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Thesis Title: "*Seasonality in returns and volatility: Evidence from the European Real Estate sector*"

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TABLE OF CONTENTS

Abstract

In this study, we investigate the day of the week effect on thirteen European real estate index returns and conditional variances (volatility). The empirical research was conducted using non-linear models from the GARCH family and daily returns from several European securitized real estate indices between 1990 and 2010. We permit two specifications for the error distribution – Student's *t* and generalized error distribution. Furthermore we are trying to explain the observed anomalies by reference to market risk in a CAPM-type framework, using as risk proxy two market indices (EPRA/NAREIT Global index and EPRA Europe index). In order to investigate if the significant seasonality remains significant for the whole sample period, we estimate the mean coefficients of GARCH models in a rolling framework.

1. Introduction

The presence of calendar anomalies (effects) in stock market returns has been documented extensively in finance literature. Following Fields (1931) numerous studies have confirmed calendar anomalies, such as: *the Weekend Effect*, where stocks display significantly lower returns over the period between Friday's close and Monday's close;[1] the January Effect, where returns are much higher during the month of January than in any other month;[2] *the Day of the Week Effect*, where returns are significantly higher on some days of the week than other days;[3] *the Turn of the month effect*, where returns are significantly high for the last trading day of a month and the following three days;[4] and *the Holiday Effect*, where returns are much higher on trading days immediately prior to holidays (Ariel, 1990).

However, no complete explanation of these anomalies has been presented so far. The day of the week effect has been explained by examining various kinds of measurement errors: delay between trading and settlements in stocks; specialists' strategies in response to informed traders; the distinction between trading and non-trading periods; the timing of corporate and government news releases; dividend

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[1] See for example, Fama (1965), Cross (1973), French (1980), Keim and Stambaugh (1984), Mills and Coutts (1995), Arsad and Coutts (1997).
[2] See Keim (1983), Reinganum (1983), Gultekin and Gultekin (1983 , 1987), Lee (1992).
[3] See Jaffe and Westerfield (1985), Barone (1990), Aggarwal and Tandon (1994), Dubois and Louvet (1996), Davidson and Faff (1999).
[4] See Lakonishok and Smidt (1988), Cadsby and Ratner (1992), Kunkel et al (2003).

patterns and time zone differences between relevant countries and markets.[5] Some potential explanations for the weekend effect involve: measurement errors in the portfolio returns; spillover effects from other large markets; concentration of certain investment decisions; timing of corporate releases after Friday's close; reduced institutional trading and greater individual trading on Mondays; country specific settlement procedures; risk-returns tradeoff; speculative short sales and systematic movements between the bid-ask spread.[6] The month of the year effect has been mostly explained by: the tax loss selling at the end of the year hypothesis; size of the firm; insider-trading/information release hypothesis; January seasonal in the risk-return relationship and omitted risk factors.[7] Possible reasons for the turn of the month effect are: the timing of the U.S. corporate earning news arrival; high transaction costs (Marquering et al., 2006); increased liquidity due to standardization of payments and the accumulation of cash by large traders at month end (Booth et al., 2001). Some explanations for the holiday effect are: the closed-market hypothesis; systematic patterns in the relative frequencies of bid and ask transaction prices; specialist's activity at the markets close and short sellers position in advanced of holidays.

The existence of these anomalies appear to conflict with the Efficient Market Hypothesis[8] since they imply that investors could develop a trading strategy to benefit from these regularities and gain abnormal returns on the basis of such patterns. Indeed, Mills and Coutts (1995) suggest that this apparently irreconcilable feature of financial markets, has led economists to question the validity of asset pricing models, and consequently the notion of efficient markets. However, evidence for the predictability of stock returns does not necessarily imply market inefficiency for at least two reasons. First it is likely that the small average excess returns documented by researchers would not generate net gains when employed in a trading strategy once

[5] See Gibbons and Hess (1981), Rogalski (1984), Fortune (1991).

[6] Lankonishok and Levi (1982) attributed the effect to the time lags between trading and settlement. According to Keim and Stambaugh (1984,p.820) if the low Monday returns are even partially due to the positive errors in prices on Friday, and if the errors vary over time, the higher than average errors on Friday would tend to produce lower than average returns on Monday. Damodaran (1989) documented that firms tend to report bad news on Fridays and suggests that the delayed release of information of bad news on Friday may cause the negative Monday effect. Kamara (1995) found that individuals tend to increase trading on Monday.

[7] Fortune (1991) indicated that the tax-loss selling hypothesis is not consistent with the efficient market hypothesis. This means that the former hypothesis should affect the ownership of shares and not their price. Ritter (1988) claimed that other explanation of the January effect that also imply inefficient markets are portfolio rebalancing, which states that window dressing by institution holders puts pressure on small stocks at turn of the year.

[8] For a survey on stock market efficiency evolution, see Lim and Brooks (2010).

the costs of transacting in the markets has been taken into account (Gregoriou et al., 2004). Therefore under 'modern' definitions of market efficiency (Jensen, 1978) these models would not be classified as inefficient. Second, the apparent differences in returns on different days of the week may be attributable to time varying stock markets risk premiums. Thus it is important that researchers appropriately account for risk when considering the extent of calendar anomalies.

For a rational investor, variations in returns only represent one dimension of the decision making process. The other important aspect is risk or volatility of returns. It is important to know whether there are variations in volatility of stock returns by day of the week patterns and if the higher (lower) return on a particular weekday is just a reward for higher (lower) risk on that day. Having such knowledge may allow investors to adjust their portfolios by taking into account variations in volatility. According to Berument and Kiymaz (2001), finding certain pattern in volatility may be useful in several ways, including the use of predicted volatility pattern in hedging and speculative purposes and in valuation of certain assets specifically stock index options. Moreover, specifying certain patterns in stock market volatility might help investors to make their investment decisions based on both risk and return. In fact, this would give investors another tool to design profitable strategies. Engle (1993) argues that risk-averse investors may adjust their portfolios by reducing their investments in those assets whose volatility is expected to increase and underlines that if the returns, volatility or correlations between markets are different for certain days of the week, then profitable strategies can be developed.

As Bowers and Dimson (1988) suggest, international comparison enable researchers to examine whether factors which are supposedly important in one particular economy, are also important in other economies. Such comparisons are useful, because stock market regularities and their explanations may be specific to individual markets and economies, and an assessment of their persistence across markets is very helpful on analyzing international financial linkages. There is vast transmission literature on capturing comovements between assets and markets, by modeling the covariance matrix or capturing the volatility spillovers across markets to identify international transmission (Hamao et al., 1990).

There is also a branch of study that looks at detecting the day-of-the-week effect in the correlation between assets and markets. The increasing internationalization of the main economies from developed nations has given the investor additional choices when considering his portfolio. This scenery is characterized by relaxation of national barriers, thus investor is no longer obliged to focus on domestic financial markets but instead may look towards other investment horizons whose markets offer opportunities to obtain greater results with respect to profit and risk. The benefits of diversification have been studied extensively since the pioneering work of Levy and Sarnat (1970) and Solnik (1974). All previous research supports the idea that diversification benefits exist as international markets are less than perfectly correlated. Nevertheless, Jacquillat and Solnik (1978) stated that the advantages that are derived from international diversification result in the relative independence between the distinct national economics and the price behavior of securities. Thus, if markets are highly integrated the opportunities of receiving profits from an international portfolio are not so high. But although it is widely accepted that financial markets have become integrated and independent, the nature and mechanism of this interdependence is not well understood. Tang and Kwok (1994) first attempted to examine the day-of-the-week effect in international portfolio diversification. They found that the benefits of portfolio diversification vary across days of the week and the benefits are smallest on Monday as the correlations among stock indices are larger.

The evidence on the day-of-the week effect in returns and volatility is highly debatable. Some recent studies assert that the day of the week effect for stock returns has disappeared in some countries starting in the 1990s due to improvements in market efficiency over time (Kohers et al., 2004; Steeley, 2001). Chan et al. (2005) by looking at the Monday returns of individual REITs before and after the structural changes from 1981 through 1999 they found that from the early 1990s the Monday seasonal pattern has started to fade away and completely disappeared by the late 1990s.[9] A similar pattern of empirical findings exists for the foreign exchange markets. Yamori and Kurihara (2004) analyze the daily returns of 29 foreign exchange rates and report evidence of the day-of-the-week effect in the 1980s for some currencies, which disappears for almost all currencies in the 1990s. These findings imply that increases in market efficiency over long time periods may erode the effects of certain anomalies such as the day-of-the-week effect. On the contrary,

[9] The disappearance of seasonal regularity on Mondays coincides with an increase in the number of institutional investors in REIT market. They also find that the level of institutional holdings affects Monday returns only for REITs that went public in the 1990s.

Cho et al. (2007) provide a test of the day-of-the-week effect in daily stock index returns based on the stochastic dominance criterion. They apply the test to a number of stock indexes including US large caps and small caps as well as UK and Japanese indexes. The empirical results show strong evidence of a Monday effect in many cases under this stronger criterion. The effect has reserved or weakened in the Dow Jones and SP 500 indexes post 1987, but is still strong in more broadly based indexes like NASDAQ, the Russell 2000 and the CRSP.

As Lakonishok and Smidt (1988) pointed out in their 90-year period study, one must be very skeptical of what is considered an anomaly. To be able to talk about an anomaly, it must appear in various data sets over different periods of time. According to Sullivan et al. (2001) the practice of using the same data set to formulate and test hypotheses introduces data-mining biases that, if not accounted for, invalidate the assumptions underlying classical statistical inference. The authors using 100 years of daily data and a bootstrap procedure[10] show that although nominal p-values for individual calendar rules are extremely significant, once evaluated in the context of the full universe from which rules were drawn, calendar effects no longer remain significant.

2. Literature

2.1. Stylized Facts of the Financial Time series

A number of stylized facts about the volatility of financial asset prices have emerged over the years, and have been confirmed in numerous studies. The most common stylized facts are the following:

1. **Volatility exhibits persistence**. The clustering of large moves (of either sign) in the price process was one of the first documented features of the volatility process of asset prices. Mandelbrot (1963) and Fama (1965) both reported evidence that large changes in the price of an asset are often followed by other large changes, and small changes are often followed by small changes. The implication of such volatility clustering is that volatility shocks today will influence the expectation of volatility many periods in the future.

[10] This bootstrap procedure allowed them to explicitly measure the distortions in statistical inference induced by data mining.

2. **Volatility is mean reverting.** Mean reversion in volatility is generally interpreted as meaning that there is a normal level of volatility to which volatility will eventually return. Very long run forecasts of volatility should all converge to this same normal level of volatility, no matter when they are made. While most practitioners believe this is a characteristic of volatility, they might differ of the normal level of volatility and whether it is constant over all time and institutional changes. More precisely, mean reversion in volatility implies that current information has no effect on the long run forecast.

3. **Innovations may have an asymmetric impact on volatility.** Volatility tends to react differently on arrival of 'good' and 'bad' news, i.e. positive and negative innovations. Engle and Patton (2001) note that this asymmetry is sometimes ascribed to a *leverage effect* and sometimes to a *risk premium* effect. In the former theory, as the prices of an asset falls, its debt-to-equity ratio rises, increasing the volatility of returns to equity holders. In the latter theory, news of increasing volatility reduces the demand of an asset because of risk aversion. The consequent decline in stock value is followed by the increased volatility as forecast by the news.

4. **Tale Probabilities.** Asset return distributions have heavy tails with narrower and higher peak. Having heavy tails means that extreme returns occur more frequently than implied by a normal distribution. Distributions with such characteristics are called leptokurtic distributions. Typical kurtosis estimates range from 4 to 50 indicating very extreme non-normality.

5. **Exogenous variables may influence volatility**. Most of the volatility characteristics outlined above have been univariate; relating the volatility of the series to only information contained in that series´ history. Of course, financial asset prices do not evolve independently of the market around them, and so we expect that other variables may contain relevant information for the volatility of the series. In addition to other assets having an impact on the volatility series, it is possible that deterministic events also have an impact. Such things as scheduled company announcements, macroeconomic announcements and even deterministic time-of-day effects may all have influence on the volatility process.

2.2. Research in Real Estate Investment Trusts and stock returns.

By definition, real estate investment trusts (REITs) invest their funds primarily in real estate assets. A REIT is a firm that owns (and often operates) income producing real estate and distributes at least 90 per cent of its taxable income to the shareholders. Like other corporations, REITs can be publicly or privately held. Public REITs may be listed on public stock exchanges like shares in common stocks in other firms. REITs can be classified as equity (investing in real properties, such as industrial, office retail, multifamily, lodging, and other types), mortgage (lending or investing in mortgage/mortgage backed securities) and hybrid (a combination of the above two types).

Created by the U.S. Congress in 1960, real estate investment trusts (REITs) have become an important segment of the U.S. economy and investment markets. The Netherlands in 1969 was the first European country to introduced REITs. While being a relatively new asset class in other countries of Europe, the European REIT industry has evolved dramatically over the past twenty years and that growth has set the stage for the adoption of the REIT approach to securitized real estate across Europe. According to the European Public Real Estate Association (EPRA), the market capitalization of European real estate companies has increased from $9,000 billion in 1990 to $224,000 billion in 2004. In 2009, the market capitalization of United Kingdom, France and Netherlands represents the 76.5% of the total European market. The U.K, the most heavily weighted country in Europe, in market capitalization terms, comprises approximately 45% of the region.

The day-of-the week anomaly in Europe has been studied in securitized in real estate indices, although less extensively. Moreover, the research thus far has concentrated most on U.S. Real Investment Trusts.

Since REITs share same characteristics with stocks[11], it is interesting to see whether the day-of-the-week effect is also observed in REITs. The returns of REITs were first examined for evidence of the day-of-the-week effect by Redman et al. (1997). The authors examined daily returns over 1986 to 1993 for a portfolio of REITs and found evidence of higher returns in January, on Friday, on turn-of-the-month trading days, and on pre-holiday trading days documenting a January, a day-of-

[11] Chosh et al. (1996) provides evidence that REIts are a bit more like direct investment in real estate, and a bit less like other types of stocks, from the perspectives of diversification and liquidity.

the-week[12], a turn-of-the-month-and a holiday effect respectively. Friday and Higgins (2000) examined daily returns over 1970 to 1995 for REITs and found a day-of-the-week pattern around the weekend. They also found autocorrelated returns from Friday to Monday in equity REITs, but not for mortgage REITs. Connors et al. (2002) also evaluated REITs for seasonal patterns by examining their daily returns over 1994 to 1999. They examined several REIT portfolios with standard regression models and found that Fridays exhibit higher returns than those experienced in other days of the week. They have also observed higher December returns, a holiday effect and a turn of the month effect. Similarly, Hardin et al. (2005) using data from the modern REIT period (1994-2002) and both REIT value-weighted and equal-weighted indices found little support for the implied negative Monday returns with either REIT. For Friday they found higher and significant average return than Monday for the equal-weighted index.

Recently, Brounen and Yair (2009) examined daily and monthly REIT returns for the ten most prominent markets around the world from 1987 to 1997. They found that Friday returns tend to be the highest of the week, while Mondays are weakest.[13] For the monthly returns the more interesting was the sell in May effect that seemed to be present in ten out of 11 markets. Lee and Ou (2010) use daily MREIT(mortgage real estate investment trusts) returns from 2001 to 2007 to examine the day-of-the-week effect. The find that MREITS have abnormal positive returns on Tuesday and Friday and abnormal negative returns on Wednesday.

The literature for stocks is summarized in Table 1A, where some studies for REITs are also referred.

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[12] The day-of-the-week effect seems to be more prominent among small firms.

[13] The day-of-the week effect appears to be most pronounced among small and young firms that have little or no institutional investors.

Paper	Methodology and/or data	Anomaly Tested	Empirical Results
Fields (1931).	Daily closing prices of Down-Jones industrial index from 1915 to 1930	Day of the week effect in returns	Saturday index values are lower (higher) than the arithmetic mean of Friday and Monday to less (more) than 50% of the cases.
Solnik and Bousquet (1990).	Daily CAC Index returns from the Paris Bourse 1978-1987		Positive returns recorded for Fridays and negative for Tuesdays. The liquidation effect can explain the Friday's higher returns but cannot explain the Tuesday's negative mean returns.
Brooks and Persand (2001).	Daily Data from 5 Southeast Asian stock markets using FTA World Price Index returns as a proxy for market risk. 1989-1996		Significant seasonality for three of the five markets. The average risk levels vary across the days of the week but they cannot explain the seasonality in returns.
Lenkkeri, Marquering and Strunkmann-Meister (2006).	Daily REIT returns of 11 European markets, the U.S. REIT returns, and two European indices.		High Friday returns in eight out of 11 European markets and in the two European indices. Significant positive autocorrelation for the Friday-Monday pairs only for Italy.
Al-Loughani and Chappell (2001).	Daily closing values of the Kuwait KIC index using GARCH(1.1) 1993-1997		The mean daily returns are significantly different from each other hence a day of the weak effect does exist in Kuwait Stock exchange.
International Evidence, Holden and Thompson (2009).	Daily data from 8 stock market indexes. Ending date is 31/12/2002 and starting date is 1994 for all indices with the exception of FTSE100 and S&P 500(1984) and FTSE 250(1986). Sub period analysis for all indices and use of rolling regression only for FTSE250 index. GARCH(1.1)		Significant negative (positive) effects on Mondays (Fridays) for UK in the early periods which declined in recent years. The significant positive Tuesday effect in the 1994-1997 period becomes negative in the latter period for USA. Only FTSE250 holds the same coefficients (Thursday and Friday) significant in both periods with the same sign.
Coutts and Hayes (1999).	Daily returns of FT30 share index from the London International stock Exchange.1979-1994. OLS		Significant negative (positive) mean returns for Mondays (Fridays).The significance of the weekend effect increases when Monday is the start of the account. When the outlier of the 'Crash' of October 1897 is excluded the weekend effect is dampened but not eradicated. The weekend effect for FT30 index is, in part, a settlement effect.
Alexakis and Xanthakis (1995).	Daily returns of a formulated index from the Athens Stock Exchange 1985-1994.The entire period is divided in two sub-periods, 1985-87 and 1988-94		Positive mean returns except for Tuesday for the whole and the first sub-period. At the second sub-period the mean returns for Monday become negative. For the whole and the two sub period's volatility increases more when returns shocks are positive.

Alagidede and Panagiotidis (2006).	Daily and monthly closing prices of DSI from the Ghana Stock Exchange 1994-2004. GARCH models and rolling regression techniques are employed	Day of the week effect, month of the year and /or holiday effect in returns	Highest monthly returns in April (8%) and March (6.3%).The latter disappears when employing a rolling window. Lower (higher) returns on Mondays (Fridays).Failure of time varying Asymmetric GARCH to find support for the existence of the day of the week effect.
Coutts and Sheikh (2002).	Daily data of All Gold Index on the Johannesburg Stock Exchange 1987-1997 and for three sub-samples of equal length. OLS		No evidence found for any of the anomaly tested over the eleven year period. Over sub sample examination, only one particular day (Tuesday), in the second sub period has a significant return. No monthly seasonality and no persistent pre-holiday effect are detected.
Arsad and Coutts (1997).	Daily returns of FT30 share index from the London International stock Exchange 1935 -1994. Data separation into 12 sub-samples of 5 years OLS		Negative mean Monday returns for the entire sample period and the 12 sub-samples. Significant weekend effect for six sub samples. Significantly positive mean returns for January all occurring after the introduction of capital gains tax in 1965.Higher pre-holiday mean returns between five and nine times the size of mean returns for non-holidays for all days except Tuesday.
Choudhry (2001).	Pre-World war one data for US, UK and Germany via asymmetric GJR model. Test the tax-loss selling hypothesis due to lack of tax treatment before 1914	Month of the year effect in returns and/or volatility	January effect (largest in absolute terms) for UK and US. Month of the year effect (August) for Germany. January effect and month of the year effect are irrelevant of the tax structure in operation.
Arago-Manzana and Fernandezizquierdo (2003).	Monthly closing prices of the Spanish IBEX-35 index and its futures contracts. 1993-1999 GARCH [PAR-PIGARCH]		Existence of monthly seasonal behavior for IBEX-35 and its futures contract in volatility but no evidence of it for the returns.
Cheung and Coutts (1997).	Daily returns of Hang Seng Index from Hong Kong Stock Exchange 1985-1997. Data partition into two sub-samples, six years before and after 1991. OLS		There is no January effect or other persistent monthly seasonality in the Hang Seng Index. For two of the data sets December return is higher than the January return.
International evidence, Fountas and Segredakis (2002).	Monthly and weekly data on stock index returns from 18 emerging stock markets. 1987-1995 OLS		Significant seasonal effects apply for all countries in the sample. The evidence for Jordan, Pakistan, Taiwan and Venezuela is weak. Strong evidence of monthly pattern is found for Chile, Colombia, India, Malaysia, Mexico, Nigeria and Zimbabwe.

International evidence, Zwergel (2010).	Closing prices of four equity futures and their corresponding indices including DAX(FDAX) ,Nikkei(NK) ,FTSE100(FTSE) ,S&P500(SP5) 1991-2005. Turn of the month Trading Strategy (TOMTS) on returns is defined separately for every index and two different benchmarks are used, namely Buy and Hold (BH) and Rest-Of-the Month (ROM), for comparison with the TOMTS. The performance of each strategy applied is assessed by several measures [(SR),(LPM),(Ω),(VaR),(ERVaR),(MDD),(CR)]	Turn of the month effect	Except for the SP5, the TOMTS shows better results than BH and ROM for all performance measures. TOMTS returns per day invested are higher than the average returns for the BH and ROM days for all four futures. Investigating the changing nature of this anomaly through linear and polynomial regression it is showed that for each future the TOMTS still generates profits in the bear market of 2000 and 2001.
Compton, Johnson and Kunkel (2006).	Daily returns of five REIT indices 1999-2003 Parametric and non-parametric statistical tests are used.		A TOM effect in all five domestic REIT indices is found: real estate 50 REIT, all REIT, equity REIT, hybrid REIT, and mortgage REIT.
Clark, Garret and Jones (1997).	Daily return data from 5 Asian-Pacific stock markets. GARCH(p,q) is used- including trading volume. 1986-1994	Day of the week effect in volatility	Significant Monday and Tuesday effect for all markets except for the Philippines which only exhibit a Monday effect. When the volume variable is included it appears to have same impact on the ARCH parameters, however the volatility on Monday remains significantly high.
Ho and Cheuing (1994).	Daily stock indexes from 8 Asian markets 1975-1989 Modified Levene's test is used		Monday returns have the highest volatility for all the emerging Asian markets with the exception of Korea (Tuesday).
International evidence, Balaban et al (2001).	Daily stock index returns from 19 countries using AR(p)- GJR-GARCH(1,1)- M model for 14 countries and AR(p)-GARCH(1,1) for 5 countries	Day of the week effect in returns and volatility	Thirteen countries exhibit seasonality in their mean returns (seven countries) or volatility (eight countries) or both (two countries).
International evidence, Kiymaz and Berument (2003).	Daily closing prices of UK, US, Canada, Germany and Japan. GARCH(1,1)-M, GJR-M		Highest volatility on Monday for Canada, Germany and Japan, and on Friday for UK and US.
Kenourgios and Samitas (2008).	Daily closing values of 6 major Athens Stock exchange (ASE) indexes. Sub-period analysis five years before and after the Greek entry to Euro Zone (1/1/2001) GARCH(1,1) , GARCH-M		Strong evidence for day of the week effect in both return and volatility for the ASE over the period 1995-2000. This anomaly has weakened over the period 2001-2005.
Charles (2008).	Daily prices of six European indexes using GARCH-GJR specification for the volatility equation. Testing if the statistically significant findings regarding seasonality in volatility lead to better out of sample volatility forecasts		Presence of seasonality in both returns and volatility for Athens, Paris while Helsinki, Milan and Zurich display seasonality only in volatility. For all series the seasonal volatility does not seem to improve the volatility forecasts.
Berument and Doyan (2010).	Equal- and value-weighted NYSE, S&P500, NASDAQ, AMEX and equal-weighted Dow index 1952-2006 EGARCH		Always positive return-volatility relationship recorded for Tuesdays and Wednesdays. For the Monday and Friday return-volatility relationship when it is statistically significant, the estimated coefficients are negative and positive respectively.

Baker, Rahman and Saadi (2008).	Daily returns of the S&P/TSX composite index from the Toronto Stock Exchange 1997-2002 GARCH(1.1) using several specifications for the error distribution	Day of the week effect in returns and volatility	Mean returns on Mondays are the lowest of any day of the week. Tuesday has the highest conditional volatility. The Students' *t*-distribution outperforms the normal distribution as well as GED and DED distributions.
Kamaly and Tooma (2009).	Daily closing values of 12 Arab markets GARCH-M 2002-2005		Four (eight) markets exhibit day-of-the-week effect on returns (volatility). Four markets have significant positive risk premium except Qatar which has negative sign.
Chukwnogor-Wdu and Feridum (2006).	Daily closing prices of 15 Asian Pacific markets in the post Asian financial crisis period 1998-2003.Use of Levene's (Kruskal-Wallis) test, to test the equality of variation (mean returns) across days of the week.		Ten of the fifteen markets show negative Monday returns. The homoscedasticity hypothesis cannot be rejected in none of the 15 markets concluding that all the markets in the post Asian financial crisis period have a lower degree of variation across the days.
International Evidence, Charles (2009).	Daily return data of five international indexes. ARMA-GARCH, ARMA-GJR and APARCH models used. 1987-2007		Presence of day of the week effect on volatility for all series but on returns only for the U.S (DJIA) index.
Alagidede (2008).	Daily returns from the 7 largest stock markets in Africa. OLS, GARCH(1,1) including FTSE All World index as a proxy for market portfolio.		Pronounced seasonality in volatility in Nigeria and in expected returns in South Africa. No evidence for day of the week effect in Kenya, Egypt, Morocco and Tunisia. Market risk in both volatility and return is highly significant in South Africa
International Evidence, Bayar and Kan (2002).	Daily stock market returns denominated in both local currency and U.S dollars for 19 countries 1993-1998		In local currency returns, volatility is the highest (lowest) on Mondays (Tuesday and Friday). In dollar returns volatility is the lowest (highest) on Tuesdays (Mondays) just after Mondays with the highest standard deviation.
Choudhry (2000).	Daily returns from seven emerging Asian stock markets 1990-1995 GARCH(1,1)		Significant negative mean returns on Mondays for Indonesia, Malaysia and Thailand. Positive Monday effect on volatility in all markets except India.
Bhattacharga, Sarkar and Mukhopadhyay (2003).	Daily data of the Indian BSE100 index from 1991-2000 including further examination of two sub periods five years before and after 1995 GARCH(1.1)		Significantly positive effect in volatility on Mondays for the entire sample and the second sub-period. No seasonality in volatility has been found for the first period. Seasonality in returns between the two sub-periods are similar but with opposite signs.
Berument and Kiymaz (2001)	S&P 500 stock index closing prices for the period 1973-1997 .Sub-period analysis for the pre and post October 1987 periods. OLS, GARCH (1.1)		Highest and lowest returns (volatility) are observed on Wednesday (Friday) and Monday (Wednesday) for the period 1973-1997. In both of the pre and post crisis periods Wednesday has the lowest day of the week effect in volatility while Tuesday has the highest volatility during the pre 1987 period and Friday during the post 1987 period.

Savva, Osborn and Gill (2006).	Data of closing daily prices of 15 European indices. [PAR-PE GARCH] model used .1993-2005	Day of the week effect in returns and volatility	Positive (negative) and significant first order autocorrelation for all countries (Luxemburg) except from U.K., France and Netherlands. Every country has at least one of its periodic asymmetric terms significant except Greece. There is a day of the week effect in intercept coefficients of volatility equation for all markets except U.K, France, Spain and Portugal.
Apolinario, Santana, Sales and Caro (2006).	Daily stocks indices on 13 European markets GARCH(1.1) and T-GARCH models are used. 1997-2004.		Most European markets do not exhibit a day of the week effect in returns except France and Sweden. Existence of seasonality in volatility for all financial markets except Portugal and Czech Republic (France and Czech Republic) when a GARCH (T-GARCH) model is applied.
International Evidence, Tsiakas (2005).	Daily return data from 10 stock market indices employing bootstrap-based hypothesis testing and periodic volatility model		The strongest day of the week effect in volatility is Monday (Friday) for nine (eight) countries. Among the month of the year volatility effects October and June are significant in all countries. In returns the strongest effect is Monday which is statistically significant in eight countries. At least 20% more day of the week, month and holiday effects are significant in volatility than the expected returns.
International Evidence, Tang and Kwaok (1997).	Daily data of 6 national stock indices. ANOVA and Bartlett's homogeneity test are used for testing the equality of mean returns and variance respectively. 1981-1992	Day of the week effect in returns, correlation and/or volatility	Negative mean returns for Hong Kong and U.K on Monday. Positive mean returns for all countries on Friday except Japan and U.S. Highest volatility occurs on Monday in all markets except the Australian and U.K markets in which occurs on Tuesday. Monday (Tuesday) has the largest correlation in 9(4) pairs of stock indices while smallest correlation occurs in 7 and 5 pairs of indices on Wednesday and Thursday respectively.
Chandra (2006).	Daily stock market index data from 6 markets of the Asian Pacific region using GARCH(1.1) and a bivariate conditional correlation model.		Existence of day of the week effect on returns in three of six markets. Tuesday effect in five of the fifteen pair-wise correlations. Three pair-wise have a Monday (or Tuesday) effect. There is no consistent day of the week effect for returns and correlation for this region.
Hogholm and Knif (2009).	Daily prices of the Finnish OMX market index and four industry level-indexes each of these it is studied an individual company for the pre- and post euro period (December 31,1998) 1993-2006. EGARCH		For the total sample the market index has higher (lower) returns (volatility) on Mondays (Fridays). All series except two industry indices exhibit significant asymmetric autocorrelation. In pre euro period none of the industry indexes show any sign of weekly patterns in returns and volatility. In post euro period all four industry indexes reveal significant volatility patterns.
Franses and Paap (2000)	Daily returns of S&P 500 1980-1994 GARCH[PAR-PIGARCH]		Positive (negative) first order correlation on Mondays (Tuesdays). Mondays (Tuesdays) exhibit the higher (lower) persistence in volatility.

3. Data

Our study is based on a data set of returns on European securitized real estate indices that was first used by Lenkkeri *et al.* (2006), provided by the European Public Real Estate Association (EPRA) and developed by a consortium of financial institutions in conjunction with the National Association of Real Estate Investment Trusts (NAREIT). The EPRA indices are indices on European real estate firms, containing more than 100 public quoted real estate companies and these indices only include securities traded within Europe. The company must be a closed-end company listed on an official European stock Exchange in order to qualify for inclusion. Furthermore, companies must derive a specific percentage of their earnings from relevant real estate activities, defined by EPRA as the ownership, trading and development of income-producing real estate. More specifically, in order to qualify for inclusion in the index, companies must meet four fundamental criteria (source: ground rules EPRA). First, each eligible company must have a free float market capitalization of 50 million or more. Second, each eligible company must have a traded volume of more than 25 million, over a three month annualized period. Third, each eligible company must derive at least 75% EBITDA[14] from relevant real estate related activities. Fourth, eligible companies must produce a set of annual accounts in English. The advantages of inclusion in the EPRA are similar to the advantages of U.S. REITs: a favorable taxation, providing liquidity in the form of a public market and they enjoy the corporate attributes of centralized management, limited liability for their investors and transferability of shares. Moreover, they enable investors to invest in large real estate enterprises and spread risk among investors. Thus, the advantages may be attractive to investors who can adapt these advantages to their return and risk objectives. Investing in publicly listed real estate shares has become increasingly popular in Europe, as investors are nowadays able to invest their funds in professionally managed real estate portfolios by buying relatively liquid shares that are traded on the stock market at low transaction costs.

[14] Earnings before interest, taxes, depreciation and amortizasion.This measure is sometimes reffered to as net operating income (NOI).

The empirical data consist of the daily closing from the following 13 European countries: Belgium, Denmark, Finland, France, Germany, Greece, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland and the United Kingdom. Returns for most countries are available from January 15, 1990 to May 11, 2010.[15] For Finland, Denmark, Greece, Norway and Spain a shorter time is available.[16] In addition to individual countries, we also consider a European real estate index and a global real estate index. The EPRA Europe index, consisting of all countries analyzed in this study (and some more countries that recently join the European Union), is weighted according to the market capitalization of individual securitized real estate market. We also consider the EPRA/NAREIT Global index, consisting of all world-participating countries. All indices are value weighted indices, and the entire amount of issued shares of a constituent company is included in the calculation of the company' s market capitalization, and adjusted by the free float weighting of the company. Since the data comes from different countries, it is unavoidable to have different holidays for each market. We replace the missing value by closing price as the day before the holiday as Savva et al. (2006). Hence the sample for each country contains all days of the week except weekends. Returns in each market (R_t) are expressed in euro currency and are calculated as the first differences in natural logarithms of market indexes multiplied by 100.

$$R_t = [\log(P_t)-\log(P_{t-1})]*100 \qquad (1)$$

where P_t is the level of prices in indices at time *t*.

Table 1 provides descriptive statistics for the entire sample. Looking at the mean returns we see that over the period 1990-2010 most countries exhibit negative average mean returns with the exception of Finland, France and Switzerland. The highest mean returns for the European countries were achieved for France. Denmark is the country with the lowest average returns. The unconditional volatility is lowest for Switzerland and highest for Denmark and Norway. Except for Belgium, all other

[15] In the 1990s REITs have become more liquid and larger in size. In addition, they have a significantly higher inside ownership and use different capital structures and management strategies (see, e.g., Capozza and Seguin, 2000)

[16] For Norway and Spain the data series exhibit discontinuances from 02/19/2008 to 06/18/2006 for the former and from 09/30/2006 to 12/17/2006 for the latter country. To overcome this problem ,we make use of the data in Eviews7 without specifying date (as Unstructured/Undated), with some cautiousness about the validity of the results.

returns are negatively skewed (or skewed to the left). The Jarque-Bera statistic of all countries is much greater than any critical value at conventional confidence levels, thus rejecting the null hypothesis of normally distributed returns. All series are leptokurtic, especially that of Greece, that is, all series have a thicker tail and a higher peak than a normal distribution. The finding of skewness and excess kurtosis in securitized real estate returns has been discussed by Bond and Patel (2002).

In order to test stationarity of the return series we perform Augmented Dickey-Fuller test proposed by Dickey and Fuller (1979). We applied two versions of this test: with constant, and with constant and trend. Both tests strongly reject the hypothesis of non-stationarity by having large negative *t*-statistics.

The descriptive statistics for returns for each day of the week and for each country are reported in Table 2. Examining the returns for each day, we notice that for each country there is at least one day with negative returns. Mean returns for Mondays are negative in all cases except for Denmark and Finland. The highest average returns are observed on Fridays for nine indexes except for Belgium, Denmark, Greece and United Kingdom. The lowest average returns are observed on Mondays for 8 indexes while for Greece, Norway and Sweden the lowest returns are observed on Tuesdays. The highest standard deviation on Mondays is found in eight of 13 indices.[17] This phenomenon can be explained by larger volatility on the day following the exchange weekend (French and Roll, 1986). For Denmark, Spain and United Kingdom the highest standard deviation is observed on Wednesday. The lowest standard deviation is found on Fridays in the case of Belgium, Finland, France, Italy, Netherlands, Spain; on Thursdays in the case of Germany, Greece, Norway, United Kingdom; on Wednesdays in Sweden, Switzerland and on Monday in the case of Denmark. Table 2 also reports skewness and kurtosis for return series for each country. We observe that positive or negative skewness and excess kurtosis is present for all days of the week in returns for each country. Jarque-Bera tests refute the null hypothesis of normality of return series.

[17] Kiymaz and Berument (2003) have shown that for Germany and Japan, the days with the highest volatility also coincide with that market's lowest trading volume.

4. Methodology

Traditionally, empirical researchers tested weekend and or day of the week effects applying either ANOVA- or Kruskal-Wallis-type tests.[18] The strategy was to test for daily differences in moments of the unconditional distributions of the returns. Another popular approach has been OLS-regression analysis with daily dummy variables. The use of this methodology however has to obvious drawbacks. The first one is that the errors in the model may be autocorrelated, which, in turn, may cause misleading inferences. The second drawback is that error variances may be time dependent as opposed to being constant. More recent dummy-regression approaches also control for conditional heteroscedasticity using GARCH-type models and add daily dummies in the volatility equation as well, in order to test for daily patterns in the second moments. Some studies extend the recent empirical work to consider whether any observed anomalies can be explained by reference to market risk in a CAPM-type framework.[19] On the other hand, some studies examine day of the week patterns employing rolling regression techniques.[20]

In order to model and test for day of the week effects we use conditional tests and models. For comparison we also report on the corresponding unconditional test results. For the unconditional tests of the day of the week effects we use a Kruskal-Wallis-test for ranks to test weekly patterns in the median, and the Brown-Forsythe (modified Levene) test for weekly patterns in the volatility.

We also perform regression analyses to gain further insights on the daily behavior of European real estate index returns. The analysis is conducted employing dummy variables D_{1t} , D_{2t} , D_{3t} , D_{4t} and D_{5t} representing the days of the week. A conventional way of modeling return seasonality is by estimating the basic model in (2):

$$R_t = \varphi_1 D_{1t} + \varphi_2 D_{2t} + \varphi_3 D_{3t} + \varphi_4 D_{4t} + \varphi_5 D_{5t} + \eta_j \sum_{i=1}^{n} R_{t-i} + e_t \qquad (2)$$

$$e_t \backslash \varphi_{t-1} \sim N(0,h_t) \qquad (3)$$

[18] For an overview on the methodology employed in previous studies of the day-of-the-week effect see Al-Loughani and Chappell (2001,p.353)
[19] See for example, Brooks and Persand (2001), Alagidede (2008).
[20] See for example Alagidede and Panagiotidis (2006), Holden and Thompson (2009)

$$h_t = \omega + \sum_{i=1}^{q} a_i e_{t-i}^2 + \sum_{j=1}^{p} \beta_j h_{t-j} = \omega + \alpha(L)e_t^2 + \beta(L)h_t \tag{4}$$

where[21] R_t is the continuously compounded daily index returns; φ_1 , φ_2 , φ_3 , φ_4 and φ_5 are parameters, e_t is a random error term and D_{1t} , D_{2t} …. D_{5t} are dummy variables for Monday, Tuesday …. Friday (i.e. $D_{1=}$ 1 if t is Monday and zero otherwise). Since we include all five weekdays as dummy variables, we omit the constant term to avoid the dummy variable trap.

However, the linear models are weak to explain certain stylized facts of financial asset returns (see, section 2). Engle (1982) introduced the Autoregressive Conditional Heteroscedasticity (ARCH) model that allows the forecasted variances of returns to change with the squared lagged values of the error terms from the previous periods:

$$h_t = \omega + \sum_{i=1}^{q} a_i e_{t-1}^2 = \omega + \mathrm{A}(L)e_t^2 \tag{6}$$

The ARCH model was extended by Bollerslev (1986) into the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model. This generalization allowed for a more flexible lag structure by including autoregressive terms of the volatility. Equation (4) is there for fit into daily data returns to model the conditional variance in the European real estate data. The conditional variance, h_t , must be non-negative and positive, hence, restrictions of $\omega \geq 0$,$\alpha_i \geq 0$,$\beta_j \geq 0$ are sufficient conditions to ensure $h_t \geq 0$. The ARCH term, α_i ,represents the impact of current news on the conditional variance process or the short run persistence of shocks, while the GARCH term, β_j , indicates the impact of old news on the volatility or the persistence of volatility to a shock. The level of persistence of volatility depends on the sum of $\alpha + \beta$. This sum should be less than unity, implying that the volatility process does return to its mean and furthermore to satisfy the non-explosiveness of the conditional variances.

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[21] The autoregressive term account for statistically significant but economically minor autocorrelation and correct for possible effects of non-synchronous trading.

The GARCH model assumes that positive and negative shocks have the same effect on volatility because it depends on the square of previous shocks. Thus, it cannot capture the asymmetric effect in the financial data, which is that financial asset returns respond differently to positive and negative innovations. Two asymmetric GARCH models are employed. Glosten, Jagannathan and Runkle (1993) introduced the GJR-GARCH model:

$$h_t = \omega + \alpha e_{t-1}^2 + \gamma e_{t-1}^2 I_{t-1} + \beta h_{t-1} \tag{7}$$

where I_{t-1} is a dummy variable that is added to capture the asymmetric effect in data. This dummy variable takes the value of one if $e_{t-1} < 0$ or zero otherwise. Coefficient α shows the impact of good news, while $\alpha + \gamma$ the impact of bad news. Asymmetry exists if $\gamma \neq 0$ and the leverage effect exist if γ is significantly greater than zero. The sum of $\alpha + \beta + \gamma/2$ provide the persistence of shocks in volatility. For $h_t \geq 0$ the following restrictions on the models parameters must hold; $\omega \geq 0$,$\alpha \geq 0$,$\beta \geq 0$ and $\alpha + \gamma \geq 0$.

Nelson (1991) introduced the Exponential GARCH (EGARCH) model, which has the following structure:

$$\log(h_t) = \omega + \sum_{i=1}^{q} a_i (\varphi z_{t-i} + \gamma \left[|z_{t-i}| - E|z_{t-i}| \right] + \sum_{i=1}^{p} \beta_i \log h_{t-1} \tag{8}$$

where $z_t = \dfrac{\sqrt{h_t}}{e_t}$ and when $a_i \varphi$ <0 then a leverage effect exists.

There are a few differences between the EViews specification of the EGARCH model used in this study and the original Nelson model. First, Nelson assumes that the error term in the mean equation, e_t , follows a Generalized Error Distribution (GED) function, while we give a choice of normal, Student's *t*-distribution, or GED. Second, EViews specification for the log conditional variance is a version of:

$$\log(h_t) = \omega + \beta \log(h_{t-1}) + \gamma \frac{e_{t-1}}{\sqrt{h_{t-1}}} + \alpha \left[\frac{|e_{t-1}|}{\sqrt{h_{t-1}}} - \sqrt{\frac{2}{\pi}} \right] \tag{9}$$

which differs slightly from the specification above. Where ω ,α , β and γ are coefficients to be estimated, and γ is the measure of asymmetric effect, where the sign of yesterday's shock enters the model in contrast to simple GARCH model. The advantage of using the logarithmic construction on the EGARCH model is that the conditional variance will be positive, so there is no need to impose a restriction of non-negative coefficients. Again asymmetries are allowed since if the relationship between volatility and returns is negative, γ will be negative. However, if the asymmetric coefficient (γ) is equal to zero then both positive and negative shocks of the same magnitude will have the same effect on market volatility.

It is possible that conditional variance, as proxy for the risk, can affect asset market return. Engle, Linien and Robins (1987) introduce the GARCH-in-Mean (GARCH-M) model, which allows the conditional standard error (or variance) to affect returns. The GARCH-M model has the following structure,

$$y_t = \mu + \delta\sqrt{h}_{t-1} + e_t \qquad e_t \sim N(0,h_t) \tag{10}$$

$$h_t = \alpha_0 + \alpha_1 e_{t-1}^2 + \beta h_{t-1} \tag{11}$$

where, δ is a measure of risk premium.

The estimated positive δ suggests that risk averse agents need to be compensated in order to accept higher risk.

Brooks and Persand (2001) used the returns on market portfolio as a proxy for the market risk. They incorporate market risk in the mean equation to examine whether any observed anomalies can be explained by reference to market risk in a CAPM-type framework, and how the risk varies through the week. Alagidede (2008) extend the model of Brooks and Persand (2001). First, he fitted GARCH (1, 1) to model second moments and second he incorporates market risk. The market model is:

$$R_t = \varphi_1 D_{1t} + \varphi_2 D_{2t} + \varphi_3 D_{3t} + \varphi_4 D_{4t} + \varphi_5 D_{5t} + \psi_i RMP_t + \eta_j \sum_{i=1}^{n} R_{t-i} + e_t \tag{12}$$

where all terminology is as for (2) and in addition RMP_t is the return on the market portfolio. D_{1t} , D_{2t} …. D_{5t} represent seasonal dummies. If these dummies are insignificant where they were previously significant in Equation 2, we can say that seasonality is captured by the risk-return trade-off. If on the other hand, they are significant, then we must look beyond the market risk for explanations. Given this intuition, Equation 4 could be written alternatively:

$$h_t = \omega_i + \alpha e^2_{t-1} + \beta h_{t-1} + \lambda_i RMP_t + \rho_2 D_{2t} + \rho_3 D_{3t} + \rho_4 D_{4t} + \rho_5 D_{5t} \tag{13}$$

Furthermore to see how the risk varies across the days of the week, interactive dummies (seasonal dummies multiplied by the return on the EPRA/NAREIT Global Index and EPRA Europe Index, in our case) are used to determine whether risk increases (decreases) on the day of high (low) returns (volatility),

$$R_t = \varphi_1 D_{1t} + \varphi_2 D_{2t} + \varphi_3 D_{3t} + \varphi_4 D_{4t} + \varphi_5 D_{5t} + \sum_{i=1}^{5} \psi_i [D_{it} RMP_t] + \eta_j \sum_{i=1}^{n} R_{t-i} + e_t \tag{14}$$

and the variance equation becomes,

$$h_t = \omega_i + \alpha e^2_{t-1} + \beta h_{t-1} + \sum_{i=1}^{5} \lambda_i [D_{it} RMP_t] + \rho_2 D_{2t} + \rho_3 D_{3t} + \rho_4 D_{4t} + \rho_5 D_{5t} \tag{15}$$

Equation 15 gives seasonality in the conditional variance given that λ account for seasonality in the conditional variance that can be attributed to the market portfolio.

We consider various classes of models to investigate the day of the week effect in both return and volatility equation. All the estimation is carried out using quasi maximum likelihood estimates (QMLE).[22]

[22] The use of stochastic regressor gives biased estimates as argued by Pagan (1984). Additionally, Pagan and Ullah (1988) suggest the use of the Full Information Maximum Likelihood Estimation (MLE) technique to estimate the system of equations in order to avoid bias. There is, however, a problem associated with use of MLE technique. As pointed out by Bollerslev and Wooldridge (1992), assumption of the normality of the standarized conditional errors may be to strong and may cause misspecification of the likelihood function. Bollerslev and Wooldridge (1992) suggest the use of Quasi Maximum Likelihood Estimation (QMLE) method in order to avoid misspecification problem. They formally show that QMLE is generally consistent and has a limited distribution.

Choudhry (2000) provides evidence of the day-of-the-week effect in emerging Asian countries using a GARCH model that assumes the error distribution follows a conditional Student's *t* density function. Nelson (1991) indicates that a generalized error distribution (GED) is preferred with a GARCH specification. In this study the normal, the Student's *t* distribution, and the generalized error distribution (GED) were employed.

5. Empirical results

5.1. Unconditional models and tests

As benchmark tests we first analyze the unconditional day of the week patterns in the thirteen return series. For testing daily differences in the median we use the Kruskal-Wallis one-way ANOVA for ranks. This test generalizes the Mann-Whitney test to a situation with more than two sub groups.

We further perform Brown-Forsythe test (Brown and Forsythe, 1974) to see whether the constancy of the variances across the days of the week can be rejected. Brown-Forsythe test is used to determine whether *k* samples have equal variance.[23] This modified Levene-test replaces the absolute mean difference with the absolute median difference and is, hence, expected to be more robust.

Table 3 presents the values and *p*-values from the tests for a significant day of the week pattern in median and variance of the unconditional distributions. By applying Kruskal-Wallis test, on a 1% level we find significant weekly pattern in median for France and Sweden, on a 5% level for Italy and Norway and on a 10% level for Spain.

By applying Brown-Forsythe test, the hypothesis that variance is constant across the days of the week is rejected for Germany, Italy and Sweden at a 1%, 5% and 10% level respectively.

Table 4 presents the OLS estimates for regression equation (2). We test the hypothesis that the coefficients corresponding to the days of the week are

[23] There are numerous tests for equal variances, but, as Box (1953) points out, many of them appear to be sensitive to departures from normality, outliers, and heteroscedasticity. Conover et al. (1981) list and compare 60 methods for testing the homogeneity of variance assumptions and show that Brown-Forsythe procedure outperforms all the other procedures. Moreover, Brown and Forsythe (1974) performed Monte Carlo studies and indicated that using the trimmed mean performed best when the underlying data followed a heavy-tailed distribution and the median performed best when the underlying data followed a skewed distribution.

simultaneously zero. To this end, an F-test is computed for each regression and reported in Table 4.

Overall, the data suggest that while there are some similarities in the day-of-the-week pattern of real estate returns, some differences between countries exist. We find that Friday returns are significantly higher for Finland, France, Italy, Norway, Spain, Sweden and Switzerland. This corresponds to the results of Lenkkeri et al. (2006) who found that eight of 11 European markets exhibit an abnormally high Friday return. While we observe a positive Friday effect in seven of 13 countries, a significant negative Monday effect is observed for Belgium, France, Italy, Netherlands and U.K. This result contradicts the results of Lenkerri et al (2006) who did not find evidence for significant Monday effect in European real estate indices. This also contradicts the results of Chan et al (2005) that the Monday seasonal disappeared in the 1990s. in U.S. REITs. Although, the day-of-the-week effect is confirmed by the significant F-statistics for France, Norway and Sweden at the 5% significance level, and for Italy at the 10% significance level.

Nevertheless, there is an increasing evidence that asset returns exhibit some stylized facts (see, section 2.1) that that linear models are unable to explain. As we can see, the diagnostics from Table 4 are not satisfactory (the statistic of Lagrange Multiplier test is significant in all cases, so we reject the null hypothesis of homoscedasticity to squared residuals). As a result the benchmark linear framework has to be rejected and we incorporate second moments.

5.2. Conditional models and tests

Six GARCH models are used: GARCH(1.1), EGARCH, GJR-GARCH, GARCH-in–mean, EGARCH-in-mean and GJR-GARCH in mean. Various extensions of these models are also employed. The selection of the model that fits data best is based on Schwartz (SIC), Akaike (AIC) and the log likelihood value.

Their standardized residuals where saved and the BDS test[24] statistic was calculated in each case. In order to test the stationarity of variance in each selected

[24] The IID assumption is examined through the applicationof the BDS test proposed by Brock et al. (1996). The BDS test for randomness and only *p*-values are reported under the null of independently and indentically distributed (*iid*) residuals.

GARCH model we perform three different unit root tests[25] in GARCH variance series. The lag length (k) for the ADF, PP and Zivot and Andrews' test is selected using two approaches. The first approach is an information-based method, such as the Schwarz information Criterion and the second is the "t sig" approach developed by Hall (1994).[26]

5.2.1. Which Model Fits data Best? The standard information criteria due to Akaike (1974) and Schwarz (1978) used to select the appropriate order of an autoregressive model are given by

$$AIC = T\log(\hat{\sigma}^2) + 2p$$

$$SIC = T\log(\hat{\sigma}^2) + p\log(T)$$

where p denotes the number of estimated parameters (which is the autoregressive model order in case), T denotes the number of observations, and $\hat{\sigma}^2$ denotes the estimated model error variance. One of the most important uses of the original information criteria for economic and financial applications has been in selecting the optimal numbers of lags to include in the model. Increasing the number of lags has to competitive effects: reducing the residual sum of squares (and therefore the error variance), and increasing the value of the penalty term (2p or plog(T)). The model chosen would be the one which minimizes the value of the information criterion, so that a model with a larger number of lags would only be chosen if the reduction in log($\hat{\sigma}^2$) as a consequence of improved fit to the data outweighed the increase in the value of the penalty term.

Many researchers do not make it clear whether standard or modified criteria are used for selection of models from the GARCH family. According to Brooks and Burke (2003), the old criteria are no longer applicable when the models in the choice set are conditionally heteroscedastic. They proposed modified information criteria that

[25] We perform two conventional unit root tests – such as the Augmented Dickey-Fuller (1979) (ADF) and Phillips-Perron (1988) test, and to allow the possibility of a structural break we perform the Zivot and Andrews' (1992) test.

[26] The Hall (1994) "t sig" approach entails starting with an upper bound of k, which is chosen a priori. If the last included lag is significant, the upper bound is chosen. If not, k is reduced by one until the last lag becomes significant. If no lags are significant, k is set equal to zero. We set, k_{max} =8 and use a critical value of 1.60 to determine the significance of the t statistic on the last lag (see Lumsdaine and Papell, 1997).

can be validly applied to the selection of such models. The modified versions of AIC and SIC criteria are written

$$HAIC = \sum_{t=1}^{T} \log(\tilde{\sigma}_t^2) + 2g$$

$$HSIC = \sum_{t=1}^{T} \log(\tilde{\sigma}_t^2) + g\log(T)$$

where g denotes the total number of estimated parameters in the mean and variance equations[27], and $\tilde{\sigma}_t^2$ are the estimated time-varying conditional variances using the specified GARCH model.

In this study we use the standard information criteria. We also calculate modified information criteria to compare if there are differences in GARCH model selection. The lag order in the mean equation was selected based on the statistical significance of autocorrelations. The number of lags order in the mean equation is selected based on the lowest standard Schwarz (SIC) and Akaike (AIC) information criteria. The best model must have the lowest SIC and AIC and the highest log likelihood value.

5.2.2. GARCH models following Student's t distribution

5.2.2.A. Day of the week effect in returns (GARCH models)

Table 5 reports the standard and modified information criteria and the log likelihood value of three GARCH models (GARCH(1.1), EGARCH, GJR-GARCH) for each country in order to examine which one of the three models fits the data best in each case. In almost all cases the standard information criteria and the log likelihood value rank EGARCH first, except France and U.K (GJR-GARCH), and Norway (GARCH(1.1)). The modified information criteria rank GJR-GARCH first for Denmark and Spain, and GARCH(1.1) for Finland and Netherlands. All other cases remain the same as standard information criteria. The asymmetric models

[27] It makes no difference whether we include the constant term coefficients in the conditional mean and conditional variances in the total number of estimated parameters *g* or not since this will add the same number of additional parameters to every model, so that the optimal model would be the same regardless.

(EGARCH, GJR-GARCH) in which the asymmetry term (γ) was found insignificant, were re-estimated as symmetric models (GARCH(1.1)). These are the cases of Denmark, Finland, Netherlands and Switzerland.

Table 6 presents day of the week effect on return equation for the thirteen European indices. The AR coefficient is not significant in all cases. The estimated coefficients of the Monday dummy variables for Denmark, Finland and Sweden are positive and statistically significant.[28] This suggests that Monday returns are higher than those of other days of the week. For Fridays, the estimated coefficients are again positive and statistically significant for Finland, France, Netherlands, Spain, Sweden and Switzerland. Only for Belgium the Friday returns are negative but they are not statistically significant. Tuesday dummy variables are negative (positive) and significant for Italy (Norway). Wednesday dummy variables are negative for Germany at 10% level of significance and positive for Sweden and Switzerland. Positive and significant weekday pattern is observed on Thursday only for Switzerland. The day of the week effect is confirmed by the significant F-statistics for Finland, France, Italy, Norway, Sweden and Switzerland.

In Table 6, we also report the estimates of the selected GARCH coefficients where ω is the estimated coefficient of the constant term for the conditional variance equation, α is the estimated coefficient of the lagged value of the squared residual term, β represents the lagged value of the conditional variance and γ is the asymmetry term. The asymmetry term is positive and significant for France and U.K where the GJR-GARCH model was performed. The term γ is negative and significant for Belgium, Germany, Greece, Italy, Spain and Sweden where the EGARCH model was performed. We can thus document significant leverage effect via GJR-GARCH and EGARCH models, indicating negative news in the eight European markets mentioned above causes volatility to rise by more than positive news of the same magnitude. The coefficients α and β are all statistically significant and positive for each country under consideration. But their sum is more than one in all countries except France and U.K.[29] Hence, our results suggest that conditional variances are positive in all cases and explosive in eleven of 13 cases. Furthermore, we test the stationarity of conditional variances for all countries employing three unit root tests, as presented in Table 7. The results suggest that we can reject the null of unit root for all conditional

[28] The level of significance is 5%, unless otherwise noted.
[29] For GJR-GARCH models we calculate the sum: $\alpha + \beta + \gamma/2$, to check the constancy of variance.

variance series at 1% level of significance except U.K where the null is rejected at 5% level of significance in both conventional and Zivot and Andrews' unit root tests.

The Ljung -Box Q-statistic on the standardized (normalized) squared residuals on all the volatility models finds model misspecification for Belgium and Spain. For Belgium EGARCH Q(10)=0.006(0.005); for Spain EGARCH Q(10)=-0.008(0.000), with p-values in parenthesis indicating incorrect specification of variance equation in both countries. Further analysis shows that the Lagrange Multiplier test gives LM(10)=2.352(0.0091) and LM(10)=4.00581(0.000) and LM(10)=1.638209(0.0895) for Belgium, Spain and Netherlands respectively. Hence, there are ARCH effects in the squared standardized residual terms for these three countries. The null hypothesis that there are no ARCH effects is rejected at 1% level for Belgium and Spain and at 10% level for Netherlands.

The results of BDS test statistic are shown in Table 7. The BDS test for IID random variables rejects the assumption of linearity for standardized (normalized) residuals for all cases except for Norway and marginally for Greece at 5% level. Hence the BDS test indicates some hidden structure in the data that GARCH models cannot capture in most cases.

5.2.2.B. Day of the week effect in returns (GARCH in mean models)

Table 9 reports the standard and modified information criteria and the log likelihood value of three GARCH-in-mean models (GARCH(1.1)-M, EGARCH-M, GJR-GARCH-M) for each European country. In almost all cases the standard information criteria and the log likelihood value rank EGARCH first, except France, U.K and Norway where a GJR-GARCH in mean model performs better in terms of standard information criteria and the log likelihood value. The modified information criteria rank GJR-GARCH-M first for Denmark, Spain, and Finland. All other cases remain the same as standard information criteria. The asymmetric models (EGARCH-M, GJR-GARCH-M) in which the asymmetry term (γ) was found insignificant, were re-estimated as symmetric models (GARCH(1.1)-M). These are the cases of Denmark, Finland, Netherlands, Norway and Switzerland.

Table 10 presents day of the week effect on return equation for the thirteen European indices. The AR coefficient is not significant in all cases. The estimated coefficients of the Monday dummy variables for Belgium, Denmark, Finland, Spain and Sweden are positive and statistically significant (for Finland at 10% level). For

Fridays, the estimated coefficients are positive and statistically significant for Finland, France, Spain, Sweden, Switzerland and U.K and negative for Norway at 10% level. Tuesday dummy variables are positive and significant for Belgium, Norway, Spain, Sweden, and U.K. Wednesday dummy variables are negative for Germany at 10% level of significance and Norway, and positive for Belgium, Spain, Sweden, Switzerland and U.K. Positive and significant weekday pattern is observed on Thursday for Belgium, Switzerland, Spain and France (at 10% level) and negative for Norway. The estimated coefficient of the conditional standard deviation of the return equation is negative for ten countries and positive for Germany, Greece and Netherlands. These results are statistically significant for Belgium, Norway, Spain, Sweden and U.K; This would suggest that investors are getting less than expected despite taking higher risk. Furthermore, when we perform the F-test, we reject the null hypothesis that the days of the week dummy variables are jointly equal to zero for Finland, France, Italy, Norway, Spain, Sweden and Switzerland.

Table 10 also reports the estimates of the coefficients of variance equations. The asymmetry term is positive and significant for France and U.K where the GJR-GARCH-M model was chosen. The term γ is negative and significant for Belgium, Germany, Greece, Italy, Spain and Sweden where the EGARCH-M model was performed. We can thus document significant leverage effect via GJR-GARCH-M and EGARCH-M models, indicating that in these markets a leverage effect exists. The coefficients α and β are all statistically significant and positive for each country under consideration. Their sum is more than one in all countries except France and U.K. In both cases the sum of the coefficients on the lagged squared error and lagged conditional variance is very close to unity. This implies that shocks to the conditional variance will be highly persistent. Our results suggest that conditional variances are positive in all cases and explosive in eleven of 13 cases. Thus, we test the stationarity of conditional variances for all countries employing three unit root tests, as presented in Table 12. The results suggest that we can reject the null of unit root for all conditional variance series at 1% level of significance in both conventional and Zivot and Andrews' unit root tests.

As before, the Ljung -Box Q-statistic on the standardized (normalized) squared residuals on all the volatility models finds model misspecification for Belgium and Spain. For Belgium EGARCH Q(10)=0.005(0.006); for Spain EGARCH Q(10)=-0.008(0.000), with p-values in parenthesis. Thus, the volatility equations are not adequate at 1% level. Further analysis shows that the Lagrange Multiplier test gives LM(10)=2.2983(0.0109), LM(10)=4.6701(0.000) and LM(10)=1.64642 (0.0874) for Belgium, Spain and Netherlands respectively. Hence, there are ARCH effects in the squared standardized residual terms for these three countries. The null hypothesis that there are no ARCH effects is rejected at 1% level for Belgium and Spain, and at 10% level for Netherlands.

The results of BDS test statistic are shown in Table 11. The BDS test for IID random variables rejects the assumption of linearity for standardized (normalized) residuals for all cases except for Norway and marginally for Greece at 5% level. Hence the BDS test indicates some hidden structure in the data that GARCH in mean models cannot capture in most cases.

5.2.2.C. Day of the week effect in volatility

Table 14 allows the conditional variance of returns to change in each day of the week. Hence, we include four new days of the week dummy variables (excluding Monday) in the conditional variance equation (see for example Equation (13) without including the market risk term). The mean equation includes a constant term and autoregressive coefficients (if significant) in order to remove any serial correlation.

Table 13 reports the standard and modified information criteria and the log likelihood value of three GARCH models (GARCH(1.1), EGARCH, GJR-GARCH) for each country in order to examine which one of the three models fits the data best in each case. In all countries the standard information criteria and the log likelihood value rank EGARCH first, except U.K (GJR-GARCH). The modified information criteria rank GJR-GARCH first for Denmark and Spain, and GARCH(1.1) for Finland, Netherlands and Norway. The HAIC information criterion shows the lowest value for GJR-GARCH model for Belgium and France. All other cases are same as the standard information criteria. The asymmetric models (EGARCH, GJR-GARCH) in which the asymmetry term (γ) was found insignificant, were re-estimated as symmetric models (GARCH(1.1)). These are the cases of Denmark, Finland, Netherlands and Switzerland.

Table 14 presents day of the week effect on volatility equation for the thirteen European indices. The AR coefficient is not significant in all cases (e.g. Italy and Germany). The results show significant negative effect of Monday on conditional variance (volatility) for Belgium, Finland, Greece, Norway and Spain and positive significant Monday effect for Netherlands. Significant positive effect implies that Monday increases stock return volatility. In the case of Friday, significant negative effect is found in the case of Italy, Netherlands and Sweden. A negative effect indicates that Friday reduces volatility. For Denmark, Finland, France, Germany, Italy, Netherlands, Sweden and Switzerland, the volatility on Tuesday is lower than volatility on Monday. Only France (at 10% level) and Italy exhibit a significant negative Tuesday effect on volatility. For Denmark, Germany, Italy, Netherlands, Sweden and Switzerland, the volatility on Wednesday is lower than volatility in Monday. The negative Wednesday volatility is significant for Belgium, Italy and Sweden. The evidence for Thursday volatility patterns is negative for all countries except Finland, but significant for Denmark, Finland and Germany at 10% level and for France, Italy and Spain. For Germany, Italy, Spain and Sweden all coefficients of dummy variables in variance equation exhibit negative sign. Overall, the lowest volatility is observed for Mondays for Belgium, Greece and Norway; on Tuesdays for France and Italy; on Wednesdays for Switzerland; on Thursdays for Denmark, Germany, Spain, and U.K; and on Friday for Finland, Netherlands, and Sweden. The highest volatility occurs on Monday for Denmark, Germany, Italy, Netherlands, Sweden and Switzerland; on Tuesday for Belgium and Greece; on Wednesday for France and U.K; on Thursday for Finland; and on Friday for Norway and Spain. The day of the week effect in conditional variance equation is confirmed by the significant F-statistics for Italy, Norway, and Sweden (at 10% level).

In Table 14, we also observe that the asymmetry term is positive and significant for Norway and U.K where an EGARCH and a GJR-GARCH model were chosen respectively. The positive term γ in the case of Norway indicates that positive news in the Norway market causes volatility to rise by more than negative news of the same magnitude. The asymmetry term γ is negative and significant for all other cases where the EGARCH model was performed. We can thus document significant leverage effect via GJR-GARCH (for U.K) and EGARCH models, indicating negative news in eight European markets causes volatility to rise by more than positive news of the same magnitude. The coefficients α and β are all statistically significant and positive for each country under consideration. But their sum is more than one in all countries except U.K. Hence, our results suggest that conditional variances are positive in all cases and explosive in twelve of 13 cases. Furthermore, we test the stationarity of conditional variances for all countries employing three unit root tests, as presented in Table 16. The results suggest that we can reject the null of unit root for all conditional variance series at 1% level of significance except U.K, where the null is rejected at 5% level when an intercept and trend is included in Zivot and Andrews' unit root test.

The Ljung-Box Q-statistic on the standardized (normalized) squared residuals on all the volatility models does find model misspecification for Belgium, France and Spain. For Belgium EGARCH Q(10)=0.006(0.005); for France EGARCH Q(10)=-0.008(0.08); for Spain EGARCH Q(10)=-0.008(0.000), with p-values in parenthesis. Thus the volatility equations are not adequate at 1% level for Belgium and Spain and at 10% level for France. Further analysis shows that the Lagrange Multiplier test gives LM(10)=2.4916(0.0056), LM(10)=1.6338(0.0896), LM(10)=1.7359(0.0671) and LM(10)=5.07219(0.000) for Belgium, France, Netherlands and Spain respectively. Hence, there are ARCH effects in the squared standardized residual terms for these four countries. The null hypothesis that there are no ARCH effects is rejected at 1% level for Belgium and Spain and at 10% level for Netherlands and France.

The results of BDS test statistic are shown in Table 15. The BDS test for IID random variables rejects the assumption of linearity for standardized (normalized) residuals for all cases except for Norway. Hence the BDS test indicates some hidden structure in the data.

5.2.2.D. Day of the week effect in return and volatility

Next we are going to study the presence of day of the week effect in both the return and volatility equations. GARCH(1.1), EGARCH and GJR-GARCH models are employed. The standard and modified information criteria and the log likelihood value of the three GARCH models (GARCH(1.1), EGARCH, GJR-GARCH) are mentioned in Table 17 for each country in order to examine which one of the three models fits the data best in each case. In almost all cases the standard information criteria and the log likelihood value rank EGARCH first, except France and U.K (GJR-GARCH). The modified information criteria rank GJR-GARCH first for Belgium, Denmark, Greece and Spain, and GARCH(1.1) for Norway and Netherlands. All other cases remain the same as standard information criteria. The asymmetric models (EGARCH, GJR-GARCH) in which the asymmetry term (γ) was found insignificant, were re-estimated as symmetric models (GARCH(1.1)). These are the cases of Denmark, Finland, Netherlands and Switzerland.

Table 18 presents the day of the week effect in return and variance equation for the thirteen European indices. In the return equation a significant positive Monday effect was found for Denmark, Finland, and Sweden while a significant negative (positive) Tuesday (Thursday) effect was found for Italy (Switzerland). Also positive significant pattern in returns was found on Wednesday for Sweden and Switzerland and on Friday for Finland, France, Netherlands, Spain, Sweden and Switzerland. No significant day of the week effect was found for Belgium in return equation. Table 18 also presents the day of the week effect on volatility equation for the thirteen European indices. The results show significant negative effect of Monday on conditional variance (volatility) for Belgium, Greece, Norway and Spain and positive significant Monday effect for Denmark and Netherlands. Significant positive effect implies that Monday increases REIT returns volatility. In the case of Friday, significant negative effect is found in the case of France, Italy, Netherlands, Norway and Sweden. A negative effect indicates that Friday reduces volatility. For Denmark, Finland, France, Germany, Italy, Netherlands, Sweden and Switzerland, the volatility on Tuesday is lower than volatility on Monday. For all markets except Belgium, Greece, Norway, Spain and U.K the volatility on Friday is lower than volatility on Monday. France (at 10% level) and Italy exhibit a significant negative Tuesday effect on volatility. The negative Wednesday volatility is significant for Belgium, Italy and Sweden. The evidence for Thursday volatility patterns is negative for all countries except Finland, but significant for Denmark, Finland and Germany at 10% level and for France, Italy and Spain. For Germany, Italy, Spain and Sweden all coefficients of dummy variables in variance equation exhibit negative sign. Overall, the lowest volatility is observed for Mondays for Belgium, Greece and Norway; on Tuesdays for France and Italy; on Wednesdays for Switzerland; on Thursdays for Denmark, Germany, Spain, and U.K; and on Friday for Finland, Netherlands, and Sweden. The highest volatility occurs on Monday for Denmark, Germany, Italy, Netherlands, Sweden and Switzerland; on Tuesday for Belgium and Greece; on Wednesday for France and U.K; on Thursday for Finland; and on Friday for Norway and Spain. The day of the week effect in return is confirmed by the significant F-statistics for Finland, France, Italy(at 10% level), Sweden and Switzerland, and in conditional variance equation is confirmed by the significant F-statistics for Italy, Norway, Sweden (at 10% level).

The asymmetry term γ is positive and significant for Norway and U.K where an EGARCH and a GJR-GARCH model were chosen respectively. The positive term γ in the case of Norway indicates that positive news in the Norway market causes volatility to rise by more than negative news of the same magnitude (inverse leverage effect). The asymmetry term γ is negative and significant for all other cases where the EGARCH model was performed. We can thus document significant leverage effect via GJR-GARCH (for U.K) and EGARCH models, indicating negative news in eight European markets causes volatility to rise by more than positive news of the same magnitude. The coefficients α and β are all statistically significant and positive for each country under consideration. Their sum is more than one in all countries except U.K. Hence, our results suggest that conditional variances are positive in all cases and explosive in twelve of 13 cases. Furthermore, we test the stationarity of conditional variances for all countries employing three unit root tests, as presented in Table 20. The results suggest that we can reject the null of unit root for all conditional variance series at 1% level of significance except U.K where the null is rejected at 5% level when intercept and trend is included in Zivot and Andrews' unit root test.

The Ljung-Box Q-statistic on the standardized (normalized) squared residuals on all the volatility models finds model misspecification for Belgium, France, Netherlands and Spain. For Belgium EGARCH Q(10)=0.006(0.003); for France EGARCH Q(10)=-0.007(0.076); for Netherlands EGARCH Q(10)=-0.019(0.098); for Spain EGARCH Q(10)=-0.008(0.000), with p-values in parenthesis. Thus the volatility equations are not adequate at 1% level for Belgium and Spain, and at 10% level for France and Netherlands. Further analysis shows that the Lagrange Multiplier test gives LM(10)=2.5121(0.0052), LM(10)=1.650(0.0865), LM(10)=1.7476(0.0648) LM(10)=4.8533(0.000) for Belgium, France, Netherlands and Spain respectively. Hence, there are ARCH effects in the squared standardized residual terms for these four countries. The null hypothesis that there are no ARCH effects is rejected at 1% level for Belgium and Spain and at 10% level for France and Netherlands.

The results of BDS test statistic are shown in Table 19. The BDS test for IID random variables rejects the assumption of linearity for standarized (normalized) residuals for all cases except for Sweden for which we do not have a clear result in the case of normal probability at 5% level. Hence the BDS test indicates some hidden structure in the data in most cases.

5.2.3. GARCH models following Generalized Error Distribution

5.2.3.A. Day of the week effect in returns

Table 21 reports the standard and modified information criteria and the log likelihood value of three GARCH models (GARCH(1.1), EGARCH, GJR-GARCH) for each country. In almost all cases the standard information criteria and the log likelihood value rank EGARCH first, except Denmark, France, Spain and U.K (GJR-GARCH). The modified information criteria rank GJR-GARCH first for Belgium, Finland, Greece, Italy and GARCH(1.1) for Denmark, Germany and Norway. For Netherlands HAIC ranks TGARCH first while HSIC ranks GARCH(1.1) first. All other cases remain the same as standard information criteria. The asymmetric models (EGARCH, GJR-GARCH) in which the asymmetry term (γ) was found insignificant, were re-estimated as symmetric models (GARCH(1.1)). These are the cases of Finland, Netherlands, Norway and Switzerland.

Table 22 presents the day of the week effect on return equation for the thirteen European indices. The AR coefficient is not significant in all cases. No significant day of the week pattern was found for Monday and Tuesday. The estimated coefficients of the Wednesday dummy variables for Sweden and Switzerland are negative and statistically significant. For Fridays, the estimated coefficients are positive and statistically significant for France, Sweden and Switzerland. Only for Belgium the Friday returns are negative but they are not statistically significant. Thursday dummy variables are negative for Germany and Sweden (at 10% level). Switzerland exhibits positive returns in all weekdays, three of which are significant. The day of the week effect is confirmed by the significant F-statistics for France, Sweden and Switzerland.

The asymmetry term is positive and significant for Denmark, France, Spain and U.K where the GJR-GARCH model was chosen. The term γ is negative and significant for Belgium, Germany, Greece, Italy, Netherlands, and Sweden where the EGARCH model was performed. We can thus document significant leverage effect via GJR-GARCH and EGARCH models, indicating negative news in the nine European markets mentioned above causes volatility to rise by more than positive news of the same magnitude. The coefficients α and β are all statistically significant and positive for each country under consideration. But their sum is more than one in most countries except Denmark, France, Netherlands, Spain, Switzerland and U.K.

Hence, our results suggest that conditional variances are positive in all cases and explosive in seven of 13 cases. Furthermore, we test the stationarity of conditional variances for all countries employing three unit root tests, as presented in Table 24. The results suggest that we can reject the null of unit root for all conditional variance series at 1% level of significance except U.K where the null is rejected at 5% level of significance in Zivot and Andrews' unit root test when intercept and trend are included and the lag length is chosen by Schwarz information criteria.

The Ljung -Box Q-statistic on the standardized (normalized) squared residuals on all the volatility models does find model misspecification for Belgium. For Belgium EGARCH Q(10)=0.015(0.013), with p-values in parenthesis. Further analysis shows that the Lagrange Multiplier test gives LM(10)=2.1477(0.0182). Hence, there are ARCH effects in the squared standardized residual terms for Belgium. The null hypothesis that there are no ARCH effects is rejected at 5% level.

The results of BDS test statistic are shown in Table 23. The BDS test for IID random variables rejects the assumption of linearity for standardized (normalized) residuals for all cases except for Finland and marginally for Greece (in the case of normal probability) at 5% level. Hence the BDS test indicates some hidden structure in the data.

5.2.3.B. Day of the week effect in returns (GARCH in mean models)

Table 25 reports the standard and modified information criteria and the log likelihood value of three GARCH-in-mean models (GARCH(1.1)-M, EGARCH-M, GJR-GARCH-M) for each country in order to examine which one of the three models fits the data best in each case. In almost all cases the standard information criteria and the log likelihood value rank EGARCH first, except Denmark, France, Spain and U.K where a GJR-GARCH in mean model performs better in terms of information criteria and the log likelihood value. The modified information criteria rank GJR-GARCH-M first for Greece and Norway. All other cases remain the same as standard information criteria. The asymmetric models (EGARCH-M, GJR-GARCH-M) in which the asymmetry term (γ) was found insignificant, were re-estimated as symmetric models (GARCH(1.1)-M). These are the cases of Finland, Netherlands and Switzerland.

Table 26 presents day of the week effect on return equation for the thirteen European indices. The AR coefficient is not significant in all cases. The estimated coefficients of the Monday dummy variables for Spain and Sweden are positive and statistically significant. For Fridays, the estimated coefficients are positive and statistically significant for Belgium, France, Spain, Sweden, Switzerland and U.K. Tuesday dummy variables are positive and significant for Belgium, Sweden and U.K. Wednesday dummy variables are positive and significant for Belgium, Sweden, Spain (at 10% level) and U.K. Positive and significant weekday pattern is observed on Thursday for Switzerland and Spain. The estimated coefficient of the conditional standard deviation of the return equation is negative for eleven countries and positive for Netherlands and Norway. These results are statistically significant for Belgium, Spain, Sweden, Switzerland and U.K.; This would suggest that investors are getting less than expected despite taking higher risk. Furthermore, when we perform the F-test, we reject the null hypothesis that the days of the week dummy variables are jointly equal to zero for France, Sweden and Switzerland.

Table 26 also reports the estimates of the coefficients of variance equations. The asymmetry term is positive and significant for Denmark, France, Norway, Spain and U.K where the GJR-GARCH-M model was chosen. The term γ is negative and significant for Belgium, Germany, Greece, Italy and Sweden where the EGARCH -M model was performed. We can thus document significant leverage effect via GJR-GARCH-M and EGARCH -M models, indicating that in these markets a leverage effect exists. In the case of Norway an inverse leverage effect exists. The coefficients α and β are all statistically significant and positive for each country under consideration. Their sum is less than one in Denmark, Finland, France, Netherlands, Spain and Switzerland. This implies that in the remaining countries shocks to the conditional variance will be highly persistent. Our results suggest that conditional variances are positive in all cases and explosive in seven of 13 cases. Thus, we test the stationarity of conditional variances for all countries employing three unit root tests, as presented in Table 28. The results suggest that we can reject the null of unit root for all conditional variance series at 1% level of significance in both conventional and Zivot and Andrews' unit root tests.

As before, the Ljung -Box Q-statistic on the standardized (normalized) squared residuals on all the volatility models is significant for Belgium with EGARCH Q(10)=0.006(0.003), with p-values in parenthesis. Further analysis shows that the Lagrange Multiplier test gives LM(10)=2.46384(0.0062). The null hypothesis that there are no ARCH effects is rejected at 1% level for Belgium. Hence, there are ARCH effects in the squared standardized residual terms for this country.

The results of BDS test statistic are shown in Table 27. The BDS test for IID random variables rejects the assumption of linearity for standardized (normalized) residuals for all cases except Denmark (normal prob.). Hence the BDS test indicates some hidden structure in the data that GARCH in mean models cannot capture in most cases.

5.2.3.C. Day of the week effect in volatility

Table 30 allows the conditional variance of returns to change in each day of the week. Hence, we include four new days of the week dummy variables (excluding Monday) in the conditional variance equation (see for example Equation (13) without including the market risk term). The mean equation includes a constant term and autoregressive coefficients (if significant) in order to remove any serial correlation.

Table 29 reports the standard and modified information criteria and the log likelihood value of three GARCH models (GARCH(1.1), EGARCH, GJR-GARCH) for each country in order to examine which one of the three models fits the data best in each case. In most countries the standard information criteria and the log likelihood value rank EGARCH first, except Denmark, France, Norway, Spain, and U.K (GJR-GARCH). The modified information criteria rank GJR-GARCH first for Belgium, Denmark, France, Germany and GARCH(1.1) for Finland, Netherlands and Italy. All other cases are same as the standard information criteria. The asymmetric models (EGARCH, GJR-GARCH) in which the asymmetry term (γ) was found insignificant, were re-estimated as symmetric models (GARCH(1.1)). These are the cases of Finland, Netherlands and Switzerland.

Table 30 presents day of the week effect on volatility equation for the thirteen European indices. The AR coefficient is not significant in all cases. The results show significant positive effect of Monday on conditional variance (volatility) for Denmark, Finland, Netherlands, Spain and Switzerland and negative significant Monday effect for Belgium. Significant positive effect implies that Monday increases stock return volatility. In the case of Friday, significant negative effect is found in the case of Greece, Italy, Netherlands, Norway and Sweden. A negative effect indicates that Friday reduces volatility. For Italy, Netherlands, Norway, Spain and Switzerland, a significant negative Tuesday effect on volatility exists. Only for France and U.K the volatility on Wednesday is higher than volatility in Monday. The negative Wednesday volatility is significant for Belgium, Finland (at 10% level), Greece, Italy, Norway, Sweden and U.K. The evidence for Thursday volatility patterns is negative for all countries except Finland, but significant for Germany, Greece, Italy, Netherlands, Norway, Finland and Spain. For Belgium, Germany and Sweden all coefficients of dummy variables in variance equation exhibit negative sign. Overall, the lowest volatility is observed on Monday for U.K; on Tuesdays Italy, Norway and Switzerland; on Wednesdays for Belgium and Sweden; on Thursdays for Denmark, France, Germany, Netherlands and Spain; and on Friday for Finland and Greece. The highest volatility occurs on Monday for Denmark, Greece, Italy, Netherlands, Norway, Spain, Sweden and Switzerland; on Wednesday for France and U.K; on Thursday for Belgium and Finland; and on Friday for Germany. The day of the week effect in conditional variance equation is confirmed by the significant F-statistics for Finland, Greece, Netherlands (at 10% level), Norway, Spain, Sweden and Switzerland.

In Table 30, we also observe that the asymmetry term is positive and significant for Denmark, France, Norway, Spain and U.K where a GJR-GARCH model was chosen. The asymmetry term γ is negative and significant for all other cases where the EGARCH model was performed. We can thus document significant leverage effect via GJR-GARCH and EGARCH models, indicating negative news in eight European markets causes volatility to rise by more than positive news of the same magnitude. The coefficients α and β are all statistically significant and positive for each country under consideration. But their sum is more than one in all countries except U.K, Finland, France and Netherlands. Hence, our results suggest that conditional variances are positive in all cases and explosive in nine of 13 cases. Furthermore, we test the stationarity of conditional variances for all countries employing three unit root tests, as presented in Table 32. The results suggest that we can reject the null of unit root for all conditional variance series at 1% level of significance except U.K where the null is not rejected for the conventional unit root tests at 1% level of significance when the lag length is chosen according to Schwarz information criteria. The null when the Zivot-Andrews' test is performed is accepted at 5% level of significance when the same criterion is used.

The Ljung-Box Q-statistic on the standardized (normalized) squared residuals of all the volatility models finds model misspecification for Belgium. For Belgium EGARCH Q(10)=0.007(0.002), with p-values in parenthesis. Thus the volatility equation is not adequate at 1% level. Further analysis shows that the Lagrange

Multiplier test gives LM(10)=2.63327(0.0034). Hence, there are ARCH effects in the squared standardized residual terms and the null hypothesis that there are no ARCH effects is rejected at 1% level for Belgium.

The results of BDS test statistic are shown in Table 31. The BDS test for IID random variables rejects the assumption of linearity for standardized (normalized) residuals for all cases except for Finland. Hence the BDS test indicates some hidden structure in the data.

5.2.3.D. Day of the week effect in returns and volatility

Next we are going to study the presence of day-of-the week effect in both the return and volatility equations. GARCH(1.1), EGARCH and GJR-GARCH models are employed. The standard and modified information criteria and the log likelihood value of the three GARCH models (GARCH(1.1), EGARCH, GJR-GARCH) are mentioned in Table 33. In almost all cases the standard information criteria and the log likelihood value rank EGARCH first, except Denmark, France, Spain and U.K (GJR-GARCH). The modified information criteria rank GJR-GARCH first for Belgium, Finland, Greece and Spain, and GARCH(1.1) for Denmark and Italy. All other cases remain the same as standard information criteria. The asymmetric models (EGARCH, GJR-GARCH) in which the asymmetry term (γ) was found insignificant, were re-estimated as symmetric models (GARCH(1.1)). These are the cases of Finland, Netherlands, Norway and Switzerland.

Table 34 presents the day of the week effect in return and variance equation for the thirteen European indices. In the variance equation a significant positive Monday effect was found for Denmark, Netherlands, Spain and Switzerland while a significant negative Monday effect was found for Belgium, Greece (at 10% level) and Norway. Also negative significant pattern in returns was found on Tuesday for Italy, Netherlands, Spain and Switzerland and on Friday for Belgium (at 10% level), Italy, Netherlands and Sweden. For Denmark, Finland, France, Germany, Italy, Netherlands, Spain, Sweden and Switzerland the volatility on Tuesday is lower than volatility on Monday. For Belgium, Denmark, Finland, Germany, Italy, Netherlands, Spain, Sweden and Switzerland the volatility on Wednesday is lower than volatility on Monday. The results about the days of the week that exhibit the highest and lowest volatility for each country remain the same as the previous section. Table 34 also presents the day of the week effect in return equation for the thirteen European indices. The results show significant negative effect of Monday on returns for Norway and on Thursday for Switzerland (at 10% level). In the case of Friday, significant positive effect is found for France, Sweden and Switzerland. Significant positive effect is found on Wednesday for Norway, Sweden and Switzerland and negative for Germany. No evidence is found for day of the week pattern on Tuesday for any country. Furthermore, no evidence for weekday pattern in returns is found for Belgium, Denmark, Finland, Greece, Italy, Netherlands, Spain and U.K. The day of the week effect in return is confirmed by the significant F-statistics for France, Norway, Sweden and Switzerland, and in conditional variance equation is confirmed by the significant F-statistics for Finland, Italy, Netherlands (at 10% level), Norway, Spain, Sweden, Switzerland (at 10% level).

The asymmetry term γ is positive and significant for Denmark, France, Spain and U.K where a GJR-GARCH model was chosen and negative for Belgium, Germany, Greece, Italy and Sweden. We can thus document significant leverage effect via GJR-GARCH and EGARCH models, indicating negative news in nine European markets causes volatility to rise by more than positive news of the same magnitude. The coefficients α and β are all statistically significant and positive for each country under consideration. Their sum is less than one in Denmark, Finland, France, Netherlands, Spain, Switzerland and U.K. Hence, our results suggest that conditional variances are positive in all cases and explosive in six of 13 cases. Furthermore, we test the stationarity of conditional variances for all countries employing three unit root tests, as presented in Table 36. The results suggest that we can reject the null of unit root for all conditional variance series at 1% level of significance except U.K where the null is not rejected for the conventional unit root tests at 1% level of significance when the lag length is chosen according to Schwarz information criteria. The null when the Zivot -Andrews' test is performed, is accepted at 5% level of significance when the same criterion is used.

The Ljung -Box Q-statistic on the standardized (normalized) squared residuals on all the volatility models finds model misspecification for Belgium. For Belgium EGARCH Q(10)=0.011(0.003), with p-values in parenthesis. Further analysis shows that the Lagrange Multiplier test gives LM(10)=2.4992(0.0054). Hence, there are ARCH effects in the squared standardized residual terms. The null hypothesis that there are no ARCH effects is rejected at 1% level for Belgium.

The results of BDS test statistic are shown in Table 35. The BDS test for IID random variables rejects the assumption of linearity for standardized (normalized) residuals for all cases except for Finland. For Spain we can accept the null hypothesis marginally at 5% level. Hence the BDS test indicates some hidden structure in the data in most cases.

5.2.4. Weekday seasonality incorporating market risk

In this section we are going to model both first and second moments of returns and also account for market risk. Our purpose is to consider whether any observed anomalies can be explained by reference to market risk in a CAPM-type framework, in particular how the risk varies through the week. As a proxy for the market portfolio we use two indices: the EPRA/NAREIT Global Index and the EPRA Europe Index. Both indices are examined separately by using again two error distributions (Student's *t* and GED).

5.2.4.A Weekday seasonality using Students t distribution.

We begin our analysis including the Global Index as proxy for market portfolio. Table 37 gives the results for estimation of equations (12) and (13). The countries for which no significant day of the week effect according to Wald test (see Table 18) was found were excluded from our analysis.

It is apparent that the incorporation of risk proxy additively does not explain all the day-to-day variation in REIT returns. The significant day of the week effects noted earlier in Table 18 are still present in most cases. Only in the case of Sweden market risk seems to explain a part of returns and volatility variations. The same result we observe in volatility equation of France. Market risk in both volatility and return is highly significant in all countries, but less than unity indicating that these European markets are less risky than the world market. Only market risk in variance equation of Italy is more than unity indicating that the Italian market is more volatile than the world market. Table 38 reports results after allowing risk to vary in both mean and volatility. As can be seen the significant day of the week effects remain in all markets even after the inclusion of the slope dummy variables which allow risk to vary across the week, although the *p*-values fall slightly in absolute value, indicating that the day of the week effects become slightly more pronounced. It is also clear that the average risk levels vary across the days of the week. For example, the average risk levels in

Finnish market vary from a low of 0.06 on Friday to a high of 0.11 on Wednesday. Thus not only is there a significant positive Friday effect in this market, but also that the responsiveness of the Finnish exchange movements to changes in the value of the general world stock market is considerably lower on this day than other days of the week. However a significant proportion of calendar anomalies remain. This can attributed to omitted risk factors.

We continue our analysis including the Europe Index as proxy for market portfolio. Table 39 gives the results for estimation of equations (12) and (13). Again the countries for which no significant day of the week effect according to Wald test (see Table 18) was found were excluded from our analysis.

The incorporation of risk proxy additively does not explain all the day-to-day variation in REIT returns. In some cases significant day of the week effects appeared such as Monday effect for Italy (at 10% level) in both mean and return equation and a Thursday effect for Sweden. Also for France all weekday patterns in volatility disappeared and a Wednesday effect appeared. For Finland all weekday patterns in both returns and volatility disappeared. Only in this case market risk seems to explain all part of returns and volatility variations. Market risk in both volatility and return is highly significant in all countries, but less than unity indicating that these markets are less risky than the European market. Only market risk in return equation of Sweden is more than unity indicating that the Swedish market is more risky than the European market. Table 40 reports results after allowing risk to vary in both mean and volatility. As can be seen the significant day of the week effects remain in all markets even after the inclusion of the slope dummy variables which allow risk to vary across the week. It is also clear that the average risk levels vary across the days of the week. For example, the average risk levels in French market vary from a low of 0.73 on Friday to a high of 0.84 on Monday. Thus not only is there a significant positive Friday effect in this market, but also that the responsiveness of the French exchange movements to changes in the value of the general Europe market is considerably lower on this day than other days of the week. However a significant proportion of calendar anomalies remain.

5.2.4.B Weekday seasonality using Generalized error distribution.

We first include the Global Index as proxy for market portfolio. Table 41 gives the results for estimation of equations (12) and (13). The countries for which no significant day of the week effect according to Wald test (see Table 34) was found were excluded from our analysis.

The incorporation of risk proxy additively does not explain all the day-to-day variation in REIT returns. The significant day of the week effects noted earlier in Table 34 are still present in most cases. Only in the case of Sweden market risk seems to explain a part of returns and volatility variations. The same result we observe in volatility equation of Finland. Market risk in both volatility and return is highly significant in all countries, but less than unity indicating that these European markets are less risky than the world market. Table 42 reports results after allowing risk to vary in both mean and volatility. As can be seen the significant day of the week effects remain in all markets even after the inclusion of the slope dummy variables which allow risk to vary across the week except Sweden where seasonality remains in a lower proportion. It is also clear that the average risk levels vary across the days of the week. However a significant proportion of calendar anomalies remain.

We continue including the Europe Index as proxy for market portfolio. Table 43 gives the results for estimation of equations (12) and (13). Again the countries for which no significant day of the week effect according to Wald test (see Table 34) was found were excluded from our analysis.

In some cases significant day of the week effects appeared such as Monday, Tuesday and Friday effect in mean equation for Italy and a Tuesday and Wednesday effect in volatility equation for France. Market risk in both volatility and return is highly significant in all countries, but less than unity indicating that these European markets are less risky than the world market. Only market risk in return equation of Sweden is more than unity indicating that the Swedish market is more risky than the European market. Table 44 reports results after allowing risk to vary in both mean and volatility. As can be seen the significant day of the week effects remain in all markets even after the inclusion of the slope dummy variables which allow risk to vary across the week. It is also clear that the average risk levels vary across the days of the week. For example, the average risk levels in Swiss market vary from a low of 0.25 on Wednesday to a high of 0.29 on Monday. Thus not only is there a significant positive Thursday effect in this market, but also that the responsiveness of the Swiss exchange movements to changes in the value of the general Europe market is considerably lower on this day than other days of the week. However a significant proportion of calendar anomalies remain.

5.2.5. Anomalies in rolling window

Changes in the day of the week effects are examined via rolling regressions. Only the countries in which a significant day of the week effect was found according to F-test are used in our analysis. Figure 1 (see Appendix 2) give the plots of p-values and R-squares of the coefficients D1-D5 for Finland, France, Italy, Sweden and Switzerland (see Table 18) where Student's *t* distribution is used. Figure 2 give the plots of p-values and R-squares of the coefficients D1-D5 for France, Sweden and Switzerland (see Table 34) where the generalized error distribution is used. A rolling sample of 70 observations (about 3 months' data) is taken with step size 5. That is, the first estimate uses observations 5-70, the second, observations 10 to 75, the third observations 15 to 80 and so on.

The *p*-value plots show how the *p*-values of the coefficients change as the estimation period moves through the data. The variation of *p*-values in all cases confirms the lack of stable day of the week effect in whole estimation period. We realize that although *p*-values for individual coefficients are significant, once evaluated in a rolling framework, calendar effects no longer remain significant exhibiting periodic behavior.

This is also illustrated with numbers in Table 2A and Table 2B below, for the two selected distributions. We observe that the significant *p*-values ($p<0.05$) represent very low proportion of the total estimation period. As an example, for Finland the cases that Monday's *p*-values are lower than 0.05 are 50 representing only the 8.65% of the total estimated coefficients *p*-values. The same picture holds for the rest of the countries (for both distributions), where the significant *p*-values stand for very low proportion compared to the insignificant p-values ($p>0.05$), fluctuating around 14 to 24 percent for the most cases.

Also included in the figures are the R-squared plots. In all cases for both distributions we observe low R-squared values (around zero) indicating that there is no significant proportion of the variability in the dependent variable that can be explained by each selected model.

Table 2A. Student's t distribution

		Monday	Tuesday	Wednesday	Thursday	Friday
Finland	p<0.05	50	56	67	93	65
	p>0.05	528	522	511	485	513
	percentage of significant p-values	8.65%	9.68%	11.59%	16.09%	11.24%
France	p<0.05	171	144	171	179	142
	p>0.05	873	900	873	865	902
	percentage of significant p-values	16.37%	13.79%	16.37%	17.14%	13.60%
Italy	p<0.05	239	192	200	173	189
	p>0.05	806	853	845	873	856
	percentage of significant p-values	22.87%	18.37%	19.13%	16.55%	18.08%
Sweden	p<0.05	214	235	241	244	199
	p>0.05	831	811	805	802	847
	percentage of significant p-values	20.45%	22.46%	23.04%	23.32%	19.02%
Switzerland	p<0.05	165	138	105	140	140
	p>0.05	880	907	940	905	906
	percentage of significant p-values	15.78%	13.20%	10.04%	13.39%	13.39%

Notes: p denotes p-value. Third row denotes the fraction: number of estimated $p<0.05$ to total number of estimated p-values

Table 2B. Generalized Error Distribution

		Monday	Tuesday	Wednesday	Thursday	Friday
France	p<0.05	206	183	218	219	203
	p>0.05	839	862	827	826	842
	percentage of significant p-values	19.71%	17.51%	20.86%	20.95%	19.42%
Sweden	p<0.05	236	173	232	200	165
	p>0.05	809	872	813	845	880
	percentage of significant p-values	22.58%	16.55%	22.2%	19.13%	15.78%
Switzerland	p<0.05	235	211	129	196	186
	p>0.05	810	834	916	849	859
	percentage of significant p-values	22.48%	20.19%	12.34%	18.75%	17.79%

Notes: as Table 2A

6. Conclusions

In this study we investigate the return behavior of European securitized real estate indices using daily data for the period 1990-2010. Our goal is to identify recurring day of the week pattern in returns and volatility in each index. Moreover, new indices of European real estate index returns have recently been developed which enable us to test daily anomalies for the first time (e.g. Greece).

The first conclusion to be drawn is that European real estate index returns, when Student's *t* distribution is used, exhibit a positive Friday effect in all countries except Belgium, result which is in line with previous studies. The findings of the Friday effect in real estate indices have important implications for practitioners and academics. For practitioners, it affects the asset allocation, hedging decisions and the timing of security issuances by firms. As investing indirectly in real estate has recently become much more popular in Europe, it has become more important for investors to gain insights into the daily seasonalities of European securitized real estate. Although the effect is too small to generate a profitable trading opportunity due to transaction costs, it affects, for example, the optimal asset allocations and timing decisions for European and international investors. For academics, the weekend effect has implications for asset pricing and performance evaluation.

Employing the GARCH in mean models, we document that the coefficients of the conditional standard deviation of the return equation are negative in ten of 13 countries, indicating that investors would not certainly want to be compensated for investing into riskier assets.

Examining the day of the week effect in volatility we find highest volatility on Monday for Denmark, Germany, Italy, Netherlands, Sweden and Switzerland. Finding highest volatility for these countries on Monday seems to be consistent with informed trader argument. Finding highest Friday volatility for Norway and Spain might be result of several economic news announcements being released on Thursday and Friday.

Moreover, we observe a leverage effect in all European countries, where the asymmetric GARCH model was performed, and for these countries, volatility increases more when the innovation is negative than when it is positive. Only for Norway, in two cases, we observe an inverse leverage effect.

When we use the generalized error distribution the weekday anomaly in returns becomes rarer. Although Friday again exhibits positive returns in all countries except Belgium. The highest volatility occurs on Monday in eight of 13 countries.

Very little of the day of the week anomalies can be accounted for by reference to market risk, as captured by the world and the European market index respectively. Only in the case of Finland market risk seems to explain sufficiently returns and volatility variations. When the assumption that the risk of each market is constant throughout the week with respect to the market indices is relaxed, some of the remaining day of the week effects can be explained. However some significant calendar anomalies remain and some others appear. It is possible that these may rationalized by reference to missing risk factors, such as unanticipated inflation or unanticipated changes in exchange rates, the term structures, or default risk premiums or the release of news information only on certain day of the week.

The evidence from the rolling regression results cast severe doubts concerning the existence of any persistent day-of-the-week effects. In a time varying GARCH framework we fail to find support for the existence of weekday patterns.

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Appendix 1

Table 1 Summary statistics for logarithmic returns

	Starting date (# obs)	Mean	Max.	Min.	Std.Dev.	Skewness	Kurtosis	Jarque-Bera test	ADF (constant, no trend)	ADF (constant, trend)
Global	01/15/1990 (5301)	0.000089	0.074	-0.089	0.010	-0.312	8.9957	8026.774*	-66.7221*	-66.7159*
Europe	01/15/1990 (5301)	0.000013	0.071	-0.070	0.009	-0.463	13.638	25188.85*	-68.8456*	-68.8424*
Belgium	01/15/1990 (5301)	-0.000063	0.104	-0.078	0.010	0.228	12.863	21533.88*	-46.2363*	-46.2370*
Denmark	01/01/1992 (4427)	-0.00403	0.171	-0.315	0.024	-2.336	32.885	168771.7*	-60.3258*	-60.3499*
Finland	01/01/1999 (2962)	0.00014	0.143	-0.117	0.018	-0.005	9.1098	4607.183*	-55.6451*	-55.6379*
France	01/15/1990 (5301)	0.00017	0.083	-0.080	0.010	-0.046	10.506	12449.10*	-72.7803*	-72.7918*
Germany	01/15/1990 (5301)	-0.000026	0.137	-2.215	0.015	-0.626	20.420	67374.23*	-70.1295*	-70.1543*
Greece	04/01/2004 (1593)	-0.00063	0.179	-0.280	0.021	-3.068	46.210	126431.6*	-38.9343*	-39.0159*
Italy	01/15/1990 (5301)	-0.000042	0.178	-0.207	0.017	-0.340	16.688	41489.67*	-73.2581*	-73.2514*
Netherlands	01/15/1990 (5301)	-0.000028	0.076	-0.072	0.009	-0.363	14.054	27107.39*	-69.1227*	-69.1293*
Norway	01/15/1990 (4955)	-0.00032	0.260	-0.299	0.024	-0.182	25.954	108810.4*	-70.1793*	-70.1872*
Spain	01/15/1990 (4948)	-0.00028	0.183	-0.213	0.019	-0.557	18.771	51536.32*	-63.9993*	-64.0655*
Sweden	01/15/1990 (5301)	-0.00018	0.130	-0.190	0.018	-0.217	11.271	15154.51*	-69.6745*	-69.7458*
Switzerland	01/15/1990 (5301)	0.00014	0.079	-0.082	0.001	-0.074	7.1218	3757.40*	-57.9447*	-57.9590*
U.K.	01/15/1990 (5301)	-0.000076	0.101	-0.104	0.013	-0.235	11.105	14561.05*	-70.7880*	-70.7849*

Notes: * denote significance at 1% level. Jarque-Bera test statistic tests hypotheses H_0: returns normally distributed, H_1: returns not normally distributed. ADF stands for the Augmented Dickey-Fuller test for the presence of unit root, with H_0: unit root, H_1: no unit root (stationary). Ending date for most series is 05/11/2010, except Denmark (12/19/2008) and Spain (03/20/2009).

Table 2 Summary statistics for logarithmic returns based on weekday

Weekday	# of Obs.	Mean	Max.	Min.	Std.Dev.	Skewness	Kurtosis	Jarque-Bera
Belgium								
Monday	1060	-0.000547	0.079984	-0.078339	0.011019	-0.031593	12.40307	3905.289*
Tuesday	1061	0.00028	0.104404	-0.056538	0.011235	1.083979	14.34242	5895.202*
Wednesday	1060	-0.000156	0.055319	-0.077652	0.010156	-0.482045	10.38904	2452.461*
Thursday	1060	0.000241	0.093301	-0.066374	0.010901	0.621211	14.31625	5724.052*
Friday	1060	-0.000135	0.066684	-0.070131	0.010036	-0.410974	10.87344	2767.775*
Denmark								
Monday	885	0.000563	0.133313	-0.253255	0.022661	-2.060415	27.27662	22358.62*
Tuesday	885	-0.000384	0.171892	-0.223416	0.024784	-1.579455	26.88295	21401.29*
Wednesday	885	-0.001667	0.118823	-0.283567	0.024907	-3.743975	38.16591	47668.71*
Thursday	886	-0.00012	0.154937	-0.234036	0.023003	-0.87915	25.25382	18396.47*
Friday	886	-0.000409	0.137371	-0.315613	0.024622	-3.016956	42.15367	57937.67*
Finland								
Monday	593	0.000049	0.104736	-0.093749	0.019509	-0.147552	7.879072	590.3421*
Tuesday	593	0.000158	0.128406	-0.085147	0.019387	0.710632	10.13439	1307.553*
Wednesday	592	-0.000856	0.074497	-0.117081	0.018766	-1.017038	8.396669	820.4504*
Thursday	592	-0.000428	0.088118	-0.105083	0.018628	-0.140964	7.239382	445.2787*
Friday	592	0.001819	0.143294	-0.082843	0.017683	0.642703	12.03048	2052.31*
France								
Monday	1060	-0.000624	0.07151	-0.080961	0.011538	-0.471817	10.95136	2831.724*
Tuesday	1061	0.000363	0.070345	-0.052072	0.010872	0.392668	9.951643	2163.648*
Wednesday	1060	0.000277	0.06575	-0.067656	0.011053	-0.184567	9.452409	1844.835*
Thursday	1060	-0.0000265	0.083269	-0.059108	0.010748	0.568227	11.24851	3062.048*
Friday	1060	0.000902	0.06646	-0.073856	0.010072	-0.458776	10.67802	2640.899*
Germany								
Monday	1060	-0.000713	0.130451	-0.215008	0.018872	-1.547026	27.70111	27370.88*
Tuesday	1061	0.000342	0.137813	-0.066759	0.015278	0.87007	12.91921	4483.555*
Wednesday	1060	0.0000501	0.098442	-0.097574	0.015191	0.0534	10.82082	2701.97*
Thursday	1060	-0.000256	0.071371	-0.077194	0.013605	-0.120055	8.110112	1155.881*
Friday	1060	0.000445	0.104138	-0.129071	0.01399	-1.457945	20.94106	14591.96*
Greece								
Monday	319	-0.001468	0.179666	-0.221498	0.023971	-1.434121	37.11995	15583.12*
Tuesday	319	-0.002616	0.070472	-0.199971	0.021931	-3.044609	27.89542	8730.769*
Wednesday	318	-0.000763	0.082861	-0.240459	0.022074	-3.809678	47.37875	26864.74*
Thursday	318	0.001580	0.096513	-0.081336	0.018123	1.019502	9.894449	684.9054*
Friday	319	0.0000891	0.085076	-0.280185	0.021839	-6.634099	88.58136	99690.35*
Italy								
Monday	1060	-0.00129	0.100983	-0.20722	0.019453	-1.792725	21.58131	15816.99*
Tuesday	1061	-0.000176	0.178409	-0.090283	0.017724	1.473765	19.88187	12983.35*
Wednesday	1060	-0.000216	0.120678	-0.113295	0.017102	-0.34918	12.01093	3607.733*
Thursday	1060	0.000555	0.088533	-0.130045	0.016779	-0.456691	10.32937	2409.463*
Friday	1060	0.000913	0.11107	-0.098302	0.015204	0.158569	10.33046	2377.769*

Notes: * denote significance at 1% level. Jarque-Bera test statistic tests hypotheses H_0: returns normally distributed, H_1: returns not normally distributed.

Weekday	# of Obs.	Mean	Max.	Min.	Std.Dev.	Skewness	Kurtosis	Jarque-Bera
Netherlands								
Monday	1060	-0.000616	0.076404	-0.067486	0.010476	-0.419799	13.47916	4881.201*
Tuesday	1061	0.0000275	0.0654	-0.053784	0.009887	-0.082555	11.79799	3423.131*
Wednesday	1060	0.000350	0.060456	-0.071373	0.009955	-0.802639	13.99893	5456.945*
Thursday	1060	-0.000261	0.067844	-0.072893	0.009662	-0.332029	14.3851	5744.386*
Friday	1060	0.000355	0.070124	-0.064738	0.008925	-0.027829	17.3298	9069.461*
Norway								
Monday	990	-0.001061	0.158469	-0.299498	0.025738	-2.608175	34.43647	41887.8*
Tuesday	992	-0.001586	0.148027	-0.110056	0.022874	-0.199656	10.01429	2040.201*
Wednesday	991	-0.000701	0.180722	-0.178539	0.024816	0.218684	17.21735	8354.311*
Thursday	991	0.000112	0.260916	-0.24152	0.022794	0.573033	36.91198	47540.59*
Friday	991	0.001603	0.254279	-0.197438	0.025634	1.364745	26.73153	23562.49*
Spain								
Monday	988	-0.000638	0.108059	-0.139164	0.020271	-0.882705	13.47904	4648.823*
Tuesday	990	-0.000284	0.098988	-0.170686	0.019349	-0.716283	13.93074	5013.253*
Wednesday	990	-0.000356	0.183008	-0.213869	0.021086	0.102101	27.52797	24818.6*
Thursday	990	-0.00113	0.132169	-0.15914	0.019413	-1.356675	17.78667	9322.827*
Friday	990	0.000969	0.164956	-0.150524	0.019335	-0.064331	18.01837	9304.679*
Sweden								
Monday	1060	-0.000585	0.115134	-0.134077	0.019771	-0.186315	11.01561	2843.842*
Tuesday	1061	-0.000965	0.103437	-0.109905	0.018891	0.003189	8.592507	1382.668*
Wednesday	1060	0.001074	0.10438	-0.082139	0.017192	0.208709	8.444241	1316.785*
Thursday	1060	-0.00186	0.080541	-0.086651	0.017391	-0.292996	7.132577	769.4529*
Friday	1060	0.00144	0.130266	-0.190803	0.017447	-0.829317	21.8647	15839.4*
Switzerland								
Monday	1060	-0.000361	0.041423	-0.052143	0.011369	-0.450858	5.844222	393.2023*
Tuesday	1061	-0.000075	0.060852	-0.063467	0.011525	-0.090027	7.238797	795.742*
Wednesday	1060	0.000155	0.073928	-0.082194	0.011177	-0.45929	9.138602	1701.575*
Thursday	1060	0.000328	0.054741	-0.054255	0.011658	0.145377	6.030715	409.4149*
Friday	1060	0.00070	0.07991	-0.04459	0.011481	0.429873	7.41623	894.0326*
UK								
Monday	1060	-0.000973	0.063848	-0.0908	0.013833	-1.29898	12.18495	4024.148*
Tuesday	1061	0.000317	0.095659	-0.092968	0.013092	0.196371	11.54003	3231.026*
Wednesday	1060	0.000334	0.083018	-0.104511	0.013858	-0.264946	10.72438	2647.653*
Thursday	1060	-0.000271	0.101897	-0.061262	0.012828	0.53061	10.57548	2584.37*
Friday	1060	0.000211	0.08037	-0.078248	0.013324	-0.096268	9.913476	2112.634*

Notes: * denote significance at 1% level. Jarque-Bera test statistic tests hypotheses H_0: returns normally distributed, H_1: returns not normally distributed.

Table 3 Tests for unconditional day-of-the-week patterns

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	U.K
Tests for equality of medians													
Kruskal-Wallis's test													
Value	3.495001	5.320555	6.689999	14.64184*	6.008475	4.619426	10.50073**	6.677408	9.93844**	8.39985***	28.62375*	5.569224	4.546982
p-Value	(0.4786)	(0.256)	(0.1532)	(0.0055)	(0.1985)	(0.3286)	(0.0328)	(0.1539)	(0.0415)	(0.078)	(0.000)	(0.2337)	(0.337)
Tests for equality of variance													
Brown-Forsythe's test													
Value	1.035353	0.113643	0.726589	1.080751	3.99915*	0.479776	3.20905**	1.745794	0.940661	0.471241	2.01766***	0.338501	0.677546
p-Value	(0.3873)	(0.9778)	(0.5737)	(0.3642)	(0.0031)	(0.7506)	(0.0122)	(0.137)	(0.4392)	(0.7569)	(0.0892)	(0.8521)	(0.6075)

Notes: * , ** and *** denote significance at 1%, 5% and 10% level respectively.

Table 4. Day of the week effects

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	U.K.
Mean equation													
Monday	-0.00056***	0.00056	0.000049	-0.00062***	-0.00073	-0.00138	-0.0013**	-0.00062**	-0.00107	-0.00073	-0.00065	-0.00022	-0.00097**
	(0.0835)	(0.4815)	(0.9494)	(0.0616)	(0.1249)	(0.2556)	(0.0143)	(0.0374)	(0.1675)	(0.2423)	(0.2412)	(0.5091)	(0.0173)
Tuesday	0.00024	-0.00042	0.00015	0.00036	0.00037	-0.00266**	-0.00021	0.0000502	-0.00168**	-0.00019	-0.00094***	-0.00011	0.00032
	(0.4606)	(0.5654)	(0.83787)	(0.2761)	(0.4367)	(0.0286)	(0.6906)	(0.8374)	(0.0295)	(0.7560)	(0.0906)	(0.7345)	(0.4261)
Wednesday	-0.00012	-0.00163**	-0.00085	0.00027	0.0000367	-0.00079	-0.00017	0.00037	-0.00067	-0.00033	0.00111**	0.00012	0.00032
	(0.7121)	(0.0420)	(0.2684)	(0.4059)	(0.9386)	(0.5148)	(0.7384)	(0.2154)	(0.3845)	(0.5956)	(0.0448)	(0.7090)	(0.4296)
Thursday	0.00022	0.0000274	-0.00042	-0.0000265	-0.00025*	0.00156	0.00055	-0.00028	0.00015	-0.0011***	-0.00191*	0.00035	-0.00028
	(0.4953)	(0.9728)	(0.5794)	(0.9367)	(0.0096)	(0.1998)	(0.2925)	(0.3517)	(0.8420)	(0.0809)	(0.0006)	(0.3130)	(0.4953)
Friday	-0.00010	-0.00040	0.00181**	0.00090*	0.00045	0.000142	0.00092***	0.00035	0.00162**	0.00107***	0.00152*	0.00076**	0.00021
	(0.7468)	(0.6191)	(0.0187)	(0.0069)	(0.3396)	(0.9073)	(0.0825)	(0.2346)	(0.0365)	(0.0891)	(0.0062)	(0.0280)	(0.5955)
AR(1)	-0.12235*	0.07765*			0.03769*	0.02651	-0.00587	0.0509*	0.00376	0.091127*	0.04752*	-0.16768*	0.02868**
	(0.0000)	(0.0000)			(0.0061)	(0.2911)	(0.6690)	(0.0002)	(0.7914)	(0.0000)	(0.0005)	(0.0000)	(0.0368)
AR(2)						-0.05171**	0.03382**	0.03107**	0.02541***			-0.04412*	
						(0.0404)	(0.0140)	(0.0243)	(0.0742)			(0.0013)	
AR(3)						0.05172**							
						(0.0406)							
S.E. of regression	0.01059	0.023949	0.018806	0.01086	0.015491	0.021651	0.017303	0.009779	0.024382	0.019824	0.018150	0.011286	0.01338
Adj R^2	0.01487	0.00557	0.000989	0.00136	0.00121	0.005568	0.001962	0.004030	0.001584	0.008453	0.006032	0.027547	0.001254
AIC	-6.25531	-4.62443	-5.107554	-6.20522	-5.49596	-4.82250	-5.27451	-6.415824	-4.588515	-5.002600	-5.179187	-6.129213	-5.787786
SBC	-6.24786	-4.61572	-5.097433	-6.19902	-5.48852	-4.79548	-5.26582	-6.407138	-4.579314	-4.994708	-5.171743	-6.120527	-5.780342
LL	16573.20	10239.87	7569.287	16451.94	14570.32	3841.894	13981.82	17005.73	11365.87	12377.43	13730.85	16246.35	15343.63
F-test	0.84971	1.03245	1.423201	2.53696**	0.834246	1.633922	2.08168***	1.635943	2.36381**	1.537397	5.50281*	1.308209	1.534081
	(0.5143)	(0.3965)	(0.2125)	(0.0266)	(0.5251)	(0.1478)	(0.0646)	(0.1468)	(0.0373)	(0.1746)	(0.000)	(0.2573)	(0.1756)
$LBQ^2(10)$	0.038*	-0.029	0.017	0.016	-0.009***	0.027	0.038***	0.016*	0.072*	0.020	0.002	0.024	-0.012*
	(0.000)	(0.106)	(0.431)	(0.130)	(0.061)	(0.402)	(0.075)	(0.000)	(0.000)	(0.363)	(0.209)	(0.371)	(0.009)
LM(10)	78.4551*	72.035*	40.601*	117.688*	40.118*	21.526*	55.2231*	157.8792*	25.3326*	87.0725*	252.2128*	38.90049*	127.3702*
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.000)	(0.000)	(0.0000)	(0.0000)	(0.0000)

Notes: * , ** and *** denote significance at 1%, 5% and 10% level respectively. The number in the parenthesis denotes the p-values of the coefficients. Adj R^2 denotes R^2 adjusted for the degrees of freedom. The F-test denotes the F- statistic corresponding to the hypothesis that all coefficients of the day-of-the-week are zero simultaneously. AIC and SBC refer to Akaike and Schwarz information criterion, respectively. LL is the log likelihood function value, LM is the Lagrange Multiplier test for conditional heteroscedasticity, LBQ is the Ljung-Box test on squared standardized residuals.

Table 5. Information criteria

		Standard information criteria				Modified information criteria		
		GARCH(1.1)	EGARCH	GJR-GARCH		GARCH(1.1)	EGARCH	GJR-GARCH
Belgium	AIC	-6.77078	-6.777082	-6.773604	HAIC	-49671.99	-49729.61	-49718.18
	SBC	-6.75713	-6.762192	-6.758714	HSIC	-49656.47	-49712.37	-49700.93
	LL	17950.19	17967.88	17958.66				
Denmark	AIC	-5.5148	-5.516985	-5.515548	HAIC	-34706.83	-34705.53	-34757.92
	SBC	-5.50035	-5.50109	-5.499654	HSIC	-34693.66	-34690.71	-34743.1
	LL	12214.25	12220.09	12216.91				
Finland	AIC	-5.50539	-5.513011	-5.504943	HAIC	-23714.1	-23662.25	-23713.36
	SBC	-5.48515	-5.490746	-5.482678	HSIC	-23700.32	-23649	-23700.11
	LL	8160.728	8173.012	8161.068				
France	AIC	-6.71154	-6.711813	-6.712346	HAIC	-50208.43	-50200.66	-50215.51
	SBC	-6.70037	-6.699408	-6.699941	HSIC	-50196.35	-50186.86	-50201.71
	LL	17797.92	17799.66	17801.07				
Germany	AIC	-6.31028	-6.32416	-6.309901	HAIC	-44072.08	-44651.95	-44069.87
	SBC	-6.29911	-6.311756	-6.297496	HSIC	-44060	-44638.15	-44056.07
	LL	16734.39	16772.19	16734.39				
Greece	AIC	-5.76904	-5.786421	-5.774996	HAIC	-12645.24	-12696.49	-12684.51
	SBC	-5.73529	-5.749297	-5.737872	HSIC	-12635.62	-12685.67	-12673.69
	LL	4602.153	4616.991	4607.896				
Italy	AIC	-5.79296	-5.797749	-5.795001	HAIC	-44943.56	-44974.16	-44961
	SBC	-5.78179	-5.785345	-5.782596	HSIC	-44931.48	-44960.36	-44947.2
	LL	15363.23	15376.93	15369.65				
Netherlands	AIC	-7.18513	-7.18818	-7.184827	HAIC	-52036.41	-52015.1	-52028.95
	SBC	-7.17272	-7.174533	-7.171179	HSIC	-52022.61	-51999.58	-52013.43
	LL	19050.59	19059.68	19050.79				
Norway	AIC	-6.63582	-5.65532	-6.61578	HAIC	-47937.08	-25578.38	-47897.6
	SBC	-6.62268	-5.64088	-6.60133	HSIC	-47923.51	-25563.12	-47882.34
	LL	16450.23	14022.06	16401.6				
Spain	AIC	-5.63731	-5.64304	-5.64169	HAIC	-41176.48	-41175.73	-41224.69
	SBC	-5.62416	-5.62858	-5.62722	HSIC	-41162.93	-41160.47	-41209.43
	LL	13956.7	13971.88	13968.53				
Sweden	AIC	-5.69526	-5.699171	-5.695713	HAIC	-44372.98	-44406.9	-44391.79
	SBC	-5.6841	-5.686766	-5.683309	HSIC	-44360.9	-44393.1	44377.99
	LL	15104.29	15115.65	15106.49				
Switzerland	AIC	-6.53359	-6.542602	-6.533259	HAIC	-49083.98	-49156.57	-49082.93
	SBC	-6.51995	-6.527712	-6.518369	HSIC	-49068.46	-49139.32	-49065.68
	LL	17321.76	17346.62	17321.87				
U.K.	AIC	-6.31386	-6.315226	-6.317253	HAIC	-48203.39	-48201.39	-48229.6
	SBC	-6.30021	-6.300336	-6.302363	HSIC	-48187.87	-48184.14	-48212.35
	LL	16739.57	16744.19	16749.56				

Table 6. Day of the week seasonality in return

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	U.K.
Mean equation													
Monday	0.0000764	0.000979*	0.001012**	-0.00023	-0.00026	-0.00068	-0.00045	-0.00011	-0.000000549	0.00022	0.00074 **	0.000101	0.000015
	(0.6814)	(0.0077)	(0.047)	(0.2935)	(0.1481)	(0.1968)	(0.1512)	(0.4905)	(-0.7653)	(0.5375)	(0.0218)	(0.6326)	(0.9553)
Tuesday	0.000287	0.0000369	0.000252	0.000316	0.000155	-0.00066	-0.00074**	0.0000701	0.000000256*	-0.0000220	0.0000146	0.0000817	0.000317
	(0.115)	(0.9197)	(0.6169)	(0.1497)	(0.383)	(0.2085)	(0.0207)	(0.6459)	(0.000)	(0.9507)	(0.9637)	(0.6939)	(0.2236)
Wednesday	0.0000511	-0.0000408	0.000296	0.000107	-0.00036***	-0.00066	0.00026	0.000183	0.000000116	0.00022	0.00088 *	0.000526**	0.000232
	(0.7865)	(0.9101)	(0.5593)	(0.6135)	(0.0516)	(0.199)	(0.4019)	(0.2196)	(-0.1719)	(0.5358)	(0.0062)	(0.0139)	(0.3605)
Thursday	0.000132	0.000127	-0.00039	0.00028	-0.00000914	-0.00011	0.00037	0.000102	-0.000000083	0.000274	-0.00052	0.000582*	-0.0000694
	(0.482)	(0.7323)	(0.4319)	(0.1907)	(0.9606)	(0.837)	(0.2348)	(0.4974)	(-0.4868)	(0.4461)	(0.11)	(0.0064)	(0.7935)
Friday	-0.0000302	0.000403	0.00148*	0.001016*	0.000204	0.00023	0.00033	0.000296***	8.54E-10	0.000822**	0.00127*	0.000593*	0.00039
	(0.8737)	(0.2766)	(0.0036)	(0.000)	(0.2524)	(0.6688)	(0.2922)	(0.0538)	(0.9999)	(0.0218)	(0.0001)	(0.0053)	(0.1447)
AR(1)	-0.1304*	-0.04326*	-0.08819*			0.062956*		0.081344*	-0.06747*	0.074042*		-0.01859*	0.025362*
	(0.000)	(0.0025)	(0.000)			(0.0043)		(0.000)	(0.0001)	(0.000)		(0.000)	(0.0536)
AR(2)	-0.02674*											-0.04782*	0.035489*
	(0.0372)											(0.0004)	(0.0091)
Variance equation													
ω	-0.35252*	0.0000214*	0.00000755*	0.00000185*	-0.12046*	-0.46745*	-0.41589*	0.00000092*	8.55E-15**	-0.32055*	-0.24074 *	6.66E-07*	0.00000101*
	(0.000)	(0.000)	(0.0004)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.0272)	(0.000)	(0.000)	(0.0001)	(0.000)
α	0.240707*	0.282242*	0.108415*	0.087187*	0.192115*	0.300921*	0.26233*	0.147749*	0.221317*	0.20988*	0.18933 *	0.101482*	0.037405*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β	0.979751*	0.775538*	0.896777*	0.880997*	0.997643*	0.961993*	0.97265*	0.865648*	0.817018*	0.979243*	0.9872 *	0.904029*	0.934392*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
γ	-0.04870*			0.034981**	-0.02018**	-0.09375*	-0.0255**			-0.04364*	-0.0248*		0.044549*
	(0.000)			(0.0141)	(0.0187)	(0.0006)	(0.0142)			(0.000)	(0.0032)		(0.000)
SE of regression	0.010603	0.024133	0.018846	0.01087	0.015503	0.021732	0.017317	0.009791	0.024877	0.02009	0.01819	0.011291	0.013396
Adj R^2	0.013169	-0.0098	-0.00451	0.000864	-0.00045	-0.00302	0.000084	0.001438	-0.00527	0.005997	0.00119	0.026635	0.000114
F-test	0.635982	1.674929	2.730394**	5.457549*	1.598102	1.029137	2.158336***	1.284027	15.5882*	1.298388	5.90137*	4.288849*	0.888075
	(0.6723)	(0.137)	(0.0182)	(0.0001)	(0.157)	(0.3988)	(0.0558)	(0.2676)	(0.000)	(0.2614)	(0.000)	(0.0007)	(0.488)
$LBQ^2(10)$	0.006*	-0.004	-0.026	-0.01	-0.004	0.008	-0.007	-0.017	0.000	-0.008*	0.005	-0.003	-0.021
	(0.005)	(1.000)	(0.952)	(0.609)	(1.000)	(0.999)	(0.981)	(0.13)	(1.000)	(0.000)	(0.381)	(0.967)	(0.313)
ARCH(10)	2.352995*	0.085124	0.38512	0.807909	0.073275	0.156013	0.297941	1.638209***	0.000202	4.00581*	1.05629	0.359249	1.185778
	(0.0091)	(0.9999)	(0.9537)	(0.6211)	(1.000)	(0.9987)	(0.9819)	(0.0895)	(1.000)	(0.000)	(0.3928)	(0.9638)	(0.295)

Notes: as Table 4

Table 7. BDS test

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	U.K.
BDS test:Bootstrap													
Dimension													
2	0.000	0.002	0.0001	0.000	0.000	0.046	0.000	0.000	0.938	0.010	0.006	0.000	0.0073
3	0.000	0.004	0.000	0.000	0.000	0.050	0.000	0.000	0.944	0.002	0.020	0.000	0.0023
4	0.000	0.014	0.000	0.006	0.000	0.060	0.000	0.000	0.924	0.000	0.032	0.000	0.0026
5	0.000	0.076	0.0001	0.006	0.000	0.058	0.000	0.000	0.914	0.002	0.064	0.000	0.0032
6	0.000	0.124	0.0001	0.002	0.000	0.098	0.000	0.000	0.906	0.014	0.078	0.000	0.0025
BDS test:Normal													
Dimension													
2	0.000	0.0038	0.0002	0.000	0.000	0.0436	0.0001	0.000	0.9887	0.0085	0.0118	0.000	0.010
3	0.000	0.0028	0.0001	0.000	0.000	0.0377	0.0000	0.000	0.9848	0.0013	0.0247	0.000	0.012
4	0.000	0.009	0.0004	0.000	0.000	0.0408	0.0000	0.000	0.9818	0.0016	0.0275	0.000	0.014
5	0.000	0.0499	0.0011	0.000	0.000	0.0336	0.0001	0.000	0.9793	0.0038	0.0593	0.000	0.018
6	0.000	0.1063	0.0018	0.002	0.000	0.0552	0.0000	0.000	0.9770	0.0074	0.0731	0.000	0.014

Notes: Only p-values of BDS test statistic are reported

Table 8. Unit root tests

COUNTRIES		ADF test (SIC)		ADF test (t sig)		Phillips-Perron test	Zivot Andrews' test (SIC)			Zivot Andrews' test (t sig)		
		t-statistic	k	t-statistic	k	t-statistic	t-statistic	k	TB	t-statistic	k	TB
Belgium	intecept	-8.03471	(14)	-9.345336	(8)	-8.84917	-9.541785	(14)	3/14/2007	-10.88138	(8)	3/14/2007
	trend and intercept	-8.04271	(14)	-9.353396	(8)	-8.8533	-9.540344	(14)	3/14/2007	-10.88121	(8)	3/14/2007
Denmark	intecept	-11.7899	(7)	-11.78989	(7)	-13.8317	-12.34976	(7)	9/20/2001	-12.34976	(7)	09/20/2001
	trend and intercept	-12.1076	(7)	-12.21023	(8)	-14.0567	-12.63182	(7)	01/20/2004	-12.75332	(8)	01/20/2004
Finland	intecept	-6.40983	(1)	-6.481929	(8)	-6.44439	-7.64425	(1)	10/29/2007	-7.876547	(8)	10/31/2007
	trend and intercept	-6.9507	(1)	-7.08915	(8	-6.99777	-9.040133	(1)	8/26/2008	-9.574602	(8)	8/27/2008
France	intecept	-6.33587	(0)	-6.051762	(7)	-6.24972	-9.219074	(0)	2/5/2007	-9.112634	(7)	20/5/2007
	trend and intercept	-7.41965	(0)	-7.179303	(7)	-7.48227	-9.183384	(0)	2/5/2007	-9.079042	(7)	2/5/2007
Germany	intecept	-5.74786	(2)	-5.917682	(8)	-5.9524	-6.729504	(2)	4/23/2007	-7.252743	(6)	4/24/2007
	trend and intercept	-6.31814	(2)	-6.535341	(8)	-6.55699	-6.915742	(2)	06/20/2003	-7.444489	(6)	06/20/2003
Greece	intecept	-13.0869	(1)	-11.75769	(2)	-11.3982	-14.2415	(1)	10/10/2008	-12.90407	(2)	10/10/2008
	trend and intercept	-13.5621	(1)	-12.2261	(2)	-11.6861	-15.47705	(1)	10/27/2008	-14.15822	(2)	10/27/2008
Italy	intecept	-14.0986	(0)	-10.618	(7)	-13.6312	-15.52119	(1)	12/6/2000	-12.01342	(7)	12/6/2000
	trend and intercept	-14.5544	(0)	-11.05115	(7)	-14.1477	-15.75739	(1)	12/6/2000	-12.24543	(7)	12/6/2000
Netherlands	intecept	-5.29364	(13)	-5.653924	(8)	-6.19378	-8.025249	(13)	2/5/2007	-8.373563	(8)	2/5/2007
	trend and intercept	-6.27016	(13)	-6.636009	(8)	-7.50994	-8.031063	(13)	2/5/2007	-8.376376	(8)	2/5/2007
Norway	intecept	-12.4554	(4)	-10.43566	(8)	-15.6144	-14.11031	(4)	3/7/2007	-12.01931	(8)	3/7/2007
	trend and intercept	-12.7741	(4)	-10.7357	(8)	-15.7877	-14.16356	(4)	3/7/2007	-12.06492	(8)	3/7/2007
Spain	intecept	-7.58569	(6)	-7.326044	(8)	-7.11467	-9.921529	(6)	28/2/2006	-9.692586	(8)	28/2/2006
	trend and intercept	-8.08523	(6)	-7.830677	(8)	-7.6895	-12.60392	(6)	27/2/2006	-12.46910	(8)	27/2/2006
Sweden	intecept	-7.30421	(5)	-6.909224	(7)	-7.29117	-8.770537	(5)	04/19/2007	-8.344763	(7)	04/19/2007
	trend and intercept	-7.30184	(5)	-6.906971	(7)	-7.28911	-8.986347	(5)	08/20/1993	-8.587577	(7)	08/20/1993
Switzerland	intecept	-9.58166	(1)	-8.389286	(6)	-9.08015	-12.08229	(1)	04/18/2007	10.86054	(6)	04/20/2007
	trend and intercept	-10.709	(1)	-9.474997	(6)	-10.4857	-12.29764	(1)	10/29/1998	-11.08386	(6)	10/29/1998
U.K.	intecept	-3.5333	(10)	-3.709489	(8)	-3.82661	-5.391308	(10)	02/28/2007	-5.627266	(8)	04/19/2007
	trend and intercept	-4.04059	(10)	-4.238164	(8)	-4.41095	-5.298898	(10)	04/19/2007	-5.551975	(8)	04/19/2007

Notes: TB is the break date and k is the lag length. ADF stands for the Augmented Dickey-Fuller test for the presence of unit root. The critical values for ADF and Philllips-Perron (PP) statistics are taken from MacKinnon (1996). The critical values for ADF and PP when including an intercept in the test equation are: -3.431645, -2.861997 and -2.567056 at 1%, 5% and 10% level of significance respectively. The critical values for ADF and PP when including an intercept and trend in the test equation are: -3.960113, -3.41821 and -3.127207 at 1%, 5% and 10% level of significance respectively. The critical values for Zivot and Andrews' test when including an intercept in the test equation are: -5.34, -4.93 and -4.58 at 1%, 5% and 10% level of significance respectively. The critical values for Zivot and Andrews' test when including an intercept and trend in the test equation are: -5.57, -5.08 and -4.82 at 1%, 5% and 10% level of significance respectively. SIC and 't sig' denote the approach of lag length (k) selection for each unit root test.

Table 9. Information criteria

		Standard information criteria				Modified information criteria		
		GARCH(1.1)-M	EGARCH-M	GJR-GARCH-M		GARCH(1.1)-M	EGARCH-M	GJR-GARCH-M
Belgium	AIC	-6.7711	-6.777801	-6.773787	HAIC	-49680.46	-49742.28	-49732.75
	SBC	-6.75621	-6.76167	-6.758899	HSIC	-49643.21	-49701.31	-49691.78
	LL	17952.03	17970.78	17962.53				
Denmark	AIC	-5.514559	-5.516808	-5.515444	HAIC	-34702.12	-34709.69	-34754.98
	SBC	-5.498665	-5.499469	-5.498105	HSIC	-34687.3	-34693.22	-34741.51
	LL	12214.72	12220.7	12217.68				
Finland	AIC	-5.50503	-5.512986	-5.504551	HAIC	-23711.14	-23665.16	-23712.98
	SBC	-5.482765	-5.488697	-5.480262	HSIC	-23697.89	-23650.44	-23698.26
	LL	8161.197	8173.976	8161.488				
France	AIC	-6.711243	-6.711878	-6.712212	HAIC	-50207.3	-50202.24	-50215.5
	SBC	-6.698839	-6.698233	-6.698567	HSIC	-50193.5	-50186.72	-50199.98
	LL	17798.15	17800.83	17801.72				
Germany	AIC	-6.30997	-6.323795	-6.309594	HAIC	-44076.61	-44652.73	-44071.79
	SBC	-6.297565	-6.31015	-6.295949	HSIC	-44062.81	-44637.21	-44056.27
	LL	16734.58	16772.22	16734.58				
Greece	AIC	-5.768669	-5.785949	-5.773974	HAIC	-12642.52	-12701.08	-12681.13
	SBC	-5.731545	-5.745451	-5.733476	HSIC	-12631.7	-12689.05	-12669.1
	LL	4602.86	4617.615	4608.083				
Italy	AIC	-5.792579	-5.797558	-5.794653	HAIC	-44941.54	-44975.82	-44959.74
	SBC	-5.780175	-5.783913	-5.781008	HSIC	-44927.74	-44960.3	-44944.22
	LL	15363.23	15377.43	15369.73				
Netherlands	AIC	-7.18477	-7.187808	-7.184483	HAIC	-52034.6	-52012.54	-52026.75
	SBC	-7.171123	-7.17292	-7.169595	HSIC	-52019.08	-51995.09	-52009.5
	LL	19050.64	19059.69	19050.88				
Norway	AIC	-6.404778	-5.540213	-6.534558	HAIC	-45000.15	-30684.74	-45012.29
	SBC	-6.39033	-5.524451	-6.518797	HSIC	-44984.89	-30667.78	-44995.33
	LL	15878.84	13737.88	16201.37				
Spain	AIC	-5.63819	-5.64504	-5.643012	HAIC	-41180.63	-41194.91	-41231.44
	SBC	-5.623725	-5.62926	-5.627232	HSIC	-41165.38	-41177.96	-41214.49
	LL	13959.88	13977.83	13972.81				
Sweden	AIC	-5.695879	-5.700548	-5.696547	HAIC	-44371.35	-44411.42	-44395.2
	SBC	-5.683475	-5.686903	-5.682902	HSIC	-44357.55	-44395.9	-44379.68
	LL	15106.93	15120.3	15109.7				
Switzerland	AIC	-6.533485	-6.542521	-6.533182	HAIC	-49082.91	-49156.22	-49082.28
	SBC	-6.518595	-6.526389	-6.517051	HSIC	-49065.66	-49137.25	-49063.61
	LL	17322.47	17347.41	17322.67				
U.K.	AIC	-6.313834	-6.315857	-6.317571	HAIC	-48203.21	-48206.66	-48231.1
	SBC	-6.298944	-6.299726	-6.30144	HSIC	-48185.96	-48187.69	-48212.13
	LL	16740.5	16746.86	16751.4				

Table 10. Day of the week seasonality in returns

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	U.K.
Mean equation													
Monday	0.000563**	0.001383**	0.001725***	0.000128	-0.000286	-0.001281	-0.000043	-0.000159	-0.00000169	0.001731*	0.001888*	0.000343	0.000693
	(0.0411)	(0.0182)	(0.0558)	(0.7261)	(0.1822)	(0.1084)	(0.9293)	(0.4762)	(0.5055)	(0.0024)	(0.0001)	(0.2438)	(0.1132)
Tuesday	0.000767*	0.00045	0.000971	0.000677***	0.000128	-0.001291	-0.000327	0.0000161	0.0000163*	0.00158*	0.00118**	0.000329	0.000996**
	(0.0049)	(0.4378)	(0.283)	(0.0637)	(0.5447)	(0.1044)	(0.5014)	(0.9421)	(0.000)	(0.0058)	(0.014)	(0.2546)	(0.0203)
Wednesday	0.000555**	0.000368	0.001009	0.000467	-0.00038***	-0.001217	0.000642	0.00013	-0.00000808*	0.001768*	0.00207*	0.000771*	0.000908**
	(0.0456)	(0.5239)	(0.2628)	(0.1964)	(0.0807)	(0.1194)	(0.1764)	(0.5556)	(0.000)	(0.002)	(0.000)	(0.0094)	(0.0327)
Thursday	0.000613**	0.000539	0.000338	0.00064 ***	-0.0000333	-0.000707	0.000767	0.0000491	-0.00000616*	0.001817*	0.000647	0.000823*	0.000607
	(0.0278)	(0.357)	(0.7049)	(0.0772)	(0.8805)	(0.3806)	(0.1096)	(0.8231)	(0.000)	(0.0016)	(0.1811)	(0.0058)	(0.1644)
Friday	0.000458	0.000802	0.002207**	0.001376*	0.00018	-0.000361	0.000732	0.000242	-0.0000028***	0.002389*	0.002452*	0.000831*	0.001071**
	(0.1005)	(0.1749)	(0.0139)	(0.0001)	(0.3944)	(0.6607)	(0.1287)	(0.2753)	(0.0848)	(0.000)	(0.000)	(0.0049)	(0.0146)
δ	-0.068483**	-0.025695	-0.045329	-0.047747	0.003315	0.042822	-0.034612	0.009245	-0.072355*	-0.12170*	-0.09788*	-0.03345	-0.07676***
	(0.0157)	(0.3689)	(0.3356)	(0.226)	(0.8077)	(0.3093)	(0.2705)	(0.7432)	(0.000)	(0.0006)	(0.0013)	(0.2407)	(0.0505)
AR(1)	-0.13162*	-0.042995*	-0.088239*			0.061298*		0.081352*	-0.055261[a]	0.070448*		-0.18631*	0.023695***
	(0.000)	(0.0027)	(0.000)			(0.0058)		(0.000)	(0.000)	(0.000)		(0.000)	(0.0717)
AR(2)	-0.026224**											-0.04818*	0.033655**
	(0.0407)											(0.0004)	(0.0134)
Variance equation													
ω	-0.330467*	0.0000213*	0.0000074*	0.0000018*	-0.12068*	-0.47808*	-0.40891*	0.00000093*	1.58E-12	-0.30266*	-0.22244*	0.000000651*	0.00000092*
	(0.000)	(0.000)	(0.0004)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.8314)	(0.000)	(0.000)	(0.0001)	(0.0001)
α	0.236456*	0.279645*	0.107044*	0.08503*	0.192104*	0.301888*	0.260551*	0.148123*	0.197302*	0.206913*	0.182256*	0.100568*	0.036548*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β	0.981718*	0.777285*	0.898073*	0.882631*	0.997624*	0.960862*	0.973326*	0.865285*	0.844652*	0.981091*	0.988757*	0.90494*	0.935539*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
γ	-0.050271*			0.037468*	-0.019992**	-0.08985*	-0.02682*			-0.04681*	-0.02809*		0.046352*
	(0.000)			(0.0083)	(0.0198)	(0.0009)	(0.0096)			(0.000)	(0.0006)		(0.000)
Adj R^2	0.012712	-0.007031	-0.003252	0.001231	-0.00072	-0.00396	-0.000449	0.000968	-0.008956	0.009932	0.001298	0.026693	0.001372
SE of regression	0.010606	0.0241	0.018834	0.010868	0.015505	0.021742	0.017321	0.009793	0.024923	0.02005	0.018191	0.011291	0.013388
F-test	1.746649	1.419271	2.217228**	4.643529*	1.559896	0.990983	2.228691*	0.78507	67.11552*	3.683123*	7.526539*	2.651443**	1.565201
	(0.1204)	(0.2138)	(0.05)	(0.0003)	(0.1678)	(0.4218)	(0.0488)	(0.5603)	(0.000)	(0.0025)	(0.000)	(0.0212)	(0.1663)
$LBQ^2(10)$	0.005*	-0.004	-0.026	-0.009	-0.004	0.008	-0.008	-0.017	0.000	-0.008*	0.005	-0.003	-0.021
	(0.006)	(1.000)	(0.955)	(0.609)	(1.000)	(0.999)	(0.979)	(0.128)	(1.000)	(0.000)	(0.28)	(0.968)	(0.321)
ARCH(10)	2.298371**	0.085059	0.376785	0.807903	0.072959	0.157232	0.306142	1.64642***	0.000202	4.670143*	1.192082	0.355268	1.173598
	(0.0109)	(0.9999)	(0.9571)	(0.6211)	(1.000)	(0.9987)	(0.9799)	(0.0874)	(1.000)	(0.000)	(0.2907)	(0.9652)	(0.3034)

Notes: as Table 4

Table 11. BDS test

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	U.K.
BDS test:Bootstrap													
Dimension													
2	0.000	0.002	0.000	0.000	0.000	0.042	0.000	0.000	0.89	0.018	0.014	0.000	0.008
3	0.000	0.004	0.000	0.000	0.000	0.032	0.000	0.000	0.906	0.000	0.014	0.000	0.006
4	0.000	0.008	0.000	0.004	0.000	0.052	0.000	0.000	0.896	0.002	0.016	0.000	0.006
5	0.000	0.04	0.000	0.008	0.000	0.058	0.000	0.000	0.900	0.006	0.046	0.000	0.012
6	0.000	0.106	0.000	0.006	0.000	0.08	0.000	0.000	0.896	0.014	0.056	0.000	0.014
BDS test:Normal													
Dimension													
2	0.000	0.003	0.0001	0.0001	0.000	0.0496	0.0001	0.000	0.9887	0.0133	0.0081	0.0002	0.0093
3	0.000	0.002	0.000	0.0005	0.000	0.0463	0.000	0.000	0.9848	0.0018	0.0152	0.000	0.0028
4	0.000	0.0063	0.0001	0.003	0.000	0.0498	0.000	0.000	0.9818	0.002	0.012	0.000	0.0026
5	0.000	0.0383	0.0001	0.0029	0.000	0.0434	0.0001	0.000	0.9793	0.0042	0.0269	0.000	0.003
6	0.000	0.0876	0.0001	0.0006	0.000	0.0669	0.000	0.000	0.977	0.0079	0.0329	0.000	0.0025

Notes: Only p-values of BDS test statistic are reported

Table 12. Unit root tests

COUNTRIES		ADF test (SIC)		ADF test (t sig)		Phillips-Perron test	Zivot Andrews' test (SIC)			Zivot Andrews' test (t sig)		
		t-statistic	k	t-statistic	k	t-statistic	t-statistic	k	TB	t-statistic	k	TB
Belgium	intecept	-7.85661	(14)	-9.184609	(8)	-8.71079	-9.357173	(14)	03/14/2007	-10.7257	(8)	03/14/2007
	trend and intercept	-7.86461	(14)	-9.192792	(8)	-8.71505	-9.355409	(14)	03/14/2007	-10.72558	(8)	03/14/2007
Denmark	intecept	-11.7579	(7)	-11.75786	(7)	-13.7612	-12.32395	(7)	09/20/2001	-12.32395	(7)	09/20/2001
	trend and intercept	-12.0782	(7)	-12.07821	(7)	-13.9892	-12.60988	(7)	01/20/2004	-12.60988	(7)	01/20/2004
Finland	intecept	-5.79273	(0)	-6.395172	(8)	-6.10636	-7.264594	(1)	10/29/2007	-7.807776	(8)	11/16/2007
	trend and intercept	-6.5538	(1)	-6.988489	(8)	-6.64934	-8.689791	(1)	08/25/2008	-9.576651	(8)	08/26/2008
France	intecept	-5.35979	(13)	-6.015216	(7)	-6.19759	-8.392051	(13)	2/5/2007	-9.094403	(7)	2/5/2007
	trend and intercept	-7.34287	(0)	-7.147473	(7)	-7.42864	-9.113062	(0)	2/5/2007	-9.060425	(7)	2/5/2007
Germany	intecept	-5.75142	(2)	-5.921498	(8)	-5.95378	-6.733694	(2)	04/23/2007	-7.251814	(6)	04/24/2007
	trend and intercept	-6.32222	(2)	-6.539741	(8)	-6.55871	-6.920233	(2)	06/20/2003	-7.443826	(6)	06/20/2003
Greece	intecept	-13.0187	(1)	-11.7134	(2)	-11.3871	-14.18889	(1)	10/10/2008	-12.87657	(2)	10/10/2008
	trend and intercept	-13.5034	(1)	-12.19174	(2)	-11.6842	-15.40093	(1)	10/27/2008	-14.10784	(2)	10/27/2008
Italy	intecept	-14.0346	(0)	-10.59999	(7)	-13.6092	-15.51916	(1)	12/6/2000	-11.99954	(7)	12/6/2000
	trend and intercept	-14.4904	(0)	-11.03373	(7)	-14.0734	-15.75451	(1)	12/6/2000	-12.23051	(7)	12/6/2000
Netherlands	intecept	-5.31092	(13)	-5.655112	(8)	-6.20936	-8.04265	(13)	2/5/2007	-8.368778	(8)	2/5/2007
	trend and intercept	-6.28804	(13)	-6.635498	(8)	-7.52491	-8.04843	(13)	2/5/2007	-8.371512	(8)	2/5/2007
Norway	intecept	-11.3586	(4)	-10.02455	(7)	-13.3611	-12.94898	(4)	3/7/2007	-11.56011	(7)	3/7/2007
	trend and intercept	-11.6599	(4)	-10.31247	(7)	-13.899	-13.00739	(4)	3/7/2007	-11.61116	(7)	3/7/2007
Spain	intecept	-7.60567	(6)	-7.353196	(8)	-7.09137	-9.941337	(6)	28/2/2006	-9.721006	(8)	28/2/2006
	trend and intercept	-8.10239	(6)	-7.855358	(8)	-7.6352	-1258525	(6)	27/2/2006	-12.45955	(8)	27/2/2006
Sweden	intecept	-7.12249	(5)	-6.816588	(7)	-7.08221	-8.578571	(5)	04/19/2007	-8.578571	(5)	04/19/2007
	trend and intercept	-7.12042	(5)	-6.814609	(7)	-7.08045	-8.781269	(5)	08/20/1993	-8.781269	(5)	08/20/1993
Switzerland	intecept	-9.51854	(1)	-8.363356	(6)	-9.03272	-12.01009	(1)	04/18/2007	-10.8325	(6)	04/20/2007
	trend and intercept	-10.6432	(1)	-9.450189	(6)	-10.4246	-12.22833	(1)	10/29/1998	-11.0586	(6)	10/29/1998
U.K.	intecept	-3.70226	(8)	-3.702263	(8)	-3.79591	-5.645947	(8)	04/19/2007	-5.645947	(8)	04/19/2007
	trend and intercept	-4.24023	(8)	-4.240233	(8)	-4.41697	-5.573112	(8)	04/19/2007	-5.573112	(8)	04/19/2007

Notes: TB is the break date and k is the lag length. ADF stands for the Augmented Dickey-Fuller test for the presence of unit root. The critical values for ADF and Philllips-Perron (PP) statistics are taken from MacKinnon (1996). The critical values for ADF and PP when including an intercept in the test equation are: -3.431645, -2.861997 and -2.567056 at 1%, 5% and 10% level of significance respectively.The critical values for ADF and PP when including an intercept and trend in the test equation are: -3.960113, -3.41821 and -3.127207 at 1%, 5% and 10% level of significance respectively. The critical values for Zivot and Andrews' test when including an intercept in the test equation are: -5.34, -4.93 and -4.58 at 1%, 5% and 10% level of significance respectively. The critical values for Zivot and Andrews' test when including an intercept and trend in the test equation are: -5.57, -5.08 and -4.82 at 1%, 5% and 10% level of significance respectively. SIC and 't sig' denote the approach of lag length (k) selection for each unit root test.

Table 13. Information criteria

		Standard information criteria				Modified information criteria		
		GARCH(1.1)	EGARCH	GJR-GARCH		GARCH(1.1)	EGARCH	GJR-GARCH
Belgium	AIC	-6.77297	-6.77798	-6.77581	HAIC	-49717.9	-49758.7	-49759
	SBC	-6.75808	-6.76309	-6.75967	HSIC	-49702.3	-49743.2	-49741.8
	LL	17953.61	17970.26	17962.11				
Denmark	AIC	-5.51456	-5.51639	-5.51524	HAIC	-34727.8	-34695.6	-34775.6
	SBC	-5.50011	-5.5005	-5.49935	HSIC	-34716.3	-34682.5	-34762.4
	LL	12213.71	12218.78	12216.23				
Finland	AIC	-5.50477	-5.5119	-5.50429	HAIC	-23707.5	-23637	-23706.7
	SBC	-5.48453	-5.48963	-5.48203	HSIC	-23697.2	-23625.2	-23695
	LL	8159.808	8171.366	8160.102				
France	AIC	-6.7102	-6.71181	-6.71105	HAIC	-50173.5	-50178.8	-50180
	SBC	-6.6953	-6.69567	-6.69492	HSIC	-50198	-50161.6	-50162.8
	LL	17787.31	17792.58	17790.57				
Germany	AIC	-6.31054	-6.3234	-6.31017	HAIC	-44302.3	-44827.3	-44305.4
	SBC	-6.29938	-6.311	-6.29776	HSIC	-44291.9	-44815.2	-44293.3
	LL	16735.09	16770.18	16735.09				
Greece	AIC	-5.77382	-5.78841	-5.77955	HAIC	-12489.6	-12646.7	-12580.7
	SBC	-5.73328	-5.74449	-5.73563	HSIC	-12478.8	-12634.7	-12568.6
	LL	4602.189	4614.786	4607.741				
Italy	AIC	-5.79272	-5.79966	-5.79479	HAIC	-44960.9	-45005.6	-44978.1
	SBC	-5.78156	-5.78726	-5.78238	HSIC	-44950.5	-44993.5	-44966
	LL	15362.61	15382.01	15369.08				
Netherlands	AIC	-7.18493	-7.18906	-7.1846	HAIC	-52015	51997.75	-52008.5
	SBC	-7.17003	-7.17293	-7.16846	HSIC	-51999.5	-51980.5	-51991.2
	LL	19044.87	19056.83	19045				
Norway	AIC	-5.43799	-5.97894	-5.46204	HAIC	-42503.7	-35963.8	-42140.3
	SBC	-5.42223	-5.96318	-5.44496	HSIC	-42488.5	-35948.6	-42123.3
	LL	13479.19	14821.84	13539.73				
Spain	AIC	-5.63731	-5.64377	-5.64163	HAIC	-41190.8	-41190.3	-41237.2
	SBC	-5.62416	-5.62931	-5.62716	HSIC	-41178.9	-41176.7	-41223.6
	LL	13956.71	13973.69	13968.39				
Sweden	AIC	-5.69217	-5.69694	-5.69255	HAIC	-44351.9	-44392.1	-44369.3
	SBC	-5.681	-5.68205	-5.68015	HSIC	-44341.6	-44376.6	-44357.2
	LL	15096.09	15106.04	15098.1				
Switzerland	AIC	-6.53261	-6.54158	-6.53227	HAIC	-49084.3	-49157.3	-49083.2
	SBC	-6.51896	-6.52669	-6.51738	HSIC	-49070.5	-49141.8	-49067.7
	LL	17319.16	17343.9	17319.26				
UK	AIC	-6.31421	-6.31609	-6.31769	HAIC	-48210.5	-48213.2	-48236.9
	SBC	-6.30056	-6.29996	-6.3028	HSIC	-48196.7	-48195.9	-48221.4
	LL	16740.5	16744.33	16750.72				

Table 14. Day of the week seasonality in volatility

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	UK
Mean equation													
c	0.0000995	0.000303***	0.000576**	0.000327*	-0.0000472	-0.0004***	-0.0000971	0.000114***	-0.00000112	0.000311***	0.000475*	0.000386*	0.000176
	(0.2414)	(0.0676)	(0.0108)	(0.0007)	(0.5672)	(0.086)	(0.4978)	(0.0991)	(0.2512)	(0.0562)	(0.0014)	(0.0001)	(0.1412)
AR(1)	-0.13067*	-0.043287*	-0.088764*	-0.02027		0.057158**		0.078137*	-0.01618***	0.073548*	0.020153	-0.185727*	0.024408***
	(0.000)	(0.0025)	(0.000)	(0.1175)		(0.0086)		(0.000)	(0.076)	(0.000)	(0.1212)	(0.000)	(0.0629)
AR(2)	-0.02684**			0.010254		0.029731		0.020046	0.015703***		0.02218***	-0.047879*	0.035336*
	(0.0361)			(0.4434)		(0.1779)		(0.137)	(0.0979)		(0.0878)	(0.0004)	(0.0093)
AR(3)				0.036067*		0.045171**		0.030509**					
				(0.0069)		(0.039)		(0.0227)					
Variance equation													
α	0.244477*	0.279381*	0.115531*	0.169364*	0.189845*	0.298709*	0.27108*	0.144537*	0.38055*	0.209872*	0.19086*	0.103767*	0.036852*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β	0.979163*	0.777894*	0.888614*	0.989368*	0.997354*	0.961384*	0.971216*	0.86726*	0.985246*	0.979534*	0.987114*	0.902132*	0.934506*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
γ	-0.04873*			-0.0177**	-0.022*	-0.09914*	-0.02884*		0.356855*	-0.0435*	-0.02587*		0.045116*
	(0.000)			(0.0159)	(0.0096)	(0.0008)	(0.0071)		(0.000)	(0.000)	(0.003)		(0.000)
Monday	-0.27146**	0.0000413**	0.0000032	-0.103	-0.00424	-0.39759**	-0.10602	0.0000047**	-0.268*	-0.1777**	-0.07034	0.00000268	-0.00000249
	(0.0012)	(0.0408)	(0.8916)	(0.1807)	(0.9598)	(0.0141)	(0.2057)	(0.0264)	(0.0013)	(0.0352)	(0.3758)	(0.4188)	(0.6064)
Tuesday	0.005005	-0.0000229	0.00000302	-0.23764***	-0.20149	0.07562	-0.53619*	-0.00000545	-0.11098	-0.16338	-0.15595	-0.00000215	0.0000076
	(0.9678)	(0.5129)	(0.941)	(0.0563)	(0.156)	(0.7627)	(0.000)	(0.1581)	(0.4472)	(0.2178)	(0.2266)	(0.7164)	(0.3628)
Wednesday	-0.2383**	0.00000438	0.0000072	0.00941	-0.11925	-0.01679	-0.25436*	-0.00000245	-0.04889	-0.17439	-0.27305**	-0.00000435	0.0000106
	(0.0244)	(0.883)	(0.8272)	(0.9262)	(0.3108)	(0.9348)	(0.0134)	(0.438)	(0.6707)	(0.114)	(0.0109)	(0.3672)	(0.1599)
Thursday	-0.05535	-0.000049***	0.0000676***	-0.22208**	-0.22835***	-0.1493	-0.33723*	-0.00000484	-0.04775	-0.2423**	-0.14064	-0.00000173	-0.00000494
	(0.601)	(0.0868)	(0.0757)	(0.0321)	(0.053)	(0.4724)	(0.0012)	(0.1284)	(0.6769)	(0.0264)	(0.1884)	(0.7149)	(0.5053)
Friday	-0.15908	-0.000034	-0.0000502	-0.15855	-0.04585	-0.26397	-0.5125*	-0.0000064***	0.342846**	-0.1227	-0.29169**	-0.0000018	0.00000434
	(0.221)	(0.2998)	(0.2484)	(0.2016)	(0.7521)	(0.2944)	(0.000)	(0.0659)	(0.0131)	(0.3688)	(0.0245)	(0.752)	(0.6093)
Adj R^2	0.013714	-0.009376	-0.004825	-0.00277	-0.000002	-0.00434	-0.00001	0.000157	-0.00023	0.006241	-0.000016	0.026691	0.000293
SE of regression	0.0106	0.024128	0.018849	0.010888	0.015499	0.021759	0.017318	0.009799	0.024814	0.020088	0.018206	0.011291	0.013395
F-test	1.684623	1.068104	1.454181	1.616155	1.396369	1.157063	5.535448*	1.103632	5.538204*	1.666617	1.99584***	0.242987	1.025887
	(0.1505)	(0.3705)	(0.2136)	(0.1672)	(0.2325)	(0.3281)	(0.0002)	(0.3529)	(0.0002)	(0.1548)	(0.0924)	(0.914)	(0.3923)
$LBQ^2(10)$	0.006*	-0.005	-0.024	-0.008***	-0.003	0.01	-0.009	-0.019	0.000	-0.008*	0.006	-0.004	-0.024
	(0.003)	(1.000)	(0.958)	(0.08)	(1.000)	(0.999)	(0.952)	(0.10)	(1.000)	(0.000)	(0.493)	(0.961)	(0.201)
ARCH(10)	2.491626*	0.122413	0.373279	1.638178***	0.066351	0.152837	0.384856	1.735903***	0.000204	5.072195*	0.928545	0.374294	1.375199
	(0.0056)	(0.9996)	(0.9585)	(0.0896)	(1.000)	(0.9988)	(0.9539)	(0.0671)	(1.000)	(0.000)	(0.5053)	(0.9581)	(0.185)

Notes: as Table 4

Table 15. BDS test

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	U.K.
BDS test:Bootstrap													
Dimension													
2	0.000	0.004	0.000	0.000	0.000	0.04	0.000	0.000	0.786	0.018	0.016	0.000	0.008
3	0.000	0.002	0.000	0.000	0.000	0.04	0.000	0.000	0.52	0.000	0.028	0.000	0.002
4	0.000	0.008	0.000	0.002	0.000	0.036	0.000	0.000	0.876	0.000	0.028	0.000	0.004
5	0.000	0.058	0.000	0.002	0.000	0.032	0.002	0.000	0.886	0.008	0.056	0.000	0.006
6	0.000	0.104	0.000	0.000	0.000	0.052	0.000	0.000	0.918	0.014	0.078	0.000	0.006
BDS test:Normal													
Dimension													
2	0.000	0.0035	0.0002	0.000	0.000	0.028	0.0005	0.000	0.9864	0.013	0.0123	0.000	0.0061
3	0.000	0.0026	0.000	0.000	0.000	0.0304	0.0001	0.000	0.9311	0.0018	0.0263	0.000	0.0015
4	0.000	0.0079	0.0001	0.000	0.000	0.026	0.0004	0.000	0.9298	0.002	0.023	0.000	0.0017
5	0.000	0.0463	0.0001	0.000	0.000	0.0221	0.001	0.000	0.9421	0.0051	0.0434	0.000	0.0021
6	0.000	0.1039	0.0001	0.000	0.000	0.0369	0.0003	0.000	0.9512	0.0095	0.0613	0.000	0.0016

Notes: Only p-values of BDS test statistic are reported

Table 16. Unit root tests

COUNTRIES		ADF test (SIC)		ADF test (t sig)		Phillips-Perron test	Zivot Andrews' test (SIC)			Zivot Andrews' test (t sig)		
		t-statistic	k	t-statistic	k	t-statistic	t-statistic	k	TB	t-statistic	k	TB
Belgium	intecept	-8.4663	(20)	-9.20574	(8)	-9.68784	-10.18709	(20)	03/14/2007	-10.69152	(8)	03/14/2007
	trend and intercept	-8.47483	(20)	-9.214787	(8)	-9.69115	-10.18958	(20)	03/14/2007	-10.69184	(8)	03/14/2007
Denmark	intecept	-11.7549	(7)	-11.75493	(7)	-13.7224	-12.31453	(7)	09/20/2001	-12.31453	(7)	09/20/2001
	trend and intercept	-12.0719	(7)	-12.17536	(8)	-13.9544	-12.59576	(7)	01/20/2004	-12.71808	(8)	01/20/2004
Finland	intecept	-6.83995	(5)	-6.527162	(8)	-6.67613	-8.193683	(5)	10/31/2007	-7.904101	(8)	10/31/2007
	trend and intercept	-7.3973	(5)	-7.107864	(8)	-7.19565	-9.881503	(5)	08/26/2008	-9.664649	(8)	08/26/2008
France	intecept	-4.81405	(23)	-4.886088	(7)	-7.25264	-8.219778	(23)	2/5/2007	-7.900767	(7)	2/5/2007
	trend and intercept	-5.8874	(23)	-5.884742	(7)	-8.64361	-8.260044	(23)	2/5/2007	-7.95983	(7)	2/5/2007
Germany	intecept	-6.07742	(22)	-5.572616	(8)	-6.21967	-7.331762	(22)	04/25/2007	-6.583225	(8)	04/23/2007
	trend and intercept	-7.14581	(20)	-6.158927	(8)	-6.89682	-7.880162	(20)	06/24/2003	-6.773129	(8)	06/24/2003
Greece	intecept	-12.4221	(2)	-12.42209	(2)	-11.7772	-13.46993	(2)	10/27/2008	-13.46993	(2)	10/27/2008
	trend and intercept	-12.8373	(2)	-12.83729	(2)	-11.9888	-14.77756	(2)	10/27/2008	-14.77756	(2)	10/27/2008
Italy	intecept	-8.33333	(16)	-10.44436	(8)	-17.5832	-9.656688	(16)	12/6/2000	-11.78346	(8)	12/7/2000
	trend and intercept	-8.74935	(16)	-10.89527	(8)	-17.9386	-9.903101	(16)	12/6/2000	-12.03536	(8)	12/7/2000
Netherlands	intecept	-5.22823	(13)	-5.624792	(8)	-6.15246	-7.953265	(13)	2/5/2007	-8.352754	(8)	2/5/2007
	trend and intercept	-6.19515	(13)	-6.60247	(8)	-7.46603	-7.958851	(13)	2/5/2007	-8.355611	(8)	2/5/2007
Norway	intecept	-22.5759	(3)	-18.05247	(8)	-29.0946	-22.67817	(3)	20/6/2006	-18.17401	(8)	20/6/2006
	trend and intercept	-22.6006	(3)	-18.08216	(8)	-29.1061	-23.05138	(3)	20/6/2006	-18.61857	(8)	20/6/2006
Spain	intecept	-5.23806	(23)	-6.958184	(8)	-7.5507	-7.598811	(23)	2/3/2006	-9.228401	(8)	28/2/2006
	trend and intercept	-5.72084	(23)	-7.443725	(8)	-8.09397	-10.73046	(23)	2/3/2006	-11.81945	(8)	28/2/2006
Sweden	intecept	-5.71633	(30)	-6.926914	(8)	-8.59419	-7.225291	(30)	04/19/2007	-8.370651	(8)	04/19/2007
	trend and intercept	-5.71328	(30)	-6.924699	(8)	-8.59209	-7.461625	(30)	08/20/1993	-8.557735	(8)	08/20/1993
Switzerland	intecept	-9.72276	(1)	-8.492358	(6)	-9.20063	-12.23348	(1)	04/19/2007	-10.97198	(6)	04/20/2007
	trend and intercept	-10.8629	(1)	-9.589177	(6)	-10.5721	-12.44894	(1)	10/29/1998	-11.19578	(6)	10/29/1998
U.K.	intecept	-3.6986	(8)	-3.698596	(8)	-3.76474	-5.602952	(8)	04/18/2007	-5.602952	(8)	04/18/2007
	trend and intercept	-4.22228	(8)	-4.222282	(8)	-4.35636	5.524404	(8)	04/18/2007	5.524404	(8)	04/18/2007

Notes: TB is the break date and k is the lag length. ADF stands for the Augmented Dickey-Fuller test for the presence of unit root. The critical values for ADF and Philllips-Perron (PP) statistics are taken from MacKinnon (1996). The critical values for ADF and PP when including an intercept in the test equation are: -3.431645, -2.861997 and -2.567056 at 1%, 5% and 10% level of significance respectively. The critical values for ADF and PP when including an intercept and trend in the test equation are: -3.960113, -3.41821 and -3.127207 at 1%, 5% and 10% level of significance respectively. The critical values for Zivot and Andrews' test when including an intercept in the test equation are: -5.34, -4.93 and -4.58 at 1%, 5% and 10% level of significance respectively. The critical values for Zivot andAndrews' test when including an intercept and trend in the test equation are: -5.57, -5.08 and -4.82 at 1%, 5% and 10% level of significance respectively. SIC and 't sig' denote the approach of lag length (k) selection for each unit root test

Table 17. Information criteria

		Standard information criteria				Modified information criteria		
		GARCH(1.1)	EGARCH	GJR-GARCH		GARCH(1.1)	EGARCH	GJR-GARCH
Belgium	AIC	-6.77115	-6.77676	-6.774236	HAIC	-49712.19	-49749.83	-49757.12
	SBC	-6.75378	-6.7569	-6.754382	HSIC	-49691.49	-49725.68	-49732.87
	LL	17957.54	17971.02	17964.34				
Denmark	AIC	-5.5139	-5.5158	-5.514662	HAIC	-34723.79	-34692.32	-34775.61
	SBC	-5.49367	-5.49413	-5.492988	HSIC	-34704.03	-34670.92	-34754.21
	LL	12216.25	12221.47	12218.95				
Finland	AIC	-5.50493	-5.51212	-5.504509	HAIC	-23717.31	-23657.58	-23717.15
	SBC	-5.47659	-5.48176	-5.474148	HSIC	-23699.65	-23638.44	-23698.01
	LL	8164.047	8175.689	8164.425				
France	AIC	-6.71203	-6.71332	-6.712889	HAIC	-50186.37	-50187.93	-50192.98
	SBC	-6.69217	-6.69223	-6.691791	HSIC	-50162.23	-50162.06	-50167.11
	LL	17796.16	17800.59	17799.44				
Germany	AIC	-6.31102	-6.32354	-6.310646	HAIC	-44206.17	-44736.58	-44205.52
	SBC	-6.2949	-6.30618	-6.29328	HSIC	-44187.2	-44715.88	-44184.82
	LL	16740.37	16774.55	16740.37				
Greece	AIC	-5.77179	-5.78527	-5.778795	HAIC	-12485.85	-12678.45	-12686.83
	SBC	-5.71773	-5.72784	-5.721364	HSIC	-12469.01	-12660.41	-12668.79
	LL	4604.569	4616.29	4611.142				
Italy	AIC	-5.79272	-5.80008	-5.794771	HAIC	-44952.05	-45008.74	-44968.99
	SBC	-5.7766	-5.78272	-5.777404	HSIC	-44933.08	-44988.04	-44948.29
	LL	15366.61	15387.12	15373.04				
Netherlands	AIC	-7.18417	-7.18863	-7.183834	HAIC	-52011.09	-51997.92	-52004.51
	SBC	-7.16431	-7.16753	-7.162736	HSIC	-51986.95	-51972.05	-51978.64
	LL	19046.86	19059.68	19046.98				
Norway	AIC	-5.46798	-5.59932	-5.471584	HAIC	-42189.84	-30679.67	-42007.93
	SBC	-5.44959	-5.57962	-5.451882	HSIC	-42169.49	-30657.63	-41985.89
	LL	13560.92	13887.32	13570.85				
Spain	AIC	-5.63638	-5.64268	-5.64079	HAIC	-41184.92	-41184.52	-41232.69
	SBC	-5.61797	-5.62295	-5.621065	HSIC	-41164.58	-41162.49	-41210.66
	LL	13958.4	13974.98	13970.31				
Sweden	AIC	-5.69413	-5.69899	-5.694597	HAIC	-44367.84	-44416.41	-44385.98
	SBC	-5.678	-5.68038	-5.677231	HSIC	-44348.87	-44393.99	-44365.28
	LL	15105.28	15117.33	15107.53				
Switzerland	AIC	-6.53229	-6.54126	-6.531954	HAIC	-49076.22	-49149.33	-49075.21
	SBC	-6.51368	-6.52141	-6.5121	HSIC	-49053.8	-49125.19	-49051.07
	LL	17322.3	17347.07	17322.41				
UK	AIC	-6.31319	-6.31461	-6.316609	HAIC	-48198.9	-48201.48	-48225.38
	SBC	-6.29458	-6.29476	-6.296755	HSIC	-48176.48	-48175.61	-48201.23
	LL	16741.79	16746.57	16751.86				

Table 18. Day of the week seasonality in return and volatility

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	UK
Mean equation													
Monday	0.0000707	0.000983*	0.001015**	-0.000166	-0.000259	-0.000722	-0.000422	-0.000101	0.00000612	0.000218	0.000717**	0.0000989	0.0000259
	(0.7076)	(0.0082)	(0.0386)	(0.4512)	(0.1781)	(0.152)	(0.2292)	(0.5246)	(0.9856)	(0.5617)	(0.0351)	(0.6473)	(0.9193)
Tuesday	0.000294	0.0000473	0.000262	0.000283	0.000156	-0.000785	-0.00075**	0.0000604	-0.0000043	-0.0000133	-0.0000228	0.000075	0.000317
	(0.1323)	(0.8979)	(0.5889)	(0.1669)	(0.3833)	(0.1527)	(0.0151)	(0.6912)	(0.9891)	(0.9712)	(0.9458)	(0.7251)	(0.2242)
Wednesday	0.0000544	-0.0000449	0.000316	0.0000764	-0.00035***	-0.000721	0.000269	0.000191	-0.0000033	0.000229	0.000865*	0.00053**	0.000234
	(0.7671)	(0.9074)	(0.5219)	(0.729)	(0.0533)	(0.1867)	(0.3923)	(0.2156)	(0.9917)	(0.5219)	(0.0061)	(0.0108)	(0.3942)
Thursday	0.000133	0.00013	-0.000418	0.000317	-0.0000133	-0.0000748	0.000374	0.0000967	-0.0000009	0.000241	-0.000538	0.000592*	-0.000065
	(0.4787)	(0.719)	(0.4495)	(0.125)	(0.9393)	(0.8883)	(0.2349)	(0.5228)	(0.9975)	(0.4771)	(0.1008)	(0.0046)	(0.8013)
Friday	-0.0000339	0.000381	0.001479**	0.000977*	0.000203	0.000112	0.000301	0.000293**	0.00000111	0.000801**	0.001274*	0.000591*	0.000393
	(0.8514)	(0.2753)	(0.0028)	(0.000)	(0.2495)	(0.82)	(0.2934)	(0.0409)	(0.9976)	(0.0203)	(0.000)	(0.005)	(0.1377)
AR(1)	-0.131*	-0.043489*	-0.088786*	-0.020706		0.057817*		0.078658*	-0.050505*	0.073639*	0.021373	-0.185675*	0.024842
	(0.000)	(0.0024)	(0.000)	(0.1104)		(0.0081)		(0.000)	(0.000)	(0.000)	(0.1004)	(0.000)	(0.0584)
AR(2)	-0.02658**			0.009409		0.031359		0.019852				-0.047171*	0.035081*
	(0.0382)			(0.4834)		(0.1542)		(0.1416)				(0.0005)	(0.0099)
AR(3)				0.036012*		0.043869**		0.030725*					
				(0.0071)		(0.046)		(0.022)					
Variance equation													
α	0.244211*	0.282087*	0.114641*	0.17*	0.192172*	0.291513*	0.270191*	0.146535*	1.384903*	0.211095*	0.190082*	0.102941*	0.0372*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.0187)	(0.000)	(0.000)	(0.000)	(0.000)
β	0.979253*	0.775833*	0.889323*	0.98933*	0.997583*	0.962084*	0.972127*	0.865784*	0.849636*	0.979193*	0.987141*	0.902941*	0.934311*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
γ	-0.048432*			-0.017256**	-0.02105**	-0.098828*	-0.027639*		0.231526**	-0.043957*	-0.025242*		0.044898*
	(0.000)			(0.0188)	(0.0139)	(0.0006)	(0.0094)		(0.0332)	(0.000)	(0.0031		(0.000)
Monday	-0.26856*	0.000041**	0.00000414	-0.100543	-0.004903	-0.395868**	-0.101859	0.00000458**	-1.398687*	-0.183334**	-0.06247	0.00000267	-0.0000023
	(0.0013)	(0.0421)	(0.8596)	(0.1911)	(0.9536)	(0.0143)	(0.2229)	(0.0313)	(0.000)	(0.0305)	(0.4318)	(0.4225)	(0.6355)
Tuesday	0.002352	-0.000022	0.00000296	-0.23653***	-0.194643	0.082617	-0.535783*	-0.0000050	0.051484	-0.162533	-0.174373	-0.0000019	0.00000726
	(0.9849)	(0.5288)	(0.9418)	(0.0573)	(0.1712)	(0.7426)	(0.000)	(0.1852)	(0.6775)	(0.2202)	(0.1766)	(0.7418)	(0.3859)
Wednesday	-0.23991**	0.00000447	0.00000605	0.004575	-0.125376	-0.010137	-0.242098**	-0.0000022	0.123752	-0.171098	-0.26818**	-0.0000045	0.0000105
	(0.0236)	(0.8804)	(0.8553)	(0.964)	(0.2874)	(0.7426)	(0.0186)	(0.4666)	(0.233)	(0.1209)	(0.0123)	(0.352)	(0.166)
Thursday	-0.057221	-0.000048***	0.000064***	-0.223831**	-0.21926***	-0.138591	-0.33361*	-0.0000045	-0.021	-0.23987**	-0.163517	-0.0000020	-0.0000052
	(0.589)	(0.0922)	(0.0865)	(0.0305)	(0.0635)	(0.5048)	(0.0014)	(0.1548)	(0.8398)	(0.0281)	(0.1263)	(0.6706)	(0.4793)
Friday	-0.162296	-0.0000333	-0.0000513	-0.17048**	-0.045183	-0.263628	-0.511115*	-0.000006***	0.458572*	-0.119838	-0.291737**	-0.0000015	0.00000414
	(0.2119)	(0.3096)	(0.2342)	(0.0305)	(0.756)	(0.2959)	(0.000)	(0.0691)	(0.0003)	(0.3811)	(0.0246)	(0.787)	(0.6257)
Adj R^2	0.013185	-0.009836	-0.004617	-0.001896	-0.000453	-0.005601	0.000011	0.000152	-0.003398	0.006019	0.002591	0.026636	0.000096
SE of regression	0.010603	0.0241	0.0188	0.010884	0.015503	0.021772	0.017317	0.0098	0.024854	0.02009	0.018181	0.0113	0.013397
F-test (mean)	0.593876	1.659374	2.9022**	5.65235*	1.535445	1.18256	2.14839***	1.344778	0.000142	1.3037	6.252387*	4.501926*	0.881364
	(0.7047)	(0.1409)	(0.0128)	(0.000)	(0.1752)	(0.3153)	(0.0569)	(0.2422)	(1.000)	(0.2592)	(0.000)	(0.0004)	(0.4925)
F-test (variance)	1.697056	1.041621	1.418389	1.646907	1.341692	1.165603	5.492989*	1.060219	5.314062*	1.627392	2.00017***	0.278356	1.009806
	(0.1477)	(0.3841)	(0.2252)	(0.1595)	(0.2518)	(0.3242)	(0.0002)	(0.3745)	(0.0003)	(0.1644)	(0.0917)	(0.8921)	(0.4008)
$LBQ^2(10)$	0.006*	-0.005	-0.024	-0.007***	-0.003	0.01	-0.01	-0.019***	-0.001	-0.008*	0.007	-0.003	-0.024
	(0.003)	(1.000)	(0.963)	(0.076)	(1.000)	(0.999)	(0.94)	(0.098)	(1.000)	(0.000)	(0.46)	(0.962)	(0.209)
ARCH(10)	2.512184*	0.123133	0.361281	1.650166***	0.067468	0.155942	0.412071	1.74766***	0.004912	4.853332	0.96073	0.371848	1.361094
	(0.0052)	(0.9996)	(0.963)	(0.0865)	(1.000)	(0.9987)	(0.9417)	(0.0648)	(1.000)	(0.000)	(0.4757)	(0.9591)	(0.1918)

Notes: as Table 4

Table 19. BDS test

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	U.K.
BDS test:Bootstrap													
Dimension													
2	0.000	0.002	0.000	0.000	0.000	0.040	0.000	0.000	0.060	0.018	0.016	0.000	0.008
3	0.000	0.004	0.002	0.000	0.000	0.036	0.000	0.000	0.006	0.004	0.024	0.000	0.000
4	0.000	0.012	0.004	0.000	0.000	0.040	0.000	0.000	0.000	0.008	0.034	0.000	0.002
5	0.000	0.050	0.008	0.000	0.000	0.042	0.002	0.000	0.000	0.024	0.076	0.000	0.004
6	0.000	0.110	0.008	0.000	0.000	0.072	0.000	0.000	0.000	0.036	0.104	0.000	0.006
BDS test:Normal													
Dimension													
2	0.000	0.0034	0.0002	0.000	0.000	0.032	0.0003	0.000	0.0605	0.0116	0.0097	0.0003	0.0065
3	0.000	0.0024	0.000	0.000	0.000	0.0296	0.0001	0.000	0.0043	0.0016	0.0236	0.000	0.002
4	0.000	0.0076	0.0001	0.0001	0.000	0.027	0.0002	0.000	0.000	0.0021	0.0247	0.000	0.0023
5	0.000	0.0472	0.0002	0.0001	0.000	0.0244	0.0004	0.000	0.000	0.0053	0.0542	0.000	0.0026
6	0.000	0.1099	0.0002	0.000	0.000	0.0416	0.0002	0.000	0.000	0.0098	0.0641	0.000	0.0018

Notes: Only p-values of BDS test statistic are reported

Table 20. Unit root tests

COUNTRIES		ADF test (SIC)		ADF test (t sig)		Phillips-Perron test	Zivot Andrews' test (SIC)			Zivot Andrews' test (t sig)		
		t-statistic	k	t-statistic	k	t-statistic	t-statistic	k	TB	t-statistic	k	TB
Belgium	intecept	-8.45549	(20)	-9.194534	(8)	-9.66937	-10.17892	(20)	03/14/2007	-10.68346	(8)	03/14/2007
	trend and intercept	-8.46409	(20)	-9.203684	(8)	-9.67276	-10.18148	(20)	03/14/2007	-10.68382	(8)	03/14/2007
Denmark	intecept	-11.7894	(7)	-11.78944	(7)	-13.8226	-12.34902	(7)	09/20/2001	-12.34902	(7)	09/20/2001
	trend and intercept	-12.1071	(7)	-12.2072	(8)	-14.0478	-12.63149	(7)	01/20/2004	-12.75036	(8)	01/20/2004
Finland	intecept	-6.80828	(5)	-6.508847	(8)	-6.64351	-8.163507	(5)	10/31/2007	-7.889111	(8)	10/31/2007
	trend and intercept	-7.36421	(5)	-7.088978	(8)	-7.16232	-9.841583	(5)	08/26/2008	-9.640889	(8)	08/26/2008
France	intecept	-4.82244	(23)	-4.890924	(7)	-7.21757	-8.234555	(23)	2/5/2007	-7.907358	(7)	2/5/2007
	trend and intercept	-5.90368	(23)	-5.896393	(7)	-8.62115	-8.272344	(23)	2/5/2007	-7.963478	(7)	2/5/2007
Germany	intecept	-6.07361	(22)	-5.527065	(8)	-6.1711	-7.328995	(22)	04/25/2007	-6.531245	(8)	04/23/2007
	trend and intercept	-7.14269	(20)	-6.107795	(8)	-6.85425	-7.878036	(20)	06/24/2003	-6.72044	(8)	06/24/2003
Greece	intecept	-12.3188	(2)	-12.31877	(2)	-11.6259	-13.38939	(2)	10/13/2008	-13.38939	(2)	10/13/2008
	trend and intercept	-12.7447	(2)	-12.7447	(2)	-11.8497	-14.70742	(2)	10/27/2008	-14.70742	(2)	10/27/2008
Italy	intecept	-8.25089	(16)	-10.38527	(8)	-17.6102	-9.561492	(16)	12/6/2000	-11.72152	(8)	12/7/2000
	trend and intercept	-8.66625	(16)	-10.83808	(8)	-17.9635	-9.807989	(16)	12/6/2000	-11.97505	(8)	12/7/2000
Netherlands	intecept	-5.2472	(13)	-5.655899	(8)	-6.22356	-7.973667	(13)	2/5/2007	-8.388016	(8)	2/5/2007
	trend and intercept	-6.21614	(13)	-6.636748	(8)	-7.54407	-7.979525	(13)	2/5/2007	-8.391072	(8)	2/5/2007
Norway	intecept	-68.584	(0)	-68.58403	(0)	-68.584	-68.6289	(0)	20/6/2006	-68.6289	(0)	20/6/2006
	trend and intercept	-68.592	(0)	-68.59197	(0)	-68.5919	-68.82759	(0)	20/6/2006	-68.82759	(0)	20/6/2006
Spain	intecept	-5.27038	(23)	-7.023585	(8)	-7.6312	-7.633896	(23)	2/3/2006	-9.297977	(8)	28/2/2006
	trend and intercept	-5.75364	(23)	-7.509938	(8)	-8.17379	-10.74771	(23)	2/3/2006	-11.87648	(8)	28/2/2006
Sweden	intecept	-5.71143	(30)	-6.839215	(8)	-8.52384	-7.232027	(30)	04/19/2007	-8.277464	(8)	04/19/2007
	trend and intercept	-5.70829	(30)	-6.836661	(8)	-8.52151	-7.442737	(30)	08/20/1993	-8.454563	(8)	08/20/1993
Switzerland	intecept	-9.67628	(1)	-8.457433	(6)	-9.15326	-12.1883	(1)	04/19/2007	-10.93951	(6)	04/20/2007
	trend and intercept	-10.8111	(1)	-9.549531	(6)	-10.5665	-12.40215	(1)	10/29/1998	-11.16057	(6)	10/29/1998
U.K.	intecept	-3.70451	(8)	-3.704509	(8)	-3.76765	-5.614486	(8)	04/18/2007	-5.614486	(8)	04/18/2007
	trend and intercept	-4.22958	(8)	-4.229575	(8)	-4.36258	-5.537308	(8)	04/18/2007	-5.537308	(8)	04/18/2007

Notes: TB is the break date and k is the lag length. ADF stands for the Augmented Dickey-Fuller test for the presence of unit root. The critical values for ADF and Philllips-Perron (PP) statistics are taken from MacKinnon (1996). The critical values for ADF and PP when including an intercept in the test equation are: -3.431645, -2.861997 and -2.567056 at 1%, 5% and 10% level of significance respectively. The critical values for ADF and PP when including an intercept and trend in the test equation are: -3.960113, -3.41821 and -3.127207 at 1%, 5% and 10% level of significance respectively. The critical values for Zivot and Andrews' test when including an intercept in the test equation are: -5.34, -4.93 and -4.58 at 1%, 5% and 10% level of significance respectively. The critical values for Zivot andAndrews' test when including an intercept and trend in the test equation are: -5.57, -5.08 and -4.82 at 1%, 5% and 10% level of significance respectively. SIC and 't sig' denote the approach of lag length (k) selection for each unit root test

Table 21. Information criteria

		Standard information criteria				Modified information criteria		
		GARCH(1.1)	EGARCH	GJR-GARCH		GARCH(1.1)	EGARCH	GJR-GARCH
Belgium	AIC	-6.788742	-6.793307	-6.791729	HAIC	-50141.2	-50161.43	-50185.06
	SBC	-6.776336	-6.77966	-6.778082	HSIC	-50127.4	-50145.91	-50169.54
	LL	18000.17	18013.26	18009.08				
Denmark	AIC	-5.513945	-5.513934	-5.515974	HAIC	-35938.84	-35791.73	-35904.4
	SBC	-5.500943	-5.499488	-5.501527	HSIC	-35927.31	-35778.56	-35891.23
	LL	12214.12	12215.09	12219.61				
Finland	AIC	-5.564192	-5.581218	-5.565124	HAIC	-24196.85	-24120.5	-24301.03
	SBC	-5.545981	-5.560983	-5.544889	HSIC	-24186.54	-24108.72	-24289.25
	LL	8249.569	8275.784	8251.949				
France	AIC	-6.713036	-6.712907	-6.713862	HAIC	-50264.92	-50263.1	-50273.05
	SBC	-6.701872	-6.700503	-6.701458	HSIC	-50252.84	-50249.3	-50259.25
	LL	17801.9	17802.56	17805.09				
Germany	AIC	-6.336451	-6.347449	-6.334935	HAIC	-47231.88	-47106.96	-47231.28
	SBC	-6.325287	-6.335044	-6.32253	HSIC	-47219.8	-47093.16	-47217.88
	LL	16803.76	16833.91	16800.74				
Greece	AIC	-5.789324	-5.802855	-5.789902	HAIC	-13420.08	-13438.11	-13340.12
	SBC	-5.755576	-5.765732	-5.752779	HSIC	-13411.66	-13428.49	-13330.5
	LL	4618.302	4630.073	4619.762				
Italy	AIC	-5.800924	-5.80411	-5.800862	HAIC	-45211.01	-45164.66	-45273.81
	SBC	-5.78976	-5.791705	-5.788458	HSIC	-45198.93	-45150.86	-42260.01
	LL	15384.35	15393.79	15385.19				
Netherlands	AIC	-7.183947	-7.185691	-7.18361	HAIC	-52438.14	-52436.49	-52438.15
	SBC	-7.17154	-7.172044	-7.169963	HSIC	-52424.34	-52420.97	-52419.63
	LL	19047.46	19053.08	19047.57				
Norway	AIC	-5.803989	-5.824985	-5.7971	HAIC	-40168.03	-39680.8	-39815.4
	SBC	-5.790855	-5.810537	-5.782652	HSIC	-40154.46	-39665.54	-39800.14
	LL	14389.38	14442.4	14373.32				
Spain	AIC	-5.627867	-5.628201	-5.631607	HAIC	-41300.43	-41204.6	-41306.47
	SBC	-5.614717	-5.613736	-5.617142	HSIC	-41286.87	-41189.35	-41291.22
	LL	13933.34	13935.17	13943.6				
Sweden	AIC	-5.696373	-5.699353	-5.69728	HAIC	-44701.86	-44723.38	-44714.4
	SBC	-5.683966	-5.685706	-5.683633	HSIC	-44688.06	-44707.86	-44698.88
	LL	15105.39	15114.29	15108.79				
Switzerland	AIC	-6.522953	-6.529206	-6.522698	HAIC	-49191.12	-49224.52	-49190.69
	SBC	-6.509303	-6.514315	-6.507807	HSIC	-49175.6	-49207.27	-49173.44
	LL	17293.56	17311.13	17293.89				
UK	AIC	-6.30941	-6.309591	-6.312059	HAIC	-48242.63	-48236.44	-49259
	SBC	-6.295761	-6.294701	-6.297169	HSIC	-48227.11	-48219.19	-48241.75
	LL	16727.78	16729.26	16735.8				

Table 22. Day of the week seasonality in returns

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	UK
Mean equation													
Monday	-0.00000968	0.000000065	-0.00000031	-0,0000701	-0.00000174	0.0000021	-0.000037	-0.0000767	-0.000000114	-0.0000146	0.000387	0.000156	0.00000152
	(0.9493)	(0.9998)	(0.9991)	(0.7284)	(0.9835)	(0.9952)	(0.8934)	(0.5673)	(0.9959)	(0.9637)	(0.1931)	(0.4401)	(0.9953)
Tuesday	0.00017	0.00000758	-0.0000029	0.000265	0.000197	-0.000416	-0.00038	0.00000493	-0.00000108	0.00000078	0.00000195	0.0000827	0.000291
	(0.2664)	(0.9766)	(0.9927)	(0.188)	(0.1025)	(0.3061)	(0.1662)	(0.9707)	(0.9778)	(0.9981)	(0.9947)	(0.6808)	(0.2486)
Wednesday	-0.0000133	-0.0000707	-0.00000035	0.0000157	-0.00000474	-0.00000604	0.000000712	0.0000234	0.000000691	0.0000376	0.000712**	0.000508**	0.000179
	(0.9315)	(0.7931)	(0.9991)	(0.9373)	(0.9597)	(0.8806)	(0.9979)	(0.8612)	(0.9841)	(0.9071)	(0.0162)	(0.0129)	(0.4748)
Thursday	-0.0000115	-0.0000195	0.00000569	0.000230	-0.00027**	-0.00000705	-0.00000109	0.00015	0.00000103	0.00000683	-0.000556**	0.000557*	-0.000101
	(0.9404)	(0.939)	(0.9859)	(0.2528)	(0.0275)	(0.8596)	(0.9968)	(0.264)	(0.9786)	(0.9832)	(0.062)	(0.0062)	(0.6938)
Friday	1.38E-09	-0.000000167	0.0000124	0.000892*	-0.00000255	-0.000000259	0.00000112	0.00018	-0.000000691	0.000448	0.00105*	0.000636*	0.000405
	(1.000)	(0.9995)	(0.9702)	(0.000)	(0.9769)	(0.9994)	(0.9968)	(0.1802)	(0.9841)	(0.1659)	(0.0004)	(0.0017)	(0.114)
AR(1)	-0.07895*							0.056659*	-0.0283*	0.048289*	0.027294**	-0.178893*	0.023234***
	(0.000)							(0.000)	(0.0006)	(0.0001)	(0.0212)	(0.000)	(0.0724)
AR(2)												-0.048354*	0.034491*
												(0.0001)	(0.0089)
Variance equation													
ω	-0.502*	0.0000177*	0.0000312*	0.00000206*	-0.181*	-0.544*	-0.424*	0.000000996*	0.0000018*	0.0000113*	-0.236*	0.00000078*	0.00000118*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
α	0.267503*	0.165515*	0.220145*	0.088406*	0.161743*	0.263341*	0.24126*	0.118544*	0.205232*	0.09095*	0.179539*	0.083386*	0.040774*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β	0.966729*	0.774413*	0.7087*	0.874957*	0.991631*	0.95713*	0.970409*	0.875463*	0.846401*	0.832993*	0.987425*	0.914839*	0.930685*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
γ	-0.05131*	0.092507*		0.036677**	-0.02468*	-0.05671*	-0.02362**			0.092112*	-0.02844*		0.041176*
	(0.0001)	(0.0075)		(0.0141)	(0.001)	(0.0017)	(0.0209)			(0.000)	(0.0004)		(0.0001)
SE of regression	0.012301	-0.00111	0.018829	0.000604	-0.00062	-0.00259	-0.00071	0.009789	0.024835	0.005109	0.003162	0.01129	0.000145
Adj R^2	0.010608	0.024028	-0.001392	0.010871	0.015504	0.02172	0.017324	0.001902	-0.00183	0.020099	0.018176	0.026828	0.013396
F-test	0.251191	0.015088	0.000346	4.568928*	1.496935	0.22087	0.387115	0.684949	0.000264	0.387304	4.673892*	4.845361*	0.886252
	(0.9394)	(0.9999)	(1.000)	(0.0004)	(0.1872)	(0.9537)	(0.858)	(0.6348)	(1.000)	(0.8578)	(0.0003)	(0.0002)	(0.4892)
$LBQ^2(10)$	0.015**	-0.004	-0.012	-0.009	-0.005	0.009	-0.006	-0.018	(0.000)	-0.01	0.006	-0.002	-0.021
	(0.013)	(1.000)	(0.658)	(0.646)	(1.000)	(0.999)	(0.985)	(0.203)	(1.000)	(0.801)	(0.354)	(0.976)	(0.35)
ARCH(10)	2.14776**	0.091362	0.784328	0.773191	0.105304	0.136585	0.280074	1.416796	0.001109	0.596363	1.090854	0.320815	1.133669
	(0.0182)	(0.9999)	(0.6441)	(0.655)	(0.9998)	(0.9993)	(0.9857)	(0.1658)	(1.000)	(0.8182)	(0.3649)	(0.9761)	(0.3322)

Notes: as Table 4

Table 23. BDS test

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	U.K.
BDS test:Bootstrap													
Dimension													
2	0.000	0.004	0.068	0.000	0.000	0.042	0.000	0.000	0.002	0.094	0.012	0.000	0.012
3	0.000	0.000	0.11	0.000	0.000	0.032	0.000	0.000	0.000	0.016	0.026	0.000	0.002
4	0.000	0.006	0.204	0.008	0.000	0.052	0.000	0.000	0.000	0.022	0.028	0.000	0.002
5	0.000	0.022	0.272	0.006	0.000	0.058	0.000	0.000	0.000	0.032	0.05	0.000	0.002
6	0.000	0.038	0.262	0.002	0.000	0.08	0.000	0.000	0.000	0.034	0.046	0.000	0.004
BDS test:Normal													
Dimension													
2	0.000	0.002	0.0801	0.0001	0.000	0.0496	0.000	0.000	0.0112	0.1069	0.0079	0.000	0.0092
3	0.000	0.0009	0.0966	0.0007	0.000	0.0463	0.000	0.000	0.0037	0.0247	0.0189	0.000	0.0035
4	0.000	0.0026	0.2087	0.004	0.000	0.0498	0.000	0.000	0.0006	0.0205	0.0172	0.000	0.004
5	0.000	0.0153	0.3061	0.0036	0.000	0.0434	0.000	0.000	0.000	0.0262	0.0358	0.000	0.0045
6	0.000	0.0286	0.3199	0.0006	0.000	0.0669	0.000	0.000	0.000	0.0223	0.038	0.000	0.0032

Notes: Only p-values of BDS test statistic are reported

Table 24. Unit root tests

COUNTRIES		ADF test (SIC)		ADF test (t sig)		Phillips-Perron test	Zivot Andrews' test (SIC)			Zivot Andrews' test (t sig)		
		t-statistic	k	t-statistic	k	t-statistic	t-statistic	k	TB	t-statistic	k	TB
Belgium	intecept	-8.93408	(13)	-10.24228	(8)	-10.4132	-10.53363	(13)	03/14/2007	-11.86448	(8)	03/14/2007
	trend and intercept	-8.93675	(13)	-10.24445	(8)	-10.4131	-10.53322	(13)	03/14/2007	-11.86418	(8)	03/14/2007
Denmark	intecept	-15.2864	(2)	-12.21756	(8)	-14.1285	-15.80785	(2)	09/20/2001	-12.75599	(8)	09/20/2001
	trend and intercept	-15.5776	(2)	-12.51551	(8)	-14.3633	-16.05304	(2)	3/12/2004	-13.01354	(8)	3/12/2004
Finland	intecept	-9.8524	(4)	-8.807467	(7)	-13.7011	-11.19099	(4)	11/16/2007	-10.14762	(7)	11/16/2007
	trend and intercept	-12.0814	(2)	-9.387951	(7)	-14.567	-14.23662	(2)	08/26/2008	-11.57575	(7)	08/27/2008
France	intecept	-5.48175	(13)	-6.012718	(8)	-6.43719	-8.49763	(13)	2/5/2007	-9.061489	(8)	2/5/2007
	trend and intercept	-7.75963	(0)	-7.338639	(7)	-7.73951	-9.546247	(0)	2/5/2007	-9.246434	(7)	2/5/2007
Germany	intecept	-6.97012	(2)	-6.737351	(8)	-6.77824	-8.051335	(2)	04/23/2007	-8.051335	(8)	04/23/2007
	trend and intercept	-7.63091	(2)	-7.41821	(8)	-7.51094	-8.274775	(2)	06/20/2003	-8.274775	(8)	06/20/2003
Greece	intecept	-13.9986	(1)	-12.34239	(2)	-12.3663	-15.08818	(1)	10/10/2008	-13.40476	(2)	10/10/2008
	trend and intercept	-14.4379	(1)	-12.77098	(2)	-12.6085	-16.26259	(1)	10/27/2008	-1459042	(2)	10/27/2008
Italy	intecept	-13.1356	(0)	-10.14614	(7)	-12.6665	-14.72363	(1)	12/6/2000	-11.56722	(7)	12/6/2000
	trend and intercept	-13.592	(0)	-10.58205	(7)	-13.1692	-14.9738	(1)	12/6/2000	-11.81193	(7)	12/6/2000
Netherlands	intecept	-5.21315	(13)	-5.462304	(8)	-5.76662	-7.934101	(13)	2/5/2007	-8.141067	(8)	2/5/2007
	trend and intercept	-6.183	(13)	-6.425814	(8)	-7.04746	-7.940729	(13)	2/5/2007	-8.144547	(8)	2/5/2007
Norway	intecept	-11.255	(4)	-10.01762	(7)	-13.2693	-12.86638	(4)	3/7/2007	-11.5852	(7)	3/7/2007
	trend and intercept	-11.5627	(4)	-10.31399	(7)	-13.7287	-12.91732	(4)	3/7/2007	-1163033	(7)	3/7/2007
Spain	intecept	-9.85082	(7)	-9.850822	(7)	-10.4453	-12.14992	(7)	28/2/2006	-12.14992	(7)	28/2/2006
	trend and intercept	-10.4205	(7)	-10.42047	(7)	-11.0066	-13.93546	(7)	16/2/2006	-13.93546	(7)	16/2/2006
Sweden	intecept	-7.26635	(5)	-6.884502	(7)	-7.239	-8.738015	(5)	04/19/2007	-8.325095	(7)	04/19/2007
	trend and intercept	-7.26383	(5)	-6.882013	(7)	-7.23673	-8.931403	(5)	08/20/1993	-8.931403	(7)	08/20/1993
Switzerland	intecept	-8.84436	(1)	-7.882198	(6)	-8.46278	-11.27888	(1)	04/18/2007	-11.27888	(6)	04/18/2007
	trend and intercept	-9.91884	(1)	-9.216876	(5)	-9.58827	-11.50449	(1)	10/29/1998	-10.83849	(5)	10/29/1998
U.K.	intecept	-3.62592	(10)	-3.82135	(8)	-3.90847	-5.517289	(10)	04/19/2007	-5.781016	(8)	04/19/2007
	trend and intercept	-4.14514	(10)	-4.36368	(8)	-4.53612	-5.436736	(10)	04/19/2007	-5.71452	(8)	04/19/2007

Notes: TB is the break date and k is the lag length. ADF stands for the Augmented Dickey-Fuller test for the presence of unit root. The critical values for ADF and Philllips-Perron (PP) statistics are taken from MacKinnon (1996). The critical values for ADF and PP when including an intercept in the test equation are: -3.431645, -2.861997 and -2.567056 at 1%, 5% and 10% level of significance respectively. The critical values for ADF and PP when including an intercept and trend in the test equation are: -3.960113, -3.41821 and -3.127207 at 1%, 5% and 10% level of significance respectively. The critical values for Zivot and Andrews' test when including an intercept in the test equation are: -5.34, -4.93 and -4.58 at 1%, 5% and 10% level of significance respectively. The critical values for Zivot andAndrews' test when including an intercept and trend in the test equation are: -5.57, -5.08 and -4.82 at 1%, 5% and 10% level of significance respectively. SIC and 't sig' denote the approach of lag length (k) selection for each unit root test.

Table 25. Information criteria

		Standard information criteria				Modified information criteria		
		GARCH(1.1)	EGARCH	GJR-GARCH		GARCH(1.1)	EGARCH	GJR-GARCH
Belgium	AIC	-6.789227	-6.794447	-6.79196	HAIC	-50139.11	-50177.86	-50172.77
	SBC	-6.77558	-6.779559	-6.777072	HSIC	-50123.53	-50160.61	-50155.52
	LL	18002.45	18017.28	18010.69				
Denmark	AIC	-5.514864	-5.513424	-5.515565	HAIC	-35791.24	-35800.92	-35824.05
	SBC	-5.500417	-5.497533	-5.499674	HSIC	-35778.07	-35786.1	-35809.23
	LL	12217.15	12214.96	12219.7				
Finland	AIC	-5.601275	-5.662406	-5.604338	HAIC	-24103.54	-21113.07	-23888.81
	SBC	-5.57901	-5.640148	-5.580049	HSIC	-24091.76	-21099.82	-23875.56
	LL	8303.688	8397.023	8309.222				
France	AIC	-6.712692	-6.71274	-6.713586	HAIC	-50263.55	-50265.17	-50282.98
	SBC	-6.700288	-6.699095	-6.699941	HSIC	-50249.75	-50249.65	-50257.46
	LL	17801.99	17803.12	17805.36				
Germany	AIC	-6.34007	-6.353926	-6.341983	HAIC	-47058.52	-47092.64	-47017.81
	SBC	-6.327666	-6.340281	-6.328338	HSIC	-47044.72	-47077.12	-47002.29
	LL	16814.36	16852.08	16820.43				
Greece	AIC	-5.794964	-5.807063	-5.789241	HAIC	-13240.64	-13312.95	-13363.78
	SBC	-5.761233	-5.769959	-5.752137	HSIC	-13231.02	-13302.13	-13352.96
	LL	4625.689	4636.326	4622.131				
Italy	AIC	-5.801168	-5.803916	-5.802241	HAIC	-45122.28	-45151.27	-45132.87
	SBC	-5.788763	-5.790271	-5.788596	HSIC	-45108.48	-45135.75	-45117.35
	LL	15385.99	15394.28	15389.84				
Netherlands	AIC	-7.183572	-7.185327	-7.183232	HAIC	-52434.59	-52433.23	-52430.85
	SBC	-7.169925	-7.17044	-7.168344	HSIC	-52419.07	-52415.98	-52413.6
	LL	19047.47	19053.12	19047.56				
Norway	AIC	-5.855145	-6.058356	-5.747489	HAIC	-39744.2	-39591.24	-39862.57
	SBC	-5.840697	-6.042595	-5.731728	HSIC	-39728.94	-39574.28	-39845.61
	LL	14517.12	15021.58	14251.4				
Spain	AIC	-5.628521	-5.629605	-5.632434	HAIC	-41278.95	-41249.05	-41309.33
	SBC	-5.614056	-5.613825	-5.616654	HSIC	-41263.7	-41232.1	-41292.38
	LL	13935.96	13939.64	13946.64				
Sweden	AIC	-5.697144	-5.700692	-5.698223	HAIC	-44702.36	-44729.51	-44718.82
	SBC	-5.683497	-5.685804	-5.683335	HSIC	-44686.84	-44712.26	-44701.57
	LL	15108.43	15118.83	15112.29				
Switzerland	AIC	-6.522805	-6.529064	-6.522579	HAIC	-49191	-49225.55	-49191.21
	SBC	-6.507915	-6.512933	-6.506448	HSIC	-49173.75	-49206.58	-49172.24
	LL	17294.17	17311.75	17294.57				
UK	AIC	-6.309344	-6.310011	-6.31231	HAIC	-48241.4	-48237.9	-48260.04
	SBC	-6.294454	-6.29388	-6.296179	HSIC	-48224.15	-48218.93	-48241.07
	LL	16728.61	16731.38	16737.46				

Table 26. Day of the week seasonality in returns

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	UK
Mean equation													
Monday	0.00033	0.0000264	0.0000053	0.000118	0.00000057	0.0000111	0.00000296	-0.0000849	-0.00000034	0.001105**	0.00139*	0.000363	0.000621
	(0.154)	(0.9452)	(0.9905)	(0.7341)	(0.9962)	(0.976)	(0.9943)	(0.6763)	(0.1444)	(0.0496)	(0.0019)	(0.2134)	(0.1492)
Tuesday	0.000581**	0.0000158	0.0000045	0.000475	0.00000012	-0.0000373	-0.000356	-0.0000029	-0.00000036	0.00106***	0.000951*	0.000319	0.000932**
	(0.0121)	(0.9678)	(0.9914)	(0.1682)	(0.9992)	(0.9311)	(0.381)	(0.9884)	(0.3076)	(0.061)	(0.0327)	(0.2676)	(0.0281)
Wednesday	0.000357	-0.0000106	0.00000473	0.000227	-0.0000263	0.0000106	0.0000083	0.0000183	-0.00000033	0.001218**	0.001751*	0.000731**	0.000784***
	(0.1246)	(0.9788)	(0.9914)	(0.5086)	(0.8241)	(0.9785)	(0.9837)	(0.9284)	(0.1894)	(0.0316)	(0.0001)	(0.0124)	(0.0645)
Thursday	0.000323	-0.000000758	0.0000047	0.000425	-0.00000119	0.00000934	0.0000105	0.000136	-0.00000036	0.001095***	0.00044	0.000769*	0.000502
	(0.166)	(0.9985)	(0.9914)	(0.2188)	(0.989)	(0.9805)	(0.9794)	(0.5042)	(0.2272)	(0.0528)	(0.3241)	(0.0087)	(0.2426)
Friday	0.000386***	0.00000137	0.0000965	0.001084*	0.000000165	0.0000103	0.0000118	0.000172	-0.00000035	0.001664*	0.002025*	0.000863*	0.00105**
	(0.0952)	(0.9971)	(0.8501)	(0.0015)	(0.9988)	(0.9763)	(0.977)	(0.3985)	(0.2659)	(0.0032)	(0.000)	(0.0029)	(0.0145)
δ	-0.047031***	-0.000486	-0.000283	-0.025337	-0.0000528	-0.00072	-0.000733	0.001457	0.000291	-0.088525**	-0.085591*	-0.030285	-0.07018***
	(0.0584)	(0.9814)	(0.9908)	(0.5032)	(0.9954)	(0.9764)	(0.9783)	(0.9576)	(0.0959)	(0.0128)	(0.003)	(0.2846)	(0.0724)
AR(1)	-0.076277*							0.055671*	-0.00441***	0.053665*	0.026994**	-0.17859*	0.022699***
	(0.000)							(0.000)	(0.080)	(0.000)	(0.0227)	(0.000)	(0.0792)
AR(2)												-0.047177*	0.033764**
												(0.0002)	(0.0105)
Variance equation													
ω	-0.331397*	0.0000241*	0.0000194*	0.000002*	-0.177062*	-0.477103*	-0.438588*	0.000000987*	-0.403*	0.0000112*	-0.219321*	0.00000076*	0.0000011*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
α	0.21018*	0.193834*	0.167474*	0.087542*	0.162099*	0.261278*	0.249704*	0.117823*	0.308968*	0.091545*	0.173897*	0.082613*	0.039549*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β	0.980553*	0.72893*	0.796088*	0.875606*	0.99208*	0.963738*	0.969371*	0.876243*	0.970391*	0.832816*	0.988939*	0.915668*	0.931827*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
γ	-0.048635*	0.119694*		0.037841**	-0.023467*	-0.062476*	-0.023586**		0.244627*	0.095348*	-0.030063*		0.043284*
	(0.000)	(0.0045)		(0.0111)	(0.0021)	(0.0022)	(0.0255)		(0.000)	(0.000)	(0.0001)		(0.000)
Adj R^2	0.01167	-0.001334	-0.001559	0.000837	-0.000949	-0.003906	-0.00094	0.001704	-0.001376	0.008647	0.003099	0.026962	0.00133
SE of regression	0.010611	0.02403	0.0188	0.01087	0.015506	0.021735	0.017326	0.00979	0.024829	0.020063	0.018177	0.011289	0.013388
F-test	1.286743	0.002811	0.0154	3.345605*	0.012434	0.003728	0.293621	0.515003	0.49371	1.76412	6.355519*	2.652803**	1.537212
	(0.2665)	(1.000)	(0.9999)	(0.0051)	(0.9999)	(1.000)	(0.9167)	(0.7651)	(0.7812)	(0.1167)	(0.000)	(0.0211)	(0.1746)
$LBQ^2(10)$	0.006*	-0.003	-0.02	-0.009	-0.005	0.007	-0.007	-0.018	0.000	-0.01	0.005	-0.002	-0.021
	(0.003)	(1.000)	(0.78)	(0.645)	(1.000)	(0.999)	(0.986)	(0.205)	(1.000)	(0.805)	(0.255)	(0.977)	(0.354)
ARCH(10)	2.46384*	0.096855	0.666704	0.774097	0.097404	0.154041	0.273537	1.409302	0.00025	0.591321	1.23012	0.317428	1.127336
	(0.0062)	(0.9999)	(0.7563)	(0.6541)	(0.9998)	(0.9988)	(0.987)	(0.1692)	(1.000)	(0.8224)	(0.2657)	(0.977)	(0.3369)

Notes: as Table 4

Table 27. BDS test

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	U.K.
BDS test:Bootstrap													
Dimension													
2	0.000	0.016	0.002	0.000	0.000	0.026	0.000	0.000	0.060	0.000	0.004	0.000	0.014
3	0.000	0.014	0.012	0.000	0.000	0.03	0.000	0.000	0.014	0.000	0.014	0.000	0.008
4	0.000	0.042	0.02	0.006	0.000	0.034	0.000	0.000	0.000	0.000	0.008	0.000	0.006
5	0.000	0.152	0.028	0.008	0.000	0.03	0.000	0.000	0.000	0.000	0.022	0.000	0.006
6	0.000	0.200	0.056	0.006	0.000	0.056	0.000	0.000	0.000	0.000	0.038	0.000	0.008
BDS test:Normal													
Dimension													
2	0.000	0.0207	0.0026	0.0001	0.000	0.0303	0.0001	0.000	0.000	0.1445	0.0053	0.000	0.0107
3	0.000	0.0188	0.0027	0.0007	0.000	0.025	0.000	0.000	0.000	0.036	0.0128	0.000	0.0035
4	0.000	0.0477	0.0084	0.0048	0.000	0.0251	0.000	0.000	0.000	0.027	0.0091	0.000	0.0032
5	0.000	0.1575	0.0189	0.0046	0.000	0.0221	0.000	0.000	0.000	0.0315	0.0201	0.000	0.0037
6	0.000	0.2097	0.0338	0.0009	0.000	0.0378	0.000	0.000	0.000	0.0255	0.0229	0.000	0.0031

Notes: Only p-values of BDS test statistic are reported

Table 28. Unit root tests

COUNTRIES		ADF test (SIC)		ADF test (t sig)		Phillips-Perron test	Zivot Andrews' test (SIC)			Zivot Andrews' test (t sig)		
		t-statistic	k	t-statistic	k	t-statistic	t-statistic	k	TB	t-statistic	k	TB
Belgium	intecept	-8.12621	(13)	-9.097172	(8)	-8.62466	-9.696396	(13)	03/14/2007	-10.68086	(8)	03/14/2007
	trend and intercept	-8.13259	(13)	-9.10338	(8)	-8.62802	-9.694577	(13)	03/14/2007	-10.68013	(8)	03/14/2007
Denmark	intecept	-12.8305	(7)	-12.8305	(7)	-16.0496	-13.3384	(7)	09/20/2001	-13.3384	(7)	09/20/2001
	trend and intercept	-17.2065	(2)	-13.1116	(7)	-16.2799	-17.67914	(2)	3/12/2004	-13.57913	(7)	3/12/2004
Finland	intecept	-9.1793	(2)	-8.392293	(4)	-9.71453	-10.50055	(2)	11/16/2007	-9.688707	(4)	10/29/2007
	trend and intercept	-9.76058	(2)	-8.702678	(8)	-10.4149	-11.8365	(2)	08/26/2008	-11.05057	(8)	08/27/2008
France	intecept	-5.46	(13)	-5.998796	(8)	-6.41463	-8.482963	(13)	2/5/2007	-9.058503	(8)	2/5/2007
	trend and intercept	-7.73044	(0)	-7.327556	(7)	-7.71774	-9.521774	(0)	2/5/2007	-9.239997	(7)	2/5/2007
Germany	intecept	-6.89859	(2)	-6.691772	(8)	-6.73202	-7.973132	(2)	04/23/2007	-7.973132	(2)	04/23/2007
	trend and intercept	-7.55408	(2)	-7.369044	(8)	-7.46062	-8.194048	(2)	06/20/2003	-8.194048	(8)	06/20/2003
Greece	intecept	-11.6451	(2)	-11.64514	(2)	-11.1981	-12.79683	(2)	10/10/2008	-12.79683	(2)	10/10/2008
	trend and intercept	-13.6988	(1)	-12.11088	(3)	-11.4168	-15.62165	(1)	10/27/2008	-14.23945	(3)	10/27/2008
Italy	intecept	-13.8757	(0)	-10.4779	(7)	-13.4228	-15.35317	(1)	12/6/2000	-11.90023	(7)	12/6/2000
	trend and intercept	-14.3357	(0)	-10.91415	(7)	-13.9439	-15.59627	(1)	12/6/2000	-12.13834	(7)	12/6/2000
Netherlands	intecept	-5.20869	(13)	-5.446725	(8)	-5.74559	-7.929279	(13)	2/5/2007	-8.121818	(8)	2/5/2007
	trend and intercept	-6.17822	(13)	-6.408645	(8)	-7.02665	-7.935961	(13)	2/5/2007	-8.125323	(8)	2/5/2007
Norway	intecept	-35.6123	(0)	-35.61232	(0)	-35.6815	-35.68241	(0)	20/6/2006	-35.68241	(0)	20/6/2006
	trend and intercept	-35.6283	(0)	-35.62832	(0)	-35.6957	-35.94695	(0)	20/6/2006	-35.94695	(0)	20/6/2006
Spain	intecept	-9.96086	(7)	-9.960859	(7)	-10.5182	-12.26022	(7)	28/2/2006	-12.26022	(7)	28/2/2006
	trend and intercept	-10.5251	(7)	-10.52514	(7)	-11.0678	-14.03908	(7)	16/2/2006	-14.03908	(7)	16/2/2006
Sweden	intecept	-7.10177	(5)	-6.79736	(7)	-6.98807	-8.566722	(5)	04/19/2007	-8.566722	(5)	04/19/2007
	trend and intercept	-7.0995	(5)	-6.795123	(7)	-6.98602	-8.752836	(5)	08/20/1993	-8.752836	(5)	08/20/1993
Switzerland	intecept	-8.78776	(1)	-7.855789	(6)	-8.46041	-11.21422	(1)	04/18/2007	-11.21422	(1)	04/18/2007
	trend and intercept	-9.85986	(1)	-9.188159	(5)	-9.59446	-11.44301	(1)	10/29/1998	-11.44301	(1)	10/29/1998
U.K.	intecept	-3.81181	(8)	-3.81181	(8)	-3.87663	-5.79335	(8)	04/19/2007	-5.79335	(8)	04/19/2007
	trend and intercept	-4.36185	(8)	-4.361845	(8)	-4.50972	-5.728934	(8)	04/19/2007	-5.728934	(8)	04/19/2007

Notes: TB is the break date and k is the lag length. ADF stands for the Augmented Dickey-Fuller test for the presence of unit root. The critical values for ADF and Philllips-Perron (PP) statistics are taken from MacKinnon (1996). The critical values for ADF and PP when including an intercept in the test equation are: -3.431645, -2.861997 and -2.567056 at 1%, 5% and 10% level of significance respectively. The critical values for ADF and PP when including an intercept and trend in the test equation are: -3.960113, -3.41821 and -3.127207 at 1%, 5% and 10% level of significance respectively. The critical values for Zivot and Andrews' test when including an intercept in the test equation are: -5.34, -4.93 and -4.58 at 1%, 5% and 10% level of significance respectively. The critical values for Zivot andAndrews' test when including an intercept and trend in the test equation are: -5.57, -5.08 and -4.82 at 1%, 5% and 10% level of significance respectively. SIC and 't sig' denote the approach of lag length (k) selection for each unit root test.

Table 29. Information criteria

		Standard information criteria				Modified information criteria		
		GARCH(1.1)	EGARCH	GJR-GARCH		GARCH(1.1)	EGARCH	GJR-GARCH
Belgium	AIC	-6.790482	-6.795186	-6.793725	HAIC	-50177.65	-50191.67	-50199.45
	SBC	-6.778076	-6.781539	-6.780078	HSIC	-50165.58	-50177.87	-50185.65
	LL	18004.78	18018.24	18014.37				
Denmark	AIC	-5.515202	-5.514025	-5.515768	HAIC	-35968.51	-35882.25	-36021.99
	SBC	-5.5022	-5.499579	-5.501321	HSIC	-35958.63	-35870.72	-36010.46
	LL	12216.9	12215.29	12219.15				
Finland	AIC	-5.540292	-5.577344	-5.546232	HAIC	-24403.15	-24279.82	-24308.41
	SBC	-5.522081	-5.557109	-5.525997	HSIC	-24394.32	-24269.51	-24298.1
	LL	8214.173	8270.046	8223.97				
France	AIC	-6.709987	-6.71075	-6.710893	HAIC	-50245.25	-50251.27	-50252.01
	SBC	-6.698823	-6.698345	-6.698489	HSIC	-50234.9	-50239.19	-50239.93
	LL	17793.82	17796.84	17797.22				
Germany	AIC	-6.019393	-6.351794	-6.30037	HAIC	-46690.09	-47239.1	-47839
	SBC	-6.008229	-6.339389	-6.287966	HSIC	-46679.74	-47227.02	-47826.92
	LL	15963.4	16845.43	16709.13				
Greece	AIC	-5.133685	-5.790885	-5.456509	HAIC	-12124.95	-13513.04	-13056.92
	SBC	-5.096543	-5.757153	-5.415991	HSIC	-12115.33	-13504.62	13046.1
	LL	4094.847	4622.44	4352.653				
Italy	AIC	-5.802591	-5.808421	-5.803929	HAIC	-45263.83	-45225.44	-45227.51
	SBC	-5.791427	-5.796017	-5.791525	HSIC	-45253.48	-45213.36	-45215.43
	LL	15388.77	15405.22	15393.31				
Netherlands	AIC	-7.184324	-7.186535	-7.183964	HAIC	-52449.48	-52444.84	-52447.39
	SBC	-7.171918	-7.172888	-7.170317	HSIC	-52437.41	-52431.04	-52433.59
	LL	19048.46	19055.32	19048.5				
Norway	AIC	-5.696229	-5.868962	-6.048453	HAIC	-40989.99	-40081.91	-41182.33
	SBC	-5.683094	-5.854514	-6.034005	HSIC	-40978.12	-40068.34	-41168.76
	LL	14122.41	14551.35	14996.04				
Spain	AIC	-5.629284	-5.629534	-5.633161	HAIC	-41289.75	-41230.53	-41313.71
	SBC	-5.616134	-5.615069	-5.618696	HSIC	-41277.88	-41216.97	-41300.15
	LL	13936.85	13938.47	13947.44				
Sweden	AIC	-5.694137	-5.698181	-5.695024	HAIC	-44681.06	-44712.55	-44693.52
	SBC	-5.68173	-5.684534	-5.681377	HSIC	-44668.99	-44698.75	-44679.52
	LL	15099.46	15111.18	15102.81				
Switzerland	AIC	-6.522974	-6.528439	-6.522703	HAIC	-49199.42	-49222.76	-49298.82
	SBC	-6.509324	-6.513548	-6.507813	HSIC	-49185.62	-49207.24	-49183.3
	LL	17293.62	17309.1	17293.9				
UK	AIC	-6.309957	-6.310455	-6.312795	HAIC	-48252.63	-48250.22	-48271.16
	SBC	-6.296308	-6.295565	-6.297905	HSIC	-48238.83	-48234.7	-48255.64
	LL	16729.23	16731.55	16737.75				

Table 30. Day of the week seasonality in variance

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	UK
Mean equation													
c	0.000000712	-0.00000002	0.00000199	0.000184**	0.00000012	-0.000000678	0.0000014	0.0000316	-0.0000065	0.0000309	0.000266	0.000431*	0.000151
	(0.9918)	(0.9999)	(0.9918)	(0.0443)	(0.9972)	(0.997)	(0.991)	(0.6024)	(0.7054)	(0.8335)	(0.0486)	(0.000)	(0.1915)
AR(1)	-0.07548*							0.053617*	-0.02757*	0.045985*	0.027301**	-0.177774*	0.021435***
	(0.000)							(0.000)	(0.0005)	(0.0002)	(0.0205)	(0.000)	(0.0971)
AR(2)												-0.0471*	0.035218*
												(0.0002)	(0.0077)
Variance equation													
α	0.225822*	0.156255*	0.284823*	0.087608*	0.175538*	0.177061*	0.248137*	0.113214*	0.187341*	0.091519*	0.180146*	0.090693*	0.039547*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β	0.976216*	0.785792*	0.599638*	0.874585*	0.98979*	0.978199*	0.97024*	0.880045*	0.848151*	0.830492*	0.987346*	0.908547*	0.931012*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
γ	-0.05107*	0.088151*		0.037993**	-0.02408*	-0.03596*	-0.0251**		0.071647**	0.094864*	-0.02857		0.042171*
	(0.000)	(0.0048)		(0.0121)	(0.0019)	(0.0056)	(0.0168)		(0.0229)	(0.000)	(0.0005)		(0.000)
Monday	-0.27006*	0.0000339**	0.0000347**	0.00000178	-0.09844	0.052031	-0.10795	0.0000056*	0.0000123	0.0000378*	-0.0448	0.0000052**	-0.0000047
	(0.0028)	(0.015)	(0.0342)	(0.6523)	(0.2068)	(0.6478)	(0.2142)	(0.0049)	(0.000)	(0.0018)	(0.5665)	(0.0369)	(0.3241)
Tuesday	-0.0373	-0.000015	0.0000288	-0.0000020	-0.16625	-0.20737	-0.55543*	-0.00000728**	-0.0000196*	-0.00004**	-0.18796	-0.000009***	0.0000103
	(0.7611)	(0.5391)	(0.2954)	(0.7546)	(0.2365)	(0.3482)	(0.000)	(0.0442)	(0.000)	(0.0475)	(0.1489)	(0.0507)	(0.2184)
Wednesday	-0.27408**	-0.0000153	-0.00003***	0.00000494	-0.10572	-0.34326***	-0.24828**	-0.00000195	-0.0000153*	-0.0000072	-0.30833*	-0.00000668	0.0000154**
	(0.0177)	(0.4118)	(0.0814)	(0.3781)	(0.3753)	(0.057)	(0.0228)	(0.5036)	(0.000)	(0.6537)	(0.0046)	(0.1187)	(0.0364)
Thursday	-0.03463	-0.0000355	0.0000993*	-0.0000028	-0.24541**	-0.5057**	-0.33564**	-0.00000753**	-0.0000123*	-0.000055*	-0.1628	-0.00000523	-0.0000046
	(0.7597)	(0.0984)	(0.0004)	(0.6146)	(0.037)	(0.0106)	(0.0026)	(0.0107)	(0.000)	(0.001)	(0.1366)	(0.2073)	(0.518)
Friday	-0.22109	-0.000027	-0.0000459	0.00000169	-0.03054	-0.75036*	-0.47743**	-0.00000638	-0.000011*	-0.000025	-0.30325**	-0.00000107	0.0000087
	(0.1097)	(0.3016)	(0.1249)	(0.7982)	(0.8266)	(0.0004)	(0.0002)	(0.0567)	(0.000)	(0.2181)	(0.0188)	(0.8294)	(0.2958)
Adj R^2	0.012608	-0.00028	-0.000061	0.000	-0.000003	-0.00086	-0.000007	0.00244	-0.00098	0.00536	0.000854	0.0267	0.000335
SE of regression	0.010606	0.024018	0.018816	0.010874	0.015499	0.021702	0.017317	0.009786	0.024824	0.020096	0.018197	0.01129	0.013395
F-test	1.570741	0.959103	5.496002*	0.372776	1.361051	5.798829*	5.477946*	2.0383***	29.21457*	2.828671**	2.409487**	2.29695***	1.711436
	(0.1792)	(0.4287)	(0.0002)	(0.8282)	(0.2448)	(0.0001)	(0.0002)	(0.0863)	(0.000)	(0.0234)	(0.0471)	(0.0567)	0.1444
$LBQ^2(10)$	0.007*	-0.004	-0.003	-0.009	-0.005	0.016	-0.009	-0.02	0.000	-0.011	0.007	-0.002	-0.025
	(0.002)	(1.000)	(0.769)	(0.691)	(1.000)	(0.987)	(0.938)	(0.142)	(1.000)	(0.688)	(0.428)	(0.957)	(0.22)
ARCH(10)	2.633277*	0.106012	0.665243	0.728855	0.089024	0.26704	0.412236	1.5451	0.001227	0.7141	0.998752	0.377704	1.334508
	(0.0034)	(0.9998)	(0.7577)	(0.6979)	(0.9999)	(0.9881)	(0.9416)	(0.1168)	(1.000)	(0.712)	(0.4418)	(0.9568)	(0.2054)

Notes: as Table 4

Table 31. BDS test

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	U.K.
BDS test:Bootstrap													
Dimension													
2	0.000	0.000	0.984	0.000	0.000	0.008	0.000	0.000	0.016	0.202	0.002	0.000	0.000
3	0.000	0.000	0.65	0.000	0.000	0.000	0.000	0.000	0.002	0.058	0.016	0.000	0.000
4	0.000	0.000	0.482	0.006	0.000	0.000	0.002	0.000	0.000	0.05	0.018	0.000	0.000
5	0.000	0.018	0.486	0.004	0.000	0.000	0.004	0.000	0.000	0.058	0.036	0.000	0.000
6	0.000	0.038	0.606	0.002	0.000	0.000	0.004	0.000	0.000	0.052	0.04	0.000	0.000
BDS test:Normal													
Dimension													
2	0.000	0.0011	0.9245	0.000	0.000	0.002	0.0001	0.000	0.0135	0.1802	0.0056	0.000	0.000
3	0.000	0.0004	0.6174	0.0002	0.000	0.0004	0.000	0.000	0.0028	0.0441	0.0134	0.000	0.000
4	0.000	0.0011	0.4292	0.0016	0.000	0.0002	0.000	0.000	0.0005	0.0337	0.0126	0.000	0.000
5	0.000	0.0086	0.4251	0.0013	0.000	0.0001	0.0001	0.000	0.000	0.0461	0.0255	0.000	0.000
6	0.000	0.0196	0.5427	0.0002	0.000	0.0002	0.000	0.000	0.000	0.0433	0.0318	0.000	0.000

Notes: Only p-values of BDS test statistic are reported

Table 32. Unit root tests

COUNTRIES		ADF test (SIC)		ADF test (t sig)		Phillips-Perron test	Zivot Andrews' test (SIC)			Zivot Andrews' test (t sig)		
		t-statistic	k	t-statistic	k	t-statistic	t-statistic	k	TB	t-statistic	k	TB
Belgium	intecept	-8.33875	(20)	-9.457959	(8)	-10.5147	-10.06362	(20)	03/14/2007	-11.0236	(8)	03/14/2007
	trend and intercept	-8.34553	(20)	-9.46409	(8)	-10.5165	-10.06442	(20)	03/14/2007	-11.0235	(8)	03/14/2007
Denmark	intecept	-14.862	(2)	-12.05322	(8)	-13.6516	-15.38224	(2)	09/20/2001	-12.59317	(8)	09/20/2001
	trend and intercept	-15.1522	(2)	-12.35177	(8)	-13.8713	-15.62693	(2)	3/12/2004	-12.8516	(8)	3/12/2004
Finland	intecept	-10.1512	(6)	-9.571969	(7)	-22.3845	-11.51803	(6)	11/16/2007	-10.91727	(7)	10/29/2007
	trend and intercept	-11.6231	(4)	-10.15633	(7)	-23.0015	-13.68439	(4)	08/26/2008	-12.31865	(7)	08/27/2008
France	intecept	-5.8232	(15)	-6.04339	(8)	-6.45817	-9.015578	(15)	2/5/2007	-9.092258	(8)	2/5/2007
	trend and intercept	-6.96829	(15)	-7.370601	(7)	-7.7725	-8.988662	(15)	2/5/2007	-9.280403	(7)	2/5/2007
Germany	intecept	-6.89751	(20)	-6.866218	(8)	-7.70821	-8.161214	(20)	04/25/2007	-7.961868	(8)	04/23/2007
	trend and intercept	-7.66523	(20)	-7.538091	(8)	-8.51932	-8.414846	(20)	06/24/2003	-8.1983	(8)	06/24/2003
Greece	intecept	-6.783	(8)	-6.783002	(8)	-9.56291	-8.460512	(8)	10/13/2008	-8.460512	(8)	10/13/2008
	trend and intercept	-8.51109	(6)	-7.462229	(8)	-10.2321	-11.25256	(6)	10/27/2008	-10.20215	(8)	10/27/2008
Italy	intecept	-8.02183	(16)	-9.952801	(8)	-17.5892	-9.32815	(16)	12/6/2000	-11.28408	(8)	12/7/2000
	trend and intercept	-8.44053	(16)	-10.40668	(8)	-18.0298	-9.586233	(16)	12/6/2000	-11.54898	(8)	12/7/2000
Netherlands	intecept	-5.16983	(13)	-5.378021	(8)	-5.61969	-7.892134	(13)	2/5/2007	-8.046556	(8)	2/5/2007
	trend and intercept	-6.138	(13)	-6.335245	(8)	-6.87294	-7.898702	(13)	2/5/2007	-8.04996	(8)	2/5/2007
Norway	intecept	-11.2948	(4)	-10.27601	(7)	-13.7021	-12.8512	(4)	3/7/2007	-11.82541	(7)	4/7/2007
	trend and intercept	-11.5903	(4)	-10.56759	(7)	-14.4062	-12.88248	(4)	3/7/2007	-11.85364	(7)	4/7/2007
Spain	intecept	-9.91557	(7)	-9.915568	(7)	-10.6383	-12.21054	(7)	28/2/2006	-12.21054	(7)	28/2/2006
	trend and intercept	-10.4847	(7)	-10.48467	(7)	-11.2021	-13.99786	(7)	16/2/2006	-13.99786	(7)	28/2/2006
Sweden	intecept	-5.68441	(30)	-6.743998	(8)	-8.88385	-7.201934	(30)	04/19/2007	-8.172328	(8)	04/19/2007
	trend and intercept	-5.68133	(30)	-6.74152	(8)	-8.88188	-7.402302	(30)	08/20/1993	-8.143428	(8)	08/20/1993
Switzerland	intecept	-9.36882	(1)	-8.265027	(6)	-8.84377	-11.86732	(1)	04/19/2007	-11.86732	(1)	04/19/2007
	trend and intercept	-10.4938	(1)	-9.35374	(6)	-10.1102	-12.08628	(1)	10/29/1998	-12.08628	(1)	10/29/1998
U.K.	intecept	-3.1518	(22)	-3.82123	(8)	-3.82761	-4.915928	(22)	02/28/2007	-5.769544	(8)	04/18/2007
	trend and intercept	-3.61512	(22)	-4.358531	(8)	-4.45675	-4.759325	(22)	04/24/2007	-5.700021	(8)	04/18/2007

Notes: TB is the break date and k is the lag length. ADF stands for the Augmented Dickey-Fuller test for the presence of unit root. The critical values for ADF and Philllips-Perron (PP) statistics are taken from MacKinnon (1996). The critical values for ADF and PP when including an intercept in the test equation are: -3.431645, -2.861997 and -2.567056 at 1%, 5% and 10% level of significance respectively. The critical values for ADF and PP when including an intercept and trend in the test equation are: -3.960113, -3.41821 and -3.127207 at 1%, 5% and 10% level of significance respectively. The critical values for Zivot and Andrews' test when including an intercept in the test equation are: -5.34, -4.93 and -4.58 at 1%, 5% and 10% level of significance respectively. The critical values for Zivot and Andrews' test when including an intercept and trend in the test equation are: -5.57, -5.08 and -4.82 at 1%, 5% and 10% level of significance respectively. SIC and 't sig' denote the approach of lag length (k) selection for each unit root test

Table 33. Information criteria

		Standard information criteria			Modified information criteria			
		GARCH(1.1)	EGARCH	GJR-GARCH		GARCH(1.1)	EGARCH	GJR-GARCH
Belgium	AIC	-6.789321	-6.793562	-6.792314	HAIC	-50187.79	-50184.72	-50203.94
	SBC	-6.771952	-6.774952	-6.773704	HSIC	-50167.09	-50162.3	-50181.52
	LL	18005.7	18017.94	18014.63				
Denmark	AIC	-5.514296	-5.512401	-5.516006	HAIC	-35921.69	-35852.83	-35909.25
	SBC	-5.495515	-5.492176	-5.495781	HSIC	-35903.58	-35833.07	-35889.49
	LL	12218.89	12215.7	12223.68				
Finland	AIC	-5.558538	-5.566572	-5.544943	HAIC	-24204.75	-24151.42	-24303.26
	SBC	-5.532233	-5.538243	-5.516614	HSIC	-24188.56	-24133.76	-24285.6
	LL	8245.195	8258.093	8226.061				
France	AIC	-6.711836	-6.712447	-6.712637	HAIC	-50258.55	-50264.82	-50266.9
	SBC	-6.695711	-6.695081	-6.695271	HSIC	-50239.58	-50244.12	-50246.2
	LL	17802.72	17805.34	17805.85				
Germany	AIC	-6.332367	-6.349971	-6.335789	HAIC	-47309.28	-47109.66	-47110.43
	SBC	-6.316241	-6.332604	-6.318423	HSIC	-47290.31	-47088.96	-47089.73
	LL	16796.94	16844.6	16807.01				
Greece	AIC	-5.456294	-5.804363	-5.781813	HAIC	-13348.83	-13345.57	-13448.82
	SBC	-5.405645	-5.757139	-5.734589	HSIC	-13335.6	-13331.14	-13434.39
	LL	4355.482	4637.175	4619.214				
Italy	AIC	-5.80095	-5.807251	-5.802332	HAIC	-45246.14	-45214.48	45227.95
	SBC	-5.784824	-5.789885	-5.784966	HSIC	-45227.17	-45193.78	-45207.25
	LL	15388.42	15406.12	15393.08				
Netherlands	AIC	-7.183512	-7.186129	-7.183157	HAIC	-52441.28	-52446.35	-52440.13
	SBC	-7.166143	-7.167519	-7.164547	HSIC	-52420.58	-52423.93	-52417.71
	LL	19050.31	19058.24	19050.37				
Norway	AIC	-5.733597	-5.835965	-5.782746	HAIC	-40879.38	-40508.93	-40692.35
	SBC	-5.715209	-5.816263	-5.763045	HSIC	-40859.03	-40464.72	-40670.31
	LL	14218.99	14473.6	14341.75				
Spain	AIC	-5.627999	-5.628068	-5.631848	HAIC	-41310.98	-41219.78	-41331.66
	SBC	-5.609588	-5.608342	-5.612123	HSIC	-41290.64	-41197.75	-41309.63
	LL	13937.67	13938.84	13948.19				
Sweden	AIC	-5.695311	-5.699545	-5.696211	HAIC	-44699.38	-44733.97	-44711.36
	SBC	-5.677942	-5.680935	-5.677602	HSIC	-44678.68	-44711.55	-44688.94
	LL	15106.57	15118.79	15109.96				
Switzerland	AIC	-6.52245	-6.527904	-6.522198	HAIC	-49195.17	-49219.54	-49194.65
	SBC	-6.503838	-6.508051	-6.502345	HSIC	-49172.75	-49195.4	-49170.51
	LL	17296.23	17311.68	17296.56				
UK	AIC	-6.309013	-6.309467	-6.311794	HAIC	-48244.36	-48242.15	-48262.77
	SBC	-6.2904	-6.289614	-6.291941	HSIC	-48221.94	-48218.01	-48238.63
	LL	16730.73	16732.93	16739.1				

Table 34. Day of the week seasonality in returns and in volatility

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	UK
Mean equation													
Monday	-0.0000123	0.0000236	-0.00000412	-0.0000714	-0.00000102	-0.000026	-0.0000624	-0.0000726	-0.00052*	0.00000471	0.000388	0.000171	0.0000172
	(0.9378)	(0.9258)	(0.9902)	(0.7244)	(0.9902)	(0.9343)	(0.8377)	(0.6067)	(0.0062)	(0.989)	(0.2145)	(0.4272)	(0.944)
Tuesday	0.000191	0.0000558	-0.00000218	0.000261	-0.0000479	-0.0000232	-0.00041	0.00000981	0.000352	-0.00000639	0.00000228	0.0000819	0.000294
	(0.2387)	(0.8353)	(0.995)	(0.1832)	(0.6907)	(0.9482)	(0.1292)	(0.9413)	(0.1563)	(0.9843)	(0.9941)	(0.6826)	(0.2408)
Wednesday	-0.0000099	-0.00000549	0.000000387	0.0000162	-0.00035**	-0.00000315	0.00000087	0.0000225	0.000585*	0.0000452	0.000722**	0.000524*	0.00017
	(0.9501)	(0.9842)	(0.999)	(0.9376)	(0.0042)	(0.9922)	(0.9975)	(0.8729)	(0.0003)	(0.895)	(0.013)	(0.0076)	(0.5318)
Thursday	-0.0000094	-0.0000157	0.00000234	0.000231	-0.00000232	-0.00000096	0.00000074	0.000148	0.0000259	0.0000242	-0.00056***	0.000563*	-0.000092
	(0.9514)	(0.9497)	(0.9952)	(0.2475)	(0.9769)	(0.9971)	(0.9979)	(0.2616)	(0.8198)	(0.9378)	(0.0597)	(0.0037)	(0.7132)
Friday	-0.0000012	-0.00000111	0.0000939	0.000895*	0.000000092	0.00000038	0.00000294	0.000179	-0.000139	0.000447	0.001034*	0.000638*	0.000405
	(0.9935)	(0.9961)	(0.8003)	(0.000)	(0.9985)	(0.9983)	(0.9909)	(0.1593)	(0.5208)	(0.1574)	(0.0002)	(0.0019)	(0.1159)
AR(1)	-0.0788*							0.056274*	-0.02837[a]	0.049654*	0.02866**	-0.178591*	0.0226***
	(0.000)							(0.000)	(0.0055)	(0.0001)	(0.0157)	(0.000)	(0.079)
AR(2)												-0.04721*	0.03453*
												(0.0002)	(0.0089)
Variance equation													
α	0.249025*	0.160494*	0.243*	0.0887*	0.165745*	0.241437**	0.253063*	0.115*	0.249*	0.090191*	0.179725*	0.089792*	0.0399*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β	0.971795*	0.78225*	0.692702*	0.874311*	0.990702*	0.96692**	0.969174*	0.878258*	0.780031*	0.831875*	0.987473*	0.90935*	0.93077*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
γ	-0.05022*	0.088602*		0.036386**	-0.02539*	-0.06203**	-0.02618**			0.093508*	-0.02805*		0.041908*
	(0.0001)	(0.008)		(0.0155)	(0.0011)	(0.0012)	(0.0138)			(0.000)	(0.0005)		(0.0001)
Monday	-0.304*	0.0000316**	0.0000326	0.00000206	-0.09002	-0.2843***	-0.12391	0.00000555*	-0.000015*	0.0000374**	-0.04109	0.0000051**	-0.0000045
	(0.001)	(0.0318)	(0.1237)	(0.5988)	(0.279)	(0.0641)	(0.156)	(0.0052)	(0.0091)	(0.0019)	(0.5963)	(0.0417)	(0.3427)
Tuesday	-0.0801	-0.00000913	0.0000116	-0.0000022	-0.16968	-0.02594	-0.5448*	-0.0000071**	0.0000572*	-0.000041***	-0.19253	-0.0000086***	0.0000099
	(0.5082)	(0.7245)	(0.7476)	(0.7401)	(0.2517)	(0.9191)	(0.000)	(0.0471)	(0.000)	(0.0502)	(0.1363)	(0.0599)	(0.2344)
Wednesday	-0.305*	-0.00000187	-0.0000422	0.00000474	-0.11007	-0.11807	-0.23593**	-0.00000191	0.000001	-0.0000089	-0.30971**	-0.00000672	0.000015**
	(0.0073)	(0.9271)	(0.1178)	(0.3946)	(0.3788)	(0.5727)	(0.0306)	(0.5138)	(0.9352)	(0.5751)	(0.0041)	(0.1174)	(0.0387)
Thursday	-0.0543	-0.0000405***	0.0000865*	-0.00000327	-0.21651***	-0.29474	-0.33341*	-0.0000074**	-0.0000117	-0.0000541*	-0.17295	-0.00000525	-0.0000048
	(0.6273)	(0.0774)	(0.01)	(0.5591)	(0.0822)	(0.1926)	(0.0028)	(0.011)	(0.1383)	(0.0012)	(0.1114)	(0.2053)	(0.4992)
Friday	-0.249***	-0.0000232	-0.0000593	0.00000089	-0.012	-0.33716	-0.48484*	-0.0000062***	0.0000681*	-0.0000256	-0.301**	-0.00000087	0.0000085
	(0.0665)	(0.4011)	(0.1169)	(0.8923)	(0.9359)	(0.1931)	(0.0002)	(0.0601)	(0.000)	(0.2166)	(0.0190)	(0.8600)	(0.3052)
Adj R^2	0.012298	-0.00119	-0.00123	0.000604	-0.00092	-0.0033	-0.00067	0.0019	-0.00243	0.00518	0.003211	0.026798	0.000097
SE of regression	0.010608	0.024029	0.018827	0.010871	0.015506	0.021728	0.017323	0.009789	0.024842	0.020098	0.018175	0.01129	0.013397
F-test	0.281043	0.011236	0.01283	4.555256*	1.664487	0.002204	0.468653	0.708954	4.28514*	0.404052	4.982627*	5.156142*	0.863224
	(0.9237)	(1.000)	(0.9999)	(0.0004)	(0.1395)	(1.000)	(0.7999)	(0.6167)	(0.0007)	(0.8463)	(0.0001)	(0.0001)	(0.5049)
	1.887283	1.370924	3.523195*	0.367161	1.138011	1.304025	5.399082*	2.00493***	47.04082*	2.687061*	2.48719**	2.26075***	1.674473
	(0.1097)	(0.2414)	(0.0071)	(0.8322)	(0.3365)	(0.2663)	(0.0002)	(0.091)	(0.000)	(0.0297)	(0.0414)	(0.0602)	(0.1529)
$LBQ^2(10)$	0.011*	-0.005	-0.0080	-0.009	-0.005	0.01	-0.009	-0.020	-0.0010	-0.011	0.007	-0.001	-0.025
	(0.003)	(1.000)	(0.801)	(0.66)	(1.000)	(0.998)	(0.947)	(0.143)	(1.000)	(0.674)	(0.422)	(0.958)	(0.227)
ARCH(10)	2.499261*	0.127123	0.638	0.759633	0.097905	0.169867	0.395355	1.5482	0.00465	0.727938	1.003604	0.373607	1.323215
	(0.0054)	(0.9995)	(0.7825)	(0.6682)	(0.9998)	(0.9982)	(0.9494)	(0.1158)	(1.000)	(0.6988)	(0.4375)	(0.9584)	(0.2113)

Notes: as Table 4

Table 35. BDS test

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	U.K.
BDS test:Bootstrap													
Dimension													
2	0.000	0.000	0.984	0.000	0.000	0.008	0.000	0.000	0.016	0.202	0.002	0.000	0.000
3	0.000	0.000	0.65	0.000	0.000	0.000	0.000	0.000	0.002	0.058	0.016	0.000	0.000
4	0.000	0.000	0.482	0.006	0.000	0.000	0.002	0.000	0.000	0.05	0.018	0.000	0.000
5	0.000	0.018	0.486	0.004	0.000	0.000	0.004	0.000	0.000	0.058	0.036	0.000	0.000
6	0.000	0.038	0.606	0.002	0.000	0.000	0.004	0.000	0.000	0.052	0.04	0.000	0.000
BDS test:Normal													
Dimension													
2	0.000	0.0011	0.9245	0.000	0.000	0.002	0.0001	0.000	0.0135	0.1802	0.0056	0.000	0.000
3	0.000	0.0004	0.6174	0.0002	0.000	0.0004	0.000	0.000	0.0028	0.0441	0.0134	0.000	0.000
4	0.000	0.0011	0.4292	0.0016	0.000	0.0002	0.000	0.000	0.0005	0.0337	0.0126	0.000	0.000
5	0.000	0.0086	0.4251	0.0013	0.000	0.0001	0.0001	0.000	0.000	0.0461	0.0255	0.000	0.000
6	0.000	0.0196	0.5427	0.0002	0.000	0.0002	0.000	0.000	0.000	0.0433	0.0318	0.000	0.000

Notes: Only p-values of BDS test statistic are reported

Table 36. Unit root tests

COUNTRIES		ADF test (SIC)		ADF test (t sig)		Phillips-Perron test	Zivot Andrews' test (SIC)			Zivot Andrews' test (t sig)		
		t-statistic	k	t-statistic	k	t-statistic	t-statistic	k	TB	t-statistic	k	TB
Belgium	intecept	-8.33875	(20)	-9.457959	(8)	-10.5147	-10.06362	(20)	03/14/2007	-11.0236	(8)	03/14/2007
	trend and intercept	-8.34553	(20)	-9.46409	(8)	-10.5165	-10.06442	(20)	03/14/2007	-11.0235	(8)	03/14/2007
Denmark	intecept	-14.862	(2)	-12.05322	(8)	-13.6516	-15.38224	(2)	09/20/2001	-12.59317	(8)	09/20/2001
	trend and intercept	-15.1522	(2)	-12.35177	(8)	-13.8713	-15.62693	(2)	3/12/2004	-12.8516	(8)	3/12/2004
Finland	intecept	-10.1512	(6)	-9.571969	(7)	-22.3845	-11.51803	(6)	11/16/2007	-10.91727	(7)	10/29/2007
	trend and intercept	-11.6231	(4)	-10.15633	(7)	-23.0015	-13.68439	(4)	08/26/2008	-12.31865	(7)	08/27/2008
France	intecept	-5.8232	(15)	-6.04339	(8)	-6.45817	-9.015578	(15)	2/5/2007	-9.092258	(8)	2/5/2007
	trend and intercept	-6.96829	(15)	-7.370601	(7)	-7.7725	-8.988662	(15)	2/5/2007	-9.280403	(7)	2/5/2007
Germany	intecept	-6.89751	(20)	-6.866218	(8)	-7.70821	-8.161214	(20)	04/25/2007	-7.961868	(8)	04/23/2007
	trend and intercept	-7.66523	(20)	-7.538091	(8)	-8.51932	-8.414846	(20)	06/24/2003	-8.1983	(8)	06/24/2003
Greece	intecept	-6.783	(8)	-6.783002	(8)	-9.56291	-8.460512	(8)	10/13/2008	-8.460512	(8)	10/13/2008
	trend and intercept	-8.51109	(6)	-7.462229	(8)	-10.2321	-11.25256	(6)	10/27/2008	-10.20215	(8)	10/27/2008
Italy	intecept	-8.02183	(16)	-9.952801	(8)	-17.5892	-9.32815	(16)	12/6/2000	-11.28408	(8)	12/7/2000
	trend and intercept	-8.44053	(16)	-10.40668	(8)	-18.0298	-9.586233	(16)	12/6/2000	-11.54898	(8)	12/7/2000
Netherlands	intecept	-5.16983	(13)	-5.378021	(8)	-5.61969	-7.892134	(13)	2/5/2007	-8.046556	(8)	2/5/2007
	trend and intercept	-6.138	(13)	-6.335245	(8)	-6.87294	-7.898702	(13)	2/5/2007	-8.04996	(8)	2/5/2007
Norway	intecept	-11.2948	(4)	-10.27601	(7)	-13.7021	-12.8512	(4)	3/7/2007	-11.82541	(7)	4/7/2007
	trend and intercept	-11.5903	(4)	-10.56759	(7)	-14.4062	-12.88248	(4)	3/7/2007	-11.85364	(7)	4/7/2007
Spain	intecept	-9.91557	(7)	-9.915568	(7)	-10.6383	-12.21054	(7)	28/2/2006	-12.21054	(7)	28/2/2006
	trend and intercept	-10.4847	(7)	-10.48467	(7)	-11.2021	-13.99786	(7)	16/2/2006	-13.99786	(7)	28/2/2006
Sweden	intecept	-5.68441	(30)	-6.743998	(8)	-8.88385	-7.201934	(30)	04/19/2007	-8.172328	(8)	04/19/2007
	trend and intercept	-5.68133	(30)	-6.74152	(8)	-8.88188	-7.402302	(30)	08/20/1993	-8.143428	(8)	08/20/1993
Switzerland	intecept	-9.36882	(1)	-8.265027	(6)	-8.84377	-11.86732	(1)	04/19/2007	-11.86732	(1)	04/19/2007
	trend and intercept	-10.4938	(1)	-9.35374	(6)	-10.1102	-12.08628	(1)	10/29/1998	-12.08628	(1)	10/29/1998
U.K.	intecept	-3.1518	(22)	-3.82123	(8)	-3.82761	-4.915928	(22)	02/28/2007	-5.769544	(8)	04/18/2007
	trend and intercept	-3.61512	(22)	-4.358531	(8)	-4.45675	-4.759325	(22)	04/24/2007	-5.700021	(8)	04/18/2007

Notes: TB is the break date and k is the lag length. ADF stands for the Augmented Dickey-Fuller test for the presence of unit root. The critical values for ADF and Philllips-Perron (PP) statistics are taken from MacKinnon (1996). The critical values for ADF and PP when including an intercept in the test equation are: -3.431645, -2.861997 and -2.567056 at 1%, 5% and 10% level of significance respectively. The critical values for ADF and PP when including an intercept and trend in the test equation are: -3.960113, -3.41821 and -3.127207 at 1%, 5% and 10% level of significance respectively. The critical values for Zivot and Andrews' test when including an intercept in the test equation are: -5.34, -4.93 and -4.58 at 1%, 5% and 10% level of significance respectively. The critical values for Zivot and Andrews' test when including an intercept and trend in the test equation are: -5.57, -5.08 and -4.82 at 1%, 5% and 10% level of significance respectively. SIC and 't sig' denote the approach of lag length (k) selection for each unit root test.

Table 37. Day of the week in return and volatility with market risk and BDS test

	Finland		France		Italy		Sweden		Switzerland	
Mean equation										
Monday	0.000788	(0.1086)	-0.000176	(0.406)	-0.000448	(0.1863)	0.000512	(0.1051)	0.000070	(0.7522)
Tuesday	0.0000071	(0.9884)	0.000211	(0.3081)	-0.000723**	(0.0181)	-0.000286	(0.3715)	0.0000065	(0.9756)
Wednesday	0.000187	(0.7040)	0.0000011	(0.9958)	0.0000586	(0.8515)	0.000772**	(0.0135)	0.000517**	(0.0132)
Thursday	-0.000529	(0.3380)	0.000250	(0.2361)	0.000243	(0.4350)	-0.000393	(0.2050)	0.000567*	(0.0075)
Friday	0.001303*	(0.0085)	0.000802*	(0.0002)	-0.0000879	(0.7599)	0.000857*	(0.0051)	0.000487**	(0.0229)
MR	0.341193*	(0.000)	0.196676*	(0.000)	0.284535*	(0.000)	0.482491*	(0.000)	0.082497*	(0.000)
AR(1)	-0.09163*	(0.000)	-0.028918**	(0.0262)			0.000261	(0.9829)	-0.185847*	(0.000)
AR(2)			0.003675	(0.7832)					-0.048153*	(0.0003)
AR(3)			0.033222**	(0.0119)						
Variance equation										
α	0.073558*	(0.000)	0.090106*	(0.000)	0.26305*	(0.000)	0.089724*	(0.000)	0.095677*	(0.000)
β	0.913154*	(0.000)	0.893275*	(0.000)	0.969251*	(0.000)	0.904063*	(0.000)	0.906757*	(0.000)
γ					-0.020177***	(0.0665)				
Monday	0.0000090	(0.7070)	0.0000012	(0.7307)	-0.153929***	(0.0722)	0.00000983	(0.2859)	0.0000028	((0.3986)
Tuesday	-0.0000031	(0.9388)	-0.0000025	(0.6801)	-0.475761*	(0.0002)	-0.0000049	(0.7624)	-0.0000035	(0.5442)
Wednesday	-0.0000092	(0.7771)	0.0000061	(0.2365)	-0.240088**	(0.0200)	0.00000686	(0.6123)	-0.0000039	(0.412)
Thursday	0.0000594	(0.1028)	-0.0000022	(0.6811)	-0.28298*	(0.0068)	-0.0000126	(0.3361)	-0.0000013	(0.7784)
Friday	-0.0000500	(0.2444)	0.0000010	(0.8669)	-0.47961*	(0.0001)	-0.0000081	(0.5927)	-0.0000012	(0.8362)
MR	-0.00096*	(0.0083)	-0.00016*	(0.0022)	-4.687958*	(0.000)	-0.000444*	(0.0012)	-0.00011**	(0.0169)
AIC	-5.5623		-6.76886		-5.854452		-5.836443		-6.54222	
SBC	-5.5299		-6.74652		-5.834605		-5.816592		-6.521126	
LL	8250.985		17948.72		15533.22		15482.57		17350.61	
ARCH(5)	0.25695	[0.9365]	0.425706	[0.8311]	0.282455	[0.9229]	1.222868	[0.2954]	0.428011	[0.8294]
BDS test										
Dimension	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.
2	0.0004	0.000	0.0004	0.000	0.002	0.002	0.0704	0.07	0.0004	0.000
3	0.000	0.000	0.001	0.000	0.0006	0.004	0.0321	0.032	0.000	0.000
4	0.000	0.000	0.0021	0.006	0.0015	0.004	0.0053	0.004	0.000	0.000
5	0.000	0.000	0.0011	0.002	0.0035	0.004	0.0064	0.008	0.000	0.000
6	0.000	0.000	0.0004	0.002	0.0016	0.004	0.0109	0.018	0.000	0.000

Notes: Results from Equations 12 and 13. MR is market risk. All other comments as Table 4 and 5.

Table 38. Day of the week with intractive dummies and risk proxy, and BDS test

	Finland		France		Italy		Sweden		Switzerland	
Mean equation										
Monday	0.000738	(0.137)	-0.00019	(0.3865)	-0.000457	(0.1773)	0.000467	(0.1423)	0.0000848	(0.7023)
Tuesday	-0.000052	(0.915)	0.000236	(0.2575)	-0.000717**	(0.016)	-0.000327	(0.3131)	-0.0000191	(0.9283)
Wednesday	0.000152	(0.7592)	0.0000558	(0.8004)	0.0000448	(0.886)	0.000793**	(0.0105)	0.00055*	(0.0092)
Thursday	-0.000497	(0.364)	0.000229	(0.2713)	0.000252	(0.4201)	-0.000403	(0.189)	0.000575**	(0.0052)
Friday	0.00136*	(0.0068)	0.000857*	(0.0001)	0.000020	(0.9455)	0.000867*	(0.0046)	0.000534**	(0.0142)
Monday MR	0.395107*	(0.000)	0.249076*	(0.000)	0.296903*	(0.000)	0.508611*	(0.000)	0.075399*	(0.0004)
Tuesday MR	0.388834*	(0.000)	0.199587*	(0.000)	0.289967*	(0.000)	0.5485*	(0.000)	0.0968*	(0.000)
Wednesday MR	0.36843*	(0.000)	0.229871*	(0.000)	0.343188*	(0.000)	0.423841*	(0.000)	0.110555*	(0.000)
Thurday MR	0.294471*	(0.000)	0.137045*	(0.000)	0.274318*	(0.000)	0.446243*	(0.000)	0.077333*	(0.0006)
Friday MR	0.235646*	(0.000)	0.162782*	(0.000)	0.231682*	(0.000)	0.487681*	(0.000)	0.058984**	(0.0131)
AR(1)	-0.089378*	(0.000)	-0.02954**	(0.0237)					-0.185368*	(0.000)
AR(2)									-0.047533*	(0.0004)
Variance equation										
α	0.06683*	(0.000)	0.09104*	(0.000)	0.265754*	(0.000)	0.086081*	(0.000)	0.085363*	(0.000)
β	0.918336*	(0.000)	0.88998*	(0.000)	0.967758*	(0.000)	0.906621*	(0.000)	0.915382*	(0.000)
γ					-0.019899***	(0.075)				
Monday	0.0000159	(0.5038)	0.0000023	(0.5242)	-0.168229***	(0.0515)	0.0000129	(0.1649)	0.00000337	(0.2953)
Tuesday	-0.0000133	(0.7487)	-0.0000043	(0.4916)	-0.47762*	(0.0001)	-0.00000710	(0.6678)	-0.00000434	(0.4559)
Wednesday	-0.0000167	(0.6049)	0.0000058	(0.2638)	-0.242876**	(0.0185)	-0.0000147	(0.2799)	-0.00000396	(0.4042)
Thursday	0.0000445	(0.2109)	-0.000005	(0.3474)	-0.283071*	(0.0067)	-0.0000160	(0.2187)	-0.0000040	(0.3717)
Friday	-0.0000530	(0.2087)	0.0000011	(0.8532)	-0.481967*	(0.0001)	-0.0000103	(0.5006)	-0.00000042	(0.9384)
Monday MR	-0.000962	(0.207)	-0.000281**	(0.0365)	-9.230861*	(0.000)	-0.00104*	(0.0016)	-0.000218***	(0.0817)
Tuesday MR	-0.001266	(0.1105)	-0.00025	(0.1048)	-2.697831	(0.3054)	-0.00044	(0.2638)	-0.000281**	(0.0248)
Wednesday MR	-0.000904	(0.2921)	0.000132	(0.4026)	-2.172524	(0.3961)	0.000118	(0.7468)	0.000331**	(0.0188)
Thurday MR	0.000563	(0.5067)	-0.00022	(0.1173)	-3.580422	(0.1391)	-0.000653***	(0.0638)	-0.0000772	(0.5339)
Friday MR	-0.002171*	(0.0074)	-0.00023	(0.1365)	-4.764376***	(0.073)	-0.0000704	(0.8426)	-0.000316*	(0.0078)
AIC	-5.560552		-6.76746		-5.85324		-5.836351		-6.541877	
SBC	-5.511974		-6.73769		-5.823469		-5.80782		-6.510856	
LL	8256.397		17957.77		15538.01		15492.25		17357.7	
ARCH(5)	0.245842	[0.942]	0.387041	[0.858]	0.33495	[0.892]	1.298994	[0.2612]	0.282972	[0.9227]
BDS test										
Dimension	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.
2	0.0005	0.002	0.0007	0.000	0.0022	0.000	0.0766	0.056	0.0003	0.000
3	0.000	0.000	0.0022	0.000	0.0009	0.000	0.0337	0.03	0.000	0.000
4	0.000	0.000	0.0042	0.004	0.0027	0.006	0.0073	0.008	0.000	0.000
5	0.000	0.000	0.0037	0.002	0.0064	0.018	0.0083	0.016	0.000	0.000
6	0.000	0.000	0.0022	0.006	0.0035	0.008	0.0131	0.026	0.000	0.000

Notes: Results from Equations 14 and 15. MR is market risk. All other comments as Table 4 and 5.

Table 39. Day of the week in return and volatility with market risk and BDS test

	Finland		France		Italy		Sweden		Switzerland	
Mean equation										
Monday	0.00056	(0.2238)	-0.00018	(0.3277)	-0.00061***	(0.0592)	0.000467	(0.1067)	0.0000972	(0.646)
Tuesday	-0.000365	(0.939)	0.000237	(0.2135)	-0.0006**	(0.0493)	-0.00035	(0.2397)	-0.00000190	(0.9928)
Wednesday	-0.000151	(0.7525)	0.0000759	(0.7069)	0.0000257	(0.935)	0.000514***	(0.0788)	0.000423**	(0.0469)
Thursday	-0.00076	(0.144)	0.00017	(0.3952)	0.000373	(0.235)	-0.00082*	(0.0050)	0.000479**	(0.0199)
Friday	0.000617	(0.1898)	0.000435**	(0.0289)	-0.000315	(0.2826)	0.000524***	(0.0712)	0.000266	(0.2038)
MR	0.783192*	(0.000)	0.801116*	(0.000)	0.674674*	(0.000)	1.014306*	(0.000)	0.25952*	(0.000)
AR(1)	-0.07102*	(0.000)	-0.0305*	(0.0008)			-0.00671	(0.4881)	-0.17892*	(0.000)
AR(2)									-0.04714*	(0.0003)
Variance equation										
α	0.047188*	(0.000)	0.054085*	(0.000)	0.146418*	(0.000)	0.0557*	(0.000)	0.086321*	(0.000)
β	0.937798*	(0.000)	0.916847*	(0.000)	0.831526*	(0.000)	0.93458*	(0.000)	0.913915*	(0.000)
Monday	-0.00000478	(0.8001)	-0.00000389	(0.1881)	0.0000272*	(0.0027)	0.00000138	(0.8554)	0.000000968	(0.7547)
Tuesday	0.0000287	(0.3883)	0.00000710	(0.1493)	-0.0000295***	(0.0672)	0.00000922	(0.4947)	0.000000588	(0.9127)
Wednesday	0.00000367	(0.896)	0.0000107**	(0.0112)	-0.0000108	(0.4007)	-0.00000204	(0.8588)	0.000000602	(0.8974)
Thursday	0.0000464	(0.1196)	0.00000517	(0.2405)	-0.0000188	(0.1543)	-0.00000209	(0.8535)	-0.00000257	(0.5847)
Friday	-0.0000300	(0.393)	0.00000415	(0.4328)	-0.0000375*	(0.0082)	-0.00000185	(0.8891)	0.000000340	(0.9516)
MR	-0.00054**	(0.0216)	-0.0000972**	(0.013)	-0.00066*	(0.0006)	-0.00032*	(0.0037)	-0.00014*	(0.0099)
AIC	-5.73325		-7.13493		-5.95526		-6.07431		-6.60435	
SBC	-5.70086		-7.11508		-5.93665		-6.05446		-6.58326	
LL	8504.071		18923.56		15799.41		16112.91		17515.23	
ARCH(5)	0.295719	[0.9155]	0.835781	[0.524]	0.308639	[0.908]	1.559352	[0.168]	0.52665	[0.7563]
BDS test										
Dimension	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.
2	0.0361	0.042	0.0135	0.012	0.0135	0.018	0.0014	0.002	0.000	0.000
3	0.0035	0.004	0.024	0.02	0.0194	0.024	0.0015	0.000	0.000	0.000
4	0.0013	0.002	0.01	0.01	0.0461	0.038	0.0004	0.002	0.000	0.000
5	0.0007	0.002	0.0185	0.018	0.0706	0.066	0.0022	0.01	0.000	0.000
6	0.0002	0.000	0.0381	0.048	0.036	0.046	0.0019	0.01	0.000	0.000

Notes: Results from Equations 12 and 13. MR is market risk. All other comments as Table 4 and 5

Table 40. Day of the week with intractive dummies and risk proxy, and BDS test

	Finland		France		Italy		Sweden		Switzerland	
Mean equation										
Monday	0.0005	(0.2753)	-0.00017	(0.3474)	-0.00066**	(0.0384)	0.000436	(0.1306)	0.000100	(0.6342)
Tuesday	-0.0000445	(0.926)	0.00023	(0.2275)	-0.0006***	(0.053)	-0.00037	(0.2159)	0.00000544	(0.9795)
Wednesday	-0.00011	(0.8175)	0.000843	(0.6773)	0.0000451	(0.885)	0.000531***	(0.0691)	0.00043**	(0.0432)
Thursday	-0.00077	(0.141)	0.000165	(0.4063)	0.000379	(0.228)	-0.00083*	(0.0045)	0.000487**	(0.0176)
Friday	0.000633	(0.1831)	0.000475**	(0.0174)	-0.000263	(0.3741)	0.000568***	(0.0511)	0.000244	(0.2574)
Monday MR	0.913906*	(0.000)	0.8448*	(0.000)	0.78847*	(0.000)	1.068719*	(0.000)	0.248469*	(0.000)
Tuesday MR	0.723378*	(0.000)	0.817679*	(0.000)	0.69141*	(0.000)	1.052928*	(0.000)	0.256456*	(0.000)
Wednesday MR	0.720752*	(0.000)	0.785513*	(0.000)	0.626467*	(0.000)	0.957905*	(0.000)	0.270872*	(0.000)
Thurday MR	0.80178*	(0.000)	0.795767*	(0.000)	0.645151*	(0.000)	1.007732*	(0.000)	0.254375*	(0.000)
Friday MR	0.775684*	(0.000)	0.738315*	(0.000)	0.617806*	(0.000)	0.98284*	(0.000)	0.273536*	(0.000)
AR(1)	-0.07359*	(0.000)	-0.0307*	(0.0008)					0.17825*	(0.000)
AR(2)									-0.04671*	(0.0003)
Variance equation										
α	0.041813*	(0.000)	0.05306*	(0.000)	0.146998*	(0.000)	0.052041*	(0.000)	0.081789*	(0.000)
β	0.942511*	(0.000)	0.916474*	(0.000)	0.827453*	(0.000)	0.937418*	(0.000)	0.917562*	(0.000)
Monday	-0.00000596	(0.7537)	-0.00000291	(0.3283)	0.0000285*	(0.0017)	0.00000221	(0.7678)	0.000000157	(0.9605)
Tuesday	0.0000277	(0.4056)	0.00000566	(0.2542)	-0.000028***	(0.0788)	0.00000891	(0.5069)	0.00000164	(0.7673)
Wednesday	0.00000332	(0.9047)	0.00000971**	(0.0209)	-0.0000153	(0.2302)	-0.00000448	(0.6935)	0.00000120	(0.7984)
Thursday	0.0000487	(0.1004)	0.00000407	(0.3579)	-0.0000196	(0.1331)	-0.00000255	(0.8197)	-0.00000198	(0.677)
Friday	-0.0000269	(0.4465)	0.00000298	(0.5734)	-0.0000376*	(0.008)	-0.00000311	(0.8125)	0.00000237	(0.6834)
Monday MR	-0.00150*	(0.0045)	-0.000242***	(0.0507)	-0.00155*	(0.0005)	-0.000939*	(0.001)	-0.000173	(0.2149)
Tuesday MR	-0.00117***	(0.0592)	-0.000210***	(0.0893)	-0.00052	(0.3304)	0.000141	(0.6633)	-0.0000834	(0.5565)
Wednesday MR	-0.00017	(0.7582)	0.0000179	(0.8738)	-0.00033	(0.4224)	-0.00025	(0.3509)	-0.0000541	(0.6877)
Thurday MR	0.0000809	(0.8875)	-0.0000531	(0.642)	-0.0000580	(0.9162)	-0.00034	(0.2671)	-0.0000614	(0.6704)
Friday MR	-0.00000333	(0.9952)	-0.0000631	(0.5887)	-0.00073	(0.1262)	-0.00014	(0.6381)	-0.00040*	(0.0058)
AIC	-5.73298		-7.13431		-5.9552		-6.0743		-6.60216	
SBC	-5.6844		-7.10453		-5.92667		-6.04577		-6.57114	
LL	8511.679		18929.92		15807.25		16122.93		17517.42	
ARCH(5)	0.487788	[0.7856]	0.838729	[0.522]	0.33766	[0.8903]	1.719399	[0.1265]	0.445367	[0.8169]
BDS test										
Dimension	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.
2	0.0666	0.096	0.01	0.018	0.0124	0.01	0.0014	0.000	0.000	0.000
3	0.0082	0.022	0.0224	0.028	0.0212	0.02	0.0011	0.000	0.000	0.000
4	0.0033	0.016	0.0122	0.02	0.0461	0.062	0.0003	0.000	0.000	0.000
5	0.0014	0.01	0.0223	0.032	0.0773	0.102	0.0024	0.004	0.000	0.000
6	0.0005	0.006	0.0444	0.05	0.0438	0.068	0.0022	0.004	0.000	0.000

Notes: Results from Equations 14 and 15. MR is market risk. All other comments as Table 4 and 5

Table 41. Day of the week in return and volatility with market risk and BDS test

	Finland		France		Italy		Spain		Sweden		Switzerland	
Mean equation												
Monday	0.00024	(0.5234)	-0.0000838	(0.6772)	-0.000479	(0.1219)	-0.000226	(0.5046)	0.000329	(0.258)	0.0000329	(0.8823)
Tuesday	0.000229	(0.531)	0.000275	(0.162)	-0.000748*	(0.0067)	-0.000285	(0.3845)	-0.000366	(0.2126)	0.00000782	(0.9689)
Wednesday	0.000235	(0.5172)	0.000106	(0.6077)	-0.0000030	(0.991)	0.000143	(0.674)	0.000874*	(0.0023)	0.000537*	(0.0065)
Thursday	-0.0000574	(0.888)	0.00024	(0.2365)	0.000122	(0.6749)	0.0000625	(0.841)	-0.000216	(0.445)	0.000526*	(0.0075)
Friday	0.000532	(0.1515)	0.000774*	(0.0001)	-0.000152	(0.5773)	0.000512	(0.1022)	0.000605**	(0.0315)	0.000585*	(0.0051)
MR	0.233777*	(0.000)	0.189063*	(0.000)	0.259166*	(0.000)	0.267053*	(0.000)	0.460656*	(0.000)	0.083958*	(0.000)
AR(1)	-0.061136*	(0.000)	-0.03109**	(0.0138)			0.064913*	(0.000)			-0.18171*	(0.000)
AR(2)											-0.04878*	(0.0001)
Variance equation												
α	0.075871*	(0.000)	0.096566*	(0.000)	0.163644*	(0.000)	0.089971*	(0.000)	0.07879*	(0.000)	0.081045*	(0.000)
β	0.902189*	(0.000)	0.881748*	(0.000)	0.817758*	(0.000)	0.843477*	(0.000)	0.91354*	(0.000)	0.916316*	(0.000)
γ							0.068513*	(0.001)				
Monday	0.0000113	(0.6404)	0.00000162	(0.6614)	0.0000353*	(0.0002)	0.0000347*	(0.0033)	0.0000101	(0.2394)	0.0000060**	(0.0353)
Tuesday	-0.0000093	(0.8228)	-0.00000225	(0.7185)	-0.0000493*	(0.0035)	-0.0000334	(0.1123)	-0.00000614	(0.6924)	-0.0000118**	(0.0286)
Wednesday	-0.00000425	(0.8969)	0.00000533	(0.3127)	-0.0000239***	(0.0637)	-0.0000139	(0.3628)	-0.0000106	(0.4157)	-0.00000731	(0.1039)
Thursday	0.0000420	(0.2455)	-0.0000012	(0.8107)	-0.0000237***	(0.0789)	-0.0000455*	(0.0054)	-0.0000125	(0.3171)	-0.00000531	(0.2424)
Friday	-0.0000447	(0.3018)	0.00000047	(0.9407)	-0.0000402*	(0.0045)	-0.0000277	(0.1532)	-0.00000899	(0.5338)	-0.00000159	(0.7606)
MR	-0.000818**	(0.029)	-0.00019*	(0.0003)	-0.000384**	(0.036)	-0.000745*	(0.0003)	-0.000381*	(0.0011)	-0.0000626***	(0.0957)
AIC	-5.590416		-6.76526		-5.841894		-5.669732		-5.833281		-6.53213	
SIC	-5.558031		-6.74541		-5.823287		-5.647376		-5.814674		-6.51103	
LL	8292.611		17943.93		15498.94		14043.92		15476.11		17323.87	
ARCH(5)	0.220071	[0.954]	0.345714	[0.8853]	0.258057	[0.9359]	1.220558	[0.2965]	1.615602	[0.1522]	0.613396	[0.6897]
BDS test												
Dimension	Normal Prob.	Bootstr Prob.	Normal Prob.	Bootstr Prob.	Normal Prob.	Bootstr Prob.	Normal Prob.	Bootstr Prob.	Normal Prob.	Bootstr Prob.	Normal Prob.	Bootstr Prob.
2	0.0002	0.000	0.0006	0.000	0.006	0.006	0.0937	0.084	0.0384	0.038	0.000	0.000
3	0.000	0.000	0.0021	0.000	0.0018	0.006	0.0204	0.012	0.011	0.014	0.000	0.000
4	0.000	0.000	0.005	0.008	0.0037	0.006	0.0122	0.014	0.0014	0.002	0.000	0.000
5	0.000	0.000	0.003	0.006	0.0071	0.01	0.0119	0.016	0.0014	0.002	0.000	0.000
6	0.000	0.000	0.0014	0.002	0.0022	0.004	0.008	0.01	0.0023	0.006	0.000	0.000

Notes: Results from Equations 12 and 13. MR is market risk. All other comments as Table 4 and 5

Table 42. Day of the week with intractive dummies and risk proxy, and BDS test

	Finland		France		Italy		Spain		Sweden		Switzerland	
Mean equation												
Monday	0.000267	(0.4829)	-0.00011	(0.5732)	-0.000541	(0.0789)	-0.000219	(0.5191)	0.000236	(0.4203)	0.0000445	(0.8411)
Tuesday	-0.0000250	(0.946)	0.000287	(0.1472)	-0.00076*	(0.0063)	-0.000198	(0.5455)	-0.00044	(0.1385)	-0.0000255	(0.8981)
Wednesday	0.000137	(0.7101)	0.000106	(0.6109)	-0.0000286	(0.920)	0.000125	(0.7133)	0.00069	(0.0149)	0.000534*	(0.0069)
Thursday	0.000000286	(0.999)	0.000281	(0.1655)	0.000149	(0.6052)	0.0000145	(0.963)	-0.000231	(0.4059)	0.00052*	(0.0071)
Friday	0.00044	(0.2383)	0.00077*	(0.0002)	-0.0000716	(0.7951)	0.000469	(0.1349)	0.000588**	(0.0357)	0.000621*	(0.0033)
Monday MR	0.290056*	(0.000)	0.231122*	(0.000)	0.301354*	(0.000)	0.267471*	(0.000)	0.490895*	(0.000)	0.078733*	(0.0002)
Tuesday MR	0.347643*	(0.000)	0.189301*	(0.000)	0.243943*	(0.000)	0.215541*	(0.000)	0.517709*	(0.000)	0.109629*	(0.000)
Wednesday MR	0.285298*	(0.000)	0.220768*	(0.000)	0.343384*	(0.000)	0.306043*	(0.000)	0.369159*	(0.000)	0.099855*	(0.000)
Thurday MR	0.168884*	(0.0002)	0.131829*	(0.000)	0.241095*	(0.000)	0.196164*	(0.000)	0.393683*	(0.000)	0.087691*	(0.000)
Friday MR	0.139575*	(0.0007)	0.167006*	(0.000)	0.179959*	(0.000)	0.313033*	(0.000)	0.473147*	(0.000)	0.050088**	(0.0323)
AR(1)	-0.053909*	(0.000)	-0.02934**	(0.02)			0.058209*	(0.000)			-0.18197*	(0.000)
AR(2)											-0.05227*	(0.000)
Variance equation												
α	0.074575*	(0.000)	0.093009*	(0.000)	0.166017*	(0.000)	0.091832	(0.000)	0.075746*	(0.000)	0.077566*	(0.000)
β	0.90161*	(0.000)	0.884661*	(0.000)	0.813898*	(0.000)	0.840761	(0.000)	0.916047*	(0.000)	0.919533*	(0.000)
γ							0.069394	(0.0011)				
Monday	0.0000156	(0.5275)	0.00000214	(0.5734)	0.0000353*	(0.0002)	0.0000358	(0.0036)	0.0000126	(0.1584)	0.00000612	(0.0435)
Tuesday	-0.0000127	(0.768)	-0.00000331	(0.6073)	-0.0000471*	(0.006)	-0.0000343	(0.1205)	-0.00000718	(0.6541)	-0.0000121**	(0.0271)
Wednesday	-0.00000983	(0.767)	0.00000515	(0.3351)	-0.000024***	(0.0634)	-0.0000143	(0.3775)	-0.0000180	(0.1728)	-0.00000681	(0.1537)
Thursday	0.0000349	(0.3349)	-0.00000313	(0.5662)	-0.000024***	(0.0664)	-0.0000487*	(0.003)	-0.0000155	(0.2234)	-0.00000660	(0.153)
Friday	-0.0000476	(0.2724)	0.000000952	(0.8811)	-0.0000389*	(0.0072)	-0.0000279	(0.159)	-0.0000102	(0.4866)	-0.000000950	(0.8611)
Monday MR	-0.000746	(0.3579)	-0.000328**	(0.017)	-0.001071**	(0.0129)	-0.00139*	(0.0019)	-0.000897*	(0.0031)	-0.000112	(0.3978)
Tuesday MR	-0.00127	(0.1462)	-0.00033	(0.0334)	-0.0000514	(0.9273)	-0.00059	(0.344)	-0.000483	(0.1703)	-0.00023***	(0.0666)
Wednesday MR	-0.000744	(0.4168)	0.000123	(0.4471)	-0.000341	(0.5029)	-0.000741	(0.2358)	0.0000580	(0.8622)	0.000188	(0.1736)
Thurday MR	0.000765	(0.3996)	-0.0002	(0.1635)	0.000158	(0.7624)	-0.000143	(0.7952)	-0.00053	(0.1045)	-0.0000140	(0.9055)
Friday MR	-0.001833	(0.0344)	-0.00025	(0.1309)	-0.000577	(0.1154)	-0.000822	(0.2134)	0.0000346	(0.9144)	-0.00016	(0.1543)
AIC	-5.589387		-6.76512		-5.841454		-5.668314		-5.833102		-6.53071	
SBC	-5.540809		-6.73535		-5.812923		-5.635438		-5.804571		-6.49969	
LL	8299.087		17951.57		15505.77		14048.41		15483.64		17328.11	
ARCH(5)	0.186878	[0.9677]	0.377879	[0.8642]	0.240552	[0.9446]	1.252012	[0.2819]	1.668872	[0.1385]	0.524269	[0.7581]
BDS test												
Dimension	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.
2	0.0003	0.000	0.0009	0.000	0.0096	0.018	0.1144	0.10	0.0326	0.038	0.0001	0.000
3	0.000	0.000	0.0029	0.000	0.0042	0.012	0.0273	0.03	0.0108	0.016	0.000	0.000
4	0.0001	0.000	0.0064	0.012	0.0098	0.018	0.0157	0.02	0.0016	0.002	0.000	0.000
5	0.0001	0.000	0.0049	0.014	0.0173	0.028	0.0154	0.022	0.0016	0.004	0.000	0.000
6	0.0001	0.000	0.0026	0.012	0.0067	0.014	0.012	0.022	0.0022	0.012	0.000	0.000

Notes: Results from Equations 14 and 15. MR is market risk. All other comments as Table 4 and 5

Table 43. Day of the week in return and volatility with market risk and BDS test

	Finland		France		Italy		Spain		Sweden		Switzerland	
Mean equation												
Monday	0.000441	(0.2619)	-0.00014	(0.442)	-0.00069**	(0.0216)	0.0000436	(0.8973)	0.000259	(0.3391)	0.0000735	(0.725)
Tuesday	-0.000260	(0.519)	0.000256	(0.1706)	-0.00063**	(0.0195)	-0.00015	(0.6382)	-0.00043	(0.1301)	0.00000015	(0.9994)
Wednesday	-0.00012	(0.7717)	0.000174	(0.3784)	-0.00000349	(0.990)	0.000134	(0.6934)	0.000357	(0.1922)	0.000412**	(0.04)
Thursday	-0.00093	(0.0351)	0.000228	(0.2513)	0.000222	(0.435)	0.0000291	(0.925)	-0.00087*	(0.0011)	0.000432**	(0.0244)
Friday	0.000206	(0.6057)	0.00035***	(0.0725)	-0.000547**	(0.0425)	0.000481	(0.1192	0.000287	(0.2911)	0.000373***	(0.0718)
MR	0.738156*	(0.000)	0.80007*	(0.000)	0.657269*	(0.000)	0.549878*	(0.000)	1.005775*	(0.000)	0.25922*	(0.000)
AR(1)	-0.06303*	(0.000)	-0.03002*	(0.0008)			0.063222*	(0.000)			-0.17933*	(0.000)
AR(2)											-0.05262*	(0.000)
Variance equation												
α	0.045783*	(0.000)	0.056136*	(0.000)	0.139736*	(0.000)	0.081023*	(0.000)	0.047187*	(0.000)	0.067447*	(0.000)
β	0.935097*	(0.000)	0.908569*	(0.000)	0.829884*	(0.000)	0.855382*	(0.000)	0.944502*	(0.000)	0.928018*	(0.000)
γ							0.072921*	(0.0002)				
Monday	-0.00000114	(0.95)	-0.00000446	(0.13)	0.0000289*	(0.0009)	0.0000335*	(0.0029)	0.00000133	(0.8537)	0.00000165	(0.5182)
Tuesday	0.00000160	(0.6215)	0.00000922***	(0.0589)	-0.0000385**	(0.0145)	-0.000038***	(0.0517)	0.00000796	(0.534)	-0.00000352	(0.4275)
Wednesday	0.00000829	(0.7606)	0.00000111*	(0.0077)	-0.0000116	(0.3463)	-0.0000103	(0.4797)	-0.00000409	(0.7117)	-0.0000007	(0.872)
Thursday	0.0000334	(0.2468)	0.00000685	(0.1079)	-0.0000217***	(0.0926)	-0.0000485**	(0.0018)	-0.00000390	(0.7226)	-0.00000361	(0.4168)
Friday	-0.0000290	(0.3933)	0.00000424	(0.4061)	-0.0000332**	(0.015)	-0.0000275	(0.1475)	0.00000068	(0.9579)	0.00000341	(0.5127)
MR	-0.00045**	(0.0383)	-0.000088**	(0.0199)	-0.00057*	(0.002)	-0.00012	(0.4289)	-0.0003*	(0.0004)	-0.00014*	(0.0087)
AIC	-5.74712		-7.12978		-5.94882		-5.70425		-6.06753		-6.59539	
SBC	-5.71473		-7.10993		-5.93022		-5.6819		-6.04892		-6.5743	
LL	8524.609		18909.93		15782.35		14129.32		16096.98		17491.49	
ARCH(5)	0.275031	[0.927]	0.806569	[0.5448]	0.304414	[0.9105]	1.101061	[0.3575]	2.01949	[0.0727]	0.558641	[0.7318]
BDS test												
Dimension	Normal Prob.	Bootstr Prob.	Normal Prob.	Bootstr Prob.	Normal Prob.	Bootstr Prob.	Normal Prob.	Bootstr Prob.	Normal Prob.	Bootstr Prob.	Normal Prob.	Bootstr Prob.
2	0.0262	0.036	0.0161	0.024	0.0096	0.012	0.3312	0.35	0.0004	0.000	0.000	0.000
3	0.0023	0.014	0.0311	0.04	0.0119	0.02	0.1111	0.138	0.0002	0.000	0.000	0.000
4	0.001	0.004	0.0135	0.018	0.0276	0.036	0.0509	0.084	0.000	0.000	0.000	0.000
5	0.0005	0.006	0.0233	0.034	0.0441	0.042	0.0354	0.06	0.0002	0.002	0.000	0.000
6	0.0001	0.004	0.0451	0.064	0.0182	0.02	0.0217	0.046	0.0001	0.002	0.000	0.000

Notes: Results from Equations 12 and 13. MR is market risk. All other comments as Table 4 and 5

Table 44. Day of the week with intractive dummies and risk proxy, and BDS test

	Finland		France		Italy		Spain		Sweden		Switzerland	
Mean equation												
Monday	0.000313	(0.4303)	-0.00012	(0.5069)	-0.00067**	(0.0232)	0.000134	(0.7144)	0.000226	(0.4027)	0.0000602	(0.7729)
Tuesday	-0.000200	(0.622)	0.00025	(0.1829)	-0.00062**	(0.0242)	-0.00015	(0.6818)	-0.00047***	(0.0963)	-0.00000601	(0.9761)
Wednesday	-0.0001	(0.8046)	0.000184	(0.354)	0.00000167	(0.995)	-0.00000494	(0.9887)	0.000427	(0.1185)	0.00042**	(0.0366)
Thursday	-0.000697	(0.116)	0.000221	(0.261)	0.000212	(0.4558)	0.0000305	(0.929)	-0.00088*	(0.0011)	0.000415**	(0.0305)
Friday	0.000272	(0.5032)	0.000384**	(0.05)	-0.000489***	(0.0707)	0.0004	(0.2521)	0.000297	(0.275)	0.000335	(0.115)
Monday MR	0.878768*	(0.000)	0.844262*	(0.000)	0.76334*	(0.000)	0.682262*	(0.000)	1.054689*	(0.000)	0.248138*	(0.000)
Tuesday MR	0.681656*	(0.000)	0.814291*	(0.000)	0.655709*	(0.000)	0.502725*	(0.000)	1.051442*	(0.000)	0.267788*	(0.000)
Wednesday MR	0.705001*	(0.000)	0.783011*	(0.000)	0.606178*	(0.000)	0.631275*	(0.000)	0.933528*	(0.000)	0.266051*	(0.000)
Thurday MR	0.78335*	(0.000)	0.799246*	(0.000)	0.602988*	(0.000)	0.468354*	(0.000)	1.002582*	(0.000)	0.246345*	(0.000)
Friday MR	0.712675*	(0.000)	0.73562*	(0.000)	0.591924*	(0.000)	0.562274*	(0.000)	0.961155*	(0.000)	0.282443*	(0.000)
AR(1)	-0.06252*	(0.000)	-0.03107*	(0.0006)			0.065989*	(0.000)			-0.17814*	(0.000)
AR(2)											-0.05174*	(0.000)
Variance equation												
α	0.043118*	(0.000)	0.054713*	(0.000)	0.142423*	(0.000)	0.08201*	(0.000)	0.045294*	(0.000)	0.00000049	(0.8688)
β	0.935921*	(0.000)	0.909449*	(0.000)	0.824977*	(0.000)	0.864108*	(0.000)	0.945448*	(0.000)	0.0638*	(0.000)
γ							0.077454*	(0.0001)				
Monday	-0.00000191	(0.9178)	-0.00000350	(0.2394)	0.0000284*	(0.0013)	0.0000223***	(0.0507)	0.00000216	(0.7669)	0.931248*	(0.000)
Tuesday	0.0000165	(0.6113)	0.00000785	(0.1111)	-0.0000326**	(0.041)	-0.0000220	(0.2756)	0.00000793	(0.5429)	-0.00000173	(0.7334)
Wednesday	0.00000923	(0.7337)	0.00000101**	(0.0152)	-0.0000152	(0.2211)	-0.0000219	(0.1612)	-0.00000623	(0.5764)	0.00000014	(0.9758)
Thursday	0.0000338	(0.2384)	0.0000050	(0.261)	-0.0000205	(0.1156)	-0.0000196	(0.2017)	-0.00000422	(0.7021)	-0.00000271	(0.5645)
Friday	-0.0000267	(0.4413)	0.00000366	(0.4867)	-0.0000326**	(0.0184)	-0.0000142	(0.4517)	-0.000000891	(0.9449)	0.00000565	(0.3471)
Monday MR	-0.00133**	(0.0107)	-0.000255**	(0.042)	-0.00150*	(0.0002)	-0.00092	(0.1631)	-0.000890*	(0.001)	-0.000185	(0.1344)
Tuesday MR	-0.00109***	(0.0905)	-0.000270**	(0.0277)	-0.00036	(0.4904)	-0.00019	(0.7977)	-0.0000141	(0.9635)	-0.0000517	(0.695)
Wednesday MR	-0.000296	(0.6153)	0.0000122	(0.9102)	-0.000281	(0.5024)	-0.00038	(0.5439)	-0.00014	(0.5567)	0.000020	(0.8792)
Thurday MR	0.00035	(0.5303)	0.0000474	(0.6309)	0.0000727	(0.8971)	0.000812	(0.2644)	-0.000310	(0.271)	-0.00026**	(0.035)
Friday MR	0.0000125	(0.9821)	-0.0000869	(0.4293)	-0.00056	(0.2796)	-0.00011	(0.8773)	-0.00019	(0.4421)	-0.00026***	(0.078)
AIC	-5.74674		-7.12983		-5.94957		-5.71888		-6.06724		-6.5932	
SBC	-5.69816		-7.10005		-5.92104		-5.686		-6.03871		-6.56217	
LL	8532.042		18918.04		15792.34		14173.5		16104.23		17493.67	
ARCH(5)	0.406754	[0.8444]	0.857404	[0.5089]	0.329907	[0.8952]	0.767502	[0.5731]	2.130338	[0.0589]	0.570551	[0.7227]
BDS test												
Dimension	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.	Normal Prob.	Bootstrap Prob.
2	0.0577	0.062	0.0119	0.018	0.0097	0.008	0.4734	0.432	0.0005	0.000	0.000	0.000
3	0.007	0.01	0.0267	0.03	0.0137	0.012	0.1871	0.188	0.0002	0.000	0.000	0.000
4	0.0026	0.008	0.0148	0.022	0.0273	0.036	0.0895	0.108	0.000	0.000	0.000	0.000
5	0.0011	0.008	0.025	0.036	0.0411	0.056	0.0617	0.078	0.0002	0.002	0.000	0.000
6	0.0003	0.004	0.045	0.054	0.0184	0.028	0.046	0.078	0.0002	0.004	0.000	0.000

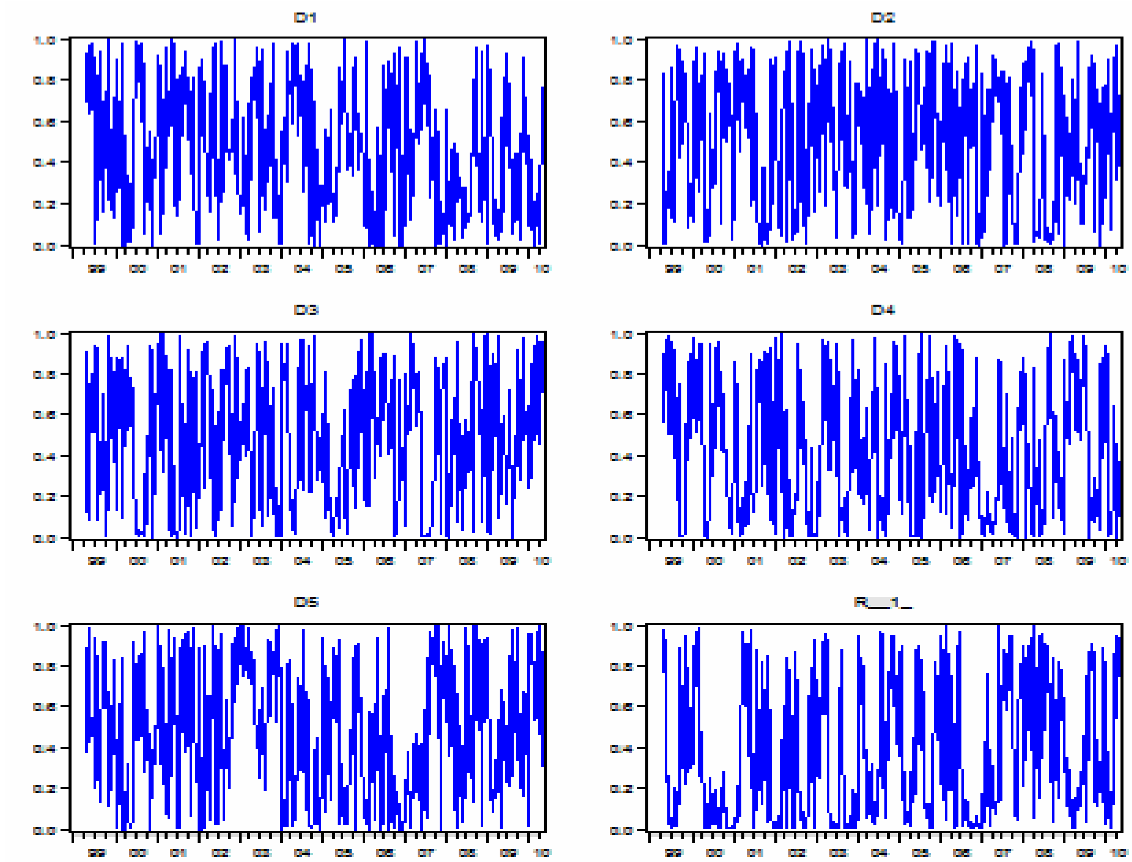
Notes: Results from Equations 14 and 15. MR is market risk. All other comments as Table 4 and 5

Appendix 2

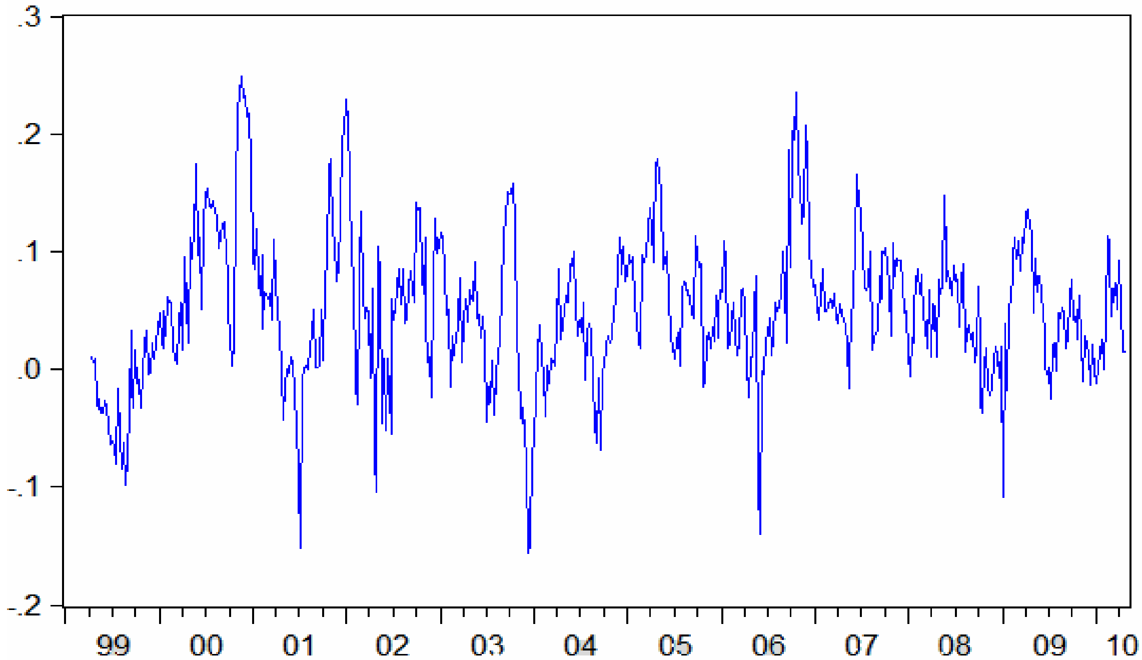
Figure 1: Rolling estimates of p-values and R-squares of the mean coefficients of GARCH models (Student's t distribution)

Finland

Rolling p-values

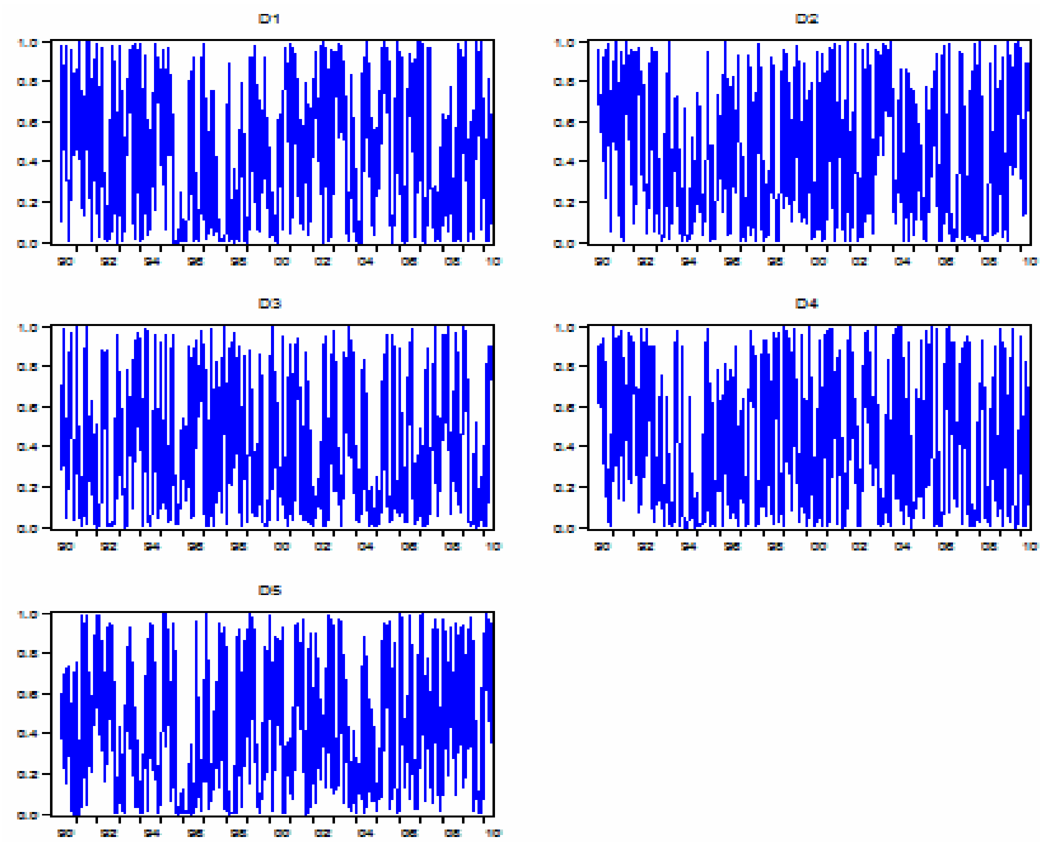


Rolling R-Squares

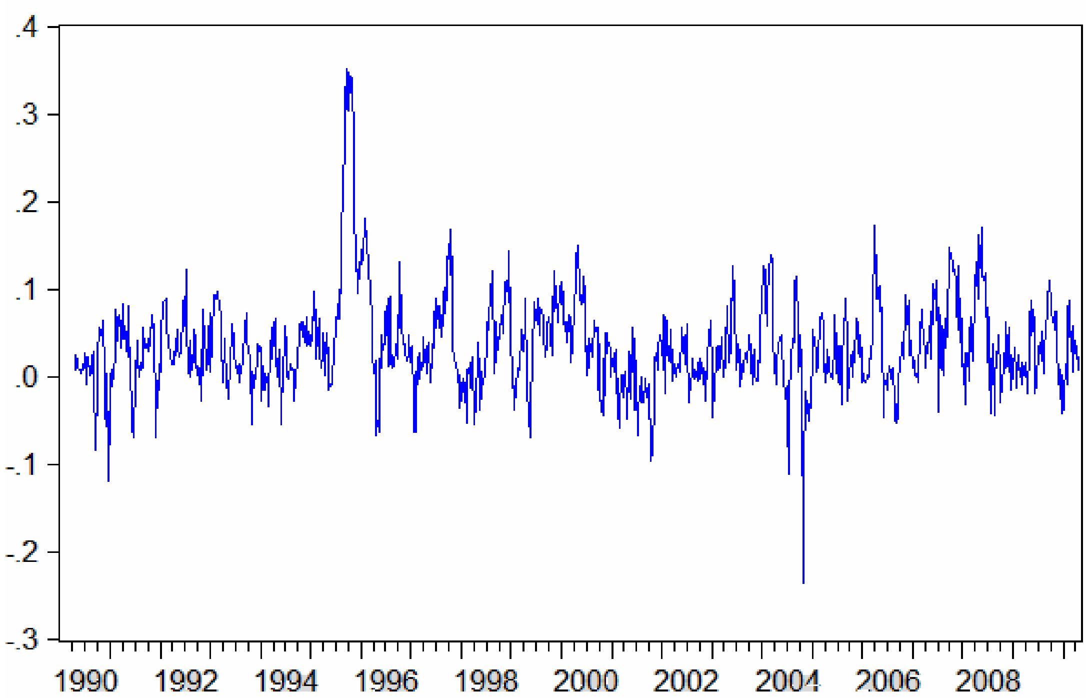


France

Rolling p-values

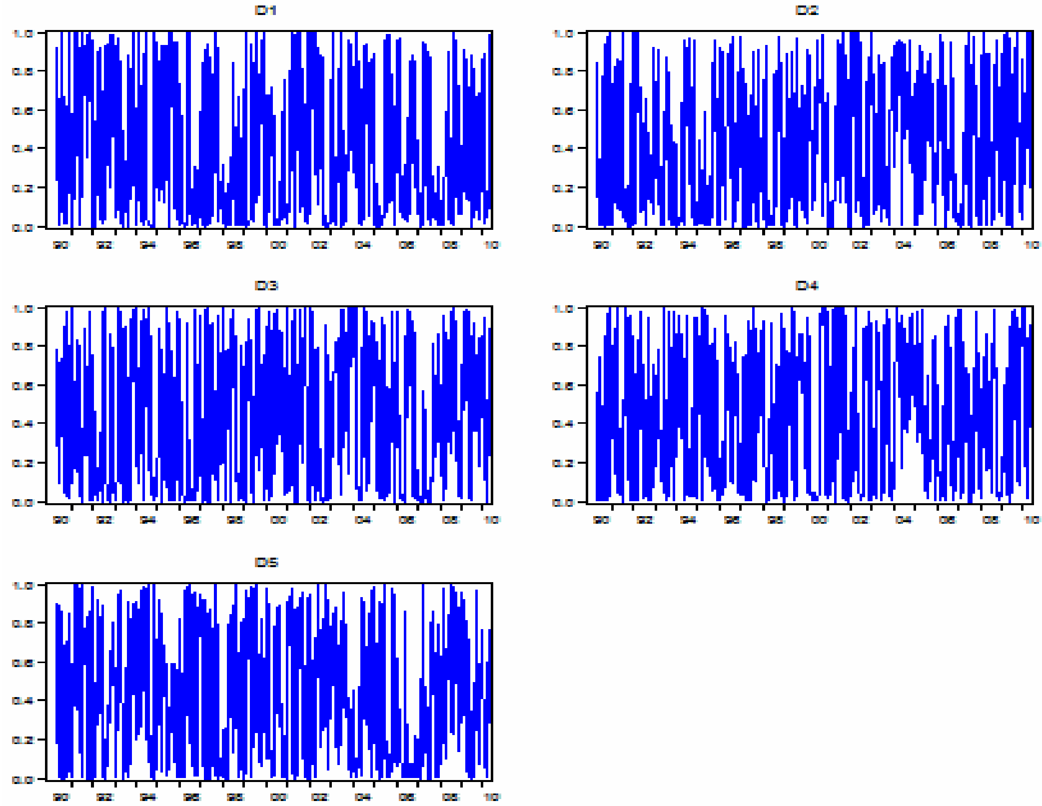


Rolling R-Squares

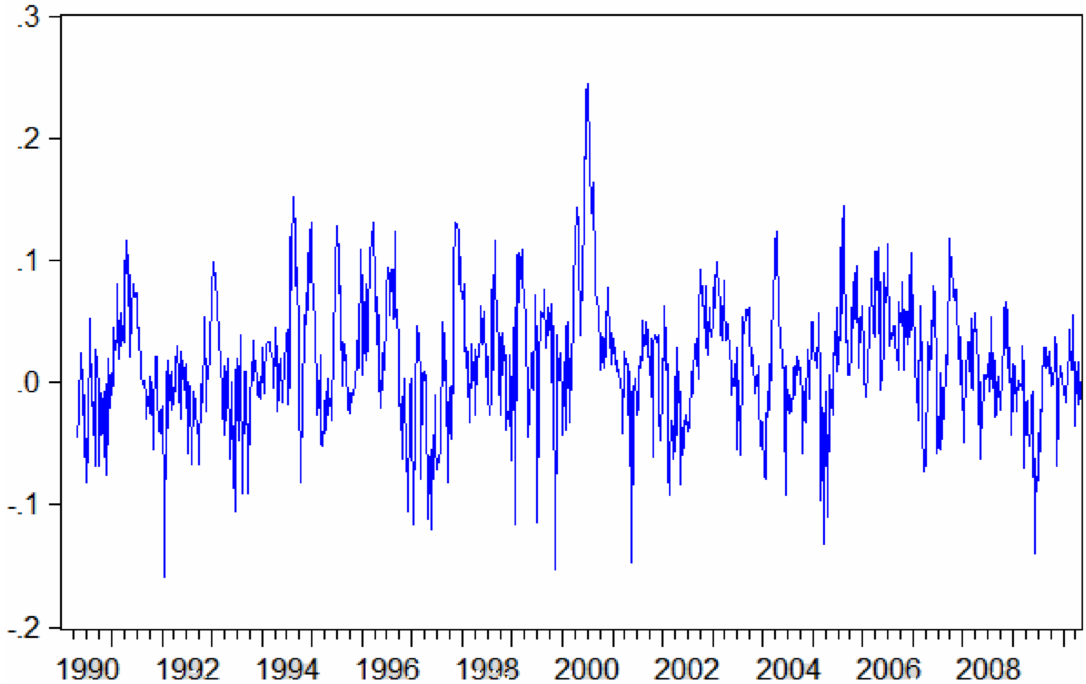


Italy

Rolling p-values

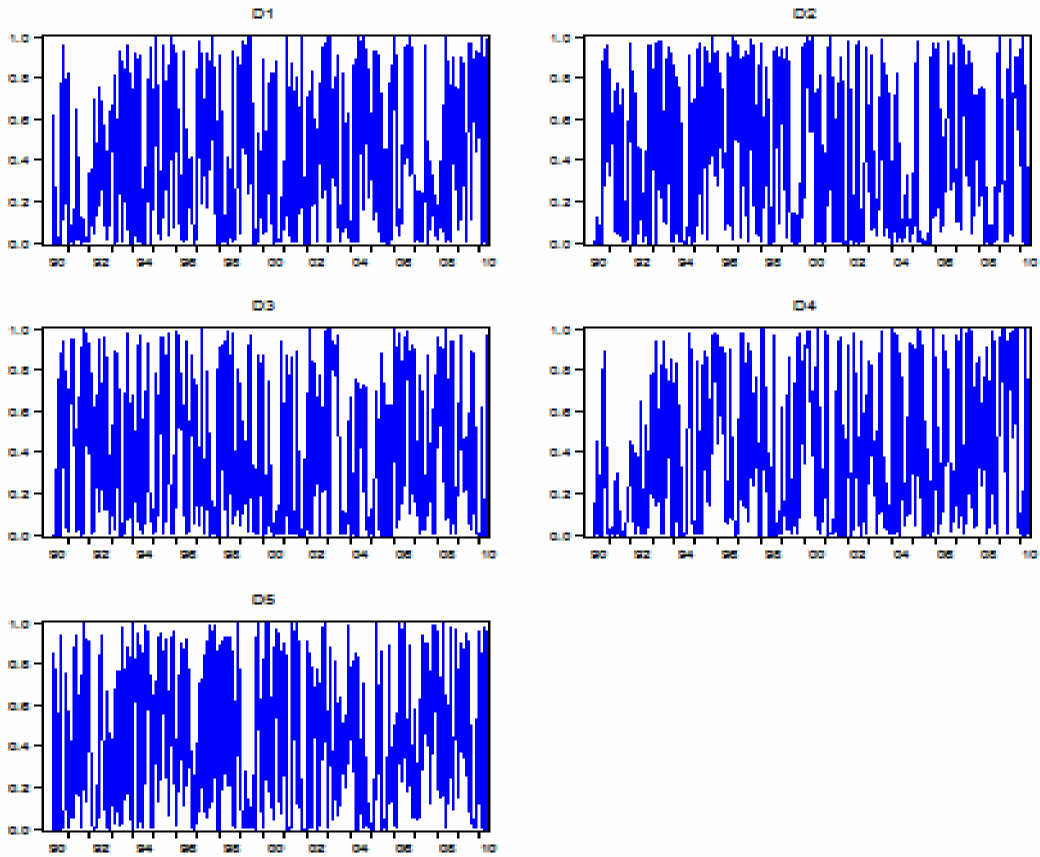


Rolling R-Squares

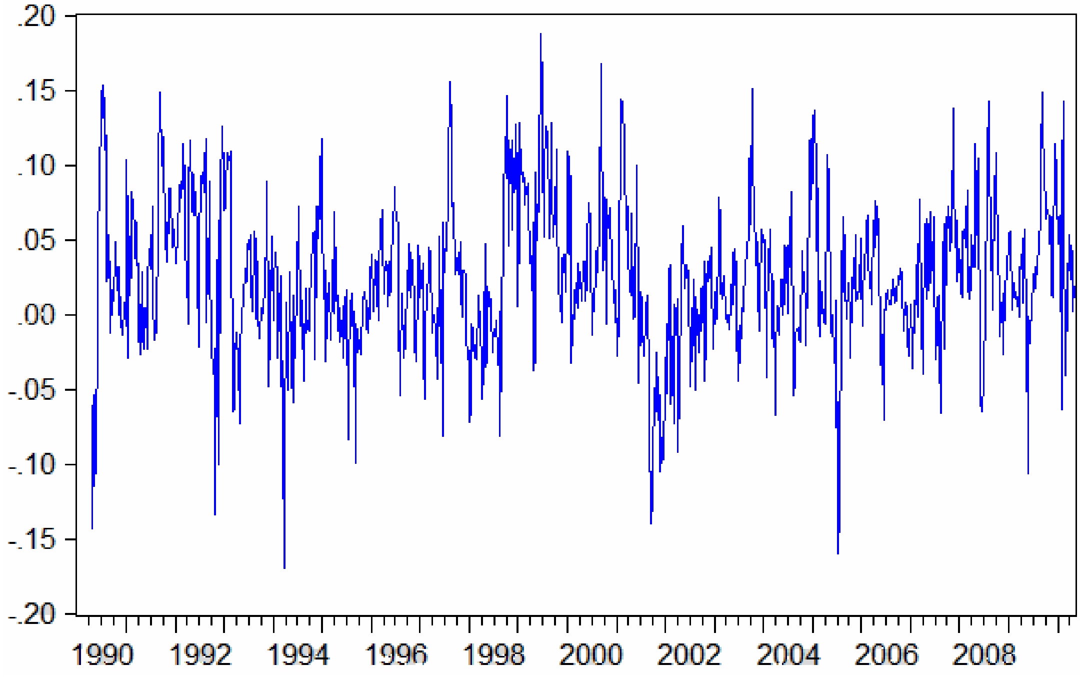


Sweden

Rolling p-values

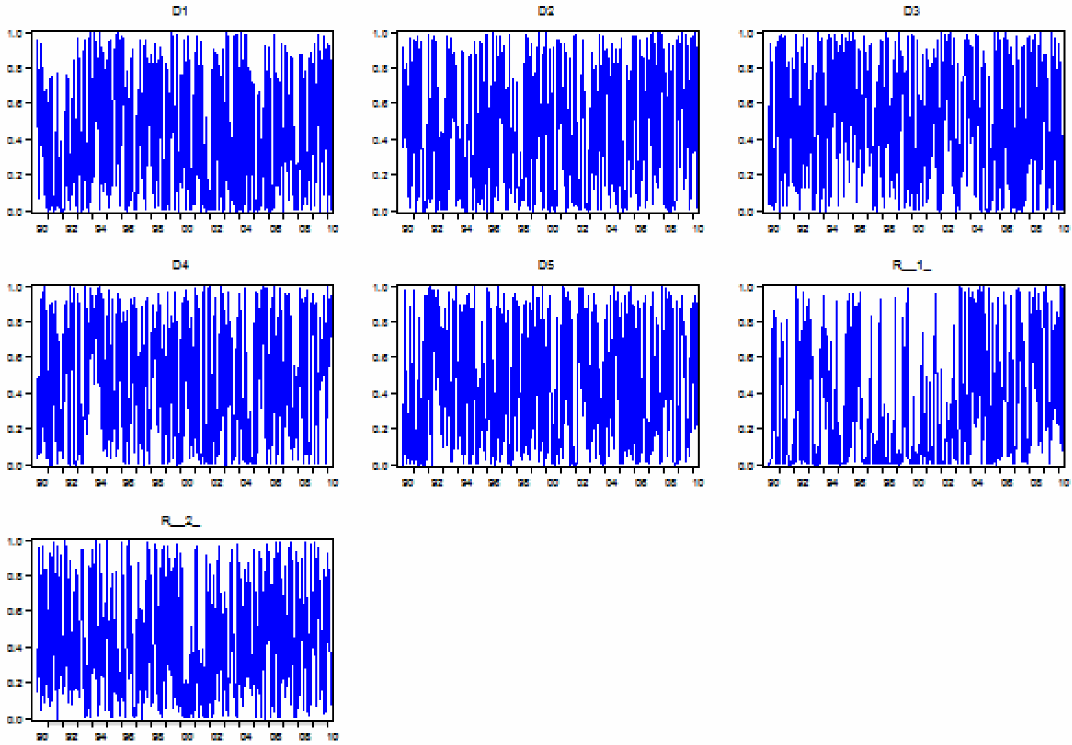


Rolling R-Squares



Switzerland

Rolling p-values



Rolling R-Squares

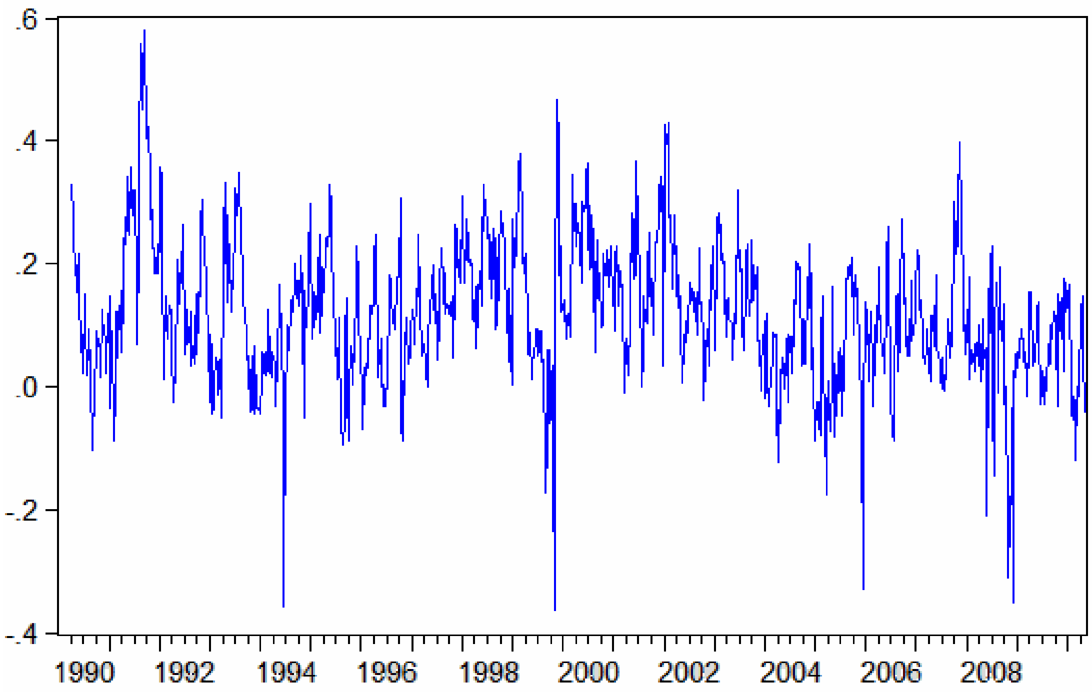
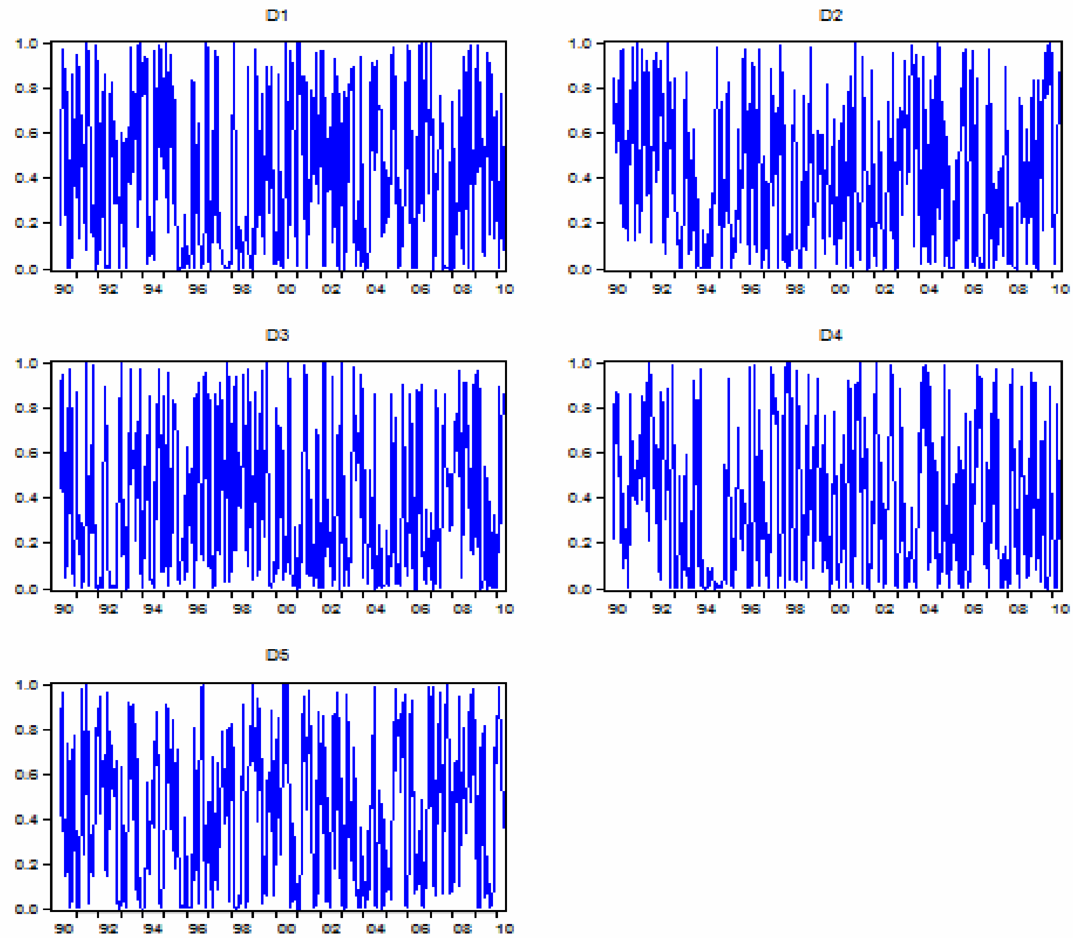


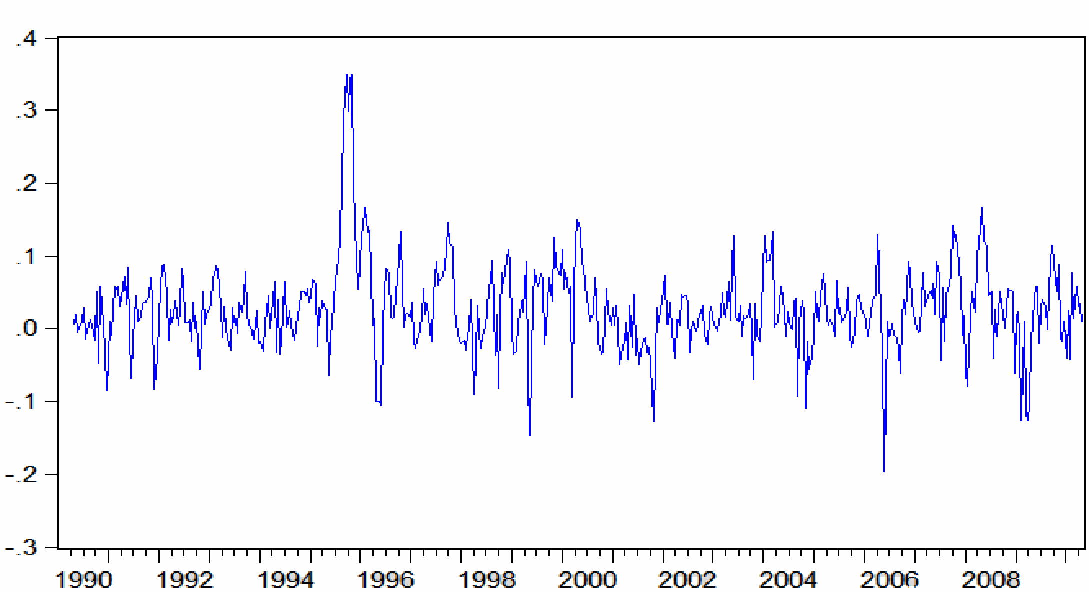
Figure 2: Rolling estimates of p-values and R-squares of the mean coefficients of GARCH models (Generalized error distribution)

France

Rolling p-values

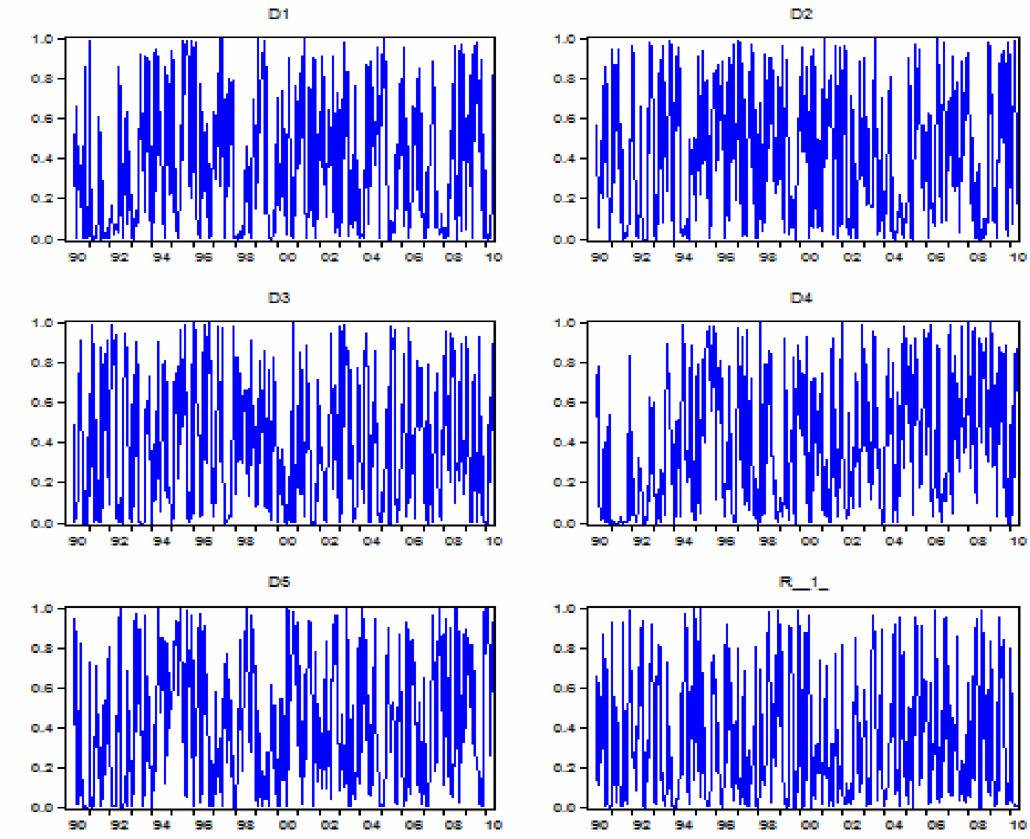


Rolling R-Squares

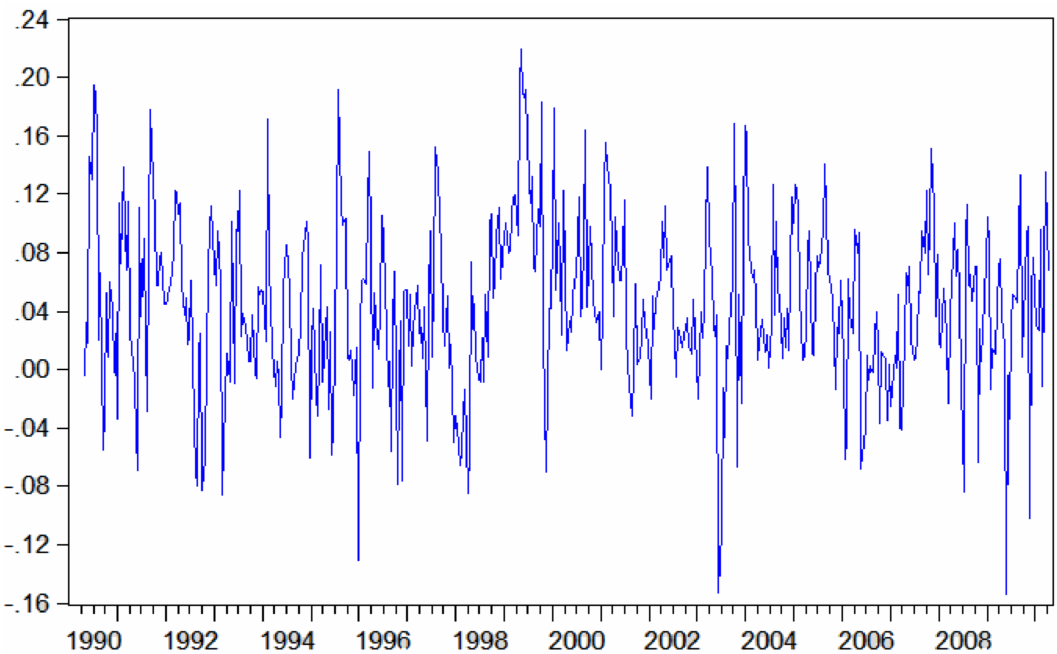


Sweden

Rolling p-values

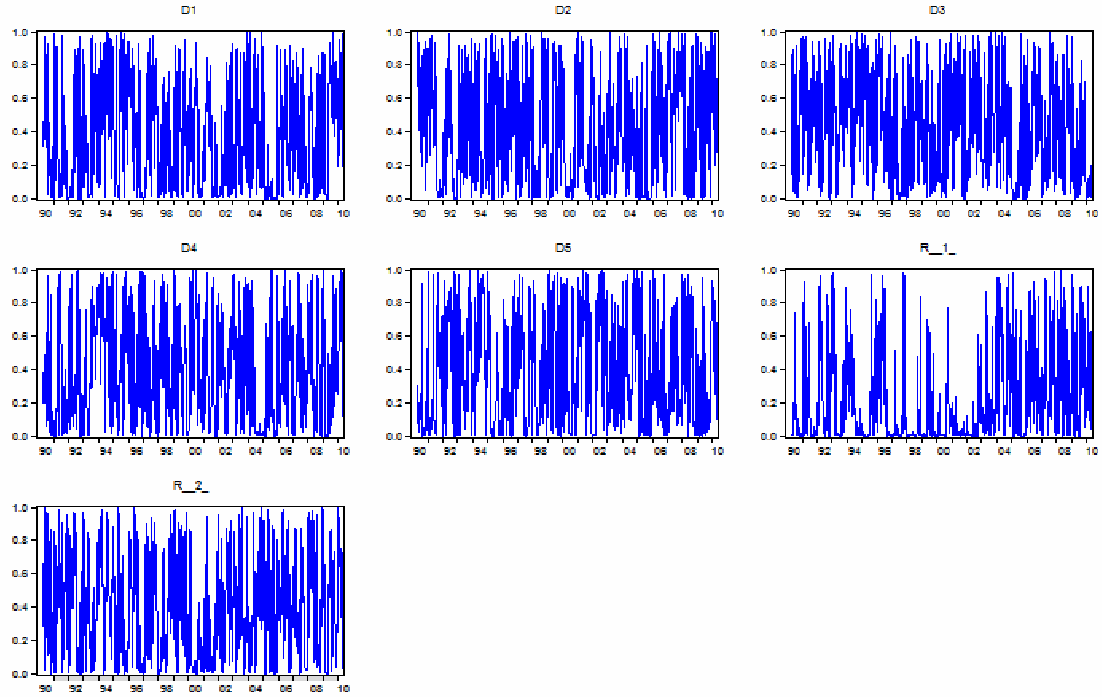


Rolling R-Squares



Switzerland

Rolling p-values



Rolling R-Squares