Journal of Applied Sciences

ISSN 1812-5654

science alert

ANSInet
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http://ansinet.com

Journal of Applied Sciences 7 (5): 633-653, 2007
ISSN 1812-5654

Stock Market Indices and Investment Funds. An Empirical Approach in the Spanish and European Context

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Abstract: This paper analyses changes in the levels of volatility of the Ibex 35 index over the past decade, as a representative index and benchmark for the Spanish equities market and the performance of the leading European stock market indices, Eurotop 100 and Euro Stoxx 50. We also consider the increasing importance and acceptance of mutual funds as the ideal instrument for the financial diversification of investment portfolios. The paper links mutual funds and benchmarks to focus on the analysis of a sample of equity investment funds, comparing their performance in terms of both returns and historical homocedastic volatility over various time periods (250, 100 and 20 days) with that of the most representative indices in the Spanish and European markets using the same parameters. These indices serve as a benchmark against which to assess the extent to which investment in funds is in fact rational in financial terms. We illustrate our approach using a sample of domestically and internationally diversified mutual funds, as well as three benchmarks, the Ibex 35, Eurotop 100 and Euro Stoxx 50 indices. Minimum quadratic linear models are applied to series of daily returns and to volatilities within the homocedastic framework and their correlation.

Key words: Investment funds, benchmark, volatility, correlation

INTRODUCTION

Stock market indices are complex, short-term numbers, normally weighted, generated for the purpose of reflecting the evolution of listed share prices over time.

These numerical indices are statistical measures providing a comparison of two figures by means of a benchmark. Since they are complex, they do not refer to a single quantity but to several, or to complex quantities.

The calculation of a stock market index is a very intricate process that furthermore involves certain derived problems, including the following:

- Selection of the stocks that are supposed to represent the market,
- Issues related with the weighting applied to each stock, which may be fixed or variable depending on capitalisation,
- Issues related with the formulation of the index itself as a mathematical expression,
- Issues related with the criteria and cadence of changes,
- Problems arising from the application of objective or subjective criteria to resolve the matter of liquidity,
- Issues related with the appropriate adjustments to take into consideration the impact of corporate operations and the payment of dividends,
- Issues related with the presence of foreign stocks listed on domestic exchanges, etc.

Despite the subjectivity of stock market indices and the problems involved in their preparation, they do fulfil a fundamental mission for the management of equity portfolios. Because of this, it has already been observed that such indices need to be quickly adapted to new needs, distinguishing between the economic regions targeted for investment and differentiating the new technologies. This would involve the creation of sector indices referring to stocks of a similar nature. The latest trends even suggest that the free float of each stock be included in the calculation.

Thus, the financial globalisation of stock markets, basically driven by ever more efficient decisions by investors seeking cross-border diversification, has led to the appearance of indices that are designed to identify the rules governing the behaviour of the European markets that have adopted the euro, or indeed European markets in general. These new indices are a response to investors' requirements and are closely followed by fund managers.

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The calculation of such a range of different indices is a response to these new needs, though only two are in fact commonly used. These are the Financial Times Stock Exchange Eurotop 100, which comprises European firms in the wide sense and the Dow Jones Euro Stoxx 50, which tracks the stocks of euro-zone companies.

The latter is gradually winning a position as the benchmark, even if a consensus in this regard is probably some way off. One of the objectives of this study is, precisely, to verify whether any appreciable differences exist at the level of risk depending upon the use of one or other index as the benchmark.

To this analysis, we add a study of the behaviour of one of the most representative indices for the Spanish stock market, the Ibex-35, over as long a period as a decade in order to assess whether the progressive integration of Spain into the European Union has been reflected in the volatility of this benchmark for domestic investment compared to its European equivalents.

After discussing the features of investment funds and their advantages for investors as the ideal vehicle for channelling investments towards domestic and international markets, providing the opportunity of professional management and financial diversification both at home and abroad, we shall go on to analyse the behaviour of risk and returns, measuring the latter in terms of the historical homocedastic volatility of various equity investment funds in parallel with changes in the stock markets indices taken as benchmarks.

Specifically we shall attempt a financial study of the relationship between returns and volatility in a sample of investment funds that have diversified within Spain on the basis of the Ibex 35 and a different set of funds holding portfolios diversified among stocks issued on euro-zone financial markets, taking the Euro Stoxx 50 as the benchmark.

We have included analyses of different time periods in order to establish whether these funds are able to outperform the benchmark portfolios. This will throw light on the importance of each mutual fund's own characteristics to achieving the goal of outperformance. Such characteristics include the obligation to hold a percentage of total assets in highly liquid instruments and even the impact of management professionalism in the quest for efficient results through such financial instruments.

Numerous and varied papers and studies focusing on analysis of the performance of mutual funds and institutional portfolios are to be found in both the specialist literature and the professional field and these are based on a range of approaches and methodologies

In general and rather simplified, terms risk and returns, as well as the links and trade-off between the two concepts, usually play a key role in the financial analysis of mutual funds and their efficiency. The literature also usually includes performance measures that are based either on the Capital Asset Pricing Model (CAPM) with some variation of a risk-adjusted return in the comparison of each mutual funds with a single benchmark or market index [see Jensen (1968, 1969), Lintner (1965), Sharpe (1966), Treynor (1965) and Treynor and Mazuy (1966)], or on multi-index models embodying the APT through real market indices [as in Elton *et al.* (1996)] or using empirically estimated new indices [as in Connor and Korzjszyk (1991)]. Occasionally, the literature even uses performance measures that do not require the use of a benchmark portfolio in view of the problems inherent in benchmarking sensitivity [e.g. as in Grinblatt and Titman (1989, 1993) and Lehman and Modest (1987)].

With respect to the biggest provider of mutual fund ranking services approaches, Lipper Analytical Services makes no adjustment for risk in their rankings and Morningstar´s approach combine different performances and risks with several different time horizons.

Key work, though the list is not intended to be exhaustive, has been done by Sharpe (1992), Solnik (1974a, b, c, d, 1983 and 1993), Östermark (1990), Jennergren (1992), Eun *et al.* (1993), Goetzmann and Ibbotson (1994), Leibowitz *et al.* (1995), Volkman and Wohar (1995), Malkiel (1995), Rubio (1993 and 1995), Grinblatt *et al.* (1995), Wong (1997), Premachandra *et al.* (1998), Morey and Morey (1999) and Indro *et al.* (1999). In the financial analysis of mutual funds, the research carried out by Chang and Lewellen (1984 and 1995), Henriksson (1984), Ferson and Schadt (1996), Chiang *et al.* (1996), Carhart (1997), Khorana and Nelling (1997), O´Neal (1997), Daniel *et al.* (1997), Murthi *et al.* (1997), Okunev (1990), Bhargava *et al.* (1998), Ribeiro *et al.* (1999), Basarrate and Rubio (1999), Chamorro and Pérez de Villarreal (2000) and Martínez (2001) is also of interest.

Empirical evidence regarding the performance of internationally diversified investment funds is inconclusive. For example, Cumby and Glen (1990) conclude that international funds are more efficient than domestic indices, but do not outperform international indices. Meanwhile, papers by Reilly and Akhtar (1995) and Redman *et al.* (2000) present uneven results from their comparisons of international funds and domestic markets. Nevertheless, Gallo and Swanson (1996) found that results were similar to local indices. Yet other research, such as that of Detzler and Wiggins (1997), indicates that international investment funds do not succeed in raising performance.

The remainder of this paper is organised as follows. Section 2 presents the data base used and describes the methodology employed in the analysis. Section 3 contains the comparative financial analysis of historical homocedastic volatility in the Ibex 35, Eurotop 100 and Euro Stoxx 50 indices over 100 days. The characteristics, advantages, returns and growth of mutual funds within the framework of the Spanish financial system is described in section 4, which also contains a calculation of the funds' volatility. The empirical comparisons of returns and volatility in the two mutual fund samples over 250, 100 and 20 days, respectively benchmarked against the Ibex 35 and Euro Stoxx 50, are presented in sections 5 and 6. The last section brings together our main findings from the study with regard to the capacity of investment funds to outperform the relevant benchmarks.

DATA BASE AND METHODOLOGY

One of the main problems for the researcher preparing an econometric study of financial markets is the range of dates on which the relevant indices were created. This diversity frequently hinders the identification of long-term trends.

In order to overcome this difficulty, we simulated the likely evolution of the three indices used (Ibex 35, Euro Stoxx 50 and Eurotop 100) before they were created, in order to extend the term of the comparative study of volatilities. By way of example, the Ibex 35 was first calculated on 1 January 1990. Simulation of this index therefore allows us to extend the study by a further two years, as shown in Table 1, which contains a summary of the starting dates for the data bases in the different markets.

In the first part of this study we shall analyse the evolution of volatility in the benchmark indices for the European financial market, comparing it with the volatility of the Ibex 35, on the basis of these data.

The study then continues with a financial analysis of the evolution of volatility in the stock market indices compared with that of the various mutual funds that treat them as the benchmark for the purposes of domestic and international portfolio diversification.

To do this, we have used samples comprising sufficiently representative actual funds, selected from among the wide range of equity vehicles offered in Spain on the basis of the volume of assets managed and the quality of the fund managers. This allows us to reach conclusions that should be valid for other similar cases, taking into consideration the limitations implicit in the empirical methodology applied in the analysis.

Table 1: Starting dates for the data bases of stock market indices and mutual funds

Market	Start
Ibex 35	9/87
Dow Jones Euro Stoxx 50	1/92
Financial Times Eurotop 100	1/90
Mutual Fund	
DB-Acciones FIM	25/09/97
DB-Europa Bolsa FIM	26/09/97
AB Bolsa Index	25/09/97
ABN Euro Equity Fund	24/11/94
BBV Bolsa FIM	25/09/97
Santander Acciones Europeas	25/09/97

In order to analyse the performance of domestically diversified mutual funds and reach conclusions in light of the rest of the Spanish market, we have performed an initial comparative financial analysis of funds managed by BBV (currently BBVA), AB and DB in contrast to the Ibex 35.

Where the objective is to establish whether the considerations applicable to domestically diversified mutual funds are also of use in connection with funds benchmarked against pan-European indices, we have observed data in respect of mutual funds managed by BSCH, ABN and DB benchmarked against the Euro Stoxx 50 index.

The data used in this part of the study of various mutual funds and their benchmark indices covers a period of three years in general (where permitted by the age of the fund) and all of the data bases end in July 2000.

Table 1 shows the starting dates for the data analysed in respect of each of the investment funds included in the study.

The methodology used in the analysis is eminently practical and based on technical and operational concerns. On the basis of actual data, we have sought to verify whether the performance of the series is in line with the traditional parameters of financial rationality defended in the first instance by Markowitz (1952) and subsequently by Sharpe (1963), whose concepts continue to be employed with more or less sophistication in a variety of approaches both in the financial literature and at the professional level.

Thus, the bases of the inductive methodology applied in the empirical study refer to the measures and models of Financial Statistics and, in particular, to minimum quadratic linear estimate models between series of returns (either of the mutual funds themselves or of the benchmark indices for the relevant markets) and series of volatilities. We have also used simple statistical measures such as mean volatility. Graphic analyses are used to describe the relationships between the various statistical series considered. In some cases it has been necessary to

harmonise the series at a given point in time by calculating certain figures at base 100 at a given date in order to ensure the comparability of the data.

Since the objective of this study is to establish the main lines of the performance returns and volatility and key trends, going beyond movements occurring over periods of only a few days, we have opted to base our work on historical homocedastic volatility. This is calculated based on the series of Naperian logarithms of daily returns. Specifically, the volatilities considered comprise the historical homocedastic volatility at 20, 100 and 250 business days.

Homocedastic volatility differs from heterocedastic volatility in that the latter is the result of applying heterocedastic estimation models to the series of returns presented by a market, while homocedastic volatility is the result of a more traditional analysis of return-volatility series. For a more detailed discussion of these matters, the reader is referred to the works of Nattemberg (1988) and Lamothe (1993), among other pioneers. In recent studies of the FTSE, Hallahan and Faff (2001) suggest that homocedastic volatility is closer to the realities of the index as it provides better predictive capabilities. We may therefore affirm that the homocedastic framework is perfectly compatible with recent econometric studies.

Homocedastic volatility refers to the volatility that would be calculated as a parameter in a function for the distribution of returns on an asset based on the hypothesis that the variance in returns is not dependent on time but remains constant. Hence, the function for the distribution of returns would be described by the following formula:

$$r(y)_t \approx f(\mu,\sigma)$$

Where:

r(y) is the return on the asset, which follows a function (f) for the distribution of mean returns mu and a standard deviation sigma, both parameters being constant.

Heterocedastic volatilities, on the other hand, are calculated based on the hypothesis that the standard deviation is not constant over time but is in itself a parameter that can be modelled.

Thus, historical homocedastic volatility may be understood as the standard deviation presented by the series of Naperian logarithms of returns expressed on an annualised basis in a business year that is generally supposed to have 250 working days. Throughout this study, historical volatility is calculated using the following formula:

$$\sigma(n)_t = (\sqrt{250})\sigma\left[\ln r(y_t)\right]$$

Where:

Sigma reflects the measurement of risk against its standard deviation

n is the calculation period (volatility at n days)

ln is the Naperian logarithm

r is the return on the assets over the n-day period for the study of the asset in question

and y is the financial asset

The subscript $_t$ denotes the moment which the calculation is performed

In this study we analyse the values presented by the correlations between volatilities and returns in the various market indices and mutual funds. It is not our aim to perform any studies to anticipate the performance of any series compared to others or to analyse relationships between the price and the volatility of any particular financial instrument. The objective is rather to examine the performance of the same variable, which is to say homocedastic volatility calculated over different periods (250, 100 and 20 days) within the same time frame, in the Spanish and European stock markets using a sample of financial instruments (mutual funds) that are supposed to outperform the benchmark results of the Ibex 35 and Euro Stoxx 50 indices.

Following Aznar (1989), we may define the models used in the next pages as univariate linear regression models. They are at the same time direct relationship models, sometimes for returns and sometimes for simultaneous volatilities.

In the case of volatilities, the models are represented by the following equation:

$$\sigma(n)_t(I_1) = \alpha + \beta\sigma(n)_t(I_2) + \mu_t$$

Where:

Sigma represents the historical n days homocedastic volatility of a given index or mutual fund I. This is the risk inherent in the asset measured by its annualised standard deviation,

alpha and beta are the parameters calculated using the linear regression model and

mu is the error term.

The formulation applicable to returns would be similar, though the expression for historical homocedastic volatilities would be replaced by the returns generated by the indices and funds considered.

COMPARATIVE VOLATILITY OF THE EUROTOP 100, EURO STOXX 50 AND IBEX 35 INDICES

In view of the growing macro-economic integration of the European Union countries, not to mention the micro-economic integration of European concerns that

have sought to acquire the critical mass to compete with North American firms through intra-European mergers, it is has become increasingly important to establish reliable indicators of the performance of Europe's ever more closely bound stock markets. The demand for such specialist financial information emerged strongly in 1999, when the eleven adopted the single currency as their legal tender. Since then companies have listed in euros and their share capital is denominated in the new common currency.

The response to this deep-seated need has been to calculate a variety of indices, the most widely used of which are the Eurotop 100 and the Euro Stoxx 50.

The Financial Times Stock Exchange Eurotop 100 is the benchmark index for the European markets, since it includes non-euro markets such as those of the United Kingdom and Switzerland. It comprises European companies in the wide sense. The formulation of the index is thus intended to respond to the need for information concerning the evolution of European business as a whole, regardless of whether firms are listed on euro or non-euro exchanges.

The Dow Jones Euro Stoxx 50 is, on the other hand, probably the most representative index for strictly euro-based markets. It is the response of the same firm that calculates the Dow Jones, but in this case the 50 companies included in the index must be registered in the euro-zone. Concentrating on the different economic areas existing in Europe, this indicator meets the perceived need for a single index in a stock market defined by a common currency.

At the same time, we have included the selective index for the Spanish stock market, the Ibex 35, which is calculated in real time and is capitalisation based, in contrast to the traditional Spanish indices such as the Madrid Stock Exchange General Index.

In this study, we shall concentrate on the analysis of the above three stock market indices. Nevertheless, the future trend seems to point to the development and consolidation of sector indices. This is because different industries have their own sharply defined cycles and there are wide differences in performance from one sector to another. The advent of the euro has made it possible to bring together sufficient firms in each industry to define sector indices and numerous sector mutual funds have recently begun to appear. These funds need such indices in order to establish valid performance rankings.

Let us begin our empirical analysis by examining the evolution of volatility in the benchmark indices for the European financial space.

Our aim here is empirically to establish the extent to which factors such as the globalisation of stock markets and the creation of Europe's new common currency, which has eliminated currency risk for the investor in stocks, have affected the volatility of the Eurotop 100 and the Euro Stoxx 50.

The variable analysed for this purpose is historical homocedastic volatility over 100 days. This is because we have been able to observe that this period best reflects trends in historic volatility and is the span over which the normalcy of the series of returns may be affirmed with the greatest confidence.

The results of this analysis are shown graphically in Fig. 1.

Analysis of Fig. 1 confirms not only that the two indices are very closely correlated, but also that the Eurotop 100 and Euro Stoxx 50 have experienced similar levels of volatility.

In light of these results, we may ask why fund managers tend to prefer the Euro Stoxx 50 to the Eurotop 100. There may be two main factors underlying the choice of the Euro Stoxx 50.

First, the volatility represented in the above figure is the result only of the distribution of the Naperian logarithm for the series of returns. There is, however, another factor in play, which is the volatility of the non-euro currencies in which certain stocks included in the Eurotop 100 are priced. This is not reflected in the volatility of the index, but could increase it considerably.

The second reason may that the Eurotop 100 contains twice as many stocks as the Euro Stoxx 50, making it much more difficult to replicate or use as a benchmark. Moreover, the additional 50 financial assets included in the Eurotop 100 do not increase the level of diversification, as is apparent from the graphic representation of volatility, since levels are not substantially lower in this index compared to its rival.

Accordingly, the Eurotop 100 would need to achieve higher returns than the Euro Stoxx 50 for investors to prefer the former, in the terms in which Markowitz (1952) and Sharpe (1963) understand the term "performance", since the levels of risk involved are practically the same.

In order to complete the study of risk, we have analysed the evolution of correlations between the homocedastic volatilities at 100 days in the different indices examined. To do this, we defined univariant linear regression models, which may be described by the following expression:

$$\sigma 100_t(I_1) = \beta \sigma 100_t(I_1) + \mu_t$$

Where sigma represents historical homocedastic volatility over 100 days for a given index I, alpha and beta are the parameters calculated by the linear regression model and mu is the error term.

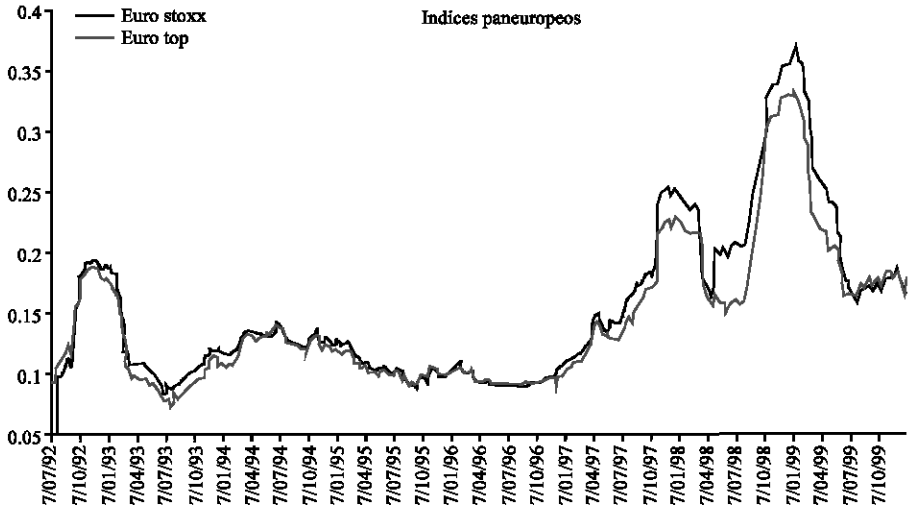

Fig. 1: Comparative volatilities of the Euro Stoxx 50 and Eurotop 100

Table 2: R^2 of linear regressions between indices

		R^2 of linear regressions using 1999 data		R^2 of linear regressions using data from the last five years		
	Ibex 35	Euro stoxx 50	Eurotop 100	Ibex 35	Euro stoxx 50	Eurotop 100
Ibex 35	1.00	0.99	0.96	1.00	0.97	0.87
Euro Stoxx 50		1.00	0.96		1.00	0.92
Eurotop 100			1.00			
			1.00			

If we examine the correlation of these direct models for the relationship between simultaneous volatilities considering the Eurotop 100 and Euro Stoxx 50, we find that the values presented are extremely high. The correlation between the two indices is 96% when the period analysed is one year (1999) and the value is still 92% when the analysis is carried out over the last five years. As shown in Table 2, these high values confirm the solidity of the results shown in Fig. 1.

Table 2 shows R^2 for the simple linear regressions taking the index for the relevant rank as the endogenous variable and each of the indices in each column as the exogenous variable, with R^2 expressed as a decimal fraction.

Let us now include an analysis of the volatility of the selective stock market index used to benchmark the Spanish financial market, the Ibex 35. Here, we shall endeavour to establish the main trends in the evolution of the index, considering changes over time and comparing them with movements in the levels of volatility of the Euro Stoxx 50 and Eurotop 100 indices.

The Ibex 35 index is fully integrated in the international context and its volatility is no higher than that of the other main national stock exchanges in Europe. It nevertheless suffers from certain shortcomings in comparison to the other main Spanish benchmark, the Madrid Stock Market General Index (IGBM). These include excessive dependence on a rather small number of stocks, its failure to include all of the sectors represented in the real economy and, finally, considerably greater subjectivity than the IGBM. However, these two Spanish indices are very closely correlated and the Ibex 35 is much more easily replicated than the IGBM. It is also more commonly used as the benchmark by Spanish mutual funds and is in many ways similar to the Euro Stoxx 50. It is for these reasons that we have chosen to use the Ibex 35 in this study.

Figure 2 shows the results of the financial analysis.

In the early 1990s the Ibex 35 was twice as volatile as the pan-European indices and systematically kept up differentials of more than 5%.

This gap narrowed over time, however, as a result of growing confidence in the ability of the Spanish economy to join the euro. This effect is particularly clear from 1997 onwards. Two factors that may explain this change were the rise in the number of listed companies and the greater liquidity of the Ibex 35 resulting from public offers by formerly nationalised companies.

Towards the end of the period considered here, the gaps between the Ibex 35 and the pan-European indices were, in fact, among the lowest out of all the euro-zone markets.

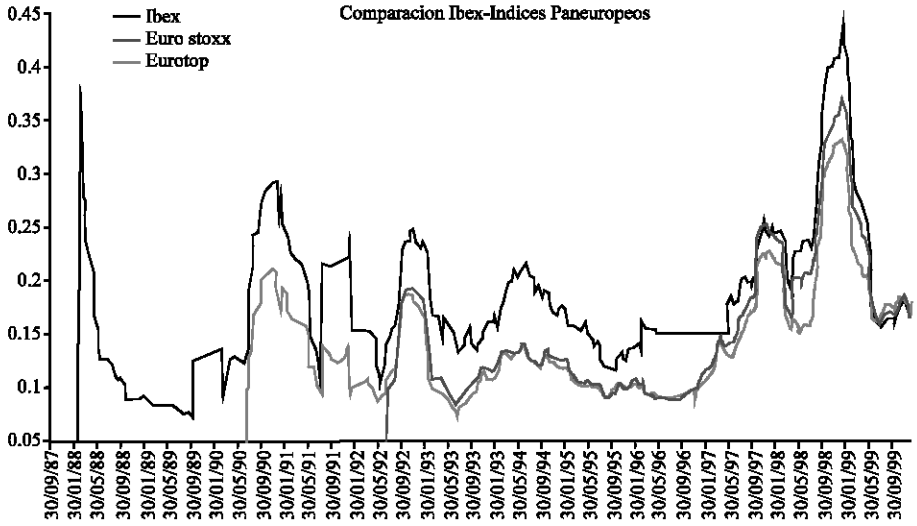

Fig. 2: Comparative volatilities of the Ibex 35 and pan-European indices

Thus, the launch of the euro and the elimination of foreign exchange risk have caused the volatility of the Ibex 35 to converge with those of the benchmark indices for European markets, among other consequences. Without doubt this will encourage funds to flow more freely towards those markets where the outlook for returns is most attractive.

This convergence is quite evident from the correlation analysis, the values from which are shown in Table 2. In fact the correlation of homocedastic volatilities over 100 days between the Ibex 35 and the Eurotop 100 is 87% considering the last five years, but as high as 96% where the period considered is only 1999.

The correlation of the Ibex 35 and Euro Stoxx 50 is also very high (97%) and more so where the analysis is confined to 1999, where the resulting value is 99%, which is close to a perfect correlation between the two variables. In both cases, the values taken by the correlation coefficient reflect a closer relationship between the Ibex 35 and the Eurotop 100 than that obtaining between the two pan-European stock market indices for the two time periods considered in the analysis.

A key point to note is that the pan-European indices systematically present lower levels of volatility than the national index considered in the study due to their greater diversification. Nevertheless, a rational investor would reduce risk considerably less by investing in the Eurotop 100 and Euro Stoxx 50 today than would have been the case a few years ago.

Even so, the Euro Stoxx 50 clearly outperformed the Ibex 35 in terms of returns in 1999. Because of this, both individual Spanish investors and funds have increasingly set their sights on Europe. Similar levels of risk and a better outlook for returns make the choice clear.

A further important factor for southern European investors should also be mentioned, though it is exogenous to this study. The euro has opened up a new market for investment with levels of liquidity that would have been unimaginable in these markets only a few years ago. The twin effects of returns/liquidity will probably mean funds will continue to flow from local equities that are not represented in the pan-European indices towards the stocks comprising, for example, the Euro Stoxx 50 in the coming years.

MUTUAL FUNDS IN THE SPANISH FINANCIAL SYSTEM AND THE CALCULATION OF THEIR VOLATILITY

In the context of increasing sophistication among investors, the provision of better financial advice by specialists, the progressive acceptance among the public of the need for an increasing proportion of equities in the make-up of investment portfolios and asset management, as well as social awareness of the possibility of opening up portfolios to foreign markets by including a percentage of cross-border shares and securities, we may ask whether it is possible to prove the financial rationality of using mutual funds as differentiated financial assets rather than investing directly in shares.

One of the main reasons leading us to undertake this study, has been the observation that mutual funds have their own characteristics as financial instruments and these clearly distinguish them as a separate option for investors.

Mutual funds are group investment institutions that seek to attract funds, assets and claims from the public for management purposes through the creation of

portfolios of stocks governed by the principles of safety, returns and liquidity. Mutual funds also achieve other objectives such as, for example, providing finance for firms and industries listed on secondary markets using the funds obtained from the public. In recent years, other assets have emerged as investment options, such as real estate funds, thereby offering greater diversification to investors.

A mutual fund may be described as a way of pooling the assets of a number of different investors, who may be either natural or juridical persons. The pooled assets are administered through a specialist mutual fund management entity known in Spain as a Sociedad Gestora De Instituciones De Inversión Colectiva (SGIIC).

The main advantages of mutual funds within the framework of the Spanish financial system are as follows:

Liquidity: Equity fund (FIM) surrenders are reimbursed within a maximum 72 h, while in the case of money market funds (FIAMM) this period is only 24 h.

Diversification: Investors can include assets with differing maturities and coupons in their fixed interest portfolios, or in the case of equity portfolios they may combine high growth stocks with shares that provide a high dividend yield.

Reinvestment: The majority of the funds compound gains by reinvesting the interest and dividends earned.

Tax benefits: Members of mutual funds enjoy very advantageous tax treatment compared to direct investment. These benefits will be even more marked in Spain as from 2003, when investors will be allowed to switch funds without incurring any tax effects.

Absence of operational problems: Investors who trade directly in fixed interest or equity portfolios need to be aware of interest and dividends collected for the purposes of including this income in their annual tax returns. Members of mutual funds, on the other hand, are not required to declare gains for personal or corporate income tax purposes until the full or partial reimbursement of the units held.

Protection: The saver is protected by legal requirements governing the operations of funds, which are designed to safeguard investors' interests.

Professional management: Investment funds provide the investor with access to professional management, which may be outside the reach of his/her personal investment skills and tools. The investor therefore avoids the need continually to analyse the market and seek relevant information on which to base successful investment decisions. The fund managers are professional analysts working with first class information on all financial markets. They also have the appropriate human resources and financial software.

Fine-tuning of risk: The wide range of investment funds available allow savers to seek out those financial instruments that provide the best fit with the levels of risk they are prepared to incur. The investor therefore needs to consider in detail the aspirations of each fund and the markets in which they invest, a task that can be dealt with by seeking professional advice.

Flexible investment periods: This is also a consequence of the wide range of mutual funds available. On the one hand, differing time horizons are provided by guaranteed funds of various kinds, both in fixed interest and equities. On the other, fixed interest investors have the option of investing in short or long-term funds. In the case of the latter, it is advisable for investors carefully to consider the usual time horizon for the investment in the fund prospectus. Some funds are completely open-ended with regard to the investment period, although riskier funds usually have longer maturities.

Wholesale advantages and returns even investing small sums: Mutual funds provide major economies of scale because they aggregate both small-scale savings and significant personal and institutional assets, all of which are managed together in the financial markets.

In Spain mutual funds have passed through four clearly distinct phases of development. The initial, or growth, phase lasted from 1964 until 1975, featuring the creation of a very large number of funds that were marketed through specialist networks. The second phase from 1976 until 1982 was defined by the stock market crisis in a scenario of world recession, which depressed share prices and the tax reform launched in Spain in 1977, which changed the tax regime governing group investment vehicles. The third phase saw the consolidation of mutual funds in the years between 1983 and 1991. It was notable for the rapid growth in the number of mutual funds launched, as well as the volume of assets. The fourth phase began in 1991 and continues to date. This has been a period of expansion, beginning with tax changes implemented in 1991, which considerably improved the tax profile of gains. This period has also seen the launch of new products, such as the Fondtesoros, a type of fund that specialises in investments in government debt.

Table 3: Average returns on different classes of mutual fund at 31 August 2000

Variase	1 Year	3 Years	5 Years
Mixed equity funds (FIM):	11.36	11.92	16.02
Spanish equity funds (FIM):	14.12	17.58	23.3
International mixed equity funds (FIM)	18.63	13.11	15.27
Euro equity funds (FIM):	29.58	23.37	26.07
International equity funds (FIM):	40.74	22.48	22.25
Total Funds	6.77	5.86	7.01
Average annual inflation	3.6	2.6	2.7

Source: Inverco

The mutual funds industry has grown spectacularly in Spain in recent years. At 31 August 2000 the total assets vested in equity funds amounted to _198,110 million with a total of 7,850,054 members. The returns obtained on these financial products have also been very attracted, particularly in the various types of equity funds.

Table 3 is a ranking prepared by INVERCO, (the Spanish Association of Group Investment and Pension Fund Institutions), at 31 August 2000 reflecting exclusively the various categories of equities-based mutual funds depending on investment goals and the average returns generated by each compared to the average return on all existing funds (including Spanish and international guaranteed funds, money market funds-FIAMM- and short-and long-term pure and mixed fixed interest funds), as well as average annual inflation rates.

The specific criteria defining each class of fund are as follows:

Mixed equity funds (FIM): These funds invest between 30 and 75% of their assets in equity stocks. The majority of assets must be held in euro currencies with a maximum of 30% in non-euro investments.

Spanish equity funds (FIM): These funds invest of 75% of their assets in listed Spanish stocks, including assets issued by Spanish firms listed on overseas markets. The net investment in Spanish equities must be at least 90% of the variable interest portfolio. The majority of assets must be held in euro currencies with a maximum of 30% in non-euro investments.

International mixed equity funds (FIM): Equities must make up between 30 and 75% of the total portfolio. Over 30% of assets are held in non-euro currencies.

Euro equity funds (FIM): These funds invest at least 75% of their assets in equity stocks. The net investment in Spanish equities may not exceed 90% of the variable interest portfolio. The majority of assets must be held in euros with a maximum of 30% in non-euro investments.

International equity funds (FIM): These funds invest at least 75% of their assets in equity stocks. Over 30% of assets are held in non-euro currencies.

At 31 August 2000, the mutual funds had generated a weighted average returns of 6.77% over the past twelve months. The highest returns over the twelve-month period were those obtained by International Equity Funds (40.74%), Euro Equity Funds (29.58%) and International Mixed Equity Funds (18.63%).

The very high returns obtained by the various classes of mutual equity fund, together with the opportunity to reduce risk through their diversified portfolios of financial assets, represent one of the main reasons for pursuing this line of research.

Having briefly reflected on the attractions and characteristics of mutual funds and before going on to compare them against the benchmark indices, let us first discuss the method used to calculate the volatility of equity funds and explain why this methodology was chosen for the study.

The basic question involved is the periodicity of the calculation. Since mutual funds publish daily data, including on public holidays, would it not be more appropriate to choose a methodology to establish the annual volatility of a fund based on a calculation over the 365 calendar days of the year rather than using the 250 business days. The same question might also be asked with regard, for example, to monthly volatility, or indeed to any other relevant period.

This question requires us to take the difference between the settlement value of mutual fund units on non-business in the stock market into consideration as compared to the preceding calendar day, which is none other than the proportional allocation of the fund's management charges for that day. Thus, if management charges are 3%, the difference with be just 3%/365.

The daily movement of any equity market in the world is certainly higher than such an amount. Hence, if volatility were calculated on this basis, it would be understated.

By way of example, we have reconstructed the calculation of annual and monthly volatility for a mutual fund investing in European stocks.

Figure 3 shows a comparison of volatility over 365 calendar days and 250 business days.

In this example case, the average volatility over 250 business days was 26.45% compared to 22.37% over 365 days. It is clear, then, that the latter figure is systematically understated.

Figure 4 shows that the same phenomenon is present in the case of monthly volatility.

The average volatility over 30 days was 19.81% compared to 22.20% over 20 days and the understatement is once again apparent.

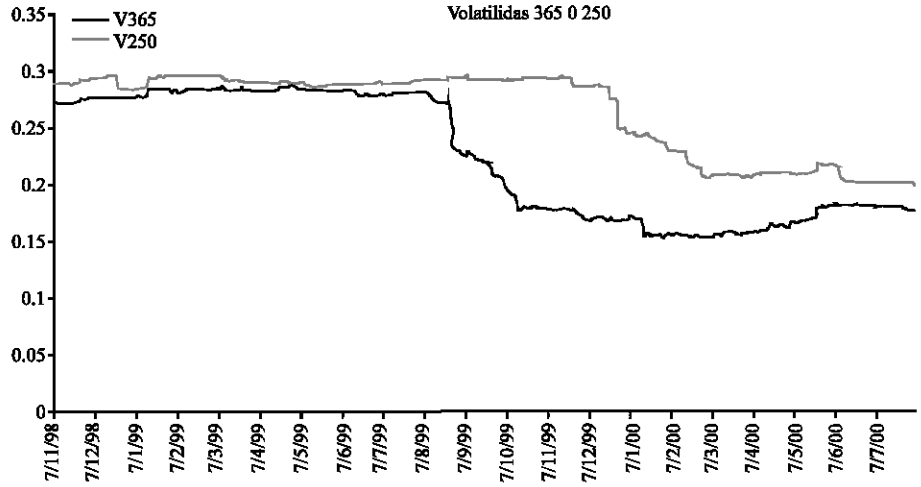

Fig. 3: Comparison of volatility data calculated for an mutual fund over 365 calendar days or 250 business days with management charges of 3%

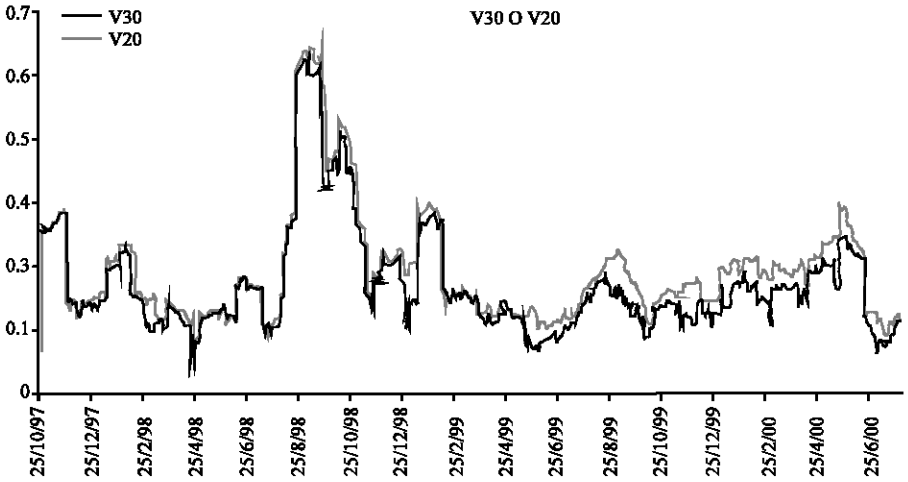

Fig. 4: Comparison of volatility data calculated for an mutual fund over 30 calendar days or 20 business days with management charges of 3%

It seems clear, then, that the most appropriate method for equity mutual funds is to employ business days, primarily because the daily volatility of the markets is higher than the proportional allocation of management charges. This has been shown to be the case for equity portfolios above, although the same considerations are evidently applicable elsewhere, including the fixed-interest markets.

From the standpoint of financial rationality, no investor would be prepared to purchase units in a fund that charged a daily commission that was above the market's potential movement on any given day, since the fees incurred would eliminate any prospective gain in the market. For papers discussing financial rationality in the context of various European indices, the reader is referred, inter alia, to Shachmurove (2001).

Secondly, it would seem prudent to select the method resulting in the highest risk measurements. It might be asked in this connection whether the financial press does not underweight the risk of investment in mutual funds, since it uses an apparently erroneous methodology, including in the volatility calculation market sessions in which no movements are recorded.

In later sections of this paper we shall, in fact, explain that the belief of many investors that mutual funds are subject to lower levels of risk than the relevant equities

markets is not always true. This may, in part, be due to the selection of volatility calculation methods that are not always appropriate.

The next question connected with volatility is the calculation period. In the section on the comparative volatility of stock market indices we explain the use of a period of 100 (business) days, since this interval best reflects the risk parameters for equity investments, although the relationship between returns and volatility is not always maximised in the time frame. It may be related with investors' conduct and the average period over which purchase or sale transactions for the same value are usually carried out.

It would, in any case, seem that longer periods should be employed in the analysis of mutual funds because, as we have already explained, the investment is optimised over a more extended term, not only in view of tax benefits, though these are declining, but also due to the costs arising in respect of fund management and surrender units, which make it inadvisable for the investor to purchase or sell units frequently.

The following sections of this paper examine volatility over 250, 100 and 20 days in light of the above considerations. This study leads to interesting findings regarding the optimisation of the risk/return relationship.

THE IBEX 35 AND SOME MUTUAL FUNDS THAT BENCHMARK IT

Although the ultimate utility of an index is its ability to measure the performance of a market, asset managers have made increasingly intensive efforts to define beta one hedging instruments, arbitrage operations and so on based on indices, redefining their role as basic management tools.

Indices are also used as basic comparative factors in the assessment of the results obtained from a variety of investment instruments, such as baskets of stocks, by weighting the value of the securities held in portfolios on the basis of their situation in the benchmark index, or stock picking (i.e., selecting stocks that outperform the benchmark). They are also applied to benchmark remuneration policy for many mutual and pension fund managers, whose earnings are based on their success in comparison to the selected index, which thus performs the role of a target.

It is in the context of this philosophy that we have carried out the empirical study described in the following sections of this paper, where we concentrate on two samples of equity-based mutual funds which are respectively benchmarked against the Ibex 35 and Euro Stoxx 50 indices.

Taking into account that diversification is not so much a matter of the quantity as of the quality of the financial assets selected to spread the risk of investment portfolios, we may consider this study as an attempt to model the behaviour of a mutual fund unit holder through the known parameters of risk and return affecting direct investment.

Let us now turn to consider the representative index for the Spanish financial markets and three investment funds that use it as a benchmark to commence our analysis of the evolution of the parameters considered in this study using inductive methods. In the first place, we shall focus on historical homocedastic volatility calculated over 250 days.

Table 4 shows the results obtained from our analysis of the correlations between the volatilities of the three funds themselves over 250 days and in comparison to the Ibex 35.

The results contained in Table 4 are interpreted as follows: the first column reflects the dependent variable, while from the second on the remaining columns contain the independent variable in a linear regression containing quadratic minimums. The values reflected in each box are the R^2 coefficients expressed as a percentage of the regression. For example, the correlation between the annual volatility of the IBEX 35 and the Deutsche Bank fund is 77.70%.

The first conclusion we may draw from the contents of Table 4 is that the annual volatilities of the funds considered is very closely correlated with that of the benchmark index. The value linking the annual volatility of the Ibex 35 with that of the BBVA fund is particularly high (96.41%).

A graphic illustration of the evolution of the four funds' historical homocedastic volatilities over 250 days also provides interesting results (Fig. 5).

The first conclusion is clear. It is possible to obtain a lower level of risk by investing in funds that replicate the index over long periods of time rather than investing directly. In fact, the three funds chosen at random outperformed the index approximately until the month of September. Table 5 shows that the average volatility for the period in which observations of the three funds are available is even lower for one (the Deutsche Bank fund) than for the index itself.

At this point, we need to establish whether the returns generated by the mutual funds is substantially different for the Spanish stock market index in the medium and long term. Once again, we have performed a financial analysis using the maximum number of values for which data are available on the mutual funds considered. The results of this econometric analysis, represented in Fig. 6, are very revealing.

Table 4: Correlations between volatilities (250 days) and returns

	Correlations between volatilities over 250 days			Correlation between returns on the Ibex 35 and mutual funds		
	BBVA f	Deutsche Bank f	AB Asesores f	BBVA fund	Deutsche Bank f	AB Asesores f
Ibex 35	96.41	77.70	82.57	96.61	76.64	95.46
BBVA fund		88.97	89.48		83.72	96.43
Deutsche Bank f			86.77			79.13

Table 5: Average annual volatility of mutual funds and the Ibex 35

Ibex 35	BBVA fund	Deutsche Bank fund	AB Asesores fund
26.18	27.10	25.20	27.40

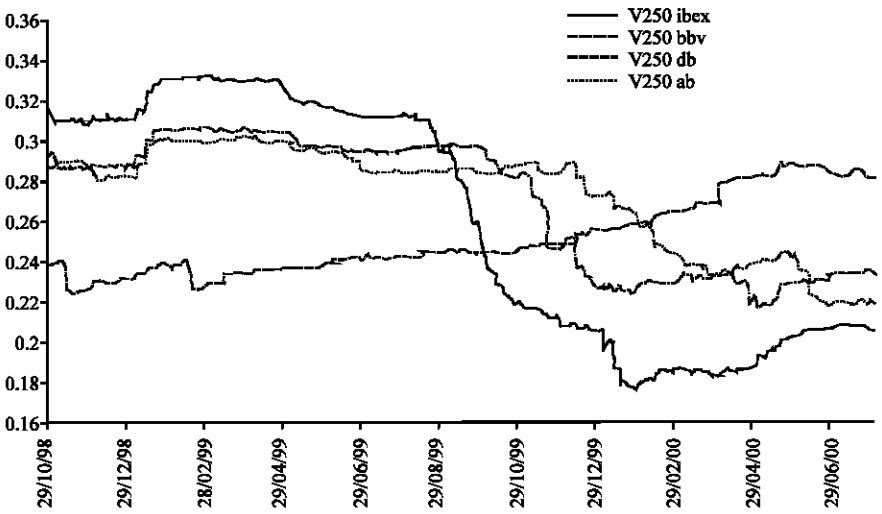

Fig. 5: Comparison of the annual volatilities of the Ibex 35 and certain mutual funds benchmarked against that index

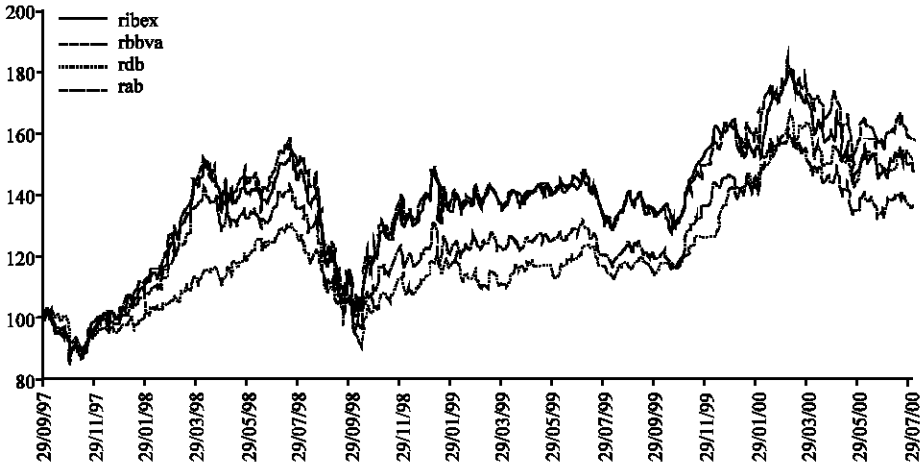

Fig. 6: Comparison of returns on the Ibex 35 and certain mutual funds using the index as a benchmark. Base 100 = 29/07/97

Graphically, the close correlation between the returns analysed is absolutely clear. The BBVA fund is practically a replica of the index itself, while movements in the Deutsche Bank and AB Asesores funds were at times slightly further out of line with the benchmark.

These results are confirmed by the conclusions reached from the analysis of correlations between the series of returns. Table 4 shows the high correlations existing between returns for the Ibex 35 index and the mutual funds considered. The high R^2

value of 96.61% obtained when the index is related with the BBVA fund stands out here.

Closer analysis of the Deutsche Bank fund reveals that the returns generated over the period considered were practically the same as those of the Ibex 35. Also, this fund presents lower volatility than the Spanish index (a value of 25.20% compared to 26.18% for the Ibex 35, Table 5). Consequently, a rational investor would more easily have achieved efficiency by investing in this instrument than in the index itself. Furthermore, it would be no easy task for a private investor to replicate the Ibex 35. This is a first indication of the financial rationality of mutual funds, regardless of other tax considerations.

Let us now go on to perform the same econometric analysis of historical homocedastic volatility calculated over 100 days. The results of this study are shown graphically in Fig. 7 and analytically in Table 6.

Where the calculation period is 100 days, the correlations between volatilities of the mutual funds decline compared to the benchmark, in some cases drastically. This may be a reflection of decisions on the part of the fund managers to keep a higher proportion of their investments in liquid assets or cash. This possibility would, for example, explain why the Deutsche Bank fund was substantially less volatile at times when market prices where moving within a fairly narrow band, as was the case for most of 1999. A second possible reason for the phenomenon would be that the funds assets were to a greater extent invested in one specific sector. This would explain both the volatility of the Deutsche Bank fund and the fact that returns increased faster than those of the Ibex 35 during this period. These effects could have been due to a higher proportion of investment in the technology sector by the mutual fund than in the Ibex 35.

To complete the analysis, we have also examined short-term volatility over a monthly period, basing our calculations on 20 business days for the reasons given above.

Considering Fig. 8, it appears that the 20 day volatilities for all of the mutual funds were basically similar to that of the Ibex 35, with the exception once again of the Deutsche Bank fund.

The findings reached from the graphic analysis are also reflected in the relationships between volatility correlations over this period, the values for which are given in Table 6.

The values of the correlations calculated over 20 days are lower than the levels for the 100-day period.

The lowest values arise in the correlation coefficients for relationships between the Deutsche Bank mutual fund with the other two. In particular, the lowest value for all R^2 is 16.59%, indicating that the volatilities of this fund and the Ibex 35 is very limited over 20 days.

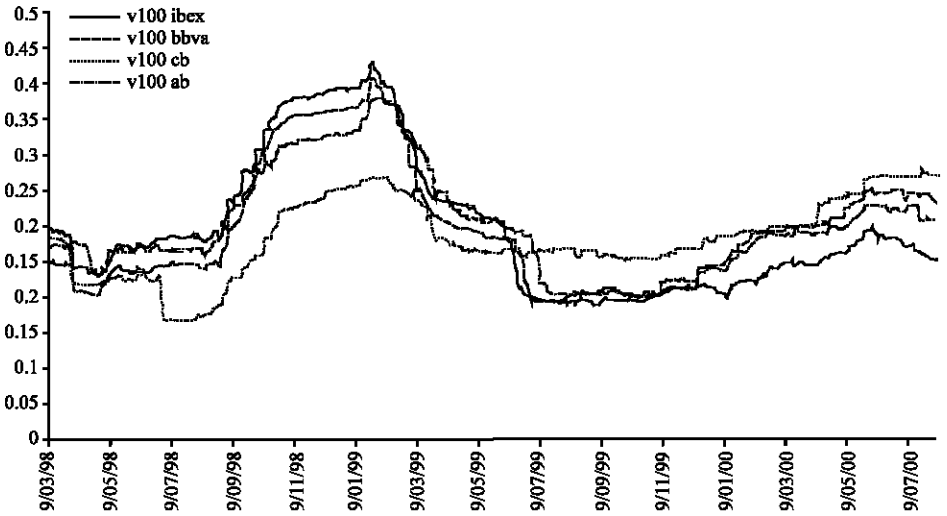

Fig. 7: Comparison of volatilities over 100 days of the Ibex 35 and funds benchmarked against the index

Table 6: Correlations between volatilities over 100 and over 20 days

	Correlations between volatilities over 100 days			Correlations between volatilities over 20 days		
	BBVA f	Deutsche Bank f	AB Asesores f	BBVA fund	Deutsche Bank f	AB Asesores f
Ibex 35	84.02	18.84	89.63	78.96	16.59	85.18
BBVA fund		49.19	91.71		38.66	88.06
Deutsche Bank f			35.47			27.9

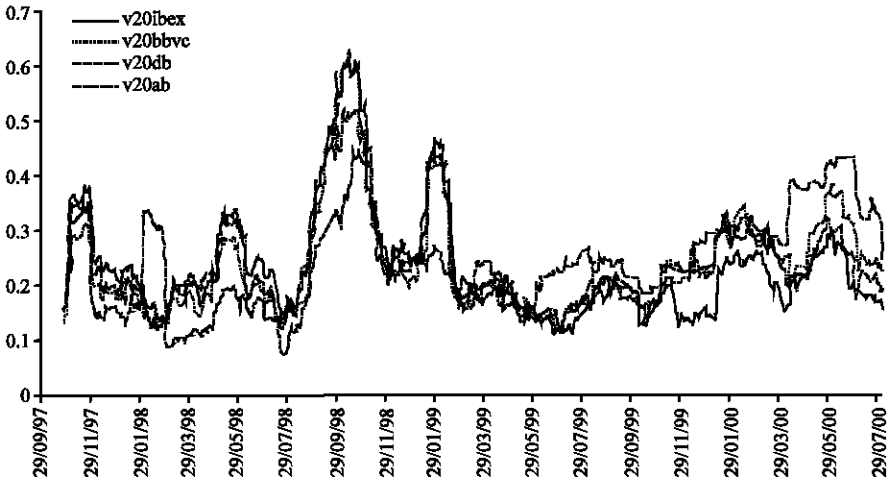

Fig. 8: Comparison of volatilities over 20 days of the Ibex 35 and funds benchmarked against the index

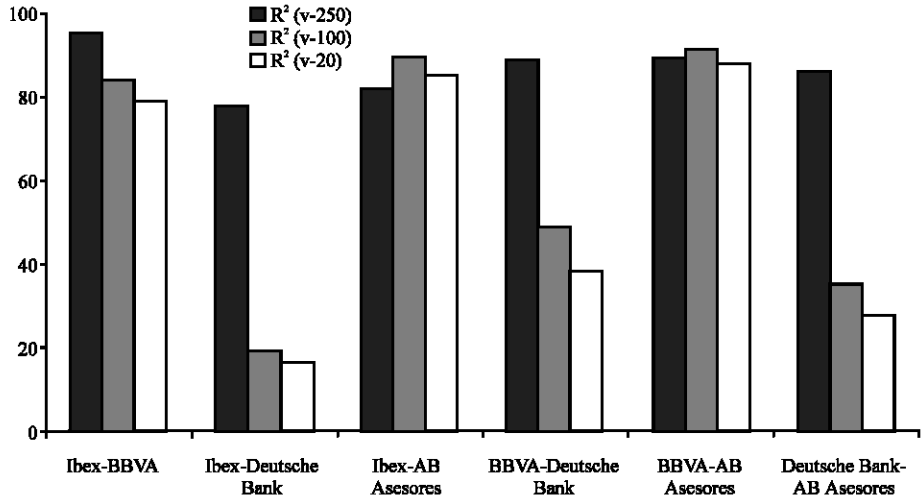

Fig. 9: Correlation coefficients of regressions between volatilities at 250, 100 and 20 days for pairs of related portfolios

For this short period of analysis, there is once again evidence that risk characteristics may differ substantially between mutual funds using the same market benchmark and significant differences may arise with regard to the variability and risk inherent in the indices used.

It thus appears that the shorter the calculation period applied in the comparative analysis, the clearer and more significant these differences are, with a few exceptions, as can be seen in Fig. 9.

EURO STOXX 50 VERSUS DIVERSIFIED EUROPEAN INVESTMENT FUNDS

In the context of international financial diversification, the initial objective is to seek to expand opportunities for investment, diversification and performance by tapping into international markets, the basic premise being that the financial decision-maker is rational and, therefore, prefers higher returns to lower returns and lower to higher risk. There is a trade-off between these two factors. This means that one cannot obtain the prospect of higher returns without being prepared to accept increasing levels of risk.

Applying these considerations to the field of equity investment and, specifically, to equity mutual funds, it should be remembered that the advent of the euro has changed benchmarking procedures.

Tying in with the conclusions of the section in which we analysed pan-European indices, the appearance of numerous investment funds benchmarked against the

Euro Stoxx 50 (at the end of 1999 an average of 30% of the assets of Spanish funds were invested in Euro Stoxx) bears out and confirms the assertion that the Dow Jones Euro Stoxx 50 has won its war with the Eurotop 100. Among the main reasons for this are the excessive number of stocks comprising the latter index and the presence of non-euro exchanges.

The clear fact is that the DJ-Euro Stoxx and its divisions are more important than the EASDAQ or the sector divisions of the Eurotop 100, providing further evidence that Europe lags behind the USA.

Following these reflections, the rest of this section will seek to establish whether the results obtained for the individual European stock market index analysed are repeated for mutual funds benchmarked against the pan-European Euro Stoxx 50 index.

The graphic presentation of the financial analysis of annual volatility (Fig. 10) seem to some extent to contradict the results obtained for the same period in the case of the Ibex 35.

Annual volatility data are obtained for all of the funds considered and the index for this period and on this basis it appears that the volatility of the funds is less likely to be lower than that of the benchmark.

Calculating the average volatility of all of the series considered provides the results shown in Table 7, where it is clearly apparent that the lowest value is that of the benchmark index.

Table 8 presents the R^2 for the linear correlations between annual volatilities.

The resulting R^2 is very much lower than was obtained in the case of the Ibex 35 with the sole exception of the ABN fund. We may wonder whether this is also so at the level of returns. Table 8 presents these results.

The results of the analysis confirm that the evolution of returns is independent from that of volatility. Apparently, fund managers seek to obtain similar, or at least linked, returns to those of the benchmark, but may do so using considerably less efficient methods. It is

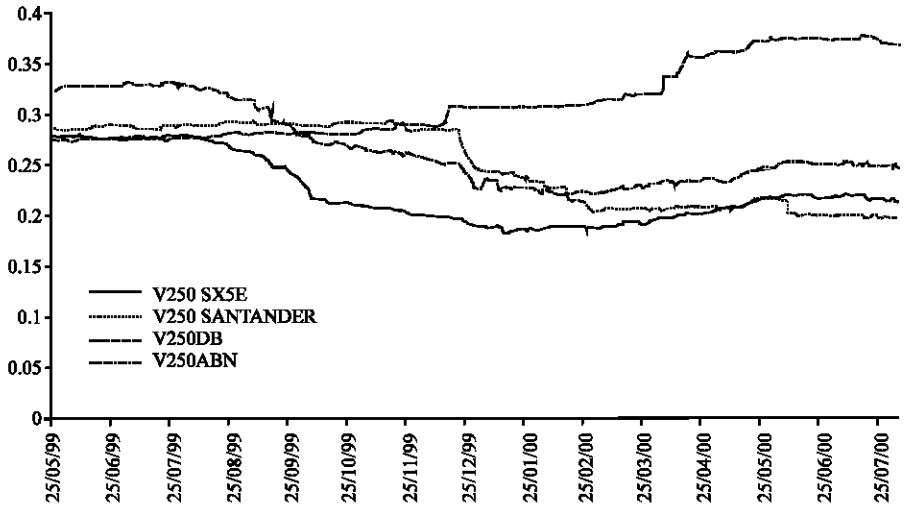

Fig. 10: Comparison of volatilities over 250 days of the Euro Stoxx 50 and funds benchmarked against the index

Table 7: Average annual volatility of the Euro Stoxx 50 and mutual funds

Euro stoxx 50	Santander fund	Deutsche bank fund	ABN fund
22.62	25.03	31.17	26.89

Table 8: Correlations between volatilities (250 days) and returns

	Correlations between volatilities over 250 days			Correlation between returns on the Euro Stoxx 50 and mutual funds		
	Santander f	Deutsche bank f	ABN Fund	Santander f	Deutsche bank f	ABN Fund
Euro stoxx 50	54.84	46.28	95.19	95.02	97.32	96.79
Santander fund		84.10	57.97		93.00	92.84
Deutsche bank f			38.11			90.5

likely that the strategy of the mutual funds considered was based on investment in high return stocks involving a significantly greater risk.

Figure 11 illustrates that it is also very difficult to generate consistently better returns than those of the Euro Stoxx 50.

We may draw the following conclusions from these results:

- Considering a time horizon of one year it is unlikely that a mutual fund will systematically achieve lower volatilities than the Euro Stoxx 50 and, by the same token, it seems far from easy that higher returns than those of the index will be generated from investment in such financial instruments.
- Given the make-up of the Euro Stoxx 50, an index in which no single stock exceeds 10% of the total compared to much higher percentages for certain stocks in Spain (the typical example is the Telefónica Group, which accounts for some 30% of the Ibex 35), it is very difficult to replicate. This may explain why managers find themselves obliged to take punts on certain high return but also high risk stocks.
- On the basis of an analysis of the results obtained, it seems the mutual funds' tendency to keep a part of their investment in liquid assets and the difficulty of replicating the benchmark far from reducing volatility may have the contrary effect. This is because these factors oblige fund managers to accumulate certain higher risk stocks to compensate for the part of the investment held in liquid assets.

The results for the 100-day analysis are shown in Fig. 12.

In this period too, it is plainly difficult to outperform the index in terms of volatility. However, the occasional mutual fund, in this case the Santander vehicle, may temporarily achieve lower volatility than the Euro Stoxx 50. The average volatility of this fund (25.15%) is not in fact far of the average for the benchmark, which is 24.68%. The value of this parameter is, however, considerably higher for the other mutual funds, reaching 31.30 and 29.01% for the Deutsche Bank and ABN funds.

On the basis of the data set out in Table 9, the correlations in general reflect a looser relationship with the benchmark, with the exception of the Santander fund, where the correlation is closer. This result is consistent with its lower volatility over this period.

The results obtained for volatility over 20 days are consistent with those obtained in Spain alone in the analysis of the Ibex 35 and the funds that take it as a benchmark.

The results of the accompanying financial analysis, which are shown in Fig. 13, reveal that more funds succeeded in staying below the volatility of the index in more periods. Once again, the effect of liquidity retirements become apparent in the shorter periods analysed.

The results contained in Table 9 show the lower correlation of pairs of equity funds as compared to the values obtained for the other periods analysed (Fig. 14).

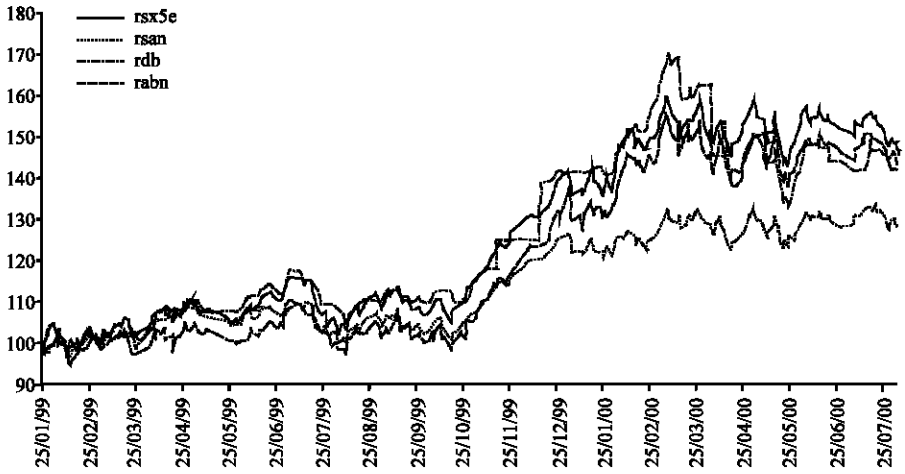

Fig. 11: Comparison of returns on the Eurostoxx 35 and certain mutual funds using the index as a benchmark. Base 100 = 25/01/99

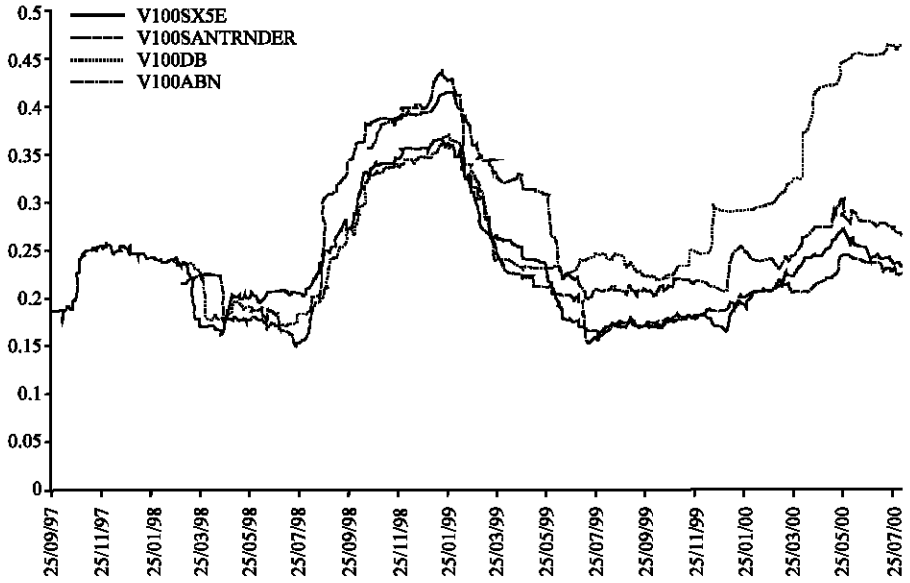

Fig. 12: Comparison of volatilities over 100 days of the Euro Stoxx 50 and funds benchmarked against the index

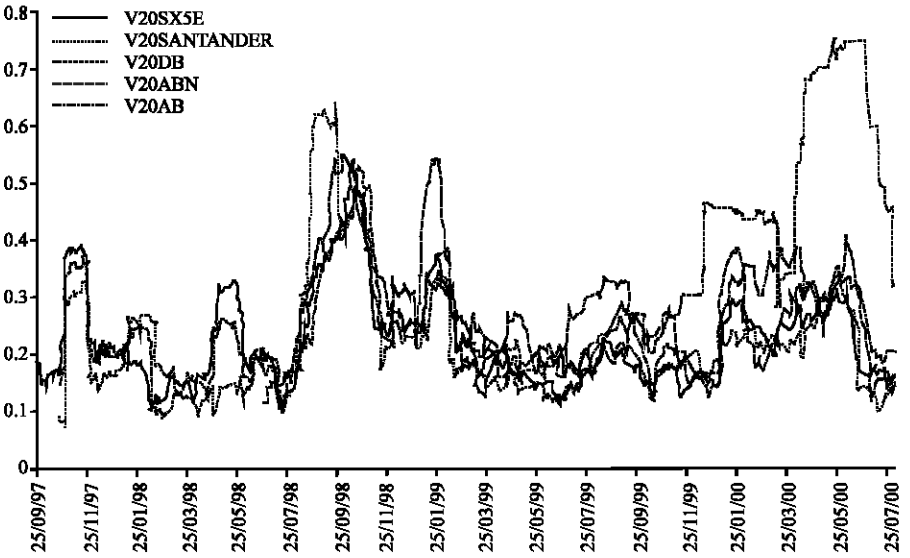

Fig. 13: Comparison of volatilities over 20 days of the Euro Stoxx 50 and funds benchmarked against the index

Table 9: Correlations between volatilities over 100 and over 20 days

	Correlations between volatilities over 100 days			Correlations between volatilities over 20 days		
	Santander f	Deutsche bank f	ABN Fund	Santander f	Deutsche bank f	ABN Fund
Euro Stoxx 50	87.46	29.52	95.09	53.83	18.08	77.83
Santander fund		21.30	89.47		14.45	57.98
Deutsche bank f			14.28			9.11

Volatility over 20 days continues to be higher in the mutual funds. For this period, the average volatility of the Euro Stoxx 50 is 23.72%, while the volatilities of the Santander, ABN and Deutsche Bank funds are 24.13, 27.78 and 34.50%, respectively.

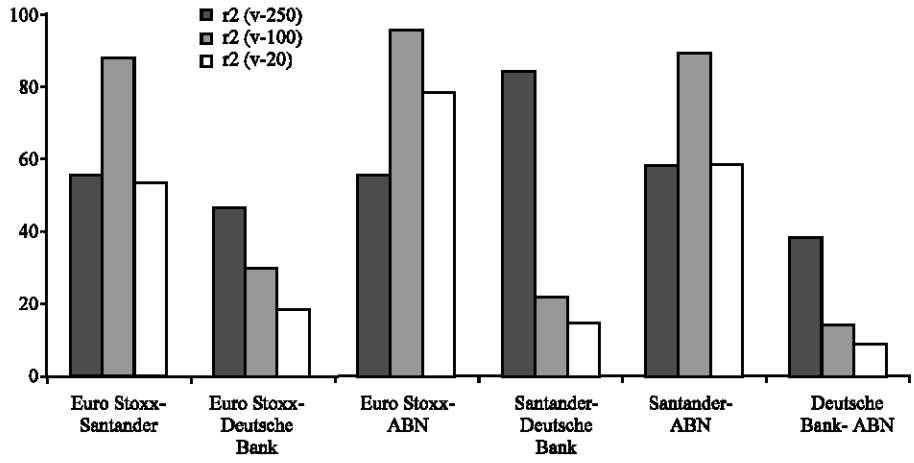

Fig. 14: Correlation coefficients of regressions between volatilities at 250, 100 and 20 days for pairs of related portfolios

Key findings from our comparative analysis of the performance of the Euro Stoxx 50 and the mutual funds using it as a benchmark are as follows:

- It is very difficult to outperform the Euro Stoxx 50 either in terms of returns or of volatility, mainly because it is so difficult to replicate, though probably also because it is a low volatility index as compared to other equity indices.
- Lower volatilities than those of the index may be achieved short term in certain periods. The effects of liquidity and active management are apparent, for example, in periods where the market is falling.
- It is not possible to assert, at least we have found no evidence among the mutual funds considered, that investment in Euro Stoxx 50 funds meets all the criteria of financial rationality. Funds do not outperform the benchmark over longer periods either in terms of risk or returns and investment by individuals using these vehicles can only be justified in terms of the difficulty of replicating the index and inadequate market information.

CONCLUSIONS

The main conclusions that may be drawn from the study are as follows:

Levels of volatility in the Eurotop 100 and the Euro Stoxx 50 are very similar and the correlation between the two is extremely close.

Thus, the advent of the euro and the elimination of foreign exchange risk have caused the volatility of the Ibex 35 to converge with those of the benchmark indices for European markets, especially since 1997.

The high returns of equity funds and the considerable possibility of achieving a reduction of risk through such portfolios of diversified assets explain the enormous demand generated and their rapid emergence in the last decade of the 20th century.

The legislation in a number of countries requires that the settlement value of mutual fund units be published on a daily basis, including public holidays. This requires a change in the traditional parameters used in volatility calculations. The empirical evidence, not to mention financial rationality, clearly suggests that volatility should be calculated on the basis of business days in the market (250 days) and not calendar days.

The tax benefits of investment in mutual funds crystallise over the long term, while individual stock investments may often have a much shorter duration. In this light, we may ask whether the benchmark volatility for the investor in funds should not therefore be estimated over a longer period than would be the case for investment in shares. In any event, it is plain that the nature of the investor and his/her knowledge of the market are important factors in the choice between mutual funds and direct investment, in view of the differing evolution of risk and returns between these two vehicles.

Our analysis of the relationship between returns and volatilities in the funds and benchmark indices reveals that in certain cases the parameters may even be better than in the case of direct investment.

The general belief that investment funds are less volatile than direct investment is unfounded. This depends rather on the management of the fund, which may at times result in volatilities that are higher than those of the benchmark. What is clear is that certain advantages may sometimes be gained from investment in mutual funds, both in tax terms and at the level of risk and returns.

The closest correlations between volatility and daily returns are obtained over period of 250 days, with some exceptions.

The volatility of some mutual funds is hardly related at all to their benchmark indices. The risk inherent in the funds may therefore be substantially different from that of the benchmark, although returns are frequently closely correlated.

The difficulty of lowering the investment risk using mutual funds increases where the benchmark index is harder to replicate.

Where there is a prolonged bull market, or in markets where volatility is low, it is very unlikely that funds will achieve lower volatilities than the benchmark. At moments of stock market exuberance, fund managers are highly unlikely to outperform the benchmark, whereas changes in the portfolio made by managers at times where the market is stable will push the fund's volatility above that of the relevant index.

The basic features of mutual funds, such as their need to hold a part of their funds in liquid assets due to market conditions and legal requirements, are reflected in significant differences in volatility and lower returns compared to stock market indices. This effect is more clearly apparent the shorter the calculation period.

Mutual funds may be considered as specific, separate financial instruments for all purposes. Specialist management ensures that they are related to their benchmark indices, but the distribution of returns and volatility may differ significantly from that of their components.

There is clear evidence that the boundaries of efficiency may be improved through investment in professionally managed mutual funds in certain markets and for certain fund managers.

Mutual funds enable the investor to obtain returns that are equal to or higher than the benchmark and sometimes at lower levels of risk. And of course, these vehicles do not involve the inherent difficulty of replicating a stock market index for the private investor. The problem is, then, to recognise the best fund managers, who will optimise the investment and obtain the greatest benefits in terms of performance and financial diversification.

This study uses an empirical/inductive methodology rather than a hypothetical/deductive approach. Accordingly, it is not possible to extrapolate general conclusions that would be universally accepted and results are restricted to the contingent and chronological framework of the research.

ACKNOWLEDGMENTS

This paper forms part of GIECOFIN Group's (Enterprise Economic and Financial Working Group) research in connection with Spanish Ministry of Education and Science Project SEJ2006-04208, as well as the University of Zaragoza Project 268-93 and the Savings Bank Ibercaja Projects 268-96 and 268-128.

Any possible errors contained in this paper are the exclusive responsibility of the authors.

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