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The performance of the European Stock Markets: a time-varying Sharpe ratio approach

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The performance of the European Stock Markets: a time-varying Sharpe ratio approach

José A. Soares da Fonseca

Abstract

This article studies the performance of the national stock markets of sixteen European countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Holland, Ireland, Italy, Norway, Portugal, Spain, Sweden Switzerland and United Kingdom), using daily data covering the period between 2nd January 2001 and 30th May 2009. Daily expected returns, and the conditional volatility of each index, were calculated using a model combining the market model and an implicit long-term relation between the index prices. Finally, time-varying (conditional) Sharpe ratios were calculated for each index. These were used as the basis for a statistical comparison of the performance of the stock indexes of this group of countries, throughout different sub periods corresponding to different conditions (of expansion and depression) in the stock markets.

Keywords: expected return, Sharpe ratio, market model, conditional volatility

JEL Classification: F36, G15

Introduction

This piece of research investigates the daily excess expected returns from sixteen European stock markets, and their conditional variance, in order to calculate time-varying Sharpe ratios, which are used to measure the performance of these stock markets between the beginning of 2001 and the middle of 2009. The use of these time-varying ratios allows a comparison between performance in different conditions (of growth and of contraction) for each market.

Simultaneously, these ratios are also used to evaluate the proximity of the performance between these countries under different market conditions. The stock markets under analysis, represented by their national stock indexes, are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Holland, Ireland, Italy, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

In order to calculate daily time-varying Sharpe ratios for each market, we estimated the daily expected return and the conditional volatility of each market, using a model specified to include both a European market model, and an implicit long-term relation between the levels of the national and the European indexes. The estimations were carried out assuming the hypothesis that the volatility of the stock return follows a GARCH model from which the conditional volatility can be obtained. It is the joint predictability of the expected return and of the conditional volatility that allows the calculation of the time varying Sharpe ratios.

The inclusion of an implicit error correction model in the econometric procedure enables us to take into consideration methodology of financial integration analysis in which co-integration methods are used for the empirical analysis of stock market integration. On the other hand, the fact that the Sharpe ratios are calculated for a market portfolio, as is the case in this article, they can be defined as market prices of risk, in agreement with Leland (1999) and Adcock (2007). This also makes the methodology used in this article close to asset pricing models. In fact, in the approach to financial market integration based on the asset pricing models, which began with the seminal article of Solnik(1974), financial market integration is considered as being verified when the same asset pricing model can be applied to a group of domestic capital markets. The initial model of Solnik, which consisted of a world capital asset pricing model containing a world market price of risk, was later taken further by other authors, such as Stehle (1977) Jorion and Schwartz (1986) to include both a domestic and a world market price of risk. The hypothesis of market efficiency contained in capital asset pricing models has caused problems in the empirical analysis based on these models, because it is often contradicted by empirical results. This is one of the reasons why, in some more recent research, co-integration models have become popular in the empirical analysis of financial market integration. Co-integration provides a tool for measuring the interdependence between a domestic stock market and an international stock market both in the long- and short-terms. Additionally, co-integration models also take into account the influence exerted by lagged changes of the variables over their current changes, which is observed in the cases in which market efficiency is absent. First studies on the subject of European stock market integration using the co-integration approach were published early in this decade. Rangvid (2001) and Miloudi (2003) used co-integration methods as a tool for evaluating the integration of the European stock markets in the years before the launch of the single currency. Other studies, such as those of Kasa (1992), Arshanapalli and Doukas (1993), and Richards (1995) also applied co-integration to evaluate the integration of non-European stock markets.

The econometric method used and the theoretical background for the calculation of the time varying Sharpe ratios

In this research each national stock market is represented by its national MSCI (Morgan Stanley Capital International) Index, expressed in euros, and using daily data which covers the period between 1st January 2001 and 31st May 2009, and comprises 2195 observations of each national index. The European Index (MSCI) and the European Overnight Interest Average (EONIA) are the two other variables used in this research, also using daily data and covering the same period as the others. Prior to econometrical testing, each index series was transformed giving the base 100 on 2nd January 2001 for all the series.

The logs of these new series were consequently calculated and used in the estimations.

The model on which the estimation of the expected returns for each of the national index is based combines a European market model, and the long-term relation between the national index and the European index. The representation of the European market model is given by:

$$R_{i,t} = \alpha_i + \beta_i R_{E,t} + \varepsilon_{i,t} \tag{1}$$

where $R_{i,t}$ and $R_{E,t}$ are the return of the national portfolio and the return of the European portfolio over period t respectively, and $\varepsilon_{i,t}$ is the error term, which has, by hypothesis, a zero mean. Taking the operators of mathematical expectations, the representation of the market model becomes:

$$E_t(R_i) = \alpha_i + \beta_i E_t(R_E) \tag{2}$$

where $E_t(R_i)$ is the expected return of the domestic portfolio (index) over period t, and $E_t(R_E)$ is the expected return of the European portfolio (index) also over period t.

The inclusion of the long-term relation between the national index and the European index is based on the error correction model of Engle-Granger (1987). Our tests were conducted using the logs of the index prices, which, from now on, will be represented in this paper by $p_i = \log(P_i)$. Thus, the error correction model takes the following form:

$$\Delta p_{i,t} = a_{1t} + a_{i,e}\left(p_{i,t-1} - \varphi_0 - \varphi_1 p_{E,t-1}\right) + \sum_{j=1}^{L} a_{11,j}\Delta p_{i,t-j} + \sum_{j=1}^{L} a_{12,j}\Delta p_{E,t-j} + \varepsilon_{i,t} \quad (3).$$

which means that the current change in the price log of the i index at period t, $\Delta p_{i,t}$,is explained by the lagged deviation of its value relative to the long-term relation with the log of European index, and by L lagged changes of the price logs of both of the domestic and the European indexes. As the changes in the price logs are the returns of the portfolios, the error correction model can take the following form:

$$R_{i,t} = a_{1t} + a_{i,e}\left(p_{i,t-1} - \phi_0 - \phi_1 p_{E,t}\right) + \sum_{j=1}^{L} a_{11,j} R_{i,t-j} + \sum_{j=1}^{L} a_{12,j} R_{E,t-j} + \varepsilon_{it} \quad (4)$$

In the empirical analysis conducted in this article the hypothesis that the returns of a national index are determined by twice the influence of the market model, and of the error correction model, is tested. The combination of both influences are given by the following:

$$\begin{aligned} R_{i,t} &= \varpi_1\left[\alpha_i + \beta_i R_{E,t}\right] \\ &+ \varpi_2\left[a_1 + a_{i,e}\left(p_{i,t-1} - \varphi_0 - \varphi_1 p_{E,t}\right) + \sum_{j=1}^{L} a_{11,j} R_{i,t-j} + \sum_{j=1}^{L} a_{12,j} R_{E,t-j}\right] + \varepsilon_{it} \end{aligned} \quad (5)$$

where ω_1 and ω_2 are the weights, respectively of the market model and of the error correction model, in the explanation of the daily return of the national index. The following equation was assigned to this model for econometrical estimation:

$$R_{i,t} = \alpha_i^* + \beta_i^* R_{E,t} + \varphi_1^* p_{i,t-1} + \varphi_2^* p_{E,t-1} + \sum_{j=1}^{L} a_{11,j}^* R_{i,t-j} + \sum_{j=1}^{L} a_{21,j}^* R_{E,t-j} + \varepsilon_{it} \quad (6)$$

As Adcock (2007) notes, it is common practice to embed the beta (market) model in models with auto-regressive and/or moving average terms, which also take in consideration the hypothesis of ARCH/GARCH effects. That is the case of the model tested in the present piece of research. The main advantage of this econometrical procedure is that it makes evident, simultaneously, and through the estimates of the coefficients, the importance of the European market model in the explanation of the daily returns of each national index, and the influence exerted by the prices or the lagged returns**.** The hypothesis that the conditional variance follows a GARCH model has also been considered in the tests. Thus, the estimation was made via a maximum likelihood procedure. The results of the tests confirmed that it is adequate to represent the conditional variance for all the national indexes under analysis using the GARCH(1,1)model:

$$\sigma_t^2 = \alpha_\varepsilon + \beta_{1,\varepsilon}\varepsilon_{t-1}^2 + \beta_{2,\varepsilon}\sigma_{t-1}^2 \qquad (7)$$

(where σ_t^2 is the conditional variance at time t, and ε_{t-1}^2 is the error term squared).

After the estimation, the normalized residuals (i.e. the residuals divided by the square root of the conditional variance) were tested for autocorrelation, using a Ljung-Box test, and for ARCH, using an F test on the coefficients of an autoregressive model of the squared normalized residuals:

$$\varepsilon_t^2 = a + \sum_{j=1}^{k} b_j \varepsilon_{t-j}^2 \qquad (8)$$

Both the Ljung-Box test and the ARCH test were carried out for a maximum of 24 lags, with a span of 4 lags. The results of these two tests determined the choice of the number of lags in the mean equation, and also the type and the order of the GARCH model of the conditional variance. According to the results of these tests, as will be discussed in more detail later, one lag (L=1) in the mean equation has been shown to be adequate in almost all the cases to eliminate residual autocorrelation. The only exception was the case of Sweden, in which it was necessary to include two lags of the dependent variable in the mean equation in order to eliminate the autocorrelation of the residuals.

One of the primary uses of the expected returns, $E(R_i)$ and of the risk, σ_t ,is to calculate the Sharpe ratio:

$$S_i = \frac{E(R_i) - r_f}{\sigma_i} \qquad (9)$$

where r_f is the return of the risk free asset. The calculation of this ratio allows a comparison between the performances of the stock market of country i and the stock markets of other countries. Leland (1999) and Adcock (2007) defined this Sharpe ratio, when related to a stock market, as the *market price of risk*. Both Leland and Adcock based their analysis on the non conditional CAPM, which implies that the market price of risk is constant during the period covering the data used to calculate the expected return and the risk.

As the empirical model estimated in the present piece of research produces daily time varying expected returns $E_t(R_i)$, and a time-varying measure of risk, the conditional volatility $\sigma_{i,t}$., a daily time varying Sharpe ratio, as shown by the following expression:

$$S_{i,t} = \frac{E_t(R_i) - r_{f,t}}{\sigma_{i,t}} \qquad (10)$$

can also be calculated for each national index, (the risk-free interest rate used in the calculation is the European Overnight Interest Average).

The use of a stochastic discount factor as a tool for asset pricing forms the theoretical basis for the economic interpretation of the time-varying Sharpe ratio. In a non-arbitrage economy with complete markets all the assets can be priced using the stochastic discount factor (or pricing kernel) of the Harrison and Kreps (1979) type , M_{t+1} , which satisfies the following condition for any asset, or portfolio i:

$$E_t(M_{t+1} R_{i.t+1}) = 1 \qquad (11)$$

where $R_{i,t+1}=\log(P_{i,t+1}/P_{i,t})$

In agreement with the non-arbitrage condition, equation (11) can also be applied to the risk-free asset, which can, thus, be represented by the inverse of the expectation of the pricing kernel:

$$r_{f,t} = E_t\left(M_{t+1}\right)^{-1} \quad (12)$$

Developing Equation (11) in accordance with the rules of the expectation of the product of two random variables, and replacing $E_t(M_{t+1})^{-1}$ by $r_{f,t}$, it can be concluded that the excess expected return of the portfolio i is proportional to its conditional covariance with the pricing kernel, i.e:

$$E_t\left(R_{i,t+1}\right) - r_{f,t} = -r_{f,t} Cov_t\left(M_{t+1}, R_{i,t+1}\right) \quad (13)$$

where Cov_t is the conditional covariance. Dividing equation (13) by the conditional standard deviation of the portfolio i, $\sigma_{i,t}$, it is possible to conclude that the conditional Sharpe ratio of the portfolio i is proportional to the conditional correlation between the return of the portfolio and the pricing kernel:

$$S_{i,t} = -r_{f,t}\sigma_{M,t} Corr_t\left(M_{t+1}, R_{i,t+1}\right) \quad (14)$$

where $\sigma_{M,t}$ is the conditional standard deviation of the pricing kernel, and $Corr_t$ is the conditional correlation between it and portolio i. As Whitelaw (1994, 1997) underlines, we can intuitively conclude that a substantial part of the variation of the conditional Sharpe ratio is attributable to variation in this conditional correlation. On the same lines as Whitelaw, goes the empirical evidence of Ayadi and Krysanovsky (2008), that the use of pricing kernel methodology can easily encompass time-varying measures of performance. Both the postulate of Whitelaw, and the empirical evidence of Ayadi and Krysanovsky show the importance of calculating time-varying Sharpe ratios as they provide an indirect way of obtaining information regarding the conditional correlation between the return of a market portfolio and the stochastic discount function (or, in a similar way, on the conditional correlation between the return of a market portfolio and the variables affecting the stochastic discount function).

The final objective of this article is to evaluate the co-movement of the conditional Sharpe ratios of this group of national indexes. The use of historical correlation is a possible tool for this objective. However, it is not suitable for taking into account the possibility that the correlations change over time. Thus, it was used the *cross-sectional dispersion measure,* proposed by Solnik and Roullet (2000), initially to be applied to stock returns, which varies inversely with instantaneous average correlation, and so provides information regarding dynamic correlation. This measure, applied in this paper, is represented by the variance across the national index Sharpe ratios, and was calculated daily. Its representation, referred to each period t:

$$CSDM_t = \sum_{i=1}^{16}\left(S_{i,t} - \overline{S}_t\right)^2 \qquad (15)$$

where $\overline{S}_t$ is the average Sharpe ratio over period t.

The statistical analysis of the series of the CSDM, through different subsamples of the period under analysis, gives information regarding the inter temporal evolution of the proximity of the performance of the indexes under analysis. We can take the proximity of the Sharpe ratios as an indicator of the degree of integration of the financial markets. Thus, conducting statistical tests on the CSDM over different subsamples, we arrive at conclusions regarding the evolution of the integration within the group of domestic financial markets. These tests were conducted on the series of the CSDM referring to these 16 countries, and, separately, the same tests were applied to the eleven euro area countries. Since the subsamples considered in these tests correspond to different phases of the stock market, it was possible to arrive at a comparative analysis of the integration of these markets in phases of both financial market expansion and contraction.

The estimation of the expected returns, Sharpe ratios and analysis of its evolution

The results of the estimation of the combined market model-error correction model, and the GARCH, for each of the stock indexes are shown in Tables I.1 to I.16. Each of these refers to one of the national indexes under study. Each table is composed of three separate parts. In the first part, a), the results of the estimation of the mean equation and the GARCH model are represented. These include, for each coefficient, the estimate, the standard error, the T statistic and the significance level. In the second part, b), results (the Chi-squared test statistic and the significance level) of the Ljung-Box tests on the autocorrelation of the residuals are shown. These refer to a maximum of 24 lags with a span of 4 lags. In the third part the tests on the residuals heteroskedasticity (ARCH), which consist on the F test statistic and (its level of significance) calculated through the estimation of autoregressive models of the squared residuals with a maximum of 24 lags and a span of 4 lags are given.

The results presented in these tables show that, in the explanation of the daily returns of major part of the national indexes, the market model dominates the influence exerted by the national and the European index values, since, for all the countries , the coefficient of the return of the European index is significantly different from zero. On the other hand, in the majority of the cases, the coefficients of the national and the European index values are not significantly different from zero. The exceptions to this rule are the cases of Finland, France, Portugal and Switzerland. In these cases the statistics of the coefficients of the national, and the European indexes, lead to the rejection of the null hypothesis that they are not significantly different from zero. Since the coefficients of the index values contain information regarding the long-term relation between each national index and the European index, it can be taken that, in the case of these four countries, the return of their national stock indexes is explained both by a European market model and by the implicit long-term relation between the national index and the European index. The German case is peculiar because the coefficient of the European index level is significantly different from zero, while the opposite situation is observed with the coefficient of the domestic index.

According to the results of the Ljung-Box test, shown in part b) of Tables I.1 to I.16, and also according to the results of the ARCH test, in part c) of those tables, there is no autocorrelation nor ARCH effects observed in the residuals of any of the regressions.

As mentioned above, the second part of the tests conducted for this article involved the calculation of daily Sharpe ratios for each national index, and their statistical analysis, both over the total period of analysis, and over different subsamples. The total period, between 1st January 2001 and 31st May 2009, was broken down into four subsamples: 1) between 1st January 2001 and 31st December 2002, 2) between 1st January 2003 and 31st December 2004, 3) between 1st January 2005 and 31st December 2006, and 4) between 1st January 2007 and 31st May 2009. During the first and fourth subsamples phases of market contraction were predominant, while during the second and the third periods the financial markets predominantly went through phases of growth (This is illustrated in Figure 1, where the series of the European index is given). The main statistics on the time-varying Sharpe ratio of each country, relative to the entire period and to the four subsamples are presented at the Table II. In general, the average of the time-varying Sharpe ratios is positive in the subsamples during which the stock markets predominantly experienced phases of growth. On the contrary, in the subsamples during which the decrease in prices was dominant, the average of the conditional Sharpe ratio is negative. The Sharpe ratio is negative when the index expected return is less than the risk-free interest rate. This situation is not necessarily precluded by the equilibrium situation in the stock market, if, as Boudoukh, Richardson and Whitelaw (1997) found, there is a nonlinear relation between the equity risk premium and the slope of the term structure of interest rates.

These statistics (mean, standard error and level of significance) are complemented by a test for equality across the subsamples. The results of this test represented by the Chi-squared statistics and the respective level of significance, presented together with the other results of each national index, confirm that the behaviour of the Sharpe ratios was not equal across subsamples.

The ex-post Sharpe ratio,:

$$S_i^{EP} = \frac{\mu}{\sqrt{\frac{\sum_{t=1}^{T}\left[\left(R_{i,t} - r_{f,t}\right) - \mu\right]^2}{T-1}}} \qquad (14)$$

where $\mu = \frac{\sum_{t=1}^{T}\left(R_{i,t} - r_{f,t}\right)}{T}$ and T is the number of observations, was calculated for the whole sample , and for the subsamples. The ex-post Sharpe ratio has, in every case, the same sign as the average conditional Sharpe ratio, as it is also shown in Table II.

The statistics regarding the series of the cross section dispersion measure (CSDM) of the conditional Sharpe ratios, between the 16 national stock indexes under analysis, are given in Table III. These statistics were calculated for the entire period as well as for the four subsamples referred to previously. These statistics (mean, standard error and level of significance) were also complemented with a test for equality across the subsamples. The results of this test, represented by the Chi-squared statistics and the respective level of significance, are also given in Table III. The average CSDM shows the lowest average value in the subsample relating to 2003-2004, which was dominated by periods of growth in the stock markets, and the highest average value in the last subsample, relating to 2007-2009, which mostly corresponds to the period following the 2007 financial crises. Figure II shows the CSDM series and illustrates these conclusions. The fact that an increase in the CSDM was particularly notable during the period following the 2007 crises suggests that there was an intensive increase in domestic bias after the crises, which is, quite probably, one of the main causes of the reduced degree of integration.

The CSDM was also calculated for the Sharpe ratios of the eleven EMU member countries (Austria, Belgium, Finland, France, Germany, Greece, Holland, Ireland, Italy, Portugal and Spain) and the statistical tests, which are given in Table IV and illustrated graphically in Figure III, lead to conclusions similar to those obtained for the complete group of sixteen countries. The average CSDM, observed over the last subsample was remarkably higher than those observed over the other subsamples. This result can be interpreted as meaning that, even within the stock markets of the EMU members, the 2007 crises caused a reduction in their degree of integration.

Conclusions

The empirical analysis conducted in this article shows that time-varying Sharpe ratios are an adequate tool for a comparative analysis of the performance of different stock markets, and also that they help us to have a perspective on the dynamics of their integration. To calculate the time-varying Sharpe ratios for sixteen European stock indexes, the conditional mean and the conditional volatility of the indexes were estimated by a model whose specification combined the market model and the influence of the long-term relation between each national index and the European index. The results of these estimations showed that the market model component is dominant, obscuring the influence of the implicit long-term relation between the national and the European index in almost all cases. The exceptions to this rule were the cases of Finland, France, Portugal and Switzerland, in which, there was evidence of the explanatory power of the index levels.

The statistical analysis of the conditional Sharpe ratios showed that they present, on average, clear differences between the growth phases (during which higher performance was observed) and the depression phases of the stock market (during which lower performance dominated).

Finally, the calculation of a cross dispersion measure, both across the group of sixteen countries and across the EMU members only, showed that the dispersion of the performance experienced a much more significant increase over the period following the 2007 crisis than that observed in the years preceding it. This result can be interpreted as evidence that the 2007 crisis caused a negative break in the process of integration between the markets under analysis.

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Table I.1: Estimation of the conditional mean return and conditional volatility

Austria

a) Coefficients of the conditional mean and conditional volatility

Coeff	Estimate	Std Error	T-Stat	Signif
α_i^*	0.00572730	0.00381320	1.50195000	0.13310978
β_i^*	0.53160000	0.02330000	22.85267000	0.00000000
φ_1^*	-0.00062654	0.00057490	-1.08983000	0.27578804
φ_2^*	-0.00039888	0.00125950	-0.31669000	0.75147554
a_{11}^*	-0.01400000	0.02150000	-0.64892000	0.51638901
a_{21}^*	0.08460000	0.02310000	3.65682000	0.00025536
GARCH(1,1)				
α_ε	0.00000179	0.00000048	3.71118000	0.00020630
$\beta_{1,\varepsilon}$	0.08800000	0.01250000	7.01157000	0.00000000
$\beta_{2,\varepsilon}$	0.89690000	0.01440000	62.44657000	0.00000000

b)The Ljung-Box Qui- Squared Test for Serial Correlation in Normalized Residuals

(number of lags within parenthesis)

	Test Statistic	Significance Level
LB(4)	0.7169	0.94923
LB(8)	5.1135	0.74537
LB(12)	9.6957	0.64264
LB(16)	15.6285	0.47917
LB(20)	17.8521	0.59714
LB(24)	18.5478	0.77565

c)F-Test of no ARCH vs. ARCH in Normalized Residuals

(number of lags within parenthesis)

	Test Statistic	Significance Level
ARCH(4)	0.17593	0.95084
ARCH(8)	0.64351	0.74153
ARCH(12)	0.81718	0.63292
ARCH(16)	0.98474	0.47057
ARCH(20)	0.89672	0.59170
ARCH(24)	0.78294	0.76233

Table I.2: Estimation of the conditional mean return and conditional volatility

Belgium

a) Coefficients of the conditional mean and conditional volatility

Coeff	Estimate	Std Error	T-Stat	Signif
α_i^*	0.00695860	0.00273020	2.54876000	0.01081076
β_i^*	0.81080000	0.01400000	57.71465000	0.00000000
φ_1^*	-0.00105720	0.00128820	-0.82062000	0.41186309
φ_2^*	-0.00043997	0.00174010	-0.25284000	0.80038934
a_{11}^*	0.01140000	0.02600000	0.44087000	0.65930594
a_{21}^*	0.03110000	0.02450000	1.27273000	0.20311267
GARCH(1.1)				
α_{ε}	0.00000063	0.00000013	4.65277000	0.00000328
$\beta_{1,\varepsilon}$	0.09190000	0.01240000	7.40991000	0.00000000
$\beta_{2,\varepsilon}$	0.90240000	0.01160000	77.68092000	0.00000000

b)The Ljung-Box Qui- Squared Test for Serial Correlation in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
LB(4)	3.6698	0.452536
LB(8)	6.0131	0.645766
LB(12)	7.7285	0.805969
LB(16)	8.9035	0.917332
LB(20)	13.2755	0.865251
LB(24)	17.6332	0.820431

c)F-Test of no ARCH vs. ARCH in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
ARCH(4)	0.88339	0.472981
ARCH(8)	0.72242	0.67190
ARCH(12)	0.67190	0.81231
ARCH(16)	0.53542	0.92979
ARCH(20)	0.64304	0.88263
ARCH(24)	0.72967	0.82518

Table I.3: Estimation of the conditional mean return and conditional volatility

Denmark

a) Coefficients of the conditional mean and conditional volatility

Coeff	Estimate	Std Error	T-Stat	Signif
α_i^*	-0.00172060	0.00369990	-0.46505000	0.64189909
β_i^*	0.66620000	0.01530000	43.43320000	0.00000000
φ_1^*	-0.00085770	0.00111420	-0.76978000	0.44143161
φ_2^*	0.00140400	0.00174710	0.80365000	0.42159961
a_{11}^*	-0.03980000	0.02130000	-1.86475000	0.06221661
a_{21}^*	0.11330000	0.02070000	5.48065000	0.00000004
GARCH(1.1)				
α_ε	0.00000078	0.00000037	2.10445000	0.03533921
$\beta_{1,\varepsilon}$	0.05170000	0.01250000	4.13850000	0.00003496
$\beta_{2,\varepsilon}$	0.93930000	0.01520000	61.73197000	0.00000000

b)The Ljung-Box Qui- Squared Test for Serial Correlation in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
LB(4)	1.7903	0.774259
LB(8)	16.8255	0.031979
LB(12)	19.0128	0.088219
LB(16)	23.9165	0.091344
LB(20)	28.0496	0.10823
LB(24)	31.1722	0.148879

c)F-Test of no ARCH vs. ARCH in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
ARCH(4)	0.44149	0.77868
ARCH(8)	2.11425	0.03147
ARCH(12)	1.66286	0.06883
ARCH(16)	1.45648	0.10711
ARCH(20)	1.37645	0.12258
ARCH(24)	1.22137	0.21037

Table I.4: Estimation of the conditional mean return and conditional volatility

Finland

a)Coefficients of the conditional mean and conditional volatility

Coeff	Estimate	Std Error	T-Stat	Signif
α_i^*	-0.00933624	0.00571014	-1.63503000	0.10204312
β_i^*	1.13403301	0.02143894	52.89595000	0.00000000
φ_1^*	-0.00769559	0.00242934	-3.16777000	0.00153611
φ_2^*	0.00887745	0.00285477	3.10969000	0.00187282
a_{11}^*	0.03150981	0.02347229	1.34243000	0.17945794
a_{21}^*	-0.00008580	0.03387621	-0.00253000	0.99797906
GARCH(1.1)				
α_ε	0.00000020	0.00000007	3.05245000	0.00226983
$\beta_{1,\varepsilon}$	0.01104221	0.00153801	7.17956000	0.00000000
$\beta_{2,\varepsilon}$	0.98740983	0.00146830	672.48744000	0.00000000

b)The Ljung-Box Qui- Squared Test for Serial Correlation in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
LB(4)	7.4716	0.112969
LB(8)	12.1906	0.142899
LB(12)	19.9516	0.068007
LB(16)	24.0749	0.087881
LB(20)	29.6503	0.075723
LB(24)	31.5268	0.139167

c)F-Test of no ARCH vs. ARCH in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
ARCH(4)	1.71003	0.14500
ARCH(8)	1.46346	0.16546
ARCH(12)	1.64414	0.07326
ARCH(16)	1.55108	0.07425
ARCH(20)	1.58776	0.04711
ARCH(24)	1.34646	0.12119

Table I.5: Estimation of the conditional mean return and conditional volatility

France

a)Coefficients of the conditional mean and conditional volatility

Coeff	Estimate	Std Error	T-Stat	Signif
α_i^*	0.00100098	0.00136941	0.73096000	0.46480359
β_i^*	1.06163835	0.00693281	153.13243000	0.00000000
φ_1^*	-0.00772613	0.00322549	-2.39534000	0.01660499
φ_2^*	0.00749174	0.00322533	2.32279000	0.02019070
a_{11}^*	-0.12378718	0.02411502	-5.13320000	0.00000028
a_{21}^*	0.12880290	0.02645591	4.86859000	0.00000112
GARCH(1.1)				
α_ε	0.00000051	0.00000009	5.37402000	0.00000008
$\beta_{1,\varepsilon}$	0.05982310	0.01050350	5.69554000	0.00000001
$\beta_{2,\varepsilon}$	0.90478290	0.01472628	61.44000000	0.00000000

b)The Ljung-Box Qui- Squared Test for Serial Correlation in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
LB(4)	3.2829	0.511639
LB(8)	12.4467	0.132359
LB(12)	18.6877	0.096348
LB(16)	20.2947	0.207241
LB(20)	21.9339	0.344106
LB(24)	23.1336	0.511921

c)F-Test of no ARCH vs. ARCH in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
ARCH(4)	0.82933	0.50634
ARCH(8)	1.57515	0.12705
ARCH(12)	1.57844	0.09090
ARCH(16)	1.24878	0.22234
ARCH(20)	1.07612	0.36796
ARCH(24)	0.95080	0.53074

Table I.6: Estimation of the conditional mean return and conditional volatility
Germany

a)Coefficients of the conditional mean and conditional volatility

Coeff	Estimate	Std Error	T-Stat	Signif
α_i^*	-0.00510716	0.00223699	-2.28305000	0.02242723
β_i^*	1.05635938	0.01098466	96.16674000	0.00000000
φ_1^*	-0.00220653	0.00139170	-1.58549000	0.11285399
φ_2^*	0.00338574	0.00166885	2.02878000	0.04248052
a_{11}^*	-0.05396259	0.02687695	-2.00776000	0.04466827
a_{21}^*	0.05453255	0.03055587	1.78468000	0.07431274
GARCH(1.1)				
α_ε	0.00000086	0.00000029	2.98633000	0.00282344
$\beta_{1,\varepsilon}$	0.00000127	0.00000020	6.40171000	0.00000000
$\beta_{2,\varepsilon}$	0.14814245	0.01850584	8.00517000	0.00000000

b)The Ljung-Box Qui- Squared Test for Serial Correlation in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
LB(4)	0.99390	0.91072
LB(8)	4.70020	0.78909
LB(12)	7.33020	0.83504
LB(16)	15.42120	0.49403
LB(20)	20.22740	0.44379
LB(24)	21.63970	0.60076

c)F-Test of no ARCH vs. ARCH in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
ARCH(4)	0.24290	0.91403
ARCH(8)	0.56294	0.80892
ARCH(12)	0.59432	0.84845
ARCH(16)	0.94838	0.51222
ARCH(20)	0.92997	0.54814
ARCH(24)	0.81157	0.72543

Table I.7: Estimation of the conditional mean return and conditional volatility
Greece

a)Coefficients of the conditional mean and conditional volatility

Coeff	Estimate	Std Error	T-Stat	Signif
α_i^*	-0.00149160	0.00606720	-0.24585000	0.80579530
β_i^*	0.58040000	0.02000000	29.00457000	0.00000000
φ_1^*	-0.00168510	0.00169310	-0.99529000	0.31959535
φ_2^*	0.00214340	0.00286500	0.74812000	0.45438976
a_{11}^*	0.03890000	0.02140000	1.81741000	0.06915471
a_{21}^*	0.07920000	0.02320000	3.41642000	0.00063449
GARCH(1.1)				
α_ε	0.00000213	0.00000074	2.86752000	0.00413709
$\beta_{1,\varepsilon}$	0.09100000	0.01640000	5.55704000	0.00000003
$\beta_{2,\varepsilon}$	0.89810000	0.01780000	50.43491000	0.00000000

b)The Ljung-Box Qui- Squared Test for Serial Correlation in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
LB(4)	1.14560	0.886972
LB(8)	1.94670	0.982603
LB(12)	2.43920	0.998374
LB(16)	11.99000	0.744671
LB(20)	15.54660	0.744323
LB(24)	16.04580	0.886416

c)F-Test of no ARCH vs. ARCH in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
ARCH(4)	0.27661	0.89321
ARCH(8)	0.22604	0.98629
ARCH(12)	0.18073	0.99909
ARCH(16)	0.73093	0.76428
ARCH(20)	0.70246	0.82733
ARCH(24)	0.59406	0.93999

Table I.8: Estimation of the conditional mean return and conditional volatility
Holland

a)Coefficients of the conditional mean and conditional volatility

Coeff	Estimate	Std Error	T-Stat	Signif
α_i^*	-0.00326882	0.00223329	-1.46368000	0.14328207
β_i^*	1.01445467	0.01046889	96.90186000	0.00000000
φ_1^*	-0.00229601	0.00156692	-1.46530000	0.14283918
φ_2^*	0.00295345	0.00167595	1.76225000	0.07802640
a_{11}^*	-0.02834799	0.02275514	-1.24578000	0.21284381
a_{21}^*	0.04265660	0.02528771	1.68685000	0.09163199
GARCH(1.1)				
α_ε	0.00000074	0.00000014	5.12097000	0.00000030
$\beta_{1,\varepsilon}$	0.06577327	0.01007172	6.53049000	0.00000000
$\beta_{2,\varepsilon}$	0.90972542	0.01304535	69.73559000	0.00000000

b) The Ljung-Box Qui- Squared Test for Serial Correlation in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
LB(4)	2.5942	0.62786
LB(8)	5.4617	0.70728
LB(12)	7.5211	0.82134
LB(16)	8.3952	0.93622
LB(20)	9.9656	0.96879
LB(24)	11.8580	0.98146

c) F-Test of no ARCH vs. ARCH in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
ARCH(4)	0.65203	0.62545
ARCH(8)	0.69795	0.69370
ARCH(12)	0.61800	0.82862
ARCH(16)	0.51451	0.94129
ARCH(20)	0.48298	0.97363
ARCH(24)	0.47411	0.98580

Table I.9: Estimation of the conditional mean return and conditional volatility

Ireland

a)Coefficients of the conditional mean and conditional volatility

Coeff	Estimate	Std Error	T-Stat	Signif
α_i^*	0,00425530	0,00428410	0,99329000	0,32056772
β_i^*	0,72050000	0,02000000	36,08621000	0,00000000
φ_1^*	-0,00005093	0,00197820	-0,02575000	0,97946004
φ_2^*	-0,00089682	0,00244610	-0,36663000	0,71389358
a_{11}^*	0,02300000	0,02340000	0,98343000	0,32539356
a_{21}^*	0,08790000	0,02500000	3,51527000	0,00043931
GARCH(1.1)				
α_ε	0,00000286	0,00000073	3,91252000	0,00009134
$\beta_{1,\varepsilon}$	0,10160000	0,01680000	6,03300000	0,00000000
$\beta_{2,\varepsilon}$	0,88280000	0,01890000	46,79823000	0,00000000

b)The Ljung-Box Qui- Squared Test for Serial Correlation in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
LB(4)	2,05830	0,72504
LB(8)	5,63810	0,68769
LB(12)	11,02800	0,52652
LB(16)	11,71890	0,76309
LB(20)	19,33420	0,50021
LB(24)	20,78360	0,65146

c)F-Test of no ARCH vs. ARCH in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
ARCH(4)	0.51316	0.72608
ARCH(8)	0.69798	0.69367
ARCH(12)	0.90410	0.54206
ARCH(16)	0.73634	0.75847
ARCH(20)	0.96306	0.50526
ARCH(24)	0.85399	0.66785

Table I.10: Estimation of the conditional mean return and conditional volatility

Italy

a) Coefficients of the conditional mean and conditional volatility

Coeff	Estimate	Std Error	T-Stat	Signif
α_i^*	0.00431680	0.00217330	1.98627000	0.04700354
β_i^*	0.85660000	0.00944520	90.69043000	0.00000000
φ_1^*	-0.00164880	0.00159250	-1.03540000	0.30048237
φ_2^*	0.00064822	0.00150790	0.42987000	0.66728930
a_{11}^*	-0.00820200	0.02460000	-0.33318000	0.73899502
a_{21}^*	0.00851660	0.02330000	0.36601000	0.71435517
GARCH(1.1)				
α_ε	0.00000051	0.00000014	3.55426000	0.00037904
$\beta_{1,\varepsilon}$	0.06730000	0.01230000	5.48509000	0.00000004
$\beta_{2,\varepsilon}$	0.91680000	0.01510000	60.59405000	0.00000000

b) The Ljung-Box Qui- Squared Test for Serial Correlation in Normalized Residuals (number of lags within parenthesis)

	Test Statistic	Significance Level
LB(4)	2.05600	0.72547
LB(8)	3.78790	0.87573
LB(12)	11.84640	0.45809
LB(16)	13.14740	0.66195
LB(20)	17.31810	0.63223
LB(24)	22.62880	0.54179

c) F-Test of no ARCH vs. ARCH in Normalized Residuals (number of lags within parenthesis)

	Test Statistic	Significance Level
ARCH(4)	0.51344	0.72587
ARCH(8)	0.46606	0.88059
ARCH(12)	0.96535	0.47997
ARCH(16)	0.78063	0.70930
ARCH(20)	0.84209	0.66293
ARCH(24)	0.89974	0.60338

Table I.11: Estimation of the conditional mean return and conditional volatility

Norway

a) Coefficients of the conditional mean and conditional volatility

Coeff	Estimate	Std Error	T-Stat	Signif
α_i^*	-0,00158160	0,00489140	-0,32335000	0,74643383
β_i^*	0,72240000	0,02260000	31,95025000	0,00000000
φ_1^*	-0,00054342	0,00085510	-0,63550000	0,52509976
φ_2^*	0,00112790	0,00166580	0,67708000	0,49835206
a_{11}^*	-0,04000000	0,02240000	-1,78293000	0,07459801
a_{21}^*	0,16130000	0,02590000	6,23939000	0,00000000
GARCH(1.1)				
α_ε	0,00000330	0,00000092	3,57426000	0,00035122
$\beta_{1,\varepsilon}$	0,08650000	0,01320000	6,54817000	0,00000000
$\beta_{2,\varepsilon}$	0,89480000	0,01650000	54,37460000	0,00000000

b)The Ljung-Box Qui- Squared Test for Serial Correlation in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
LB(4)	1,17220	0,88265
LB(8)	4,73520	0,78547
LB(12)	5,47820	0,94007
LB(16)	8,11260	0,94544
LB(20)	13,76690	0,84211
LB(24)	16,40680	0,87284

c)F-Test of no ARCH vs. ARCH in Normalized Residuals
(number of lags within parenthesis

	Test Statistic	Significance Level
ARCH(4)	0.29091	0.88401
ARCH(8)	0.60072	0.77798
ARCH(12)	0.47103	0.93232
ARCH(16)	0.53773	0.92843
ARCH(20)	0.70383	0.82593
ARCH(24)	0.70734	0.84883

Table I.12: Estimation of the conditional mean return and conditional volatility

Portugal

a) Coefficients of the conditional mean and conditional volatility

Coeff	Estimate	Std Error	T-Stat	Signif
α_i^*	-0.00326190	0.00290070	-1.12451000	0.26079871
β_i^*	0.49900000	0.01320000	37.74321000	0.00000000
φ_1^*	-0.00760090	0.00241120	-3.15228000	0.00162002
φ_2^*	0.00848250	0.00258540	3.28088000	0.00103486
a_{11}^*	0.06280000	0.02160000	2.90420000	0.00368187
a_{21}^*	0.02220000	0.01680000	1.32216000	0.18611529
GARCH(1.1)				
α_ε	0.00000051	0.00000022	2.32173000	0.02024730
$\beta_{1,\varepsilon}$	0.05880000	0.01060000	5.54828000	0.00000003
$\beta_{2,\varepsilon}$	0.93520000	0.01210000	76.99398000	0.00000000

b) The Ljung-Box Qui- Squared Test for Serial Correlation in Normalized Residuals (number of lags within parenthesis)

	Test Statistic	Significance Level
LB(4)	3.86790	0.42419
LB(8)	10.17830	0.25274
LB(12)	13.16710	0.35701
LB(16)	24.28640	0.08343
LB(20)	32.60080	0.03730
LB(24)	34.70190	0.07295

c) F-Test of no ARCH vs. ARCH in Normalized Residuals (number of lags within parenthesis)

	Test Statistic	Significance Level
ARCH(4)	0.94552	0.43652
ARCH(8)	1.33206	0.22262
ARCH(12)	1.12704	0.33284
ARCH(16)	1.45472	0.10782
ARCH(20)	1.52030	0.06484
ARCH(24)	1.36660	0.11019

Table I.13: Estimation of the conditional mean return and conditional volatility

Spain

a) Coefficients of the conditional mean and conditional volatility

Coeff	Estimate	Std Error	T-Stat	Signif
α_i^*	0.00116230	0.00239600	0.48509000	0.62761464
β_i^*	0.95980000	0.01100000	86.94178000	0.00000000
φ_1^*	-0.00111340	0.00102760	-1.08347000	0.27860133
φ_2^*	0.00096242	0.00127760	0.75330000	0.45127104
a_{11}^*	0.04890000	0.02590000	1.88592000	0.05930604
a_{21}^*	-0.05720000	0.02650000	-2.15454000	0.03119793
GARCH(1.1)				
α_ε	0.00000045	0.00000012	3.65950000	0.00025270
$\beta_{1,\varepsilon}$	0.05730000	0.01050000	5.47143000	0.00000004
$\beta_{2,\varepsilon}$	0.93200000	0.01190000	78.52230000	0.00000000

b) The Ljung-Box Qui- Squared Test for Serial Correlation in Normalized Residuals (number of lags within parenthesis)

	Test Statistic	Significance Level
LB(4)	3.90480	0.41904
LB(8)	10.08120	0.25937
LB(12)	15.24790	0.22816
LB(16)	19.01110	0.26809
LB(20)	26.76900	0.14189
LB(24)	28.77460	0.22873

c)F-Test of no ARCH vs. ARCH in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
ARCH(4)	0.96857	0.42351
ARCH(8)	1.26886	0.25525
ARCH(12)	1.27292	0.22770
ARCH(16)	1.15163	0.30058
ARCH(20)	1.28409	0.17815
ARCH(24)	1.14269	0.28660

Table I.14: Estimation of the conditional mean return and conditional volatility

Sweden

a) Coefficients of the conditional mean and conditional volatility

Coeff	Estimate	Std Error	T-Stat	Signif
α_i^*	-0.00121538	0.00493473	-0.24629000	0.80545686
β_i^*	1.11693257	0.01782879	62.64770000	0.00000000
φ_1^*	-0.00507551	0.00223429	-2.27165000	0.02310792
φ_2^*	0.00544122	0.00311505	1.74675000	0.08067997
$a_{11,1}^*$	-0.03131529	0.02209709	-1.41717000	0.15643382
$a_{11,2}^*$	-0.02107185	0.01273871	-1.65416000	0.09809527
a_{21}^*	0.10050070	0.02922101	3.43933000	0.00058316
GARCH(1.1)				
α_ε	0.00000065	0.00000027	2.35483000	0.01853125
$\beta_{1,\varepsilon}$	0.03230886	0.00850062	3.80077000	0.00014425
$\beta_{2,\varepsilon}$	0.96046012	0.01066594	90.04931000	0.00000000

b) The Ljung-Box Qui- Squared Test for Serial Correlation in Normalized Residuals (number of lags within parenthesis)

	Test Statistic	Significance Level
LB(4)	6.6014	0.15851
LB(8)	13.8824	0.08488
LB(12)	17.8977	0.11883
LB(16)	21.7491	0.15148
LB(20)	27.2499	0.12838
LB(24)	29.0949	0.21658

c) F-Test of no ARCH vs. ARCH in Normalized Residuals (number of lags within parenthesis)

	Test Statistic	Significance Level
ARCH(4)	1.65831	0.15700
ARCH(8)	1.90722	0.05490
ARCH(12)	1.65973	0.06955
ARCH(16)	1.43682	0.11530
ARCH(20)	1.43213	0.09652
ARCH(24)	1.22683	0.20568

Table I.15: Estimation of the conditional mean return and conditional volatility

Switzerland

a) Coefficients of the conditional mean and conditional volatility

Coeff	Estimate	Std Error	T-Stat	Signif
α_i^*	0,00576680	0,00253750	2,27267000	0,02304619
β_i^*	0,75950000	0,01090000	69,69342000	0,00000000
φ_1^*	-0,00684150	0,00217280	-3,14867000	0,00164013
φ_2^*	0,00564370	0,00202370	2,78884000	0,00528964
a_{11}^*	-0,07540000	0,02300000	-3,28208000	0,00103043
a_{21}^*	0,09690000	0,02100000	4,62025000	0,00000383
GARCH(1.1)				
α_ε	0,00000086	0,00000029	2,98633000	0,00282344
$\beta_{1,\varepsilon}$	0,08190000	0,01620000	5,05588000	0,00000043
$\beta_{2,\varepsilon}$	0,89610000	0,02140000	41,96684000	0,00000000

b) The Ljung-Box Qui- Squared Test for Serial Correlation in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
LB(4)	7,0595	0,13278
LB(8)	12,9620	0,11317
LB(12)	16,2472	0,18017
LB(16)	20,9701	0,17966
LB(20)	23,3852	0,27028
LB(24)	26,0011	0,35311

c)F-Test of no ARCH vs. ARCH in Normalized Residuals
(number of lags within parenthesis)

	Test Statistic	Significance Level
ARCH(4)	1.73591	0.13931
ARCH(8)	1.58688	0.12351
ARCH(12)	1.32169	0.19872
ARCH(16)	1.22135	0.24278
ARCH(20)	1.04627	0.40237
ARCH(24)	0.97108	0.50221

Table I.16: Estimation of the conditional mean return and conditional volatility

United Kingdom

a) Coefficients of the conditional mean and conditional volatility

Coeff	Estimate	Std Error	T-Stat	Signif
α_i^*	0.00288720	0.00231280	1.24837000	0.21189393
β_i^*	0.98020000	0.00841430	116.49217000	0.00000000
φ_1^*	-0.00230410	0.00192380	-1.19768000	0.23104055
φ_2^*	0.00162940	0.00160230	1.01692000	0.30919275
a_{11}^*	-0.11170000	0.02560000	-4.36337000	0.00001281
a_{21}^*	0.08310000	0.02650000	3.14186000	0.00167879
GARCH(1.1)				
α_ε	0.00000026	0.00000009	2.78198000	0.00540280
$\beta_{1,\varepsilon}$	0.07090000	0.01590000	4.47269000	0.00000772
$\beta_{2,\varepsilon}$	0.91980000	0.01720000	53.52706000	0.00000000

b) The Ljung-Box Qui- Squared Test for Serial Correlation in Normalized Residuals (number of lags within parenthesis)

	Test Statistic	Significance Level
LB(4)	6.19150	0.18530
LB(8)	9.40680	0.30915
LB(12)	13.83480	0.31138
LB(16)	22.18810	0.13722
LB(20)	24.63580	0.21572
LB(24)	29.06040	0.21787

c) F-Test of no ARCH vs. ARCH in Normalized Residuals (number of lags within parenthesis)

	Test Statistic	Significance Level
ARCH(4)	1.50043	0.19942
ARCH(8)	1.08780	0.36849
ARCH(12)	1.02096	0.42619
ARCH(16)	1.24674	0.22382
ARCH(20)	1.13522	0.30478
ARCH(24)	1.12395	0.30708

Table II Statistics on the Sharpe ratios

Statistics on the Conditional Sharpe Ratio				Ex Post Sharpe Ratio
AUSTRIA				
SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL	
2001-2009	0.06304	0.65741	0.00001	-0.00057
2001-2002	0.01826	0.82904	0.61642	-0.01780
2003-2004	0.13459	0.65486	0.00000	0.15236
2005-2006	0.11664	0.49503	0.00000	0.09525
2007-2009	-0.00830	0.60436	0.73086	-0.06620
Test for equality across the subsamples:				
Chi-Squared(4)= 13.675877 with Significance Level 0.00840471				
BELGIUM				
SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL	
2001-2009	0.04161	1.37614	0.15691	-0.02934
2001-2002	-0.08182	1.45462	0.20106	-0.05760
2003-2004	0.16143	1.30841	0.00513	0.05153
2005-2006	0.14597	1.32747	0.01246	0.08493
2007-2009	-0.04782	1.39329	0.39008	-0.08765
Test for equality across the subsamples:				
Chi-Squared(4)= 38.713376 with Significance Level 0.00000008				
DENMARK				
SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL	
2001-2009	0.02383	0.93667	0.23355	-0.00252
2001-2002	-0.04979	1.00341	0.25923	-0.07739
2003-2004	0.07672	0.90266	0.05338	0.06995
2005-2006	0.12511	0.69497	0.00005	0.11367
2007-2009	-0.04758	1.06525	0.26346	-0.03351
Test for equality across the subsamples:				
Chi-Squared(4)= 18.384682 with Significance Level 0.00103775				
FINLAND				
SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL	
2001-2009	-0.03852	1.19238	0.13049	-0.02519
2001-2002	-0.11278	0.85449	0.00279	-0.05277
2003-2004	-0.01208	0.77649	0.72316	-0.01385
2005-2006	0.13342	0.97435	0.00189	0.05819
2007-2009	-0.14601	1.74170	0.03605	-0.03560
Test for equality across the subsamples:				
Chi-Squared(4)= 31.957941 with Significance Level 0.00000195				
FRANCE				
SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL	
2001-2009	-0.05269	3.62067	0.49560	-0.02079
2001-2002	-0.24666	3.63305	0.12290	-0.06591
2003-2004	0.15747	2.83163	0.20577	0.02334
2005-2006	0.20669	2.77706	0.09026	0.07833
2007-2009	-0.29340	4.65362	0.11461	-0.04736
Test for equality across the subsamples:				
Chi-Squared(4)= 177.228993 with Significance Level 0.00000000				
GERMANY				
SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL	
2001-2009	-0.02929	2.29488	0.55013	-0.01750
2001-2002	-0.21987	2.02937	0.01399	-0.07744
2003-2004	0.06201	1.63600	0.38823	0.03197
2005-2006	0.25650	2.09466	0.00542	0.07662
2007-2009	-0.18914	3.00314	0.11500	-0.04063
Test for equality across the subsamples:				
Chi-Squared(4)= 96.548386 with Significance Level 0.00000000				
GREECE				
SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL	
2001-2009	0.02100	0.63696	0.12276	-0.02004
2001-2002	-0.01445	0.76038	0.66556	-0.10970
2003-2004	0.06599	0.56957	0.00855	0.09052
2005-2006	0.07123	0.46660	0.00054	0.07690
2007-2009	-0.03276	0.69210	0.23602	-0.05761
Test for equality across the subsamples:				
Chi-Squared(4)= 9.044960 with Significance Level 0.05998547				

Table II (Cont.)

Statistics on the Conditional Sharpe Ratio				Ex Post Sharpe Ratio
HOLLAND				
SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL	-0.02696
2001-2009	-0.05062	2.27754	0.29804	-0.06610
2001-2002	-0.26361	2.37994	0.01200	-0.00258
2003-2004	0.01752	1.99905	0.84186	0.08137
2005-2006	0.18879	1.89466	0.02348	-0.05270
2007-2009	-0.13985	2.65073	0.18660	
Test for equality across the subsamples:				
Chi-Squared(4)= 103.285507 with Significance Level 0.00000000				
IRELAND				
SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL	
2001-2009	-0.00260	0.80509	0.87998	-0.03749
2001-2002	-0.09786	1.00975	0.02784	-0.06677
2003-2004	0.05263	0.78326	0.12645	0.06489
2005-2006	0.08096	0.70307	0.00890	0.05615
2007-2009	-0.04395	0.69418	0.11307	-0.08985
Test for equality across the subsamples:				
Chi-Squared(4)= 17.171741 with Significance Level 0.00178993				
ITALY				
SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL	
2001-2009	-0.04409	1.97730	0.29649	-0.02853
2001-2002	-0.17488	2.00531	0.04769	-0.06897
2003-2004	0.06417	1.80998	0.41968	0.04635
2005-2006	0.10045	1.64125	0.16343	0.06010
2007-2009	-0.15432	2.30454	0.09383	-0.06485
Test for equality across the subsamples:				
Chi-Squared(4)= 66.133349 with Significance Level 0.00000000				
NORWAY				
SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL	
2001-2009	0.04061	0.75575	0.01193	-0.00109
2001-2002	-0.01872	1.04438	0.68348	-0.05524
2003-2004	0.08184	0.72127	0.01001	0.07167
2005-2006	0.10316	0.45790	0.00000	0.06745
2007-2009	-0.00082	0.69154	0.97616	-0.03123
Test for equality across the subsamples:				
Chi-Squared(4)= 9.938038 with Significance Level 0.04148445				
PORTUGAL				
SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL	
2001-2009	0.00918	0.78909	0.58599	-0.02596
2001-2002	-0.01085	0.87996	0.77913	-0.09535
2003-2004	0.01373	0.65251	0.63180	0.05197
2005-2006	0.12719	0.68606	0.00003	0.09672
2007-2009	-0.07961	0.87795	0.02340	-0.06269
Test for equality across the subsamples:				
Chi-Squared(4)= 16.419283 with Significance Level 0.00250519				
SPAIN				
SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL	
2001-2009	0.00991	1.93966	0.81096	-0.00566
2001-2002	-0.10571	1.75071	0.16997	-0.05210
2003-2004	0.11323	1.77975	0.14783	0.05396
2005-2006	0.18583	1.84095	0.02174	0.10293
2007-2009	-0.13306	2.25869	0.14037	-0.03711
Test for equality across the subsamples:				
Chi-Squared(4)= 63.853824 with Significance Level 0.00000000				
SWEDEN				
SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL	
2001-2009	0.00104	1.49984	0.97399	-0.01487
2001-2002	-0.02120	1.35527	0.72197	-0.06319
2003-2004	0.09744	1.30724	0.09008	0.06066
2005-2006	0.09306	1.17084	0.07048	0.07017
2007-2009	-0.14374	1.93519	0.06317	-0.04283
Test for equality across the subsamples:				
Chi-Squared(4)= 36.571652 with Significance Level 0.00000022				

Table II (Cont.)

Statistics on the Conditional Sharpe Ratio				Ex Post Sharpe Ratio
SWITZERLAND				
SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL	
2001-2009	-0.02269	1.57521	0.50012	-0.01979
2001-2002	-0.12652	1.64614	0.08084	-0.06672
2003-2004	0.10948	1.32491	0.06034	0.01319
2005-2006	0.07163	1.23927	0.18807	0.10564
2007-2009	-0.13252	1.90896	0.08241	-0.05500
Test for equality across the subsamples: Chi-Squared(4)= 46.794663 with Significance Level 0.00000000				
UNITED KINGDOM				
SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL	
2001-2009	-0.06877	2.77699	0.24627	-0.02548
2001-2002	-0.26357	2.93487	0.04146	-0.06066
2003-2004	0.08375	2.48447	0.44288	0.01602
2005-2006	0.11496	2.12876	0.21872	0.06513
2007-2009	-0.19824	3.28943	0.13149	-0.05242
Test for equality across the subsamples: Chi-Squared(4)= 117.202131 with Significance Level 0.00000000				

Table III – Statistics on the Cross Section Dispersion Measure between the Conditional Sharpe Ratios of the 16 stock indexes

SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL
2001-2009	0.80911	1.87144	0.00000
2001-2002	0.74513	1.20997	0.00000
2003-2004	0.50410	0.81653	0.00000
2005-2006	0.51517	1.33881	0.00000
2007-2009	1.36118	2.92020	0.00000

Test for equality across the subsamples:
Chi-Squared(4)= 295.674687 with Significance Level 0.00000000

Table IV – Statistics on the Cross Section Dispersion Measure between the Conditional Sharpe Ratios of the 11 EMU members stock indexes

SUB-SAMPLE	MEAN	STD ERROR	SIG LEVEL
2001-2009	0.90064	2.11351	0.00000
2001-2002	0.81303	1.35733	0.00000
2003-2004	0.54376	0.87134	0.00000
2005-2006	0.55471	1.48043	0.00000
2007-2009	1.55949	3.31590	0.00000

Test for equality across the subsamples:
Chi-Squared(4)= 414.279744 with Significance Level 0.00000000

Figure I

European Index

Figure II

Cross Section Dispersion Measure (16 Indexes)

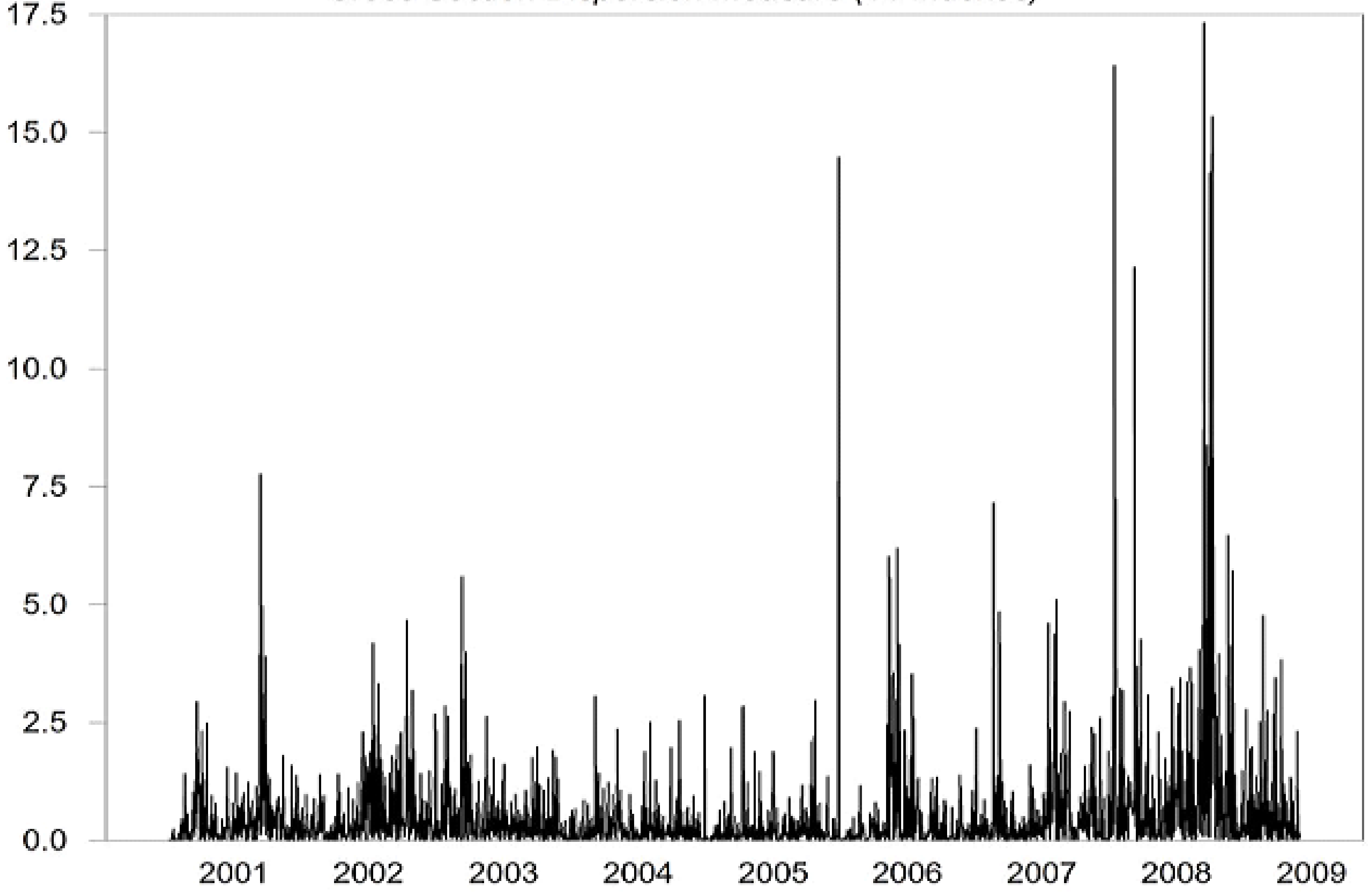
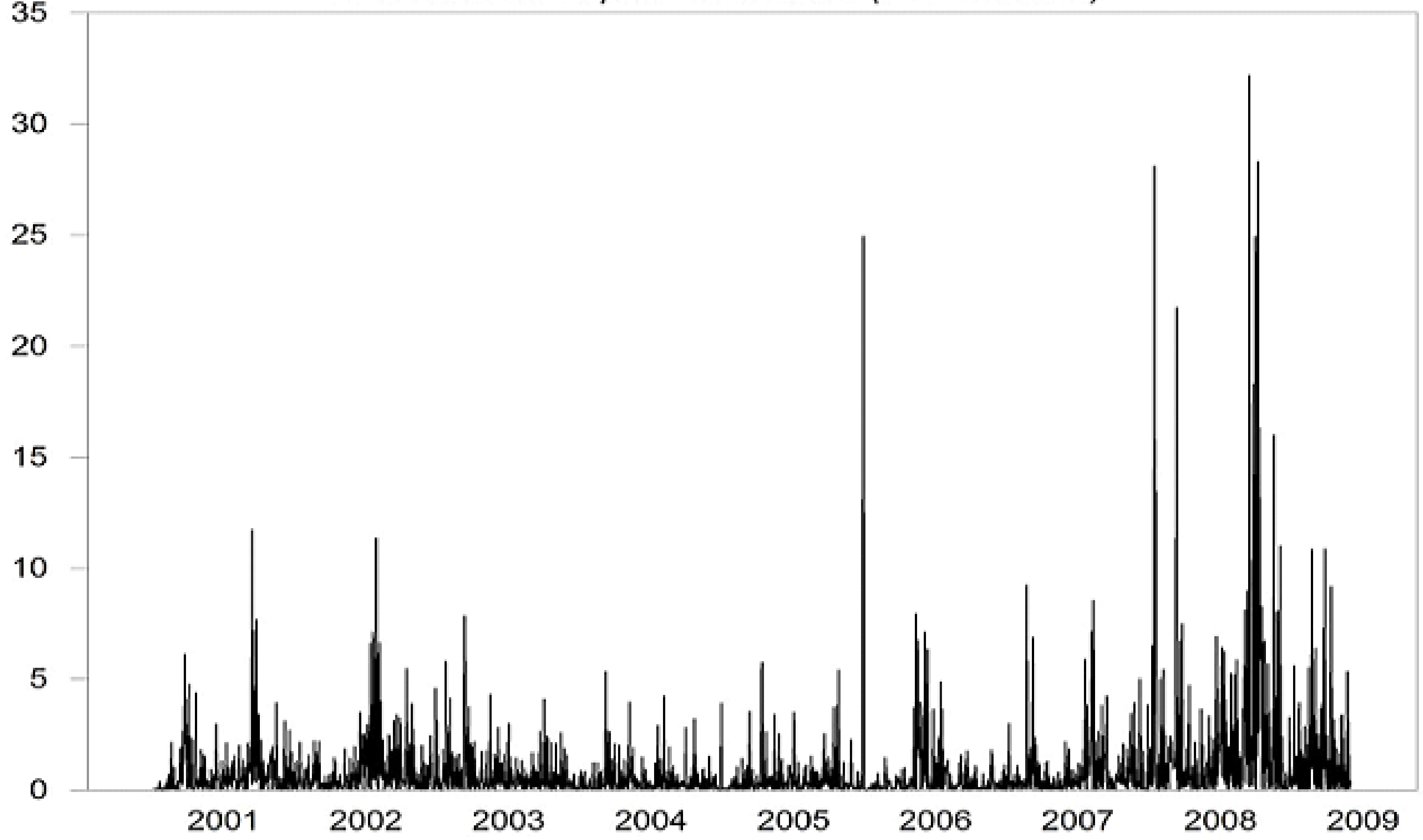


Figure III

Cross Section Dispersion Measure (EMU Indexes)



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