Historical Volatility as a Risk Indicator for Investment Funds

Comments to CESR/09-047 Document

A. Introduction

The purpose of this text is to respond to some of the questions posed in the public consultation issued by CESR (Ref: CESR/09-047). This document covers several issues from among which the use of historical volatility as a risk indicator for investment funds is highlighted. The following questions are examined in this analysis (vide CESR/09/047 document, pages 13 and 14, questions 3 and 4):

1. Could the methodology lead to the classification of funds in a category that is significantly lower than the one in which they should belong?
2. Does the methodology allow appropriate discrimination between different funds across the universe of UCITS funds so that there is no excessive bunching of funds in one or two categories?

Note that CESR's proposed methodology is based on the use of the standard deviation of the historical series of fund returns, namely a three-year series for weekly data or 5 years for monthly data.

To respond to these questions an exercise will be conducted based on the use of a database known as Lipper that is currently availed by Reuters. This database contains, besides other information, the series of monthly returns for a set of 55457 funds. These funds are based in 50 countries. However, this exercise only contemplates those funds that fulfil the following requirements:

- funds based in the European Union
- funds whose life cycle covers the period between April 1998 and March 2008.
- only the following types of funds were included:

	No. of Funds
Bond	1587
Equity	2808
Guaranteed	247
Mixed	973
Money	771
Total	6386

The final sample includes 6386 funds. For each analysed fund, the annualised volatility was calculated based on 60 observations of monthly returns. The volatility of each fund in month j is given by σ_j and is calculated in accordance with the following equation:

$$\sigma_j = \sqrt{12 * \frac{\sum_{t=j-59}^{j}(r_t - \bar{r})^2}{59}}$$

in which r_t is the fund's return for month t and $\bar{r}$ is the average return between month j-59 and j.

B. Analysis of the results

After the selection of the sample and the calculation of the volatility of the diverse funds based on monthly returns, the funds were then grouped into a risk category in accordance with the indications suggested in the CESR document.

For this purpose, the mentioned document proposes the establishment of risk scales based upon historical volatility (which already occurs in Portugal). However, the working group did not forward proposals for the relevant limits, and only suggested a set of general principles. Among the most notable of these was the establishment of a seven-level scale of risk categories and the introduction of a non-linear scale.

Due to the lack of a scale proposed by CESR, initially two alternative scales are used: the first is based on a scale currently used in Portugal, and the second is a non-linear add-hoc scale. A third option will be employed later on.

Table 1 – Risk and Volatility Scales

Scale 1	Scale 2	Risk Level
0=<x<1.5%	*0=<x<5%*	*1*
1.5%=<x<5%	*5%=<x<11%*	*2*
5%=<x<10%	*11%=<x<18%*	*3*
10%=<x<15%	*18%=<x<25%*	*4*
15%=<x<20%	*25%=<x<33%*	*5*
20%=<x<25%	*33%=<x<42%*	*6*
x>=25%	*x>=42%*	*7*

a. Results obtained using Scale 1 (E1)

Scale 1 is based on a scale that is currently in use in Portugal. A seventh level was added to the six levels currently established on this scale. A risk level was attributed to each fund according to the volatility registered during the period under analysis.

Table 2- Volatility registered per Fund Type (Scale 1)

		Bond	Equity	Guaranteed	Mixed	Money
2004	*0=<x<1.5%*	14.6%	0.1%	26.3%	1.3%	75.6%
	1.5%=<x<5%	48.7%	0.2%	53.4%	17.1%	14.0%
	5%=<x<10%	25.0%	0.5%	16.2%	32.3%	0.9%
	10%=<x<15%	3.1%	5.0%	1.2%	29.9%	0.5%
	15%=<x<20%	1.1%	31.3%	-	10.0%	0.1%
	20%=<x<25%	2.8%	31.2%	0.4%	4.0%	1.0%
	x>=25%	4.7%	31.7%	2.4%	5.4%	7.8%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
2005	*0=<x<1.5%*	16.1%	0.1%	27.1%	2.0%	77.4%
	1.5%=<x<5%	51.0%	0.2%	63.6%	20.5%	13.4%
	5%=<x<10%	24.4%	0.7%	5.3%	38.7%	0.8%
	10%=<x<15%	2.8%	11.1%	0.8%	26.3%	0.6%
	15%=<x<20%	0.9%	45.8%	-	7.1%	-
	20%=<x<25%	0.6%	26.7%	0.4%	1.8%	0.6%
	x>=25%	4.2%	15.4%	2.8%	3.6%	7.1%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
2006	*0=<x<1.5%*	15.9%	0.1%	27.9%	2.0%	77.8%
	1.5%=<x<5%	54.2%	0.2%	64.4%	22.4%	13.1%
	5%=<x<10%	22.6%	0.6%	4.5%	38.8%	0.8%
	10%=<x<15%	2.8%	15.1%	0.4%	26.0%	0.5%
	15%=<x<20%	0.4%	48.6%	-	6.0%	-
	20%=<x<25%	0.3%	23.5%	0.4%	2.1%	1.0%
	x>=25%	3.8%	11.9%	2.4%	2.8%	6.7%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
2007	*0=<x<1.5%*	17.8%	0.1%	28.3%	2.4%	80.5%
	1.5%=<x<5%	57.3%	0.2%	62.8%	26.4%	12.8%
	5%=<x<10%	20.3%	1.2%	6.5%	41.7%	0.9%
	10%=<x<15%	1.6%	33.7%	0.4%	23.0%	0.4%
	15%=<x<20%	0.4%	46.4%	-	3.5%	-
	20%=<x<25%	0.1%	11.9%	-	0.5%	0.8%
	x>=25%	2.5%	6.5%	2.0%	2.5%	4.5%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
2008	*0=<x<1.5%*	18.7%	0.0%	27.5%	2.3%	80.9%
	1.5%=<x<5%	58.9%	0.1%	57.9%	34.2%	13.2%
	5%=<x<10%	18.9%	8.2%	12.1%	52.1%	0.8%
	10%=<x<15%	0.8%	57.2%	0.4%	8.1%	0.3%
	15%=<x<20%	0.1%	24.3%	-	1.3%	-
	20%=<x<25%	0.2%	5.7%	-	-	0.9%
	x>=25%	2.4%	4.5%	2.0%	2.0%	3.9%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%

Table 2 shows the distribution of funds per risk level.[1] The results of said table indicate that in 2008, 77.6% of the bond funds exhibited volatility levels below 5% and that 91.7% of the stocks funds had volatility levels above 10%. In all of the periods analysed the treasury/money market funds are grouped in the lowest-risk categories, with more than ¾ of the funds presenting volatility levels below 1.5%. In other words, each category of funds presents some level of grouping within a risk class. However, overall there is a dispersion of funds throughout the risk classes.

Table 3 provides a comparison for each fund between the risk levels during a specific year and the risk levels recorded in the foregoing year. For example, in 2008, 52.1%[2] of mixed funds presented a risk level of 3. In 2007, this percentage was 41.7%. This means that between these two years there were funds that underwent risk profile change. Thus, between 2007 and 2008 the following changes took place:

- In 2008, 33.1% of the funds maintained the 3 risk level recorded in 2007;
- 17.4% of the funds decreased their risk level from 4 to 3 between 2007 and 2008;
- 0.7% of the funds increased the risk level from 2 to 3;
- 0.4% and 0.5% of the funds decreased their risk level from 5 and 7 to 3, respectively.

Overall the treasury/money market funds exhibit a high level of stability in the investment unit value. It is also worthy of note, that in addition to the low volatility indexes, this typology of funds demonstrated few changes in the risk level during consecutive years. Essentially, the data suggests that volatility is a rather stable measurement over time, such that, past volatility appears to be a good indicator of future volatility. Approximately 95% of the treasury/money market funds maintained their risk levels throughout the four periods which were examined.

The majority of bond funds show volatility levels between 1.5% and 10%. Similarly to that of treasury/money market funds, the volatility of the bond funds is stable over time. As such, the percentage of funds that maintained the risk level in subsequent periods was always greater than 88%. Such confirms the sturdiness of historical volatility as a forecast for future volatility.

[1] March is the reference month in each period. Thus, when reading "2008", it shall be understood to mean "the five year period ending in March 31, 2008."
[2] To obtain this percentage, the amounts in the table shall be read in line.

In 2008 it can be observed that 65.5% equity funds presented risk levels less than or equal to 4. In 2007 this percentage was 35.2%. Simultaneously, throughout all of the periods examined, except for 2008, a weak concentration of funds in risk levels 1, 2 and 3 can be observed. Evidence points to a sharp difference of risk in comparison to the other types of funds. However, the data also reveals that volatility is a substantially unstable measurement in this type of fund, given that there is a high likelihood of risk level change over the years. For example, between 2007 and 2008 slightly more than half of the funds presented changes in the risk level.

Table 3 - Risk Scale 1 and registered Volatility (year t versus t-1)

Type	t		t-1							Total
			0=<x<1.5%	1.5%=<x<5%	5%=<x<10%	10%=<x<15%	15%=<x<20%	20%=<x<25%	x>=25%	
Bond	2005	0=<x<1.5%	14.4%	1.6%	-	-	-	0.1%	-	16.1%
		1.5%=<x<5%	0.3%	45.7%	3.8%	-	-	0.6%	0.6%	51.0%
		5%=<x<10%	-	1.1%	21.1%	0.8%	0.1%	1.3%	0.2%	24.4%
		10%=<x<15%	-	-	-	2.3%	0.3%	0.1%	0.1%	2.8%
		15%=<x<20%	-	-	-	-	0.7%	0.3%	-	0.9%
		20%=<x<25%	-	-	-	-	-	0.4%	0.1%	0.6%
		x>=25%	-	0.3%	0.1%	-	-	0.1%	3.7%	4.2%
		Total	14.6%	48.7%	25.0%	3.1%	1.1%	2.8%	4.7%	100.0%
	2006	0=<x<1.5%	15.8%	0.1%	-	-	-	-	-	15.9%
		1.5%=<x<5%	0.3%	49.7%	3.3%	-	-	0.3%	0.7%	54.2%
		5%=<x<10%	-	0.9%	20.8%	0.4%	-	0.1%	0.3%	22.6%
		10%=<x<15%	-	-	0.1%	2.3%	0.4%	-	-	2.8%
		15%=<x<20%	-	-	-	-	0.4%	-	-	0.4%
		20%=<x<25%	-	-	-	-	0.1%	0.2%	-	0.3%
		x>=25%	0.1%	0.3%	0.2%	0.1%	-	0.1%	3.2%	3.8%
		Total	16.1%	51.0%	24.4%	2.8%	0.9%	0.6%	4.2%	100.0%
	2007	0=<x<1.5%	15.6%	2.0%	-	-	-	-	0.2%	17.8%
		1.5%=<x<5%	0.3%	51.2%	4.5%	0.1%	0.1%	0.1%	1.1%	57.3%
		5%=<x<10%	-	0.5%	17.9%	1.3%	-	-	0.6%	20.3%
		10%=<x<15%	-	0.1%	-	1.5%	-	-	-	1.6%
		15%=<x<20%	-	-	-	-	0.3%	0.1%	-	0.4%
		20%=<x<25%	-	-	-	-	-	0.1%	-	0.1%
		x>=25%	0.1%	0.4%	0.1%	-	-	-	1.9%	2.5%
		Total	15.9%	54.2%	22.6%	2.8%	0.4%	0.3%	3.8%	100.0%
	2008	0=<x<1.5%	17.4%	1.2%	0.1%	-	-	-	-	18.7%
		1.5%=<x<5%	0.4%	54.5%	3.7%	0.1%	0.1%	-	0.1%	58.9%
		5%=<x<10%	-	1.5%	16.4%	0.7%	0.1%	-	0.1%	18.9%
		10%=<x<15%	-	-	-	0.8%	0.1%	-	-	0.8%
		15%=<x<20%	-	-	-	-	0.1%	-	-	0.1%
		20%=<x<25%	-	-	-	-	-	0.1%	0.1%	0.2%
		x>=25%	-	0.1%	0.1%	-	-	-	2.2%	2.4%
		Total	17.8%	57.3%	20.3%	1.6%	0.4%	0.1%	2.5%	100.0%

Type	t		t-1 0=<x<1.5%	1.5%=<x<5%	5%=<x<10%	10%=<x<15%	15%=<x<20%	20%=<x<25%	x>=25%	Total
Equity	2005	0=<x<1.5%	0.1%	0.0%	-	-	-	-	-	0.1%
		1.5%=<x<5%	-	0.2%	0.0%	-	-	-	-	0.2%
		5%=<x<10%	-	0.0%	0.4%	0.2%	-	-	0.0%	0.7%
		10%=<x<15%	-	-	0.0%	4.6%	6.3%	0.1%	0.1%	11.1%
		15%=<x<20%	-	-	-	0.2%	24.8%	18.1%	2.8%	45.8%
		20%=<x<25%	-	-	-	-	0.1%	13.0%	13.6%	26.7%
		x>=25%	-	-	-	0.0%	0.1%	0.1%	15.1%	15.4%
		Total	0.1%	0.2%	0.5%	5.0%	31.3%	31.2%	31.7%	100.0%
	2006	0=<x<1.5%	0.1%	-	-	-	-	-	-	0.1%
		1.5%=<x<5%	0.0%	0.1%	0.0%	-	-	-	-	0.2%
		5%=<x<10%	-	0.1%	0.4%	0.2%	-	-	-	0.6%
		10%=<x<15%	-	-	0.2%	10.0%	4.5%	0.1%	0.2%	15.1%
		15%=<x<20%	-	-	-	0.8%	40.0%	6.8%	1.1%	48.6%
		20%=<x<25%	-	-	-	-	1.1%	19.3%	3.1%	23.5%
		x>=25%	0.0%	-	-	0.0%	0.3%	0.5%	11.0%	11.9%
		Total	0.1%	0.2%	0.7%	11.1%	45.8%	26.7%	15.4%	100.0%
	2007	0=<x<1.5%	0.1%	-	-	-	-	-	-	0.1%
		1.5%=<x<5%	-	0.2%	-	-	-	-	-	0.2%
		5%=<x<10%	-	0.0%	0.6%	0.5%	-	-	-	1.2%
		10%=<x<15%	-	-	-	14.3%	18.8%	0.2%	0.4%	33.7%
		15%=<x<20%	-	-	-	-	29.2%	16.1%	1.1%	46.4%
		20%=<x<25%	-	-	-	-	0.1%	7.0%	4.8%	11.9%
		x>=25%	-	-	-	0.2%	0.5%	0.2%	5.6%	6.5%
		Total	0.1%	0.2%	0.6%	15.1%	48.6%	23.5%	11.9%	100.0%
	2008	0=<x<1.5%	0.0%	-	-	-	-	-	-	0.0%
		1.5%=<x<5%	-	0.1%	0.0%	-	-	-	-	0.1%
		5%=<x<10%	0.0%	0.1%	0.9%	7.0%	0.1%	-	-	8.2%
		10%=<x<15%	-	-	0.2%	25.4%	29.5%	1.1%	0.9%	57.2%
		15%=<x<20%	-	-	-	1.2%	15.7%	6.5%	0.9%	24.3%
		20%=<x<25%	-	-	-	0.0%	0.8%	3.6%	1.2%	5.7%
		x>=25%	-	-	-	0.1%	0.3%	0.7%	3.5%	4.5%
		Total	0.1%	0.2%	1.2%	33.7%	46.4%	11.9%	6.5%	100.0%

Type	t		t-1							Total
			0=<x<1.5%	1.5%=<x<5%	5%=<x<10%	10%=<x<15%	15%=<x<20%	20%=<x<25%	x>=25%	
Guaranteed	2005	0=<x<1.5%	23.5%	3.6%	-	-	-	-	-	27.1%
		1.5%=<x<5%	2.4%	49.8%	11.3%	-	-	-	-	63.6%
		5%=<x<10%	-	-	4.9%	0.4%	-	-	-	5.3%
		10%=<x<15%	-	-	-	0.8%	-	-	-	0.8%
		20%=<x<25%	-	-	-	-	-	0.4%	-	0.4%
		x>=25%	0.4%	-	-	-	-	-	2.4%	2.8%
		Total	26.3%	53.4%	16.2%	1.2%	-	0.4%	2.4%	100.0%
	2006	0=<x<1.5%	23.9%	3.6%	-	-	-	-	0.4%	27.9%
		1.5%=<x<5%	3.2%	59.1%	1.6%	0.4%	-	-	-	64.4%
		5%=<x<10%	-	0.8%	3.6%	-	-	-	-	4.5%
		10%=<x<15%	-	-	-	0.4%	-	-	-	0.4%
		20%=<x<25%	-	-	-	-	-	0.4%	-	0.4%
		x>=25%	-	-	-	-	-	-	2.4%	2.4%
		Total	27.1%	63.6%	5.3%	0.8%	-	0.4%	2.8%	100.0%
	2007	0=<x<1.5%	25.1%	2.8%	-	-	-	0.4%	-	28.3%
		1.5%=<x<5%	2.8%	58.3%	1.6%	-	-	-	-	62.8%
		5%=<x<10%	-	3.2%	2.8%	-	-	-	0.4%	6.5%
		10%=<x<15%	-	-	-	0.4%	-	-	-	0.4%
		x>=25%	-	-	-	-	-	-	2.0%	2.0%
		Total	27.9%	64.4%	4.5%	0.4%	-	0.4%	2.4%	100.0%
	2008	0=<x<1.5%	24.7%	2.4%	-	0.4%	-	-	-	27.5%
		1.5%=<x<5%	3.6%	53.8%	0.4%	-	-	-	-	57.9%
		5%=<x<10%	-	6.5%	5.7%	-	-	-	-	12.1%
		10%=<x<15%	-	-	0.4%	-	-	-	-	0.4%
		x>=25%	-	-	-	-	-	-	2.0%	2.0%
		Total	28.3%	62.8%	6.5%	0.4%	-	-	2.0%	100.0%

Type	t		t-1							Total
			0=<x<1.5%	1.5%=<x<5%	5%=<x<10%	10%=<x<15%	15%=<x<20%	20%=<x<25%	x>=25%	
Mixed	2005	0=<x<1.5%	1.2%	0.7%	-	-	-	-	-	2.0%
		1.5%=<x<5%	0.1%	16.1%	3.9%	-	-	0.1%	0.2%	20.5%
		5%=<x<10%	-	0.1%	28.3%	9.0%	0.2%	0.7%	0.4%	38.7%
		10%=<x<15%	-	-	-	20.8%	4.8%	0.2%	0.5%	26.3%
		15%=<x<20%	-	-	-	-	4.9%	1.7%	0.4%	7.1%
		20%=<x<25%	-	-	-	-	-	1.2%	0.6%	1.8%
		x>=25%	-	0.1%	0.1%	0.1%	-	-	3.3%	3.6%
		Total	1.3%	17.1%	32.3%	29.9%	10.0%	4.0%	5.4%	100.0%
	2006	0=<x<1.5%	1.5%	0.4%	-	-	-	-	-	2.0%
		1.5%=<x<5%	0.4%	19.5%	2.2%	-	-	-	0.3%	22.4%
		5%=<x<10%	-	0.5%	35.5%	2.7%	0.1%	-	0.1%	38.8%
		10%=<x<15%	-	-	1.0%	23.1%	1.5%	-	0.3%	26.0%
		15%=<x<20%	-	-	-	0.4%	5.3%	0.1%	0.1%	6.0%
		20%=<x<25%	-	-	-	-	-	1.7%	0.3%	2.1%
		x>=25%	-	-	0.1%	0.1%	0.1%	-	2.5%	2.8%
		Total	2.0%	20.5%	38.7%	26.3%	7.1%	1.8%	3.6%	100.0%
	2007	0=<x<1.5%	2.0%	0.4%	-	-	-	-	-	2.4%
		1.5%=<x<5%	-	22.0%	4.2%	-	-	-	0.2%	26.4%
		5%=<x<10%	-	-	34.3%	7.2%	-	-	0.2%	41.7%
		10%=<x<15%	-	-	0.2%	18.5%	4.0%	0.1%	0.2%	23.0%
		15%=<x<20%	-	-	-	-	2.0%	1.5%	-	3.5%
		20%=<x<25%	-	-	-	-	-	0.4%	0.1%	0.5%
		x>=25%	-	-	0.1%	0.3%	-	-	2.1%	2.5%
		Total	2.0%	22.4%	38.8%	26.0%	6.0%	2.1%	2.8%	100.0%
	2008	0=<x<1.5%	2.0%	0.3%	-	-	-	-	-	2.3%
		1.5%=<x<5%	0.4%	25.4%	8.3%	-	-	0.1%	-	34.2%
		5%=<x<10%	-	0.7%	33.1%	17.4%	0.4%	-	0.5%	52.1%
		10%=<x<15%	-	-	0.3%	5.4%	2.4%	-	-	8.1%
		15%=<x<20%	-	-	-	0.1%	0.7%	0.4%	0.1%	1.3%
		x>=25%	-	-	-	0.1%	-	-	1.8%	2.0%
		Total	2.4%	26.4%	41.7%	23.0%	3.5%	0.5%	2.5%	100.0%

Type	t		t-1 0=<x<1.5%	1.5%=<x<5%	5%=<x<10%	10%=<x<15%	15%=<x<20%	20%=<x<25%	x>=25%	Total
Money	2005	0=<x<1.5%	75.2%	1.0%	-	-	-	0.3%	0.9%	77.4%
		1.5%=<x<5%	-	12.8%	0.3%	-	-	0.3%	-	13.4%
		5%=<x<10%	-	0.1%	0.6%	-	-	-	-	0.8%
		10%=<x<15%	-	-	-	0.5%	0.1%	-	-	0.6%
		20%=<x<25%	-	-	-	-	-	0.5%	0.1%	0.6%
		x>=25%	0.4%	-	-	-	-	-	6.7%	7.1%
		Total	75.6%	14.0%	0.9%	0.5%	0.1%	1.0%	7.8%	100.0%
	2006	0=<x<1.5%	76.5%	0.4%	-	-	-	-	0.9%	77.8%
		1.5%=<x<5%	-	12.8%	0.1%	-	-	-	0.1%	13.1%
		5%=<x<10%	-	-	0.6%	0.1%	-	-	-	0.8%
		10%=<x<15%	-	-	-	0.5%	-	-	-	0.5%
		20%=<x<25%	0.3%	-	-	-	-	0.6%	0.1%	1.0%
		x>=25%	0.6%	0.1%	-	-	-	-	6.0%	6.7%
		Total	77.4%	13.4%	0.8%	0.6%	-	0.6%	7.1%	100.0%
	2007	0=<x<1.5%	76.9%	0.4%	-	-	-	0.4%	2.9%	80.5%
		1.5%=<x<5%	0.3%	12.3%	0.1%	-	-	-	0.1%	12.8%
		5%=<x<10%	0.1%	-	0.6%	0.1%	-	-	-	0.9%
		10%=<x<15%	-	-	-	0.4%	-	-	-	0.4%
		20%=<x<25%	-	0.1%	-	-	-	0.6%	-	0.8%
		x>=25%	0.5%	0.3%	-	-	-	-	3.8%	4.5%
		Total	77.8%	13.1%	0.8%	0.5%	-	1.0%	6.7%	100.0%
	2008	0=<x<1.5%	79.2%	0.5%	-	-	-	0.1%	1.0%	80.9%
		1.5%=<x<5%	0.6%	12.3%	0.3%	-	-	-	-	13.2%
		5%=<x<10%	-	-	0.6%	0.1%	-	-	-	0.8%
		10%=<x<15%	-	-	-	0.3%	-	-	-	0.3%
		20%=<x<25%	0.3%	-	-	-	-	0.6%	-	0.9%
		x>=25%	0.4%	-	-	-	-	-	3.5%	3.9%
		Total	80.5%	12.8%	0.9%	0.4%	-	0.8%	4.5%	100.0%

The analysis of risk level changes over various periods is used to assess the sturdiness of historical volatility as a forecasting tool for future volatility. The previous tables show the percentage of the funds that remained at the same risk level between one period and another, as well as the percentage of those that have undergone an increase or decrease. Table 4 summarises this data. In addition, it also includes the comparison with the risk level verified two years later (year t versus year t-2).

Table 4 - Proportion of funds which underwent a risk level change (E1)

		Variation t versus t-1					
	t	<=-2	-1	0	1	>=2	Total
Bond	2005	3.0%	6.9%	88.4%	1.4%	0.4%	100.0%
	2006	1.3%	4.3%	92.3%	1.4%	0.6%	100.0%
	2007	2.1%	7.9%	88.5%	0.8%	0.7%	100.0%
	2008	0.6%	5.7%	91.6%	1.9%	0.2%	100.0%
Equity	2005	3.1%	38.2%	58.1%	0.5%	0.2%	100.0%
	2006	1.4%	14.5%	81.0%	2.7%	0.4%	100.0%
	2007	1.7%	40.2%	57.0%	0.3%	0.8%	100.0%
	2008	3.1%	44.3%	49.2%	3.0%	0.5%	100.0%
Guaranteed	2005	0.0%	15.4%	81.8%	2.4%	0.4%	100.0%
	2006	0.8%	5.3%	89.9%	4.0%	0.0%	100.0%
	2007	0.8%	4.5%	88.7%	6.1%	0.0%	100.0%
	2008	0.4%	2.8%	86.2%	10.5%	0.0%	100.0%
Mixed	2005	2.8%	20.9%	75.8%	0.2%	0.3%	100.0%
	2006	0.9%	7.2%	89.2%	2.4%	0.3%	100.0%
	2007	0.7%	17.5%	81.2%	0.2%	0.4%	100.0%
	2008	1.1%	28.8%	68.4%	1.5%	0.1%	100.0%
Money	2005	1.4%	1.6%	96.5%	0.1%	0.4%	100.0%
	2006	1.0%	0.8%	97.1%	0.0%	1.0%	100.0%
	2007	3.4%	0.6%	94.7%	0.3%	1.0%	100.0%
	2008	1.2%	0.9%	96.6%	0.6%	0.6%	100.0%

		Variation t versus t-2					
		<=-2	-1	0	1	>=2	Total
Bond	2006	4.4%	9.4%	83.8%	1.4%	0.9%	100.0%
	2007	3.8%	10.6%	83.0%	1.3%	1.3%	100.0%
	2008	3.0%	12.3%	82.2%	1.6%	0.9%	100.0%
Equity	2006	7.8%	43.3%	47.4%	1.1%	0.4%	100.0%
	2007	5.6%	47.3%	44.7%	1.3%	1.1%	100.0%
	2008	15.3%	60.4%	21.4%	1.8%	1.1%	100.0%
Guaranteed	2006	1.6%	18.2%	74.1%	5.7%	0.4%	100.0%
	2007	1.6%	6.9%	84.2%	7.3%	0.0%	100.0%
	2008	1.2%	5.7%	78.1%	15.0%	0.0%	100.0%
Mixed	2006	4.1%	25.0%	69.9%	0.4%	0.6%	100.0%
	2007	2.1%	22.2%	73.9%	1.1%	0.7%	100.0%
	2008	4.4%	39.8%	54.3%	1.0%	0.5%	100.0%
Money	2006	2.3%	2.3%	93.9%	0.1%	1.3%	100.0%
	2007	4.4%	1.4%	91.8%	0.3%	2.1%	100.0%
	2008	4.5%	1.0%	92.1%	0.8%	1.6%	100.0%

Equity funds compose the largest percentage of funds in which an alteration of risk levels was verified over the time period examined. Thus, close to 49.2% of the funds remained in the same risk category in 2008 apropos 2007. This amount contrasts with the percentage of funds that maintained the same risk level between 2005 and 2006, which was 81%. When however we analyse the percentage of equity funds that maintained their risk profile over the two year period, we observe that this percentage reached only 21.4% of the funds in 2008.

Equity funds are distinct from the other types of funds examined. For all of the other funds the historical volatility constitutes a good forecasting mechanism for future risk, especially for treasury/money market funds. The stability of the volatility of this type of fund is visible through the comparison between the risk profile recorded in a given year and the profile verified during the previous year or even two years prior to that. Thus, the percentage of treasury/money market funds that maintained their risk profile after two years exceeded 90%. This percentage exceeded 80% for bond funds.

In order to ascertain whether the methodology proposed by CESR could lead to the classification of funds in a category that is significantly lower than the one in which they belong, the percentage of the funds which exhibit a variation greater than or equal to two risk levels (in absolute terms) in consecutive years was calculated. In overall terms, this percentage is less than 5%, regardless of the periods and type of funds examined. From this point of view, guarantee funds present greater stability than the rest do.

An identical analysis related to the comparison of risk level recorded two years later provides for the conclusion that equity funds are less stable. Thus, between 2006 and 2008, close to 16.4% of the equity funds recorded variations (in absolute terms) of more than one risk level. Less than 6.5% of the treasury/money market funds, bond funds and guarantee funds presented such a variation.

In all, Scale 1 ensures a proper correlation between the type of fund and its risk profile - the level of risk presented by the fund may, to a certain extent, denote the nature of the fund and the type of assets that compose it. In other words, the application of the methodology proposed by the CESR using scale 1 appears to ensure an efficient discrimination between the various funds within the universe of the UCITS. Stability wise, the date of the risk classifications obtained from Scale 1, show that the treasury/money market funds, guarantee funds and bond funds present substantially stable classifications over time. The mixed funds, and especially equity funds present rather unstable risk profiles.

b. Results obtained using Scale 2 (E2)

Scale 2 presents a non-linear convex structure, in other words, the range of each level increases as the volatility increases. The advantage of this scale rests in the gains obtained from the level of segmentation of the equity funds that present higher volatilities, which may enable equity funds with a higher and lower risk to be identified. The likely downturn to this scale is related to a more deficient segmentation between the funds which present, in general, lower volatility levels. This is particularly the case for treasury/money market funds, guarantee funds and certain bond funds.

Table 5 highlights this issue. The lowest risk level (volatility between 0 and 5%) in 2008 showed 77.6% of the bond funds, 85.4% of the guarantee funds and 94.2% of the treasury/money market funds. It can thus be inferred that Scale 2 may result in a deficient classification of the risk of various types of funds inasmuch as with the comparison of Scale 1, there is a higher concentration of funds in certain categories, with the exception of equity funds.

Table 5- Volatility registered per Fund Type (Scale 2)

		Type of Fund				
		Bond	Equity	Guaranteed	Mixed	Money
2004	0=<x<5%	63.3%	0.4%	79.8%	18.4%	89.6%
	5%=<x<11%	26.0%	0.8%	16.6%	38.5%	1.2%
	11%=<x<18%	3.0%	20.2%	0.8%	30.8%	0.4%
	18%=<x<25%	3.1%	46.9%	0.4%	6.8%	1.0%
	25%=<x<33%	0.5%	20.0%	0.4%	1.5%	0.1%
	33%=<x<42%	1.8%	5.7%	1.6%	1.4%	3.5%
	x>=42%	2.3%	5.9%	0.4%	2.5%	4.2%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
2005	0=<x<5%	67.1%	0.4%	90.7%	22.4%	90.8%
	5%=<x<11%	25.2%	1.2%	5.7%	44.3%	0.9%
	11%=<x<18%	2.7%	38.5%	0.4%	26.2%	0.5%
	18%=<x<25%	0.8%	44.6%	0.4%	3.5%	0.6%
	25%=<x<33%	0.3%	8.3%	0.4%	0.5%	0.1%
	33%=<x<42%	1.7%	3.8%	2.0%	1.2%	3.2%
	x>=42%	2.1%	3.3%	0.4%	1.8%	3.8%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
2006	0=<x<5%	70.1%	0.3%	92.3%	24.4%	90.9%
	5%=<x<11%	23.6%	1.4%	4.5%	44.4%	0.9%
	11%=<x<18%	2.1%	43.8%	0.4%	25.1%	0.4%
	18%=<x<25%	0.3%	42.7%	0.4%	3.4%	1.0%
	25%=<x<33%	0.3%	7.7%	0.4%	0.3%	0.4%
	33%=<x<42%	1.2%	1.7%	2.0%	0.8%	3.0%
	x>=42%	2.3%	2.5%	-	1.6%	3.4%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
2007	0=<x<5%	75.1%	0.2%	91.1%	28.8%	93.4%
	5%=<x<11%	20.9%	2.2%	6.9%	49.6%	1.0%
	11%=<x<18%	1.2%	65.2%	-	17.7%	0.3%
	18%=<x<25%	0.3%	25.8%	-	1.4%	0.8%
	25%=<x<33%	0.1%	3.2%	-	0.3%	0.4%

	33%=<x<42%	1.3%	0.9%	2.0%	0.7%	1.7%
	x>=42%	1.1%	2.4%	-	1.4%	2.5%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
2008	0=<x<5%	77.6%	0.1%	85.4%	36.5%	94.2%
	5%=<x<11%	19.3%	19.1%	12.6%	56.3%	0.9%
	11%=<x<18%	0.5%	64.4%	-	4.8%	0.1%
	18%=<x<25%	0.2%	11.9%	-	0.4%	0.9%
	25%=<x<33%	-	2.1%	-	0.3%	0.3%
	33%=<x<42%	1.3%	0.3%	2.0%	0.8%	1.7%
	x>=42%	1.1%	2.1%	-	0.8%	1.9%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%

Table 5 also demonstrates a significant reduction of the risk of equity funds between 2004 and 2008. As an example, the percentage of level 3 funds (volatility between 11 and 18%), increased from 20.2% to 64.4% in 2008. The percentage of funds in the risk-level 4 category (volatility between 18% and 25%) went from 46.9% in 2004 to 11.9% in 2008. Apparently, the reduction in volatility that occurred between 2004 and 2008 reduced the advantage of using this scale, given that the percentage of funds in the risk categories 5, 6 and 7 declined sharply. The non-linear aspect of this scale may generate better results during periods of greater turbulence in the equity markets.

The treasury/money market funds present a more stable volatility throughout time and, consequently are those in which the future risk appears to be more foreseeable. The percentage of treasury/money market funds that do not register annual risk level variations is greater than 95%. It is also of note that more than 90% of the bond funds and 87% of the guarantee funds do not also present annual risk level variation. The equity funds however, demonstrate the opposite and present greater instability of historical volatility. In 2008, 40.1% of the equity funds registered a change in the risk level apropos 2007.

Table 6 – Scale 2 and Registered Volatility (t Year versus t-1)

Type	t		t-1							Total
			0=<x<5%	5%=<x<11%	11%=<x<18%	18%=<x<25%	25%=<x<33%	33%=<x<42%	x>=42%	
Bond	2005	0=<x<5%	62.0%	3.8%	-	0.8%	-	0.2%	0.4%	67.1%
		5%=<x<11%	1.1%	22.0%	0.6%	1.3%	0.1%	0.1%	-	25.2%
		11%=<x<18%	-	0.1%	2.3%	0.3%	-	-	-	2.7%
		18%=<x<25%	-	-	-	0.7%	-	0.1%	0.1%	.8%
		25%=<x<33%	-	-	-	-	0.3%	-	-	.3%
		33%=<x<42%	0.2%	-	-	-	-	1.4%	0.1%	1.7%
		x>=42%	0.1%	0.1%	-	0.1%	0.1%	-	1.8%	2.1%
		Total	63.3%	26.0%	3.0%	3.1%	0.5%	1.8%	2.3%	100.0%
	2006	0=<x<5%	65.8%	3.3%	-	0.3%	-	0.5%	0.2%	70.1%
		5%=<x<11%	0.9%	21.7%	0.6%	0.1%	-	0.2%	0.1%	23.6%
		11%=<x<18%	-	-	2.0%	0.1%	-	-	-	2.1%
		18%=<x<25%	-	-	-	0.3%	-	-	-	.3%
		25%=<x<33%	-	-	-	-	0.3%	-	-	.3%
		33%=<x<42%	0.1%	0.1%	-	0.1%	-	1.0%	-	1.2%
		x>=42%	0.3%	0.1%	0.1%	-	-	-	1.8%	2.3%
		Total	67.1%	25.2%	2.7%	0.8%	0.3%	1.7%	2.1%	100.0%
	2007	0=<x<5%	69.1%	4.5%	0.2%	0.1%	0.1%	0.3%	0.8%	75.1%
		5%=<x<11%	0.5%	18.9%	0.9%	-	0.1%	0.2%	0.3%	20.9%
		11%=<x<18%	0.1%	0.1%	1.1%	-	-	-	-	1.2%
		18%=<x<25%	-	-	-	0.3%	-	-	-	.3%
		25%=<x<33%	-	-	-	-	0.1%	-	-	.1%
		33%=<x<42%	0.4%	0.1%	-	-	-	0.7%	0.1%	1.3%
		x>=42%	0.1%	-	-	-	-	-	1.0%	1.1%
		Total	70.1%	23.6%	2.1%	0.3%	0.3%	1.2%	2.3%	100.0%
	2008	0=<x<5%	73.5%	3.8%	0.1%	-	-	0.1%	0.1%	77.6%
		5%=<x<11%	1.5%	17.0%	0.7%	0.1%	-	0.1%	-	19.3%
		11%=<x<18%	-	0.1%	0.4%	0.1%	-	-	-	.5%
		18%=<x<25%	-	-	-	0.1%	0.1%	-	-	.2%
		33%=<x<42%	0.1%	0.1%	-	-	-	1.1%	-	1.3%
		x>=42%	0.1%	-	-	-	-	-	1.1%	1.1%
		Total	75.1%	20.9%	1.2%	0.3%	0.1%	1.3%	1.1%	100.0%

Type	t		t-1							Total
			0=<x<5%	5%=<x<11%	11%=<x<18%	18%=<x<25%	25%=<x<33%	33%=<x<42%	x>=42%	
Equity	2005	0=<x<5%	0.3%	0.0%	-	-	-	-	-	0.4%
		5%=<x<11%	0.0%	0.7%	0.5%	-	0.0%	-	-	1.2%
		11%=<x<18%	-	-	19.6%	17.5%	0.8%	0.1%	0.5%	38.5%
		18%=<x<25%	-	-	0.1%	29.3%	13.7%	0.7%	0.7%	44.6%
		25%=<x<33%	-	-	0.0%	0.0%	5.4%	2.6%	0.2%	8.3%
		33%=<x<42%	-	-	-	-	-	2.2%	1.6%	3.8%
		x>=42%	-	0.0%	0.1%	0.1%	0.0%	0.0%	3.0%	3.3%
		Total	0.4%	0.8%	20.2%	46.9%	20.0%	5.7%	5.9%	100.0%
	2006	0=<x<5%	0.2%	0.0%	-	-	-	-	-	0.3%
		5%=<x<11%	0.1%	0.9%	0.4%	-	-	-	-	1.4%
		11%=<x<18%	-	0.3%	36.5%	6.1%	0.1%	0.5%	0.2%	43.8%
		18%=<x<25%	-	-	1.4%	37.8%	2.8%	0.1%	0.6%	42.7%
		25%=<x<33%	-	-	0.1%	0.4%	5.3%	1.8%	0.1%	7.7%
		33%=<x<42%	-	-	0.0%	0.1%	0.1%	1.2%	0.2%	1.7%
		x>=42%	0.0%	-	0.0%	0.2%	-	0.1%	2.1%	2.5%
		Total	0.4%	1.2%	38.5%	44.6%	8.3%	3.8%	3.3%	100.0%
	2007	0=<x<5%	0.2%	-	-	-	-	-	-	0.2%
		5%=<x<11%	0.0%	1.4%	0.8%	-	-	-	-	2.2%
		11%=<x<18%	-	-	42.3%	22.1%	0.2%	0.4%	0.2%	65.2%
		18%=<x<25%	-	-	0.1%	20.3%	5.1%	0.1%	0.2%	25.8%
		25%=<x<33%	-	-	0.1%	0.1%	2.4%	0.5%	0.2%	3.2%
		33%=<x<42%	-	-	0.0%	0.0%	-	0.7%	0.1%	0.9%
		x>=42%	-	-	0.5%	0.2%	0.0%	-	1.7%	2.4%
		Total	0.3%	1.4%	43.8%	42.7%	7.7%	1.7%	2.5%	100.0%
	2008	0=<x<5%	0.1%	0.0%	-	-	-	-	-	0.1%
		5%=<x<11%	0.1%	1.6%	17.1%	-	-	0.1%	0.0%	19.1%
		11%=<x<18%	-	0.5%	46.4%	16.3%	0.4%	0.2%	0.5%	64.4%
		18%=<x<25%	-	-	1.5%	8.6%	1.6%	0.1%	0.1%	11.9%
		25%=<x<33%	-	-	0.0%	0.6%	1.2%	0.1%	0.0%	2.1%
		33%=<x<42%	-	-	-	-	-	0.3%	0.0%	0.3%
		x>=42%	-	-	0.2%	0.2%	0.0%	-	1.7%	2.1%
		Total	0.2%	2.2%	65.2%	25.8%	3.2%	0.9%	2.4%	100.0%

	t		t-1						
			0=<x<5%	5%=<x<11%	11%=<x<18%	18%=<x<25%	25%=<x<33%	33%=<x<42%	x>=
Guaranteed	2005	0=<x<5%	79.4%	11.3%	-	-	-	-	
		5%=<x<11%	-	5.3%	0.4%	-	-	-	
		11%=<x<18%	-	-	0.4%	-	-	-	
		18%=<x<25%	-	-	-	0.4%	-	-	
		25%=<x<33%	-	-	-	-	0.4%	-	
		33%=<x<42%	0.4%	-	-	-	-	1.6%	
		x>=42%	-	-	-	-	-	-	0.4
		Total	79.8%	16.6%	0.8%	0.4%	0.4%	1.6%	0.4
	2006	0=<x<5%	89.9%	2.0%	-	-	-	-	0.4
		5%=<x<11%	0.8%	3.6%	-	-	-	-	
		11%=<x<18%	-	-	0.4%	-	-	-	
		18%=<x<25%	-	-	-	0.4%	-	-	
		25%=<x<33%	-	-	-	-	0.4%	-	
		33%=<x<42%	-	-	-	-	-	2.0%	
		Total	90.7%	5.7%	0.4%	0.4%	0.4%	2.0%	0.4
	2007	0=<x<5%	89.1%	1.6%	-	0.4%	-	-	
		5%=<x<11%	3.2%	2.8%	0.4%	-	0.4%	-	
		33%=<x<42%	-	-	-	-	-	2.0%	
		Total	92.3%	4.5%	0.4%	0.4%	0.4%	2.0%	
	2008	0=<x<5%	84.6%	0.8%	-	-	-	-	
		5%=<x<11%	6.5%	6.1%	-	-	-	-	
		33%=<x<42%	-	-	-	-	-	2.0%	
		Total	91.1%	6.9%	-	-	-	2.0%	

	t		t-1							
			0=<x<5%	5%=<x<11%	11%=<x<18%	18%=<x<25%	25%=<x<33%	33%=<x<42%	x>=42%	Total
Mixed	2005	0=<x<5%	18.2%	3.9%	-	0.1%	-	0.1%	0.1%	22.4%
		5%=<x<11%	0.1%	34.5%	8.5%	0.7%	-	0.1%	0.3%	44.3%
		11%=<x<18%	-	-	22.2%	3.2%	0.6%	0.1%	0.1%	26.2%
		18%=<x<25%	-	-	-	2.8%	0.7%	-	-	3.5%
		25%=<x<33%	-	-	0.1%	-	0.2%	0.2%	-	0.5%
		33%=<x<42%	0.1%	-	-	-	-	0.8%	0.3%	1.2%
		x>=42%	-	0.1%	-	-	-	0.1%	1.6%	1.8%
		Total	18.4%	38.5%	30.8%	6.8%	1.5%	1.4%	2.5%	100.0%
	2006	0=<x<5%	21.9%	2.2%	-	-	-	0.2%	0.1%	24.4%
		5%=<x<11%	0.5%	40.9%	2.8%	-	-	0.2%	-	44.4%
		11%=<x<18%	-	1.1%	22.9%	0.7%	-	0.1%	0.2%	25.1%
		18%=<x<25%	-	-	0.3%	2.8%	0.3%	-	-	3.4%
		25%=<x<33%	-	-	-	-	0.2%	0.1%	-	0.3%
		33%=<x<42%	-	-	0.1%	-	-	0.6%	0.1%	0.8%
		x>=42%	-	0.1%	0.1%	-	-	-	1.4%	1.6%
		Total	22.4%	44.3%	26.2%	3.5%	0.5%	1.2%	1.8%	100.0%
	2007	0=<x<5%	24.4%	4.2%	-	-	-	0.2%	-	28.8%
		5%=<x<11%	-	40.1%	9.4%	-	-	0.1%	0.1%	49.6%
		11%=<x<18%	-	-	15.4%	2.1%	-	-	0.2%	17.7%
		18%=<x<25%	-	-	-	1.3%	-	-	0.1%	1.4%
		25%=<x<33%	-	-	-	-	0.3%	-	-	0.3%
		33%=<x<42%	-	-	0.1%	-	-	0.5%	0.1%	0.7%
		x>=42%	-	0.1%	0.2%	-	-	-	1.1%	1.4%
		Total	24.4%	44.4%	25.1%	3.4%	0.3%	0.8%	1.6%	100.0%
	2008	0=<x<5%	28.1%	8.3%	-	0.1%	-	-	-	36.5%
		5%=<x<11%	0.7%	41.2%	13.7%	0.2%	0.1%	0.1%	0.3%	56.3%
		11%=<x<18%	-	0.1%	3.9%	0.8%	-	-	-	4.8%
		18%=<x<25%	-	-	-	0.3%	-	-	0.1%	0.4%
		25%=<x<33%	-	-	-	-	0.2%	0.1%	-	0.3%
		33%=<x<42%	-	-	0.1%	-	-	0.5%	0.2%	0.8%
		x>=42%	-	-	-	-	-	-	0.8%	0.8%
		Total	28.8%	49.6%	17.7%	1.4%	0.3%	0.7%	1.4%	100.0%

	t		t-1							Total
			0=<x<5%	5%=<x<11%	11%=<x<18%	18%=<x<25%	25%=<x<33%	33%=<x<42%	x>=42%	
Money	2005	0=<x<5%	89.1%	0.3%	-	0.5%	-	0.1%	0.8%	90.8%
		5%=<x<11%	0.1%	0.8%	-	-	-	-	-	0.9%
		11%=<x<18%	-	0.1%	0.4%	-	-	-	-	0.5%
		18%=<x<25%	-	-	-	0.5%	-	0.1%	-	0.6%
		25%=<x<33%	-	-	-	-	0.1%	-	-	0.1%
		33%=<x<42%	0.3%	-	-	-	-	3.0%	-	3.2%
		x>=42%	0.1%	-	-	-	-	0.3%	3.4%	3.8%
		Total	89.6%	1.2%	0.4%	1.0%	0.1%	3.5%	4.2%	100.0%
	2006	0=<x<5%	89.8%	0.1%	-	-	-	0.5%	0.5%	90.9%
		5%=<x<11%	-	0.8%	0.1%	-	-	-	-	0.9%
		11%=<x<18%	-	-	0.4%	-	-	-	-	0.4%
		18%=<x<25%	0.3%	-	-	0.6%	-	0.1%	-	1.0%
		25%=<x<33%	0.3%	-	-	-	0.1%	-	-	0.4%
		33%=<x<42%	0.4%	-	-	-	-	2.6%	-	3.0%
		x>=42%	0.1%	-	-	-	-	-	3.2%	3.4%
		Total	90.8%	0.9%	0.5%	0.6%	0.1%	3.2%	3.8%	100.0%
	2007	0=<x<5%	89.9%	0.1%	-	0.4%	-	1.8%	1.2%	93.4%
		5%=<x<11%	0.1%	0.8%	0.1%	-	-	-	-	1.0%
		11%=<x<18%	-	-	0.3%	-	-	-	-	0.3%
		18%=<x<25%	0.1%	-	-	0.6%	-	-	-	0.8%
		25%=<x<33%	-	-	-	-	0.4%	-	-	0.4%
		33%=<x<42%	0.5%	-	-	-	-	1.2%	-	1.7%
		x>=42%	0.3%	-	-	-	-	-	2.2%	2.5%
		Total	90.9%	0.9%	0.4%	1.0%	0.4%	3.0%	3.4%	100.0%
	2008	0=<x<5%	92.7%	0.3%	-	0.1%	0.1%	0.4%	0.5%	94.2%
		5%=<x<11%	-	0.8%	0.1%	-	-	-	-	0.9%
		11%=<x<18%	-	-	0.1%	-	-	-	-	0.1%
		18%=<x<25%	0.3%	-	-	0.6%	-	-	-	0.9%
		25%=<x<33%	-	-	-	-	0.3%	-	-	0.3%
		33%=<x<42%	0.1%	-	-	-	-	1.3%	0.3%	1.7%
		x>=42%	0.3%	-	-	-	-	-	1.7%	1.9%
		Total	93.4%	1.0%	0.3%	0.8%	0.4%	1.7%	2.5%	100.0%

Table 7 shows the percentage of funds that registered a variation that exceeds the risk level during consecutive years and following a 2-year period. For consecutive years, the percentage level is 5% lower regardless of the year or fund type breakdown. This percentage reaches 8% for both equity funds and risk classification changes following a 2-year period.

Table 7 – Fund Ratio wherein Risk Scale Variation occurs (E1)

		t versus t-1 Variation					
		<=-2	-1	0	1	>=2	Total
Bond	2005	3.0%	4.8%	90.6%	1.1%	0.5%	100.0%
	2006	1.3%	4.1%	93.0%	0.9%	0.6%	100.0%
	2007	2.1%	5.5%	91.1%	0.6%	0.7%	100.0%
	2008	0.4%	4.7%	93.1%	1.6%	0.2%	100.0%
Equity	2005	3.1%	35.9%	60.5%	0.2%	0.3%	100.0%
	2006	1.7%	11.4%	84.1%	2.4%	0.5%	100.0%
	2007	1.5%	28.6%	68.9%	0.2%	0.9%	100.0%
	2008	1.5%	35.3%	59.9%	2.8%	0.5%	100.0%
Guaranteed	2005	0.0%	11.7%	87.9%	0.0%	0.4%	100.0%
	2006	0.4%	2.0%	96.8%	0.8%	0.0%	100.0%
	2007	0.8%	2.0%	93.9%	3.2%	0.0%	100.0%
	2008	0.0%	0.8%	92.7%	6.5%	0.0%	100.0%
Mixed	2005	2.3%	16.9%	80.4%	0.2%	0.3%	100.0%
	2006	0.8%	6.2%	90.8%	2.0%	0.3%	100.0%
	2007	0.7%	15.7%	83.1%	0.0%	0.4%	100.0%
	2008	0.9%	23.1%	75.0%	0.8%	0.1%	100.0%
Money	2005	1.6%	0.3%	97.3%	0.5%	0.4%	100.0%
	2006	1.2%	0.3%	97.5%	0.0%	1.0%	100.0%
	2007	3.4%	0.3%	95.3%	0.1%	0.9%	100.0%
	2008	1.2%	0.6%	97.5%	0.0%	0.6%	100.0%

		t versus t-2 Variation					
		<=-2	-1	0	1	>=2	Total
Bond	2006	4.3%	7.6%	86.1%	0.9%	1.1%	100.0%
	2007	3.5%	8.8%	85.4%	0.9%	1.3%	100.0%
	2008	2.8%	8.9%	86.2%	1.2%	0.9%	100.0%
Equity	2006	7.3%	39.9%	51.1%	1.0%	0.7%	100.0%
	2007	5.0%	33.7%	58.9%	0.9%	1.4%	100.0%
	2008	6.5%	54.2%	36.8%	1.1%	1.4%	100.0%
Guaranteed	2006	0.4%	13.8%	84.6%	0.8%	0.4%	100.0%
	2007	1.2%	3.2%	92.3%	3.2%	0.0%	100.0%
	2008	1.2%	1.6%	87.9%	9.3%	0.0%	100.0%
Mixed	2006	3.8%	19.8%	75.1%	0.6%	0.6%	100.0%
	2007	1.6%	20.1%	77.1%	0.4%	0.7%	100.0%
	2008	2.1%	37.3%	59.4%	0.7%	0.5%	100.0%
Money	2006	2.6%	0.6%	94.9%	0.5%	1.3%	100.0%
	2007	4.5%	0.5%	92.9%	0.1%	1.9%	100.0%
	2008	4.4%	0.9%	93.1%	0.1%	1.4%	100.0%

In all, these results suggest that when one applies scale 2, several funds fall short of a clear distinction, particularly funds which show volatilities below the 11% slot. As to the suitability of the proposed methodology for adequately classifying the fund risk, scale 2 also produces less satisfactory results than scale 1. Thus, the fund risk estimate is robust, particularly treasury/money market funds, guarantee funds and bond funds, albeit same does not occur for equity funds.

c. Results obtained whilst using another alternative risk indicator: ratio between fund volatility and market volatility (ER1)

In the case of equity funds, historical volatility is a rather an unstable risk indicator. This instability draws from the correlation between funds' returns and that of markets' returns. Over time, equity market volatility depicts several fluctuations, hence influencing the funds' volatility exposed to same.

An alternative approach to both CESR's methodology and former scales would be that of indexing the volatility of each equity fund to the market volatility, i.e. by using a relative risk measure. It is clear though that this method unearths greater consistency in equity funds than in the remainder of the funds. In this document, the method used to illustrate the latter is based on the comparison made between the mentioned funds' volatility and the benchmark's volatility. Morgan Stanley's MSCI World Index is the benchmark used. The comparison was carried out by calculating the ratio between the fund's volatility and the index's volatility for each of the covered periods.

A different solution to an absolute risk measure could be adopted by indexing the historical volatility to a benchmark and from these results, create risk scales similar to what was done for Scales 1 and 2. For instance, 7 risk scales (E-R1) were produced for the ratio between the fund volatility and the benchmark volatility (MSCI World).

- Scale 1: ratio <0.5
- Scale 2: ratio between [0.5;0.75[
- Scale 3: ratio between [0.75;1[
- Scale 4: ratio between [1;1.25[
- Scale 5: ratio between [1.25;1.5[
- Scale 6: ratio between [1.5;1.75[
- Scale 7: ratio> =1.75

The first three scales include funds that show a lower volatility than that of the benchmark's volatility. In 2008, only 20% of the analysed equity funds showed a lower volatility apropos the MSCI World Index volatility – same attained 40.7% in 2007 (Table 8). Conversely, this alternative approach allows for greater categorisation of the different funds since the relevant risk level is not that concentrated as in any of the previous two methodologies.

Table 8 – Ratio between the equity fund volatility and the MSCI World Index volatility –
t versus t-1 years

		Classification in t-1							
Classification in t		<0.5	0.5-0.75	0.75-1	1-1.25%	1.25-1.5	1.5-1.75	>=1.75	Total
2005	<0.5	0.5%	0.0%	-	-	-	-	-	**0.6%**
	0.5-0.75	0.2%	2.5%	0.3%	-	0.0%	-	-	**3.0%**
	0.75-1	-	0.6%	22.8%	4.3%	0.5%	0.1%	0.5%	**28.8%**
	1-1.25%	-	-	2.2%	26.5%	4.3%	1.0%	0.8%	**34.9%**
	1.25-1.5	-	-	0.0%	2.6%	11.9%	3.2%	0.9%	**18.7%**
	1.5-1.75	-	-	0.0%	-	1.0%	3.0%	1.1%	**5.2%**
	>=1.75	-	0.0%	0.1%	0.2%	0.0%	0.5%	8.0%	**8.8%**
		0.7%	**3.2%**	**25.5%**	**33.6%**	**17.8%**	**7.8%**	**11.3%**	**100.0%**
2006	<0.5	0.4%	-	-	-	-	-	-	**0.4%**
	0.5-0.75	0.1%	2.3%	0.5%	-	-	-	0.0%	**3.0%**
	0.75-1	-	0.7%	25.9%	4.2%	0.2%	-	0.5%	**31.5%**
	1-1.25%	-	-	2.4%	29.1%	6.3%	0.2%	0.7%	**38.7%**
	1.25-1.5	-	-	0.0%	1.4%	11.7%	2.0%	0.4%	**15.5%**
	1.5-1.75	-	-	0.0%	0.1%	0.5%	2.8%	1.8%	**5.3%**
	>=1.75	0.0%	-	-	0.1%	0.0%	0.1%	5.2%	**5.6%**
		0.6%	**3.0%**	**28.8%**	**34.9%**	**18.7%**	**5.2%**	**8.8%**	**100.0%**
2007	<0.5	0.4%	0.1%	-	-	-	-	-	**0.4%**
	0.5-0.75	0.1%	2.5%	1.0%	-	-	-	-	**3.5%**
	0.75-1	-	0.4%	28.6%	7.1%	0.1%	-	0.5%	**36.8%**
	1-1.25%	-	-	1.4%	30.6%	4.8%	0.2%	0.3%	**37.3%**
	1.25-1.5	-	-	0.0%	0.7%	9.9%	1.6%	0.4%	**12.6%**
	1.5-1.75	-	-	-	0.0%	0.6%	3.1%	0.9%	**4.6%**
	>=1.75	-	-	0.5%	0.3%	0.1%	0.4%	3.5%	**4.8%**
		0.4%	**3.0%**	**31.5%**	**38.7%**	**15.5%**	**5.3%**	**5.6%**	**100.0%**
2008	<0.5	0.1%	-	-	-	-	-	-	**0.1%**
	0.5-0.75	0.2%	0.7%	-	-	-	-	-	**1.0%**
	0.75-1	0.0%	2.2%	15.7%	0.8%	-	-	0.1%	**18.9%**
	1-1.25%	-	0.5%	17.0%	18.3%	1.2%	-	0.6%	**37.6%**
	1.25-1.5	-	0.0%	3.6%	10.2%	4.2%	0.4%	0.2%	**18.7%**
	1.5-1.75	-	-	0.3%	6.7%	3.2%	1.3%	0.2%	**11.8%**
	>=1.75	-	-	0.2%	1.2%	4.0%	2.9%	3.6%	**11.9%**
		0.4%	**3.5%**	**36.8%**	**37.3%**	**12.6%**	**4.6%**	**4.8%**	**100.0%**

Table 9 – Ratio between the equity fund volatility and the MSCI World Index Volatility – t versus t-2 years

Classification in t		Classification in t-2							Total
		<0.5	0.5-0.75	0.75-1	1-1.25%	1.25-1.5	1.5-1.75	>=1.75	
2006	<0.5	0.4%	-	-	-	-	-	-	**0.4%**
	0.5-0.75	0.2%	2.0%	0.7%	-	0.0%	-	0.0%	**3.0%**
	0.75-1	-	1.2%	21.5%	6.4%	1.1%	0.1%	1.1%	**31.5%**
	1-1.25%	-	-	3.1%	24.3%	7.5%	2.2%	1.7%	**38.7%**
	1.25-1.5	-	-	0.1%	2.5%	8.0%	3.2%	1.6%	**15.5%**
	1.5-1.75	-	-	0.0%	0.1%	1.0%	1.9%	2.2%	**5.3%**
	>=1.75	0.0%	0.0%	0.1%	0.3%	0.1%	0.3%	4.7%	**5.6%**
		0.7%	**3.2%**	**25.5%**	**33.6%**	**17.8%**	**7.8%**	**11.3%**	**100.0%**
2007	<0.5	0.4%	0.1%	-	-	-	-	-	**0.4%**
	0.5-0.75	0.1%	2.0%	1.2%	0.0%	0.0%	-	0.0%	**3.5%**
	0.75-1	0.0%	0.9%	24.8%	8.8%	0.9%	0.1%	1.2%	**36.8%**
	1-1.25%	-	-	2.1%	24.4%	8.6%	0.9%	1.2%	**37.3%**
	1.25-1.5	-	-	0.1%	1.2%	8.4%	1.6%	1.4%	**12.6%**
	1.5-1.75	-	-	0.0%	0.1%	0.5%	2.2%	1.8%	**4.6%**
	>=1.75	0.0%	-	0.5%	0.4%	0.3%	0.4%	3.2%	**4.8%**
		0.6%	**3.0%**	**28.8%**	**34.9%**	**18.7%**	**5.2%**	**8.8%**	**100.0%**
2008	<0.5	0.1%	0.0%	-	-	-	-	-	**0.1%**
	0.5-0.75	0.2%	0.6%	0.1%	-	-	-	-	**1.0%**
	0.75-1	0.1%	1.5%	14.9%	2.2%	0.1%	-	0.3%	**18.9%**
	1-1.25%	0.0%	0.7%	12.6%	20.8%	2.1%	0.2%	1.1%	**37.6%**
	1.25-1.5	-	0.1%	2.8%	8.9%	5.4%	0.8%	0.7%	**18.7%**
	1.5-1.75	-	-	0.5%	5.2%	3.9%	1.3%	1.0%	**11.8%**
	>=1.75	-	0.0%	0.7%	1.6%	4.0%	3.0%	2.6%	**11.9%**
		0.4%	**3.0%**	**31.5%**	**38.7%**	**15.5%**	**5.3%**	**5.6%**	**100.0%**

The period from 2004 to 2007 was marked by a drop in the markets' volatility – the percentage of funds that did not register a scale change apropos the previous year, surpassed 75%. On the contrary, in 2008 the ratio marked 44% (Table 10). When compared with the results obtained from the two previous alternatives (Scales 1 and 2), the volatility ratio suggests that there is a higher percentage of funds that remain stable or increase the relevant risk level and a lower percentage that reduces the risk level.

Table 10 – Percentage of equity funds in which no risk-scale change occurs

	t versus t-1			t versus t-2		
	Decrease	**Stable**	**Increase**	**Decrease**	**Stable**	**Increase**
2005	17.2%	**75.2%**	7.6%	-	**-**	-
2006	16.9%	**77.5%**	5.6%	28.0%	**62.7%**	9.3%
2007	17.0%	**78.4%**	4.6%	27.8%	**65.5%**	6.7%
2008	3.6%	**44.0%**	52.4%	8.6%	**45.7%**	45.7%

In 2008, the percentage of funds registering a significant annual (absolute) variation of the risk level (Table 11), increased. Thus 16.6% of the funds registered an annual increase equal or greater than two levels, and 1% of the funds registered an annual decrease equal or greater than two levels.

Table 11 – Percentage of equity funds that registered a variation greater or equal to two levels

	t versus t-1			t versus t-2		
	Decrease	**Increase**	**Total**	**Decrease**	**Increase**	**Total**
2005	3.9%	0.4%	**4.3%**	-	-	-
2006	2.2%	0.4%	**2.5%**	8.0%	0.9%	**8.6%**
2007	1.5%	1.0%	**2.5%**	5.8%	1.5%	**6.0%**
2008	1.0%	16.6%	**17.5%**	2.4%	15.7%	**7.0%**

In order to assess the exchangeability or reciprocity among the three scales, a non-parametric correlation indicator was used: Kendalls's tau_b. The correlations in the risk levels obtained from the three scales are high (greater than 0.70) – meaning that the volatility ratio may clearly indicate the equity funds' risk.

Table 12 – Correlation between the risk levels obtained for Scales E1, E2 and E-R1 (equity funds)

Correlations: Kendall's tau_b

		Scale	Scale	Volatility Ratio Scale
2004	Volatility Scale 1	1.000	0.845**	0.866**
	Volatility Scale 2	.	1.000	0.882**
	Volatility Ratio Scale	.	.	1.000
2005	Volatility Scale 1	1.000	0.800**	0.837**
	Volatility Scale 2	.	1.000	0.845**
	Volatility Ratio Scale	.		1.000
2006	Volatility Scale 1	1.000	0.763**	0.831**
	Volatility Scale 2	.	1.000	0.817**
	Volatility Ratio Scale	.	.	1.000
2007	Volatility Scale 1	1.000	0.705**	0.906**
	Volatility Scale 2	.	1.000	0.750**
	Volatility Ratio Scale	.		1.000
2008	Volatility Scale 1	1.000	0.728**	0.829**
	Volatility Scale 2	.	1.000	0.799**
	Volatility Ratio Scale	.	.	1.000

However, the volatility ratio should not be considered as an isolated tool. To illustrate this, the risk evolution is measured by Scale 2 and by the Volatility Ratio Scale. It is shown that in comparison to 2007, 2008 witnessed an increase of the risk levels measured by the volatility ratio (by 52.4% of the funds in question). However, this increase does not correspond to the level of absolute risk measured by using Scale 2, since 33.2% of the funds registered a drop in the risk level, while the volatility ratio registered a risk increase. This indicates a decrease or steadiness of the absolute risk of the majority of the funds and an increase of the risk level regarding same funds.

Table 13 – Comparison between the evolution of the risk level measured by Scale 2 and the risk level measured by the Volatility Risk Scale (equity funds)

			Volatility Risk Scale			
			Decrease	Stable	Increase	**Total**
Scale 2	2005	Decrease	14.2%	23.9%	1.6%	39.7%
		Stable	3.0%	51.2%	5.4%	59.6%
		Increase	-	0.1%	0.5%	0.6%
		Total	17.2%	75.2%	7.6%	100.0%
	2006	Decrease	6.9%	6.7%	-	13.6%
		Stable	10.0%	69.2%	4.9%	84.0%
		Increase	-	1.6%	0.7%	2.4%
		Total	16.9%	77.5%	5.6%	100.0%
	2007	Decrease	6.3%	21.9%	0.1%	28.2%
		Stable	10.8%	56.4%	3.4%	70.6%
		Increase	-	0.1%	1.1%	1.2%
		Total	17.0%	78.4%	4.6%	100.0%
	2008	Decrease	3.2%	22.4%	7.6%	33.2%
		Stable	0.4%	21.6%	40.6%	62.5%
		Increase	-	0.0%	4.2%	4.2%
		Total	3.6%	44.0%	52.4%	100.0%

Were this comparison to be carried out for the 2004 – 2008 period (Table 14), one would conclude that 83.1% of funds would register a decrease in the absolute risk level (Scale 2) between both periods, albeit only 19.2% would register a decrease in the level of relative risk. Thus, one is led to conclude that the volatility drop of the funds that occurred during the two periods was largely due to the drop in the markets' volatility.

Table 14 – Comparison between the risk evolution measured by Scale 2 and the risk measured by the Volatility Risk Scale (2004 - 2008) – equity funds

			Volatility Risk Scale			
			Decrease	Stable	Increase	**Total**
2008	Scale 2	Decrease	19.2%	41.5%	22.3%	83.1%
		Stable	-	1.2%	12.6%	13.8%
		Increase	-	-	3.1%	3.1%
		Total	19.2%	42.8%	38.0%	100.0%

C. Conclusion

As regards the first question (*Could the methodology lead to the classification of funds in a category that is significantly lower than the one in which they should belong?*), one concludes that historical volatility may be seen as an efficient method for classifying the fund's risk. This conclusion is based on the results obtained from the temporal evolution of the risk level of the funds. With same in mind, it is evident that historical volatility represents a rather precise estimate for future volatility, with the exception of equity funds. On the other hand, historical volatility is rather unstable in respect of equity funds. Same instability results from exposing equity funds to equity markets that show fluctuations that are relatively high during crisis periods. When two periods are analysed with one-year intervals, one sees that same have kept to the same risk category with between 49.2% and 81.0% for equity shares, if one considers Scale 1, and between 59.9% and 84.1% for equity shares, if one considers Scale 2. Albeit, the percentage of equity funds with a significant annual variation of the risk level is still lower than 5%. This means that even if one includes equity funds, the implemented methodology (Scales 1 and 2) will not lead to a significantly lower categorisation of the fund than the one were same is classified. Furthermore, as to equity funds and as an additional measure for risk assessment, using the risk scale based on a relative risk measure (volatility ratio apropos the market volatility), would serve as an advantage for minimizing the results caused by the abnormal variations of market risk. Consequently, its implications in the evolution of the risk level of these funds would be reduced.

With reference to the second question (*Does the methodology allow appropriate discrimination between different funds across the universe of UCITS funds so that there is no excessive bunching of funds in one or two categories?*) – the data suggests that Scale 1 allows for a more efficient sectioning of the risk level than Scale 2 does. With Scale 2, one is unable to distinguish treasury/money market funds from that of guarantee funds or bond funds. On the contrary, the limits defined in Scale 1 distinguish the different fund types by simply examining the risk level associated to each fund. To see this, it stands to reason that: (i) it is highly likely that the volatility of a treasury fund will not surpass 1.5%; (ii) the volatility of an equity fund surpasses 10%; (iii) and that the likelihood of a bond fund attaining a volatility of between 1.5% - 10% is high. In all, the use of scales gives rise to certain problems that should be taken into consideration. Both the range of the intervals as well as the limits themselves do influence the indicator's robustness. The higher-ranged intervals will contribute towards fewer changes to the risk level of the funds when KID/Simplified Prospectus undergoes annual review. Albeit, higher-ranged intervals may result in poorer discrimination of the funds, due to the associated risk potential and may also produce a 'cluster of funds' in a very few number of risk levels. One should note however that the higher efficiency of Scale 1 could be the result of the definition used for the risk level 1 in Scale 2 (0 to 5%). If the upper limit is lower than 5% then the inefficiency of the Scale 2 might be removed or at least diminished.

Lastly, it should be noted that using contiguous time periods for comparison affords greater stability for categorising funds that are at risk level, than comparing non-adjacent periods, which suggests that re-classification of the risk level of a fund should be carried out at one-year intervals or even less.