years he obtains 1.04; using 5 years, 1.13; and using 10 years, 1.18. Using daily data he obtains 1.33; using weekly data, 1.38; using monthly data, 1.13; using quarterly data 0.44; and using annual data, 0.77.

4. The calculated betas depend on what returns (monthly, daily…) are used

Figures 7 through **11** show how the betas of various Spanish companies change depending on whether monthly, weekly or daily data are used to calculate them.

Figure 7. Beta of Telefónica (calculated with data of the previous 5 years)
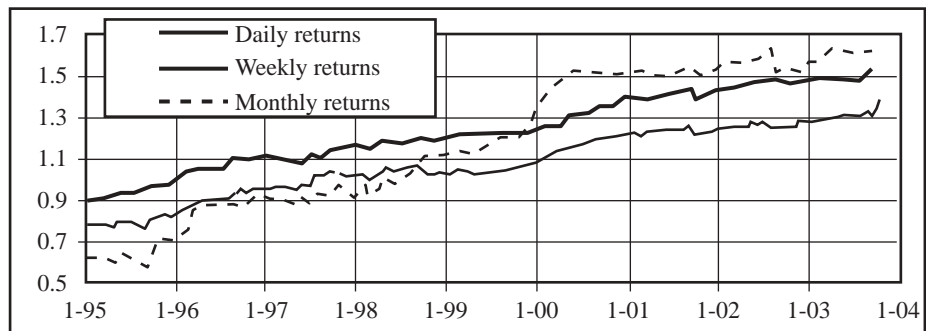
Figure 8. Beta of Repsol (calculated with data of the previous 5 years)
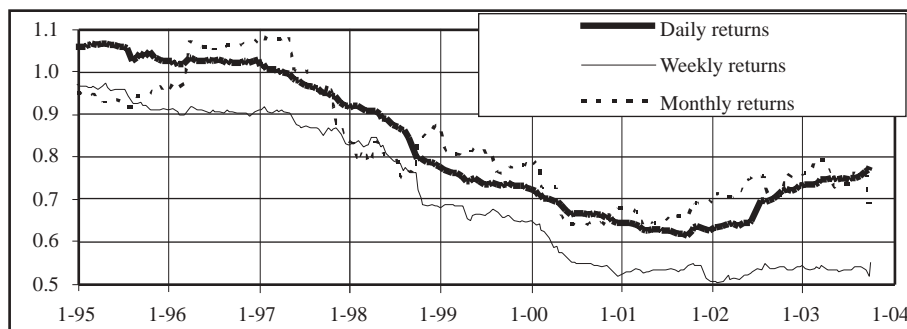
Figure 9. Beta of Endesa (calculated with data of the previous 5 years)
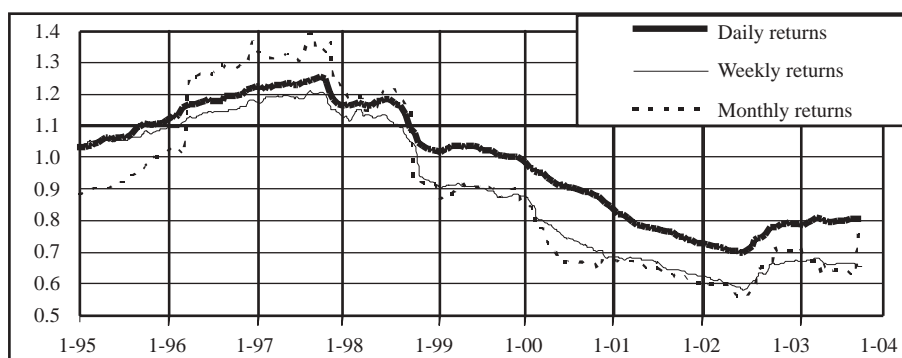
Figure 10. Beta of BBVA (calculated with data of the previous 5 years)
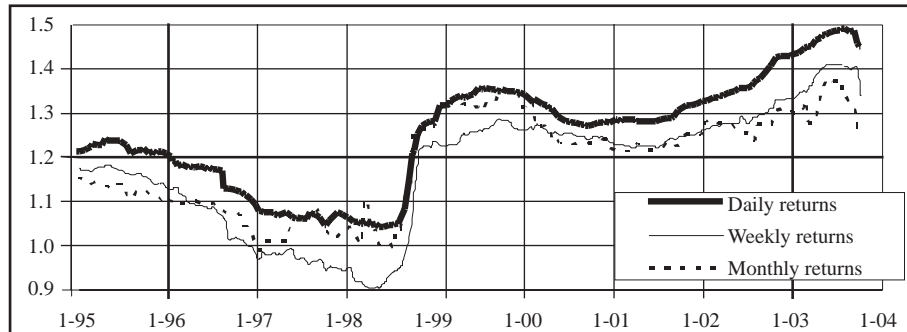
Figure 11. Beta of BSCH (calculated with data of the previous 5 years)
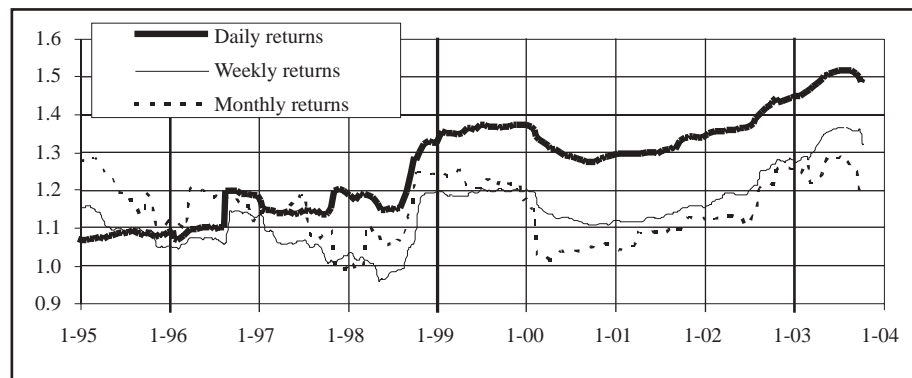
5. It is difficult to say whether the beta of one company is bigger or smaller than the beta of another company

Looking at **Figures 2** and **3**, it is difficult to say which company has the biggest beta and which the smallest.

Based on the calculated betas of the 106 Spanish companies, we constructed, for each day of December, 10 portfolios using as our criterion the beta calculated on that day. Portfolio 1 contained the 10 companies with the smallest beta, and Portfolio 10 contained the 10 companies with the biggest beta. We then observed whether there were any changes in the composition of the portfolios and found that all the portfolios changed their composition every day, with seven exceptions (Portfolio 1 did not change on one day, and Portfolio 10 did not change on six days). **Table 5** shows the changes (in number of companies) in each portfolio from the given day to the following day.

Table 5. Portfolios formed daily according to the betas of the 106 Spanish companies in December 2001

The table shows the number of companies that were in a different portfolio the following day. For example, 4 companies that on December 1 were in Portfolio 1 (the 10 companies with the smallest beta) were not in that portfolio on December 2.

Number of companies that were in a different portfolio the following day

	Portfolios										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**sum**
1/12/01	4	7	8	6	7	6	7	4	3	1	53
2/12/01	3	5	6	4	4	7	5	3	2	0	39
3/12/01	2	5	6	6	3	6	6	5	3	0	42
4/12/01	1	4	4	4	2	6	7	4	2	0	34
5/12/01	1	4	7	7	6	5	8	5	4	1	48
6/12/01	1	1	2	5	6	6	4	3	2	0	30
7/12/01	1	1	4	2	4	5	5	5	3	1	31
8/12/01	2	2	5	4	6	6	5	6	7	2	45
9/12/01	0	2	4	2	6	6	6	4	3	2	35
10/12/01	2	4	6	7	6	6	6	5	4	2	48
11/12/01	1	3	6	4	5	6	6	6	4	1	42
12/12/01	1	2	3	6	7	5	4	6	5	2	41
13/12/01	1	3	5	5	6	9	4	4	4	1	42
14/12/01	1	3	5	6	4	4	4	5	5	2	39
15/12/01	1	3	5	5	6	7	8	5	2	2	44
16/12/01	2	4	4	4	3	7	8	8	4	1	45
17/12/01	2	5	5	5	7	5	6	7	6	3	51
18/12/01	2	5	3	4	5	7	5	6	6	1	44
19/12/01	3	4	5	4	7	8	4	3	3	2	43
20/12/01	3	4	6	6	5	5	5	5	5	1	45
21/12/01	1	3	7	8	8	7	6	4	5	2	51
22/12/01	2	4	3	6	6	6	9	7	2	1	46
23/12/01	1	4	6	5	4	5	7	5	3	1	41
24/12/01	3	7	5	3	8	5	4	5	3	2	45
25/12/01	3	6	6	5	5	3	3	5	4	2	42
26/12/01	3	4	5	6	6	6	3	6	6	2	47
27/12/01	1	7	7	5	7	8	7	7	4	2	55
28/12/01	3	5	5	5	8	7	5	5	4	2	49
29/12/01	3	6	8	4	8	5	6	4	1	0	45
30/12/01	1	3	3	1	2	3	4	5	2	0	24

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**sum**
Sum of changes	55	120	154	144	167	177	167	152	111	39	1286
Average changes/day	1.8	4.0	5.1	4.8	5.6	5.9	5.6	5.1	3.7	1.3	42.9
Percentage	18.3	40.0	46.7	48.0	50.6	53.6	50.6	46.1	33.6	13.0	40.4
Days with no change	1	0	0	0	0	0	0	0	0	6	7

Lastly, **Table 6** shows the calculated betas of Coca-Cola, PepsiCo, AT&T and Merck on September 30, 2003 and December 31, 2000. Betas have been calculated with respect to different indexes, and using data of different frequency (daily, weekly, biweekly and monthly), and different periods (6 months, 1 year and 5 years). As can be seen, the calculated betas of Coca-Cola on September 30, 2003 varied between –0.08 and 0.82. The conclusion to be drawn from this table is that, by changing the calculation period, the frequency of the data, and the reference index, you can obtain whatever beta you like.

Table 6. Betas of Coca-Cola, PepsiCo, AT&T and Merck, calculated on September 30, 2003 and December 31, 2000, using data of different periods, with different frequency, and different indexes

	September 30, 2003				December 31, 2000			
Beta with respect to S&P 500	Coca-Cola	PepsiCo	AT&T	Merck	Coca-Cola	PepsiCo	AT&T	Merck
monthly data of 5 years	0.29	0.52	1.11	0.35	0.71	1.09	1.10	0.57
monthly data of 1 year	0.39	0.89	1.96	1.07	–0.61	0.31	1.21	–0.43
monthly data of 6 months	0.69	0.64	1.12	0.35	–1.25	–0.13	0.82	–0.33
weekly data of 5 years	0.41	0.43	1.13	0.72	0.79	0.47	0.89	0.66
weekly data of 1 year	0.63	0.61	1.24	0.82	–0.02	–0.14	1.16	–0.09
weekly data of 6 months	–0.07	0.54	0.45	1.13	–0.22	–0.19	1.15	–0.51
daily data of 5 years	0.58	0.56	0.94	0.75	0.72	0.69	0.90	0.84
daily data of 1 year	0.57	0.67	0.94	0.95	0.26	0.27	0.98	0.48
daily data of 6 months	0.60	0.69	0.77	0.91	–0.14	–0.06	1.08	–0.06
biweekly data of 5 years	0.43	0.38	1.07	0.65	0.77	0.50	0.86	0.64
biweekly data of 1 year	0.74	0.62	1.48	1.01	–0.14	–0.19	1.16	–0.21
biweekly data of 6 months	–0.03	0.64	0.35	1.44	–0.51	–0.19	0.85	–0.44
Beta with respect to DJ 30								
monthly data of 5 years	0.43	0.52	0.72	0.47	0.87	0.96	0.66	0.63
monthly data of 1 year	0.31	0.92	1.92	1.08	–0.15	0.40	0.73	0.35
monthly data of 6 months	0.78	0.67	1.75	0.05	–1.06	–0.08	0.43	–0.18
weekly data of 5 years	0.55	0.54	1.04	0.82	1.00	0.53	0.75	0.76
weekly data of 1 year	0.71	0.56	1.28	0.76	0.38	–0.02	0.88	0.17
weekly data of 6 months	0.12	0.46	0.51	1.07	0.64	0.09	–0.30	–0.22
daily data of 5 years	0.69	0.63	0.87	0.81	0.84	0.75	0.82	0.89
daily data of 1 year	0.62	0.70	0.89	0.93	0.58	0.49	0.87	0.72
daily data of 6 months	0.69	0.70	0.77	0.92	0.21	0.12	0.94	0.18
biweekly data of 5 years	0.57	0.46	0.88	0.72	1.02	0.55	0.62	0.71
biweekly data of 1 year	0.82	0.56	1.47	0.92	0.30	0.01	0.79	0.25
biweekly data of 6 months	0.25	0.47	0.32	1.48	0.13	–0.03	0.00	–0.19
Beta with respect to Wilshire 5000								
monthly data of 5 years	0.23	0.44	1.10	0.15	0.56	0.98	1.11	0.35
monthly data of 1 year	0.46	0.85	2.10	0.99	–0.90	0.11	1.21	–0.88
monthly data of 6 months	0.76	0.57	1.27	0.17	–1.11	0.00	0.84	–0.39
weekly data of 5 years	0.34	0.37	1.15	0.63	0.62	0.40	0.88	0.51
weekly data of 1 year	0.61	0.61	1.28	0.83	–0.16	–0.18	1.03	–0.18
weekly data of 6 months	–0.08	0.51	0.44	1.05	–0.30	–0.10	1.05	–0.44
daily data of 5 years	0.52	0.50	0.95	0.70	0.62	0.61	0.90	0.76
daily data of 1 year	0.58	0.68	0.99	0.98	0.10	0.12	0.93	0.31
daily data of 6 months	0.60	0.70	0.81	0.93	–0.20	–0.14	0.95	–0.10
biweekly data of 5 years	0.36	0.30	1.11	0.52	0.59	0.40	0.83	0.45
biweekly data of 1 year	0.72	0.63	1.56	1.03	–0.28	–0.24	0.98	–0.38
biweekly data of 6 months	–0.05	0.62	0.37	1.35	–0.55	–0.04	0.83	–0.39
maximum beta	**0.82**	**0.92**	**2.10**	**1.48**	**1.02**	**1.09**	**1.21**	**0.89**
minimum beta	**–0.08**	**0.30**	**0.32**	**0.05**	**–1.25**	**–0.24**	**–0.30**	**–0.88**

Looking at **Table 7**, which offers a similar analysis for football clubs that had a stock market listing, we come to the same conclusion: the range of variation of the beta is very wide, depending on the period, the frequency, and the data used.

Table 7. Betas of the football teams with a stock market listing, calculated on October 24, 2003, using data of different periods and with different frequency

Only teams that have had a listing for more than 5 years are included

	Capitali-zation Oct-03	Net Income 2002	Betas										
			Monthly data			Weekly data			Daily data				
			5 years	2 years	1 year	5 years	2 years	1 year	5 years	2 years	1 year	max	min
Tottenham Hotspur	38.8	0	–0.04	–0.04	0.52	0.14	0.07	0.07	0.08	0.02	0.01	0.52	–0.04
Manchester Utd.	904.6	25	0.27	0.23	–0.31	0.45	0.17	–0.03	0.20	0.21	0.20	0.45	–0.31
Celtic	21.4	–4	0.25	0.17	0.57	0.06	0.03	0.10	0.04	–0.01	–0.03	0.57	–0.03
Preston Nth. End	5.7	4	0.12	–0.03	0.14	0.08	–0.12	–0.03	0.00	–0.02	0.01	0.14	–0.12
Chelsea	86.4	–17	0.55	0.30	0.94	0.78	0.95	0.44	0.24	0.24	0.02	0.95	0.02
Leeds United	13.1	–34	0.52	–0.32	–1.14	0.29	–0.05	0.18	0.24	0.18	0.23	0.52	–1.14
Sunderland	7.0	–4	0.23	0.23	–0.69	0.15	0.16	0.00	0.04	–0.01	–0.04	0.23	–0.69
Sheffield Utd.	12.2	–2	–0.27	–0.31	–3.21	0.31	0.29	0.07	0.25	0.18	0.07	0.31	–3.21
Southampton	14.6	2	0.02	0.04	–1.60	0.11	0.19	0.18	0.14	0.02	0.00	0.19	–1.60
West Bromwich	9.5	2	0.01	0.03	0.24	–0.02	0.00	0.06	0.03	0.00	0.01	0.24	–0.02
Birmingham City	20.1	–6	–0.22	–0.09	0.74	0.09	–0.06	0.32	0.07	0.05	0.07	0.74	–0.22
Charlton Athletic	14.6	–11	0.19	0.39	–0.03	–0.12	–0.33	–0.46	0.03	–0.02	–0.10	0.39	–0.46
Newcastle Utd.	70.9	–3	0.32	0.12	0.11	–0.01	–0.20	–0.23	0.09	0.05	–0.01	0.32	–0.23
Aston Villa	31.7	0	0.27	0.72	1.00	0.17	0.48	0.37	0.04	0.04	0.06	1.00	0.04
Heart Of Midlothian	3.0	–3	–0.29	–0.27	–1.31	–0.08	–0.15	–0.04	–0.01	–0.02	–0.04	–0.01	–1.31
Lazio	135.5	–103	0.86	0.60	0.09	0.24	–0.41	–1.37	0.27	0.20	0.07	0.86	–1.37
Ajax	94.1	–16	0.29	0.31	0.47	0.27	0.16	0.31	0.15	0.14	0.10	0.47	0.10
Sporting	20.1		0.31	0.36	0.21	0.55	0.67	0.37	0.16	0.19	0.12	0.67	0.12
Oporto	49.5		0.37	0.52	1.32	0.17	0.33	0.40	0.27	0.25	0.28	1.32	0.17

6. There is little correlation between calculated betas and stock returns

Tables 8 and **9** show the lack of correlation between calculated betas and stock returns. Table 8 shows the correlation between 8 portfolios constructed in accordance with the betas of the 106 Spanish companies calculated on December 31, 2001, using monthly data of the previous 5 years. Portfolio 1 is made up of the shares with the highest beta and Portfolio 8, of the shares with the lowest beta. It can be seen that there is little correlation between the beta and the return of the shares before or after December 2001.

Table 9 shows the results of the regression of the calculated beta of each company on the stock's return in different periods. It can be seen that the R^2 of all the regressions is small. **Figure 12** shows one such regression: the one corresponding to the return of the shares in the two years following the calculation of the beta.

Table 8. Return of the portfolios in decreasing order of calculated betas on December 31, 2001

	Market capitalization (€ millions)	Average beta	Return of the portfolio in different periods						
			1996-2001	1997-2001	1998-2001	1999-2001	2000-2001	2001-2002	2001- 2003
Portfolio 1	162,32	1.25	232%	23%	–21%	–23%	1%	–30%	–13%
Portfolio 2	5,32	0.95	49%	–7%	–32%	–6%	12%	–7%	10%
Portfolio 3	16,073	0.83	113%	3%	–15%	–4%	12%	–10%	12%
Portfolio 4	35,676	0.71	135%	58%	15%	14%	10%	8%	35%
Portfolio 5	63,719	0.60	262%	81%	7%	19%	6%	–6%	21%
Portfolio 6	35,962	0.46	89%	56%	19%	20%	16%	9%	39%
Portfolio 7	26,877	0.35	72%	23%	5%	22%	19%	6%	42%
Portfolio 8	3,764	0.21	179%	44%	11%	16%	14%	2%	22%

**Table 9. Parameters of the regression performed in different periods for the Spanish companies:
Return = a + b calculated beta**

	1996-2001	1997-2001	1998-2001	1999-2001	2000-2001	2001-2002	2001- 2003
a	1.05	0.63	0.30	0.40	0.21	0.19	0.52
b	0.50	–0.41	–0.46	–0.48	–0.15	–0.32	–0.46
R^2	0.4%	2.5%	9.3%	15.5%	2.9%	9.6%	11.2%

**Figure 12. Regression of the calculated betas of the Spanish companies
on their return in the two years following the calculation**
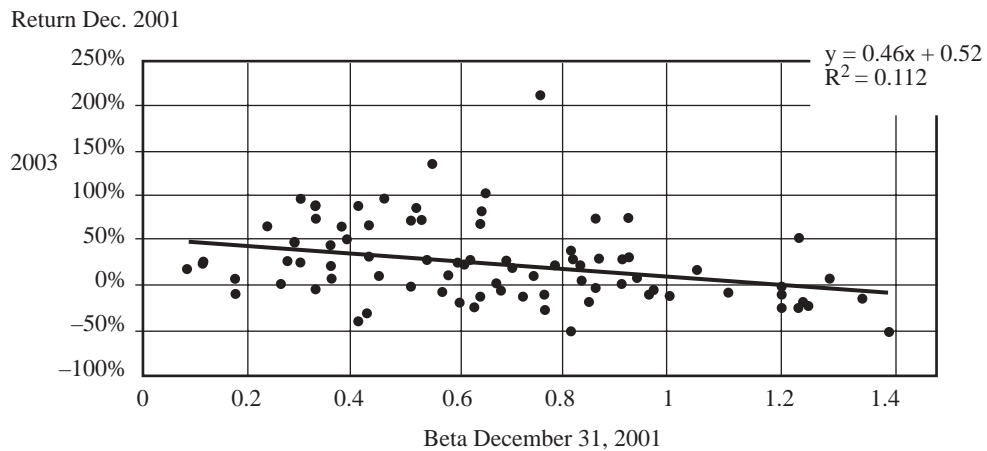
7. Calculating a qualitative beta

Given the instability of betas and the meaninglessness of historical betas, companies are increasingly resorting to calculating a qualitative beta of companies or investment projects.

Example[7]: A company uses the MASCOFLAPEC method (from the initials of the parameters used to evaluate the risk of each project) to estimate the beta. Each parameter is scored from 1 to 5 according to its contribution to the risk. Each factor also has to be weighted. In the attached example, the sum of the scores of each parameter, bearing in mind its weight, was 3.5. Multiplying this number by 0.5, we obtain a beta of 1.75. Note that with this system (owing to the parameter 0.5), the beta can vary between 0.5 and 2.5. If a parameter equal to 0.6 were used, then the beta could vary between 0.6 and 3.0.

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[7] This example is taken from Fernández (2002, page 212).

Table 10. Calculation of a qualitative beta

Weight			Risk low 1	average 2	substantial 3	high 4	very high 5	Weighted risk
10%	M	Management	1					0.1
25%	A	Assets: Business: industry / product ...					5	1.2
3%	S	Strategy				4		0.1
15%	C	Country risk				4		0.6
10%	O	Operating leverage				4		0.4
15%	F	Financial leverage		2				0.3
5%	L	Liquidity of investment					5	0.2
5%	A	Access to sources of funds			3			0.1
2%	P	Partners				4		0.0
5%	E	Exposure to other risks (currencies...)		2				0.1
5%	C	Cash flow stability			3			0.1
100%								3.5

Beta of equity =	3.5	x	0.5	=	1.75

Alternatives to the MASCOFLAPEC method include the MARTILLO method and the BAMIFLEX method:

M	Management		B	Business: product / demand / market
A	Asset quality		A	Access to credit: capacity to obtain finance
R	Risk exposure		M	Management: managers, shareholders...
T	Trade analysis: product/market		I	Indebtedness. Solvency and long-term survival
I	IRR of new investments		F	Flows. Resource generation (capacity to pay debts) and return
L	Leverage		L	Liquidity of the shares
L	Liquidity		EX	Exposure to other risks: foreign exchange, country, interest rate, raw materials...
O	Other relevant factors			

Goldman Sachs recommends the CAMEL method: C (for Capital, referring to leverage); A (for Asset quality, referring to business risk); M (for Management, referring to the confidence we have in the management); E (for Earnings, referring to the volatility of earnings); and L (for Liquidity, referring to the liquidity of the shares).

These methods are simply an aid to common sense. The beta that should be used to value a company will depend on the risk that the valuer sees in the expected flows of the company.

8. Conclusion

We have shown that, in general, it is an enormous error to use the historical beta as a proxy for the expected beta. First, because it is almost impossible to calculate a meaningful beta because historical betas change dramatically from one day to the next; second, because very often we cannot say with a relevant statistical confidence that the beta of one company is smaller or bigger than the beta of another; third, because historical betas do not make much sense in many cases: high-risk companies very often have smaller historical betas than low-risk companies; fourth, because historical betas depend very much on which index we use to calculate them. □

Exhibit 1

ON THE INSTABILITY OF BETAS:
THE CASE OF SPAIN

Historical betas of 106 companies from the continuous market in December 2001

Betas are calculated for each day of December 2001 with respect to the IGBM using monthly data of the previous 5 years. For example, on December 18, 2001 the beta is calculated by means of the regression of 60 monthly returns of the company on 60 monthly returns of the IGBM. The monthly returns are calculated on the 18th of each month.

The exhibit contains the maximum beta, the minimum beta, and the average beta of the 31 calculated betas for each company. The companies are shown in decreasing order of market capitalization (at December 31, 2001).

	Company	Beta IGBM			Capitalization		Company	Beta IGBM			Capitalization
		Max.	Min.	Avge.	31/12/01			Max.	Min.	Avge.	31/12/01
1	Telefónica	1.54	1.31	1.42	70,219	56	Urbis	1.05	0.51	0.80	474
2	BBVA	1.58	1.28	1.42	44,422	57	Faes	0.76	0.44	0.60	450
3	BSCH	1.50	1.29	1.39	43,903	58	B. Galicia	0.36	0.11	0.24	426
4	Bayer	0.64	0.35	0.49	26,658	59	Koipe	0.64	0.25	0.46	391
5	Repsol	0.80	0.60	0.71	19,998	60	Tele Pizza	1.70	0.89	1.38	389
6	Endesa	0.79	0.54	0.65	18,602	61	Campofrío	1.39	0.91	1.14	378
7	Volkswagen	1.05	0.63	0.84	16,464	62	Ence	1.11	0.80	0.92	363
8	Iberdrola	0.50	0.25	0.36	13,181	63	Aldeasa	0.81	0.38	0.64	360
9	Banesto	0.90	0.55	0.70	8,485	64	Uralita	1.16	0.69	0.95	299
10	Gas Natural	0.93	0.50	0.70	8,373	65	Bami	1.26	0.69	0.93	257
11	B. Popular	0.80	0.49	0.63	8,009	66	Uniland	0.76	0.30	0.53	242
12	Altadis	0.46	0.13	0.31	5,835	67	Viscofan	1.50	0.89	1.19	238
13	Unión Fenosa	0.75	0.45	0.60	5,539	68	Baron Ley	0.69	0.09	0.35	201
14	Carrefour	0.79	0.45	0.62	4,262	69	Azkoyen	1.07	0.65	0.83	200
15	Arcelor	1.09	0.53	0.75	3,521	70	Filo	1.15	0.66	0.91	195
16	Cepsa	0.83	0.50	0.64	3,342	71	Ta. Fibras	1.06	0.65	0.80	193
17	Acesa	0.55	0.16	0.37	3,269	72	Cune	0.59	0.29	0.42	188
18	Hidrocantábrico	0.59	0.21	0.39	3	73	Aragonesas	0.82	0.59	0.70	184
19	FCC	0.92	0.67	0.79	2,792	74	Picking Pack	1.92	1.25	1.62	179
20	Acciona	0.79	0.58	0.70	2,606	75	B. Cto. Balear	0.49	0.16	0.37	176
21	Dragados	0.93	0.71	0.79	2,59	76	Tubacex	1.04	0.75	0.87	168
22	Bankinter	1.15	0.67	0.98	2,473	77	Unipapel	1.09	0.51	0.74	155
23	Acerinox	1.07	0.71	0.86	2,253	78	Vidrala	0.91	0.53	0.70	148
24	Aceralia	1.35	0.73	0.97	2,208	79	Miquel Costas	0.79	0.29	0.49	137
25	Ag. Barna	0.81	0.44	0.64	1,977	80	Iberpapel	0.82	0.42	0.59	134
26	Alba	0.96	0.69	0.80	1,896	81	Pescanova	0.83	0.07	0.35	132
27	ACS	1.00	0.74	0.87	1,755	82	Amper	1.68	1.10	1.33	117
28	Zeltia	1.60	0.44	0.85	1,746	83	Tecnocom	0.79	0.28	0.50	102
29	Zardoya	0.60	0.42	0.50	1,719	84	Duro Felguera	0.96	0.45	0.69	101
30	Aurea	0.45	0.14	0.29	1,637	85	Sotogrande	0.96	0.58	0.74	98.5
31	Sol Melià	1.24	0.78	0.96	1,578	86	Tudor	1.26	0.66	0.98	97.9
32	Indra	1.54	0.88	1.34	1,408	87	Dinamia	0.92	0.60	0.75	95.7
33	Ebro Puleva	0.51	0.19	0.37	1,342	88	Ercros	1.26	0.87	1.04	93.6
34	NH	1.19	0.75	0.96	1,335	89	Omsa	0.72	0.33	0.51	88.5
35	Mapfre Vida	1.05	0.40	0.70	1,227	90	Tavex	1.03	0.67	0.87	82.9
36	Mapfre	1.28	0.79	1.09	1,182	91	Global Steel	1.42	0.84	1.16	71.1
37	Vallehermoso	0.78	0.42	0.61	1,082	92	A. Dominguez	1.19	0.53	0.81	70.6
38	Metrovac.	0.57	0.31	0.44	968	93	Aceros and For.	0.84	0.24	0.46	69.7
39	Prosegur	1.00	0.36	0.67	908	94	B. Guipuzcoano	0.32	-0.08	0.14	67.4
40	B. Valencia	0.55	0.28	0.38	874	95	Seda	1.38	0.64	0.94	66.4
41	B. Zaragozano	0.57	0.26	0.46	824	96	Dogi	1.02	0.70	0.83	48.5
42	B. Pastor	0.64	0.51	0.57	823	97	Bod. Rioj.	0.63	0.28	0.49	47.9
43	B. Andalucía	0.56	0.32	0.41	815	98	Lingotes	0.54	0.24	0.42	33.9
44	C. Portland	0.58	0.33	0.44	805	99	Indo	0.71	0.29	0.45	32.2
45	B. Atlántico	0.39	0.23	0.30	761	100	Sniace	1.29	0.61	0.92	30.3
46	Logista	0.82	0.46	0.62	722	101	Nicolás Correa	1.16	0.73	1.00	24.3
47	Iberpistas	0.28	0.05	0.15	704	102	Española Zinc	1.44	0.84	1.14	23.6
48	Abengoa	1.23	0.82	1.02	625	103	Inbesos	0.56	0.28	0.43	14.4
49	Europistas	0.54	0.20	0.39	564	104	General Inver.	1.05	0.38	0.74	12.4
50	B. Guipuzcoa	0.37	0.21	0.29	536	105	Nueva Montaña	1.30	0.74	1.02	11.3
51	Gr. Occidente	0.60	0.31	0.47	516	106	Eppic-L.	0.83	0.30	0.55	4.7
52	Cortefiel	0.99	0.53	0.79	500		Sum				362,46
53	Valderribas	0.88	0.50	0.69	498		Average	0.93	0.51	0.71	
54	OHL	0.95	0.47	0.68	491		Max.	1.92	1.31	1.62	
55	B. Castilla	0.34	0.01	0.18	483		Min.	0.28	-0.08	0.14	

Exhibit 2

ON THE INSTABILITY OF BETAS:
THE CASE OF SPAIN

Other data on the calculated betas of the 106 Spanish companies in December 2001

The standard deviation (a measure of the measurement error of the betas) does not depend on the average value of the beta.
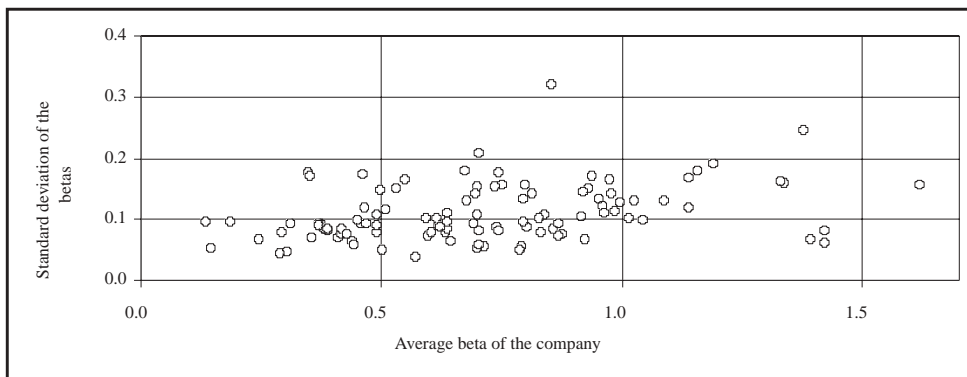
The beta depends on the correlation coefficient between the return of the share and the market return, and on the volatility of the return of the share.
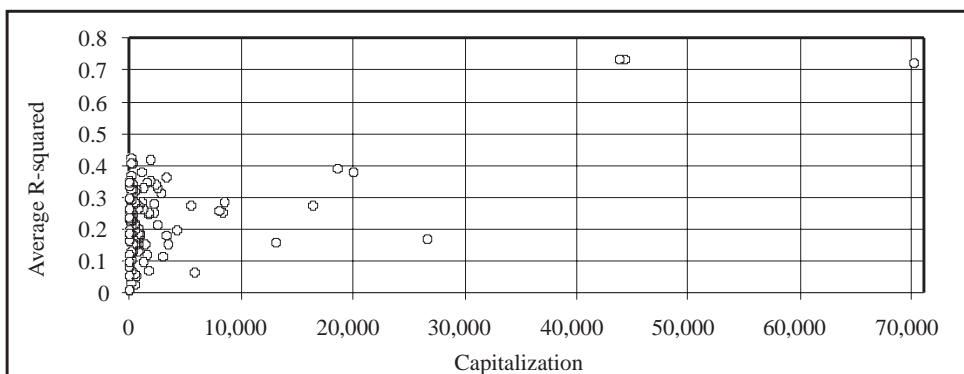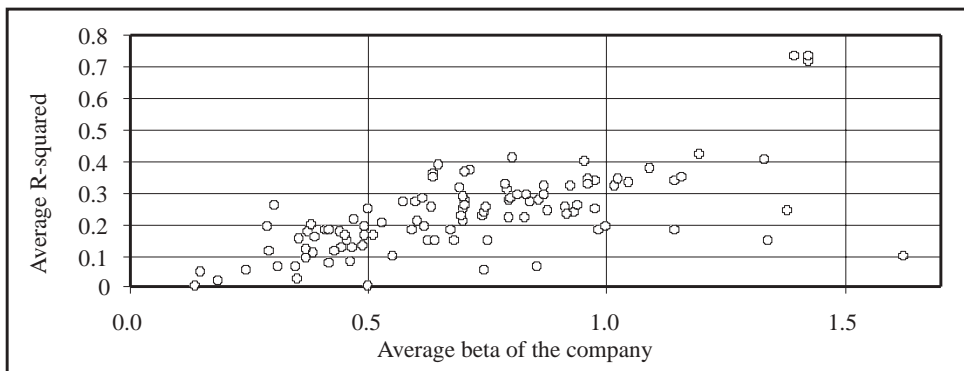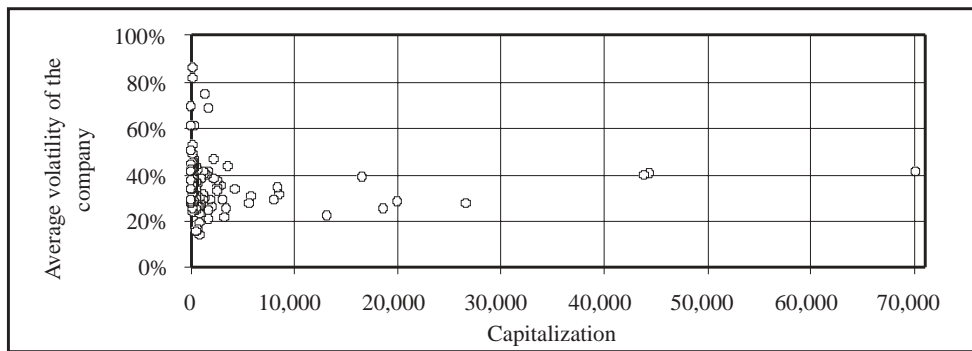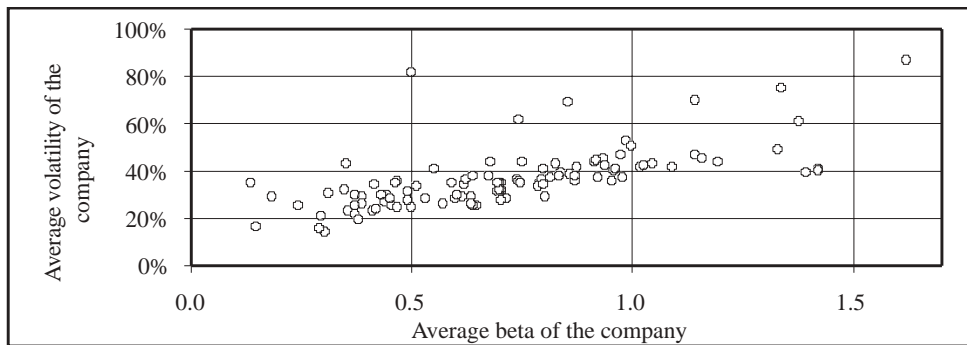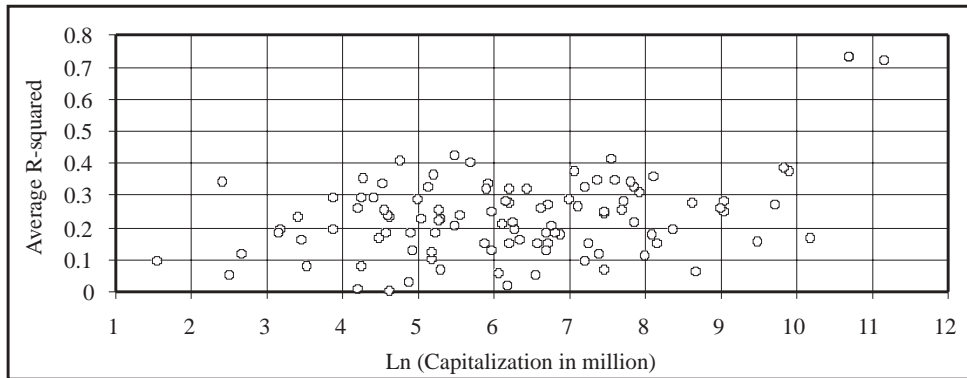
Exhibit 2 (continued)

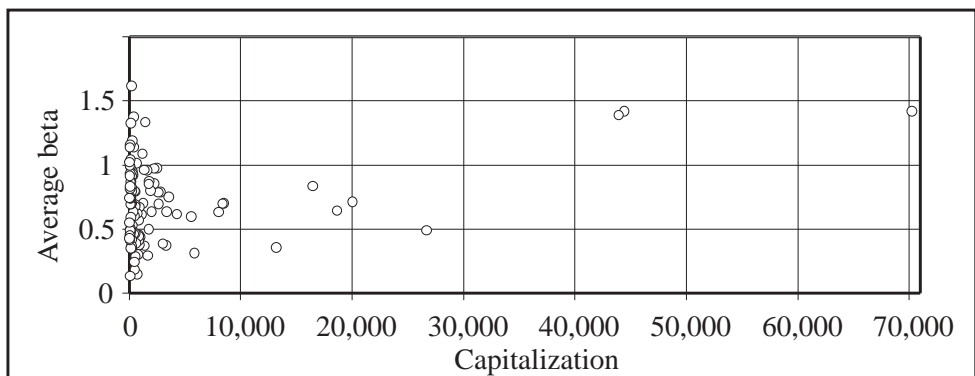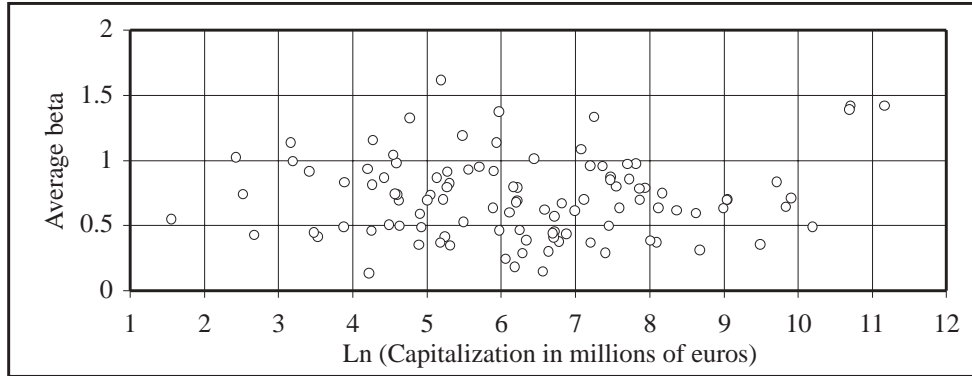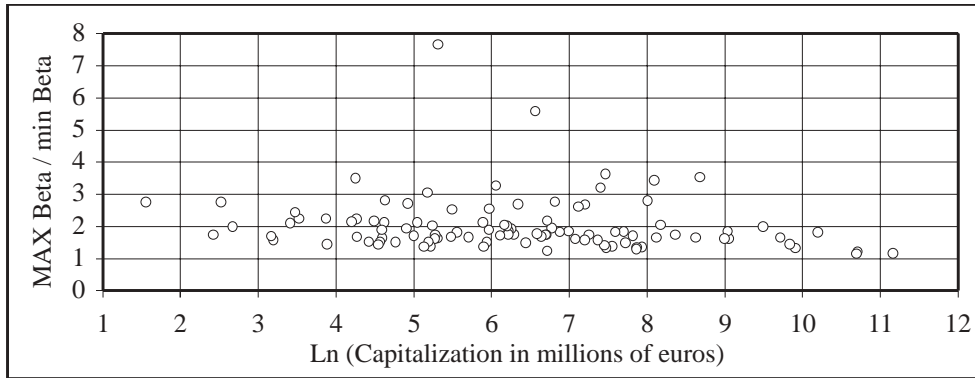The beta does not depend on the size of the company.

Exhibit 2 (continued)

The dispersion of the beta does not depend on the size of the company.
Excluding extreme values of Max/min.

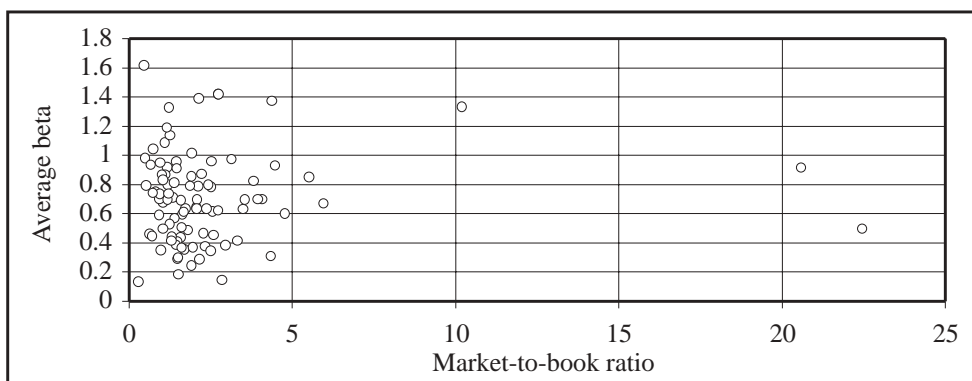There is little correlation between the beta and the market-to-book ratio.

Exhibit 3

ON THE INSTABILITY OF BETAS:
THE CASE OF SPAIN

Historical industry betas in the USA in December 2001
The betas are calculated each day of December 2001 with respect to the S&P 500 using
monthly data of the previous 5 years

			Calculated betas in December 2001				
No. of companies	Industry	Market capitalization	31/12/01	MAX	Min	Avge.	MAX-min
16	Internet	16,525	3.18	3.36	2.34	2.78	1.02
7	Home entertainment	144,719	2.40	2.65	2.13	2.37	0.52
51	Telecom equipment	381,307	1.86	2.10	1.61	1.92	0.49
75	Semiconductors	537,32	1.85	2.01	1.40	1.69	0.61
153	Software	645,918	1.79	1.87	1.41	1.62	0.47
75	Computer hardware	477,712	1.60	1.70	1.17	1.47	0.53
23	Telecom wireless	20,248	1.59	1.80	1.18	1.51	0.62
151	Electronic equipment	125,08	1.43	1.84	1.26	1.54	0.57
20	Textiles+leather goods	24,489	1.38	1.66	1.05	1.37	0.61
11	Asset managers	20,94	1.38	1.68	1.26	1.45	0.43
18	Hotels	39,117	1.35	1.67	0.76	1.30	0.91
21	Broadcasting	50,16	1.29	1.52	1.10	1.29	0.42
19	Consumer finance	138,531	1.21	1.58	1.08	1.33	0.50
66	Retail, hardlines	255,328	1.20	1.38	1.03	1.23	0.35
26	Non-ferrous metals	52,588	1.18	1.18	0.58	0.80	0.59
31	Oil services	98,91	1.13	1.13	0.63	0.90	0.50
17	Cable + satellite	117,424	1.12	1.39	0.92	1.09	0.46
15	Media agencies	40,377	1.10	1.40	1.03	1.19	0.37
11	Automobile	187,167	1.07	1.10	0.57	0.76	0.53
409	Banks	1,150,040	1.06	1.33	0.96	1.13	0.37
76	Diversified industry	638,721	1.05	1.26	1.05	1.13	0.22
26	House building	20,469	1.04	1.29	0.77	1.00	0.51
31	Airlines + airports	40,147	1.04	1.19	0.87	1.03	0.32
58	Biotechnology	192,061	1.03	1.33	0.80	1.02	0.53
21	Paper	43,11	1.02	1.03	0.64	0.80	0.38
23	Other financial	53,148	0.97	1.25	0.81	0.98	0.44
117	Engineering, general	66,833	0.96	1.11	0.86	0.97	0.26
13	Discount stores	345,658	0.95	1.20	0.79	1.00	0.41
6	Insurance brokers	46,995	0.94	1.24	0.68	0.97	0.56
42	Leisure facilities	85,144	0.90	1.26	0.76	1.02	0.50
15	Education + training	32,224	0.89	1.39	0.78	1.00	0.61
48	Publishing + printing	174,347	0.89	1.12	0.87	0.98	0.26
96	Computer services	138,186	0.86	1.18	0.80	0.98	0.39
135	Business support	130,932	0.82	0.98	0.73	0.84	0.25
23	Life assurance	92,156	0.81	1.09	0.74	0.89	0.35
20	Chemicals, commodity	122,737	0.77	0.80	0.61	0.71	0.20
17	Health Maint. Orgs.	39,688	0.76	1.08	0.41	0.77	0.67
7	Soft drinks	215,019	0.70	0.97	0.44	0.69	0.53
45	Rail, road, freight	71,64	0.70	1.03	0.56	0.78	0.47
86	Oil + gas expl./prod.	120,006	0.69	0.73	0.37	0.53	0.36
67	Insurance, non-life	153,75	0.66	1.02	0.49	0.75	0.53
29	Leisure equipment	18,896	0.59	0.94	0.44	0.78	0.50
48	Hospital management	87,405	0.54	0.84	0.36	0.59	0.48
20	Environmental control	24,292	0.51	0.90	0.03	0.44	0.87
138	Med equip. + supplies	341,617	0.51	0.78	0.41	0.62	0.37
103	Pharmaceuticals	1,083,135	0.50	0.93	0.34	0.63	0.59
17	Mortgage finance	190,573	0.48	0.95	0.26	0.60	0.70
18	Gold mining	17,861	0.47	0.48	-0.21	0.06	0.69
13	Household products	147,402	0.47	0.96	0.11	0.55	0.85
35	Food + drug retailers	118,5	0.46	0.76	0.27	0.54	0.49
16	Oil integrated	430,272	0.43	0.65	0.25	0.44	0.39
7	Defense	38,292	0.37	0.74	0.13	0.45	0.61
5	Tobacco	114,095	0.19	0.37	-0.13	0.11	0.50
9	Brewers	50,093	0.18	0.46	0.04	0.21	0.41
2645	Sum	10,009,300					
	Average		1.01	1.25	0.75	0.99	0.50

Source: Fernández (2004).

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