The Month-of-the-Year Effect: Evidence from GARCH models in Fifty Five Stock Markets

Eleftherios Giovanis*

Abstract

This study explores the month of the year effect in global level. Fifty five stock market indices from fifty one countries are examined. Based on the asymmetry tests is suggested that the asymmetric GARCH models are more proper than the symmetric GARCH model. In addition the asymmetric GARCH models are utilized to deal and to account with certain effects in the conditional variance, such as volatility clustering, leptokurtosis and leverage effects. The main findings of this study suggest that a December effect is found on twenty stock markets, where higher positive returns are reported in the specific month. February effect is presented in nine stock markets, followed by January and April effects in seven and six stock markets respectively. These patterns provide positive and highest returns on the mentioned months. However, a pattern where a specific month gives a persistent signal of negative returns could not be found.

Keywords: Asymmetric GARCH models; Asymmetry Tests; Calendar Effects; January effect; Month of the Year Effect; Seasonality

JEL Codes: G11, G14, G15

* University of Verona, Department of Economics, Via Cantarane 24, 37129 Verona, Italy
0039 32 789 111 54
Email: eleftherios.giovanis@univr.it

Yılın Ayı Etkisi: Ellibeş Adet Borsada GARCH Modellerinden Bulgular

Eleftherios Giovanis*

Özet

Bu çalışma yılın ayı etkisini küresel düzeyde incelemektedir. Ellibir ülkeye ait toplamda elli beş tane borsa endeksi incelenmiştir. Yapılan asimetrik testler sonucunda asimetrik GARCH modellerinin, simetrik GARCH modellerinden daha doğru modeller olduğu ortaya koyulmuştur. Asimetrik GARCH modelleri koşullu varyansta yer alan volatilite kümelenmesi, kalın kuyruk problemi ve kaldıraç etkisi gibi mutlak etkilerin çözümünde kullanılabilmektedir. Çalışmanın temel bulgusu yirmi borsada Aralık etkisinin var olduğu ve yüksek pozitif getirilerin bu spesifik ayda gerçekleştiğidir.Sırasıyla Şubat etkisi dokuz tane borsada, Ocak etkisi yedi adet borsadada ve Nisan etkisi altı borsada gerçekleşmiştir.Söz konusu aylarda elde edilebilecek en yüksek pozitif getiriler elde edilmiş olup, daimi düzeyde negatif getiri uyarısı veren spesifik bir ayın varlığına rastlanmamıştır.

Anahtar Kelimeler: Asimetrik GARCH modelleri; Asimetri testleri; Takvim anomalileri etkisi; Ocak etkisi; Yılın ayı etkisi; Mevsimsellik

JEL Kodları: G11, G14, G15

* Verona Üniversitesi, Ekonomi Bölümü, Via Cantarane 24, 37129 Verona, İtalya
0039 32 789 111 54
Email: eleftherios.giovanis@univr.it

1. Introduction

During the last four decades a long and massive research has been conducted, since Fama (1965) developed the Efficient Market Hypothesis (EMH). Under EMH the share prices follow a random walk, thus, it is apparent that the investors and the private funds cannot use the historical prices with some particular techniques, to create forecasting patterns for predicting the future prices. Moreover, the investors cannot beat the market even though, they employ financial analysis of the profit and loss statements and the assets of the listed firms, in order to identify stocks that are undervalued and consequently, to earn supernormal profits.

Since Fama (1965) stated the theory of market efficiency, some certain events have been observed, which were totally contradictory with the principles of the particular theory. Those phenomena were determined as market anomalies, as they cannot be defined under the reasoning of EMH because they lead to abnormal gains.

Throughout the years significant academic research showed that several anomalies are present, which were not consistent with that theory. One of the first studies is by Basu (1977) who performed a study on the relation of the price to earnings ratios with the market efficiency and he reached the conclusion for the examined period, that the securities which seemed to have lower price to earnings ratios outperformed the higher ones. Therefore, since the stock prices did not reflected those figures there were opportunities for the investors to obtain supernormal profits.

These patterns are called calendar effects or calendar anomalies. The calendar effects in stock and security prices are of major importance for the finance academic literature, but also for professional and practitioners, who are interested on testing whether those anomalies exist, and the real reasons for these patterns occurrence.

These anomalies demonstrate significant patterns during particular periods of time, such as the day of the week, the month of the year or the day of the month among others, fact that can offer the opportunity to professional investors to gain any advantage from them and consequently make profit. In addition, it could be said that the presence of those anomalies comprises an apparent indication that the financial markets are not quite integrated and accordingly, it is sensible that profit opportunities will arise.

Throughout the years several explanations have been stated for the calendar effects, though, there is not a precise justification for their existence. On the one hand, some of them attribute the anomalies as a product of a group of factors concerning bad news, transaction costs and biases. On the other hand, a number of different opinions are based on speculative strategies of the market participants, whereas several studies explain the anomalies existence as a shortcoming of poor statistical models. The behavioural finance analysts attribute these anomalies to psychology factors linked with investors' idiosyncrasies and hence depending on their mood, they drive the returns. Furthermore, it is a general consensus that the calendar effects with the most empirical results documented are the day-of-the-week and the month-of-the-year.

In addition, at this point it is crucial to admit that, in contrast with the majority of the research conducted through the years on the calendar effects, in this analysis models of the GARCH are adopted. The problem with ordinary least squares (OLS) method is, that leads to unreliable estimations, as in all estimations autocorrelation and ARCH effect exist. For this reason GARCH models are estimated.

The purpose of this paper is to investigate and test the January or the month of the year effect in a global level, without to be restricted in regional or national level, in order to examine if actually January presents the highest returns than the other months of the year, as also to identify other monthly patterns which can be used for the optimum asset allocation with result the maximization of profits. Because each stock market behaves differently and presents different monthly patterns, the trading strategy should be formed in this way where the buy and sell signals and actions will be varied in each stock index.

The structure of the study is as follows: The second section discusses the previous research studies, while the third part presents the methodology followed and the data sample used in the analysis. In section four the empirical results are reported, while in section five the concluding remarks of this study are presented.

2. Literature Review

The literature review is very useful in order to identify and present previous empirical researches regarding calendar effects in stock returns. More specifically, based on the market efficiency theory no calendar effects should be exist in financial markets and stock returns, therefore no profit exploitations are possible. Furthermore, the literature review is very helpful for comparing the empirical results of the current research with those derived by past studies.

Several empirical studies have been conducted through the years for the presence of these effects on the stock returns, while numerous conclusions have been reported. One of the calendar effects that still puzzles the practitioners, is the month of the year effect or what is called "the January effect". More specifically, such an event presupposes that the stock returns are observed to be higher during a particular month than the rest of the months of the year. The latter can be defined additionally as the January effect, since it is a frequent phenomenon for the returns to be higher during the first days of January.

Floros (2008) estimates OLS regressions of daily returns on twelve dummies, where the first dummy is equal with one if returns are referred in January and zero otherwise and the same definitions are applied for the rest eleven dummies. Floros rejects January effect for all indices examined. More specifically, the author found higher returns over other months, but the estimated coefficients are insignificant, except from significant negative returns reported in June. Mills et al. (2000) examined the month effect, using the same procedure with Floros (2008). Based on Mills et al. (2000) study, significant higher average returns are reported on January and February. Choudhry (2001) used monthly data during the period 1870- 1913 for UK and Germany, while for USA the period 1871-1913 is examined. Choudhry (2001) found significant positive returns in January for UK. Additionally, significant positive returns are found in January, April and August for USA. Moreover, Choudhry's (2001) findings show that there are significant negative returns in March and July for UK. Aggarwal and Rivoli (1989) examined the month -of-the-year effect and they found higher returns in January. Arsad and Coutts (1997) applied OLS, estimating the same models as in previous studies (Mills et al., 2000; Floros, 2008). Arsad and Coutts (1997) found significant positive returns in January after the implementation of the law of capital gains tax in 1965. Marquering, et al. (2006) found significant higher returns in January and February. Alagidede and Panagiotidis's (2009) results show that in February, March,

April and July, significant average monthly returns are presented and the highest returns are reported in April. Also Alagidede and Panagiotidis (2009) estimated recursive OLS for both models and they showed that there is variation in the estimating coefficients confirming the lack of stability in the month of the year effect. In the latter half of the sample January, February, March, April, August and December tend to convergence. Based on Tonchev and Kim's (2004) results a January effect is presented in the Czech Republic.

On the contrary other studies report different results. Szakmary and Kiefer (2004) found that the turn of the year effect in small capitalization stocks as the S&P 400 Midcap and Russell 2000 indices, is eliminated by market participants. Generally January effect does not exist, but increased returns for small-cap stock indices on the last trading day of December are reported. Floros (2008) rejected January effect for three stock indices examined in Athens stock exchange market and higher returns over other months are reported instead in January. However, the estimated coefficients are statistically insignificant, with the exception that significant negative returns are presented in June regarding all indices. Giovanis (2009) examined fifty five stock markets and the January effect is rejected, as it is presented only in seven stock markets, while the most frequent significant higher monthly returns are reported in December and specifically in twelve stock markets.

From the previous empirical researches becomes clear that the month of the year effect is changing through the time, depending in the stock market and the country examined. Based on the previous researches, a January effect takes place, based on the early studies, while other month of the year effects are found on the latest studies.

3. Methodology and Data

3.1 GARCH models

For the month-of-the year effect we estimate the following regression:

$$R_t = \sum_{i-1}^{12} \beta_i D_{it} + \varepsilon_t \qquad (1)$$

R_t denotes the daily stock returns and are defined as $log(P_t)$-$log(P_{t-1})$. P_t and P_{t-1} is the current stock index price and the stock index price with one lag respectively, while log is the logarithm. D_{it} represents the twelve dummy variables for twelve months, where D_{1t} takes value 1 if returns belong in days of January and 0 otherwise, continuing at the last dummy variable D_{12t}, which takes value 1 if the returns belong in days of December and 0 otherwise and ε_t is the disturbance term.

The OLS method has been applied in all estimations, but the results are not reported, as in all cases heteroskedasticity, ARCH effects and autocorrelation were present. So for this reason is claimed that OLS estimations reports are not necessary, as the results are not reliable. Thus, one major reason why GARCH models are preferred to OLS method, is that in ordinary least squares there is the assumption that the expected value of all squared error terms are the same in any time given point. This assumption is well known as homoskedasticity. However this assumption is violated in financial time series, which is known as

heteroskedasticity. Thus, the value the variances of the error terms are not equal. Therefore, GARCH models are able to treat heteroskedasticity as a variance, which can be modeled and estimated. Additionally, ARCH-GARCH specifications allow to estimate the models more accurately and to forecast the volatility of financial time series. More specifically, GARCH specification assert that the best predictor of the future volatility or variance is the weighted average of the past variances, especially in long-run or large data sets used in financial econometric modelling (Bollerslev, 1986).

The presence of heteroskedasticity and ARCH effects in the estimations is expected. If actually there are ARCH effects three GARCH models are followed in this study. The first is the symmetric GARCH (1,1) model proposed by Bollerslev (1986) and is defined as:

$$\sigma_t^2 = a_0 + a_1 u_{t-1}^2 + a_2 \sigma_{t-1}^2 \qquad (2)$$

The symmetric GARCH model in (2) is useful because it is able to capture for volatility clustering. More specifically, volatility clustering in the case of financial assets and time series data, can be easily understood as news clustering, which means that there are "good" and "bad" news in financial markets. On the other hand, one major disadvantage and weakness of the GARCH model is that it is symmetric in its response to past innovations. Since good news and bad news may have different effects on the volatility two GARCH models are taken into consideration. This is an attempt to capture the asymmetric nature of volatility responses. Asymmetric volatility can be explained by two models, leverage effect and time-varying risk premium (Cappiello et al., 2003). Since the symmetric GARCH model is unable to account for the leverage effects asymmetric GARCH models are proposed and examined in this study. The other two GARCH models we estimate are the asymmetric EGARCH and GJR models. EGARCH model was proposed by Nelson (1991) and is defined as:

$$\log(\sigma_t^2) = \omega + \log a_0(\sigma_{t-1}^2) + \gamma \frac{u_{t-1}}{\sqrt{\sigma_{t-1}^{\ 2}}} + a_1 \left[\frac{|u_{t-1}|}{\sqrt{\sigma_{t-1}^{\ 2}}} - \sqrt{\frac{2}{\pi}} \right] \qquad (3)$$

For EGARCH if the relationship between volatility and returns is negative, a negative value for coefficient γ is expected. More specifically, it is observed that "good news" generates less volatility than "bad news", where γ reflects the leverage effect (Zlatko, 2007).

The second asymmetric GARCH model used is GJR- GARCH, which was proposed by Glosten et al. (1993):

$$\sigma_t^2 = a_0 + a_1 u_{t-1}^2 + a_2 \sigma_{t-1}^2 + \gamma u_{t-1}^2 I_{t-1} \qquad (4)$$

I_{t-1} is a dummy variable, where $I_{t-1} = 1$ *if* $u^2_{t-1} < 0$ *and* $I_{t-1} = 0$ otherwise. Also for a leverage effect it is expected that $\gamma > 0$. Therefore, the "bad news" has larger impacts. Furthermore, it should hold that $\alpha_1 + \gamma \geq 0$ and $\alpha_1 \geq 0$ for non-negativity conditions (Zlatko, 2007). It should be noticed that Engle (1982) used normal distribution.

However, in order to allow the model to capture the excess kurtosis a more fat tailed distribution, the t - distribution is used in this study.

Concluding the asymmetric GARCH models are preferred in the current study, not only because correct for heteroskedasticity, but they are able to capture also for asymmetric volatility. Furthermore, two alternative asymmetric GARCH models are estimated for two reasons. Firstly, these are the most widely used models in financial research studies, presenting very satisfying results. Secondly, almost all financial time series, and specifically stock market indexes used in this study, can be described and characterized well by both asymmetric GARCH models. However, based on Log-likelihood statistics and information criteria, the appropriate asymmetric GARCH model is selected, even if the differences can be minimal. This is a result of an effort to take the most robust estimations.

It should be mentioned that the results of both asymmetric GARCH models are not presented in all stock markets, but the optimum one is chosen. This choice is made based on Akaike and Schwartz information criteria, the Log-Likelihood statistic, as also based on which model is able to eliminate ARCH effects and autocorrelation.

3.2 Asymmetry Tests

Following the GARCH (1,1) estimations, the case whether there are asymmetries in volatility of the calendar effects or not is examined. In this section the methodology of the asymmetry tests followed in this study are presented. Engle and NG (1993) have proposed a sets of tests for asymmetry in volatility. We define S^{-}_{t-1} as a dummy indicator taking value 1 if $\hat{u}_{t-1}<0$ and zero otherwise. So the first test is the sign test and it is defined by the equation:

$$\hat{u}_t^2 = d_0 + d_1 S^{-}_{t-1} + e_t \qquad (5)$$

,where e_t is an iid error term. If positive and negative shocks $\hat{u}_{t-1}<0$ impact differently in the conditional variance then d_1 will be statistically significant. The second test is the negative sign bias and it is defined as:

$$\hat{u}_t^2 = d_0 + d_1 S^{-}_{t-1} u_{t-1} + e_t \qquad (6)$$

, where d_1 will be statistically significant. Then we define S^{+}_{t-1} =1- S^{-}_{t-1}, so that picks out the observations with positive innovations, so the positive sign bias test can be defined as:

$$\hat{u}_t^2 = d_0 + d_1 S^{+}_{t-1} u_{t-1} + e_t \qquad (7)$$

Engle and NG (1993) proposed a joint test for size and sign bias based on the following regression:

$$\hat{u}_t^2 = d_0 + d_1 S^{-}_{t-1} + d_2 S^{-}_{t-1} u_{t-1} + d_3 S^{+}_{t-1} u_{t-1} + e_t \qquad (8)$$

In this case significance of d_1 indicates the presence of sign bias, while on the other hand the significance d_2 or d_3 would suggest the presence of sign bias, where not only the sign, but also the magnitude of the shock is important. The joint test is calculating by TR^2, where T is the sample size, and asymptotically follows chi-square distribution with 3 degrees of freedom under the null hypothesis of no asymmetric effects. The null hypothesis is H_0: $d_1 = d_2 = d_3 = 0$.

3.3 Data

The data are daily and have been obtained from various websites. The analysis is based in terms of daily returns. In table 1 the countries, the indices symbols and the sources-websites presented. The ending period is 31 December 2009 for all series, while the starting period is varied based on table 1.

(*Insert table 1)*

4. Empirical Results

In table 2 the asymmetry tests of GARCH (1,1) model are reported. It is observed that the null hypothesis of the joint test (11) is rejected in all stock markets, with the exceptions of the stock markets in Luxemburg and Turkey. For this reason GARCH(1,1) is applied for these two market indices. In table 3 the symmetric and asymmetric GARCH estimations of equation (2) are reported. In every case the specific asymmetric GARCH model applied is noted. Table 4 reports the diagnostic tests of GARCH regressions.

The coefficients of GARCH equations are statically significant in the most cases. Furthermore, the coefficient γ denoting the leverage effect is statistically significant and presents the expected and correct sign in all cases, except from the stock markets in Estonia, Latvia, Sri Lanka and Yugoslavia, where the coefficient γ has the correct sign, but is insignificant, as well as in the case of Jordan, where the coefficient γ presents the wrong sign but it is insignificant too.

From the overall results it is observed that the January effect is presented only in seven stock markets, and these are in Malaysia, Pakistan, Peru, Singapore, Thailand and Dow Jones and Nasdaq-100 in USA. On the contrary, in the majority a December effect is reported, meaning that the highest positive and significant returns are reported in December. The specific calendar effect is presented in twenty stock markets. These are in Austria, Belgium, Brazil, Canada, Denmark, Estonia, Germany, India, Indonesia, Ireland, Luxemburg, Mexico, Netherlands, New Zealand, Philippine, Switzerland, Turkey, UK indices FTSE-100 and FTSE-250 and finally in Yugoslavia, where in Canada and New Zealand the highest returns are presented also in February and September respectively. Furthermore, a February effect is stronger than January, as it is presented in ten stock markets; Chile, Egypt, Finland, Hong Kong, Italy, Portugal, Russia, Spain, and Sweden including the stock market examined in Canada, as it was mentioned previously.

April effect is followed in Australia, China, Greece, Israel, Kuwait and S&P 500 index in USA, while October presents the highest significant returns in the stock markets examined in Argentina, Croatia, and Norway. Some other weaker monthly anomalies are March, September and November effects presented in Japan, and France for March, Lithuania and Sri Lanka for September and South Korea and NY Composite for November. Finally, May exhibits higher significant returns in the stock market of Jordan, July in Latvia, June in Taiwan

and August in Zambia.

On the contrary there are not persistent anomalies and negative returns categorized in groups. For example it was expected that September might present negative returns in stock markets, but this is not happened as it is present only in China, while in the most cases returns in September are insignificant, while in few stock markets present positive significant returns, but not the lowest among the other months of the year.

(Insert Tables 2-4)

Overall the current study' results are not consistent with the first studies, where a January effect is strong presenting positive returns. A December effect was found instead of January effect, which is consistent with recent studies as the study by of Szakmary and Kiefer (2004) who argue that the activity of the investors seeking profit having heightened awareness of the January" effect have led to a sharp reduction of average returns June of 1993 in small cap indices, while this activity resulted in increased returns in the last trading day of December.

Similarly, Marquering et al. (2006) found that the average returns reported in January are not higher than the market's average returns. Additionally, Marquering et al. (2006) suggest that after the publication of Rozeff and Kinney's (1976) study, the strength of the month-of-the year effect has substantially dropped.

5. Conclusions

The purpose of this paper was the examination of the month of the year and the January effect. Because the main interest in the majority of the studies is restricted to major stock markets in the world, as Dow Jones Industrial and S&P 500 in USA and FTSE-100 in UK among others, this study tried to examine representative stock markets around the world. Thus, the analysis was not restricted in national and regional level or major stock markets, but was extended in global level. Generally, the results are mixed, but the main concluding remark is that January effects does not exist in global level and it is a very week calendar effect, as it is presented only in seven stock markets. On the other hand December presents higher returns in twenty stock markets out of fifty five indices examined. Furthermore, this study showed that the market efficiency hypothesis, always based on the month of the year effects, is violated, as in each stock market separately monthly patterns, with purpose the exploitation of profits, are formulated.

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Table 1. Stock market indices and estimating periods

Countries	Starting Period	Countries	Starting Period
Argentina (MERVAL INDEX)[1]	9 October 1996	Indonesia (JKSE Composite Index)[1]	2 July 1997
Australia (All ordinaries Index)[2]	9 January 2001	Ireland (GENERAL INDEX) www.ise.ie	4 January 1983
Austria (ATX INDEX)[1]	12 November 1992	Israel (TA-100 INDEX)[1]	2 July 1997
Belgium (BFX INDEX)[1]	14 February 2005	Italy (MIBTEL INDEX)[1]	4 January 2000
Brazil (IBOVESPA INDEX)[1]	28 April 1993	Japan(Nikkei 225)[1]	5 January 1984
Canada (S&P/TSX Composite index)[1]	4 January 2000	Jordan (Weighted General Index) www.ase.com.jo	4 January 1992
Chile (IPSA INDEX)[2]	23 September 2003	Kuwait (All Share Index)[2]	19 June 2001
China (Shanghai composite Index)[2]	4 July 1997	Latvia (OMX Riga) www.baltic.omxnordicexchange.com	4 January 2000
Croatia (CROBEX INDEX) www.zse.hr	3 January 1997	Lithuania (OMX Vilnius) www.baltic.omxnordicexchange.com	4 January 2000
Denmark (KFX INDEX)[2]	6 January 2000	Luxemburg (LuxX INDEX) www.bourse.lu	10 May 1988
Egypt (CCSI INDEX)[1]	3 July 1997	Malaysia (KLSE INDEX)[1]	6 December 1993
Estonia (OMX Tallinn)[6]	3 January 2000	Mexico (IPC INDEX)[1]	11 November 1991

Finland (Helsinki General Index)[2]	4 July 1997	Netherlands (AEX INDEX)[1]	13 October 1990
France (CAC 40 INDEX)[1]	2 March 1990	New Zealand (New Zealand Stock Exchange 50 Index)[2]	5 May 2004
Germany (DAX INDEX)[1]	27 November 1990	Norway (OSEAX INDEX)[1]	8 February 2001
Greece (GENERAL INDEX) www.enet.gr	5 Januaary 1998	Pakistan (Karachi 100 Index)[2]	8 July 1997
Hong Kong (HANG SENG INDEX)[1]	2 January 1987	Peru (Lima General Index)[2]	4 May 1998
India (BSE SENSEX)[1]	2 January 1997	Philippine (PSE Composite Index)[2]	7 July 1997
Portugal (PSI GERAL INDEX) www.euronext.com	14 February 2005	Turkey (ISTANBUL NAT-100)[2]	4 July 1997

Table 1 (cont.) Stock market indices and estimating periods

Countries	Starting Period	Countries	Starting Period
Russia Federation (RTSI INDEX) www.rts.ru,	4 September 1995	UK (FTSE-100)[2]	3 April 1984
Singapore (STI INDEX)1	7 July 1997	UK (FTSE-250)[2]	6 January 2000
South Korea (KOSPI Composite Index)1	2 July 1997	USA (Dow Jones composite)[1]	24 December 1980
Spain (IBEX 35)2	9 January 2002	USA (Nasdaq 100)[1]	8 February 1971
Sri Lanka (CSE All share Index)[2]	4 July 1997	USA (NY composite)[1]	3 January 1966

Sweden (SAX ALL SHARE INDEX)2	9 January 2001	USA (S&P 500)[1]	4 January 1950
Swiss (SSMI INDEX)[1]	12 November 1990	Yugoslavia (BELEX 15)	5 October 2005
Taiwan (TSEC weighted index)[1]	3 July 1997	www.belex.co.yu Zambia (LASI INDEX) www.luse.co.zm	2 January 2002
Thailand (SET INDEX)[2]	3 July 1997		

1.Source www.yahoofinance.com, 2. Source www.econstats.com

Table 2. Asymmetric tests for the month-of-the-year effect

Countries	Sign Bias	Negative Size Bias	Positive Size Bias	Joint test F-statistic	Countries	Sign Bias	Negative Size Bias	Positive Size Bias	Joint test F-statistic	Countries	Sign Bias	Negative Size Bias	Positive Size Bias	Joint test F-statistic
ARGENTINA	7.60e-05 (0.1225)	-0.00885 (0.000)	0.00348 (0.0224)	12.167 (0.000)	IRELAND	-1.69e-05 (0.9048)	-0.0059 (0.000)	-0.003 (0.0009)	22.399 (0.000)	SINGAPORE	8.23e-07 (0.9777)	-0.00401 (0.0024)	0.0053 (0.0001)	7.896 (0.000)
AUSTRALIA	4.80e-05 (0.0737)	-0.0175 (0.000)	-0.00192 (0.2872)	22.545 (0.000)	ISRAEL	3.19e-05 (0.1279)	-0.00698 (0.000)	-0.00270 (0.0076)	18.659 (0.000)	SOUTH KOREA	7.56e-05 (0.0548)	-0.00374 (0.0047)	0.00091 (0.4812)	4.076 (0.0067)
AUSTRIA	4.02e-05 (0.0007)	-0.00462 (0.000)	-0.0029 (0.000)	20.557 (0.000)	ITALY	3.73e-05 (0.0060)	-0.00317 (0.0002)	-0.00369 (0.0131)	13.752 (0.000)	SPAIN	4.78e-05 (0.0024)	-0.00383 (0.000)	-0.00289 (0.0006)	14.616 (0.0000)
BELGIUM	2.85e-05 (0.3246)	-0.00516 (0.0024)	-0.00461 (0.0140)	5.627 (0.0008)	JAPAN	2.77e-05 (0.0580)	-0.00324 (0.000)	-0.00442 (0.000)	19.422 (0.000)	SRI LANKA	1.91e-05 (0.4876)	-0.00531 (0.0006)	0.00257 (0.1371)	4.809 (0.0024)
BRAZIL	-6.51e-05 (0.3591)	-0.0114 (0.000)	-0.0085 (0.000)	18.726 (0.000)	JORDAN	-1.81e-05 (0.0178)	-0.00464 (0.000)	-0.00018 (0.7334)	21.625 (0.000)	SWEDEN	3.19e-05 (0.0848)	-0.00291 (0.0023)	-0.00374 (0.0001)	9.046 (0.000)
CANADA	3.32e-05 (0.0236)	-0.00273 (0.0038)	-0.00198 (0.0448)	5.708 (0.0007)	KUWAIT	2.45e-05 (0.0234)	-0.0108 (0.000)	0.00012 (0.8738)	66.566 (0.000)	SWITZERLAND	2.40e-05 (0.0157)	-0.00479 (0.000)	-0.00185 (0.0022)	25.502 (0.000)
CHILE	2.07e-05 (0.0974)	-0.00663 (0.000)	-0.00332 (0.0008)	23.080 (0.000)	LATVIA	2.42e-05 (0.5921)	-0.0197 (0.000)	0.00686 (0.0014)	35.090 (0.000)	TAIWAN	1.81e-05 (0.3937)	-0.00448 (0.000)	-0.00083 (0.3579)	8.532 (0.000)
CHINA	2.97e-05 (0.2520)	-0.00505 (0.0001)	-0.00232 (0.0312)	6.717 (0.0002)	LITHUANIA	1.69e-05 (0.1898)	-0.00499 (0.000)	0.00033 (0.7284)	9.086 (0.000)	THAILAND	-0.00011 (0.0164)	-0.00103 (0.4977)	0.0111 (0.000)	18.765 (0.000)
CROATIA	-1.64e-05 (0.7478)	0.00265 (0.1889)	-0.0171 (0.0157)	19.460 (0.000)	LUXEMBURG	0.00015 (0.3053)	-0.00714 (0.000)	-0.00248 (0.0131)	1.747 (0.1550)	TURKEY	-1.47e-05 (0.8572)	-0.00208 (0.3094)	-3.30e-05 (0.9873)	0.3563 (0.7846)

DENMARK	3.75e-05	-0.00126	-0.00174	7.042	MALAYSIA	-1.8e-05	0.0218	0.0102	33.061	UK-FTSE 100	2.08e-05	-0.00475	-0.00347	35.628
	(0.0009)	(0.0715)	(0.0202)	(0.0001)		(0.7263)	(0.000)	(0.000)	(0.000)		(0.0180)	(0.000)	(0.000)	(0.000)
EGYPT	1.70e-05	-0.00793	-0.00277	20.584	MEXICO	9.05e-06	-0.0067	-0.0025	18.823	UK-FTSE 250	3.87e-05	-0.00324	-0.00242	12.395
	(0.2942)	(0.000)	(0.0154)	(0.000)		(0.6789)	(0.000)	(0.0075)	(0.000)		(0.0006)	(0.0001)	(0.0032)	(0.000)
ESTONIA	1.00e-05	-0.0056	0.00155	11.224	NETHERLANDS	3.87e-05	-0.0039	-0.0033	16.089	US DOW JONES COMPOSITE	2.43e-05	-0.00825	-0.0003	17.730
	(0.4411)	(0.000)	(0.1474)	(0.000)		(0.0116)	(0.000)	(0.000)	(0.000)		(0.1231)	(0.000)	(0.7843)	(0.000)
FINLAND	8.89e-05	-0.0061	-0.00392	7.697	NEW ZEALAND	1.19e-05	-0.00129	0.00038	3.474	US NASDAQ 100	4.66e-05	-0.0056	-0.0055	64.245
	(0.0672)	(0.0003)	(0.0156)	(0.000)		(0.0295)	(0.0232)	(0.5178)	(0.0156)		(0.000)	(0.000)	(0.000)	(0.000)
FRANCE	1.68e-05	-0.00249	-0.00139	7.925	NORWAY	6.37e-05	-0.00833	-0.00519	35.364	US NEW YORK COMPOSITE	1.23e-05	-0.00498	-0.00264	22.489
	(0.1650)	(0.0001)	(0.0273)	(0.000)		(0.0009)	(0.000)	(0.000)	(0.000)		(0.1643)	(0.000)	(0.0001)	(0.000)
GERMANY	3.70e-05	-0.00415	-0.00248	18.621	PAKISTAN	0.000118	-0.00627	-0.00224	19.396	US – S&P 500	1.63e-05	-0.00677	-0.00151	39.958
	(0.0071)	(0.000)	(0.0004)	(0.000)		(0.000)	(0.000)	(0.0419)	(0.000)		(0.0414)	(0.000)	(0.0110)	(0.000)
GREECE	-0.0001	-0.0106	-0.0548	110.122	PERU	2.04e-05	-0.0101	-0.00293	34.555	YUGOSLAVIA	-1.98e-05	-0.00995	0.0146	11.314
	(0.2167)	(0.0002)	(0.000)	(0.000)		(0.2704)	(0.000)	(0.0043)	(0.000)		(0.7487)	(0.0005)	(0.000)	(0.000)
HONG KONG	0.000105	-0.0390	-0.0075	58.649	PHILLIPINE	1.56e-06	-0.00387	0.00529	7.657	ZAMBIA	-0.00021	0.00544	-0.0103	34.558
	(0.1318)	(0.000)	(0.0064)	(0.000)		(0.9579)	(0.0035)	(0.0001)	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)
INDIA	7.52e-05	-0.00795	-0.00393	28.850	PORTUGAL	3.19e-05	-0.00465	-0.00608	10.430					
	(0.0017)	(0.000)	(0.0001)	(0.000)		(0.0922)	(0.000)	(0.2413)	(0.000)					
INDONESIA	7.38e-05	-0.0085	0.00368	11.497	RUSSIA	0.000171	-0.0187	0.00226	29.452					
	(0.1347)	(0.000)	(0.0157)	(0.000)		(0.0285)	(0.0015)	(0.000)	(0.000)					

P-values in parentheses

Table 3. GARCH estimations of equations (2-4)

Countries	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8	β_9	β_{10}	β_{11}	β_{12}	ω	α_1	γ	α_2
ARGENTINA GJR-GARCH	0.00161	0.00197	-0.00034	0.00058	0.00063	-0.00043	0.00051	-0.00098	0.00174	0.00206	0.00131	0.00189	1.50e-05	0.0588	0.1151	0.8531
	(0.00098)	(0.00098)	(0.00095)	(0.00098)	(0.00110)	(0.00097)	(0.00101)	(0.00097)	(0.00093)	(0.00090)	(0.00096)	(0.00109)	(2.99e-06)	(0.0154)	(0.0232)	(0.0170)
	[1.640]	[2.003]**	[-0.360]	[0.588]	[0.578]	[-0.445]	[0.504]	[-1.007]	[1.885]***	[2.284]**	[1.361]	[1.730]***	[5.033]*	[3.825]*	[4.974]*	[50.259]*
AUSTRALIA EGARCH	0.00068	0.00040	0.00060	0.00113	0.00025	-3.46e-05	0.00081	0.00063	0.00035	0.00105	1.26e-06	0.00097	-0.4608	0.1645	-0.0585	0.9656
	(0.00028)	(0.00030)	(0.00029)	(0.00031)	(0.00030)	(0.00030)	(0.00028)	(0.00030)	(0.00029)	(0.00030)	(0.00033)	(0.00033)	(0.0558)	(0.0148)	(0.0083)	(0.0051)
	[2.355]**	[1.299]	[2.010]**	[3.640]*	[0.821]	[-0.112]	[2.822]*	[2.127]**	[1.234]	[3.492]*	[0.003]	[2.895]*	[-8.251]*	[11.112]*	[-7.020]*	[187.25]*
AUSTRIA GJR-GARCH	0.00134	0.00156	-0.00016	0.00120	0.00082	0.00020	0.00017	0.00016	-0.00069	0.00093	0.00084	0.00175	4.20e-06	0.0489	0.0822	0.8710
	(0.00047)	(0.00047)	(0.00049)	(0.00048)	(0.00047)	(0.00049)	(0.00045)	(0.00051)	(0.00048)	(0.00052)	(0.00049)	(0.00050)	(7.72e-07)	(0.0139)	(0.0171)	(0.0146)
	[2.877]*	[3.329]*	[-0.330]	[2.504]**	[1.744]***	[0.412]	[0.382]	[0.319]	[-1.421]	[1.790]***	[1.705]***	[3.520]*	[5.447]*	[3.519]*	[4.817]*	[59.492]*
BELGIUM EGARCH	0.00129	0.00124	-0.00078	0.00023	-0.00032	-0.00066	0.00056	-0.00046	0.00092	0.00013	-0.00023	0.00165	-0.2113	0.0457	-0.1639	0.9815
	(0.00060)	(0.00062)	(0.00056)	(0.00059)	(0.00065)	(0.00071)	(0.00064)	(0.00063)	(0.00061)	(0.00061)	(0.00060)	(0.00057)	(0.0468)	(0.0262)	(0.0202)	(0.0044)
	[2.138]**	[2.164]**	[1.387]	[0.388]	[-0.499]	[-0.928]	[0.874]	[-0.734]	[1.520]	[0.212]	[0.380]	[2.894]*	[-4.514]*	[1.714]***	[-8.051]*	[221.33]*
BRAZIL GJR-GARCH	0.00201	0.00153	0.00064	0.00161	0.00233	0.00090	0.00061	0.00081	0.00132	0.00129	0.00274	0.00327	9.79e-06	0.0689	0.0761	0.8789
	(0.00103)	(0.00119)	(0.00106)	(0.00106)	(0.00096)	(0.00102)	(0.00095)	(0.00099)	(0.00104)	(0.00098)	(0.00112)	(0.00104)	(2.19e-06)	(0.0113)	(0.0139)	(0.0126)
	[1.945]***	[1.279]	[0.601]	[1.521]	[2.427]**	[0.886]	[0.641]	[0.818]	[1.265]	[1.318]	[2.443]**	[3.138]*	[4.465]*	[6.105]*	[5.471]*	[69.990]*
CANADA EGARCH	0.00057	0.00115	8.56e-05	0.00022	0.00107	-7.74e-05	0.00070	0.00038	0.00034	0.00063	0.00040	0.00115	-0.2081	0.1010	-0.0761	0.9862
	(0.00047)	(0.00053)	(0.00053)	(0.00060)	(0.00056)	(0.00053)	(0.00054)	(0.00053)	(0.00049)	(0.00056)	(0.00060)	(0.00051)	(0.0377)	(0.0180)	(0.0134)	(0.0035)
	[1.215]	[2.165]**	[0.160]	[0.369]	[1.930]***	[-0.145]	[1.313]	[0.720]	[0.694]	[1.119]	[0.674]	[2.247]**	[-5.513]*	[5.606]*	[-5.674]*	[279.91]*

CHILE EGARCH	0.00085 (0.00078) [1.091]	0.00216 (0.00067) [3.219]*	2.04e-05 (0.00077) [0.026]	0.00043 (0.00074) [0.577]	0.00065 (0.00073) [0.885]	0.00135 (0.00076) [1.765]***	0.00049 (0.00070) [0.703]	0.00094 (0.00060) [1.559]	0.00076 (0.00083) [0.920]	0.00136 (0.00068) [2.006]**	0.00021 (0.00078) [0.276]	0.00094 (0.00085) [1.109]	-0.8265 (0.1373) [-6.016]*	0.2819 (0.0457) [6.169]*	-0.1055 (0.0224) [-4.704]*	0.9369 (0.0130) [71.575]*
CHINA EGARCH	0.00137 (0.00082) [1.675]***	-7.20e-05 (0.00107) [-0.067]	0.00073 (0.00070) [1.042]	0.00185 (0.00072) [2.550]**	0.00111 (0.00089) [1.245]	-0.00071 (0.00078) [-0.917]	-0.00020 (0.00073) [-0.282]	0.00012 (0.00066) [0.193]	-0.00132 (0.00068) [-1.95]**	-0.00087 (0.00083) [-1.048]	0.00060 (0.00071) [0.842]	-8.21e-05 (0.00066) [-0.122]	-0.3979 (0.0684) [-5.811]*	0.2261 (0.0260) [8.669]*	-0.0615 (0.0140) [-4.379]*	0.9726 (0.0069) [140.38]*
CROATIA EGARCH	0.00087 (0.00065) [1.348]	-0.00039 (0.00081) [-0.484]	0.00114 (0.00066) [1.711]***	0.00246 (0.00046) [5.289]*	-0.00045 (0.00072) [-0.621]	4.25e-05 (0.00090) [0.046]	0.00092 (0.00063) [1.455]	0.00066 (0.00074) [0.893]	0.00138 (0.00051) [2.731]*	0.00280 (0.00046) [6.015]*	0.00131 (0.00091) [1.438]	0.00037 (0.00058) [0.643]	-0.3889 (0.0254) [-15.273]*	0.2427 (0.0107) [22.514]*	-0.0338 (0.0061) [-5.461]*	0.9738 (0.0026) [369.21]*
DENMARK GJR-GARCH	0.00063 (0.00049) [1.300]	0.00040 (0.00048) [0.841]	-0.00007 (0.00049) [-0.135]	0.00056 (0.00058) [0.959]	0.00077 (0.00054) [1.426]	0.00052 (0.00048) [1.084]	0.00099 (0.00044) [2.238]**	0.00048 (0.00048) [1.012]	0.00033 (0.00049) [0.677]	0.00069 (0.00048) [1.449]	0.00056 (0.00051) [1.092]	0.00130 (0.00050) [2.608]*	2.53e-06 (5.39e-07) [4.702]*	0.0557 (0.0122) [4.575]*	0.0718 (0.0163) [4.406]*	0.8873 (0.0121) [73.117]*
EGYPT EGARCH	0.00092 (0.00030) [3.081]*	0.00151 (0.00027) [5.521]*	0.00047 (0.00059) [0.796]	-2.55e-05 (0.00040) [-0.063]	-0.00126 (0.00028) [-4.495]*	0.00025 (0.00051) [0.499]	2.88e-05 (0.00058) [0.049]	-0.00037 (0.00033) [-1.117]	8.00e-05 (0.00039) [0.203]	0.00067 (0.00038) [1.760]***	0.00014 (0.00042) [0.336]	0.00022 (0.00046) [0.486]	-0.4576 (0.0300) [-15.221]*	0.3179 (0.0145) [21.926]*	-0.0246 (0.0075) [-3.268]*	0.9756 (0.0026) [363.03]*
ESTONIA EGARCH	0.00090 (0.00053) [1.691]***	0.00121 (0.00064) [1.883]***	0.00136 (0.00054) [2.503]*	0.00017 (0.00051) [0.340]	-0.00017 (0.00043) [-0.392]	-3.67e-05 (0.00041) [-0.088]	0.00016 (0.00039) [0.424]	0.00132 (0.00043) [3.062]*	0.00110 (0.00045) [2.410]**	0.00034 (0.00055) [0.616]	0.00110 (0.00065) [1.697]***	0.00149 (0.00056) [2.644]*	-0.5005 (0.0960) [-5.210]*	0.3201 (0.0411) [7.785]*	-0.0061 (0.0182) [-0.335]	0.9697 (0.0089) [108.90]*
FINLAND EGARCH	0.00050 (0.00085) [0.586]	0.00226 (0.00081) [2.764]*	0.00111 (0.00073) [1.518]	0.00072 (0.00088) [0.814]	0.00040 (0.00097) [0.411]	0.00091 (0.00085) [1.073]	0.00067 (0.00075) [0.896]	-0.00046 (0.00086) [-0.531]	0.00138 (0.00080) [1.721]***	0.00262 (0.00088) [2.992]*	0.00146 (0.00090) [1.616]	-0.00035 (0.00108) [-0.331]	-0.1678 (0.0256) [-6.534]*	0.1454 (0.0175) [8.275]*	-0.0382 (0.0107) [-3.577]*	0.9929 (0.0023) [419.45]*
FRANCE EGARCH	0.00046 (0.00046) [1.005]	0.00074 (0.00048) [1.540]	0.00085 (0.00046) [1.853]***	0.00041 (0.00050) [0.822]	-0.00015 (0.00050) [-0.301]	-0.00053 (0.00048) [-1.122]	0.00018 (0.00047) [0.387]	7.62e-05 (0.00048) [0.157]	-0.00043 (0.00041) [-0.844]	0.00036 (0.00046) [0.784]	0.00033 (0.00049) [0.688]	0.00075 (0.00051) [1.460]	-0.2287 (0.0291) [-7.856]*	0.1157 (0.0123) [9.376]*	-0.0812 (0.0079) [-10.26]*	0.9845 (0.0028) [350.76]*

Table 3. (cont.) GARCH estimations of equations (2-4)

Countries	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8	β_9	β10	β11	β12	ω	α_1	γ	α_2
GERMANY EGARCH	0.00052 (0.00045) [1.147]	0.00117 (0.00047) [2.452]**	-0.00021 (0.00051) [-0.415]	0.00039 (0.00051) [0.762]	0.00065 (0.00047) [1.378]	-0.00012 (0.00047) [-0.254]	0.00096 (0.00046) [2.104]**	0.00024 (0.00051) [0.481]	-0.00042 (0.00047) [-0.890]	0.00072 (0.00049) [1.452]	0.00079 (0.00049) [1.608]	0.00160 (0.00052) [3.031]*	-0.2260 (0.0284) [-7.942]*	0.1366 (0.0138) [9.891]*	-0.0699 (0.0084) [-8.313]*	0.9866 (0.0026) [378.18]*
GREECE GJR-GARCH	0.00122 (0.00073) [1.665]***	-0.00036 (0.00077) [-0.461]	-0.00078 (0.00091) [-0.854]	0.00178 (0.00090) [1.989]**	0.00036 (0.00078) [0.460]	-0.00182 (0.00076) [-2.375]**	0.00101 (0.00076) [1.336]	0.00039 (0.00077) [0.508]	0.00007 (0.00081) [0.088]	0.00082 (0.00082) [0.990]	0.00118 (0.00076) [1.551]	0.00099 (0.00082) [1.205]	7.16e-06 (1.49e-06) [4.792]*	0.0940 (0.0165) [5.682]*	0.1014 (0.0231) [4.389]*	0.8364 (0.0156) [53.709]*
HONG KONG EGARCH	0.00112 (0.00049) [2.271]**	0.00156 (0.00055) [2.820]*	-0.00054 (0.00051) [-1.055]	0.00070 (0.00050) [1.269]	0.00109 (0.00050) [2.197]*	0.00027 (0.00050) [0.545]	0.00117 (0.00046) [2.539]**	7.30e-05 (0.00047) [0.155]	0.00049 (0.00050) [0.983]	0.00115 (0.00051) [2.229]**	0.00095 (0.00050) [1.894]***	0.00100 (0.00053) [1.864]***	-0.2951 (0.0324) [-9.094]*	0.1613 (0.0138) [11.610]*	-0.0584 (0.0083) [-7.045]*	0.9796 (0.0031) [308.02]*
INDIA GJR-GARCH	-0.00019 (0.00079) [-0.239]	0.00148 (0.00079) [1.857]***	-0.00067 (0.00091) [-0.736]	-0.00021 (0.00094) [-0.223]	0.00134 (0.00092) [1.456]	0.00095 (0.00087) [1.094]	0.00110 (0.00079) [1.397]	0.00093 (0.00078) [1.201]	0.00153 (0.00080) [1.929]***	-0.00003 (0.00079) [-0.038]	0.00232 (0.00085) [2.723]*	0.00260 (0.00081) [3.203]*	1.19e-05 (2.15e-06) [5.547]*	0.0536 (0.0184) [2.922]*	0.1731 (0.0280) [6.192]*	0.8167 (0.0195) [41.956]*
INDONESIA GJR-	0.00143 (0.00083)	-0.00019 (0.00085)	0.00066 (0.00082)	0.00163 (0.00087)	0.00225 (0.00089)	0.00073 (0.00082)	0.00064 (0.00072)	-0.00158 (0.00084)	0.00100 (0.00091)	0.00022 (0.00086)	0.00179 (0.00081)	0.00246 (0.00086)	1.92e-05 (3.41e-06)	0.0945 (0.0205)	0.1635 (0.0351)	0.7718 (0.0246)

GARCH	[1.715]***	[-0.217]	[0.810]	[1.876]***	[2.541]**	[0.883]	[0.880]	[-1.86]***	[1.097]	[0.252]	[2.222]**	[2.846]*	[5.640]*	[4.607]*	[4.661]*	[31.359]*
IRELAND EGARCH	2.67e-05 (0.00021) [0.128]	1.42e-05 (0.00023) [0.059]	-2.85e-07 (0.00025) [-0.011]	1.82e-05 (0.00025) [0.071]	9.88e-07 (0.00026) [0.003]	1.06e-05 (0.00026) [-0.004]	0.00032 (0.00022) [1.420]	-5.36e-07 (0.00025) [-0.002]	-1.51e-05 (0.00025) [-0.059]	1.78e-05 (0.00025) [0.071]	1.01e-05 (0.00026) [0.037]	0.00057 (0.00024) [2.397]**	-0.0605 (0.0079) [-7.652]*	0.1332 (0.0234) [5.678]*	-0.0843 (0.0156) [-5.396]*	0.9978 (0.0094) [1061.1]*
ISRAEL EGARCH	-0.00073 (0.00086) [-0.846]	0.00062 (0.00081) [0.765]	0.00105 (0.00080) [1.316]	0.00204 (0.00094) [2.159]**	0.00126 (0.00088) [1.428]	-0.00068 (0.00086) [-0.799]	-7.29e-05 (0.00074) [-0.097]	-0.00097 (0.00077) [-1.248]	-0.00016 (0.00078) [-0.208]	0.00201 (0.00085) [2.365]**	0.00187 (0.00089) [2.103]**	0.00185 (0.00079) [2.331]**	-0.8120 (0.1504) [-5.398]*	0.1909 (0.0287) [6.634]*	-0.1133 (0.0188) [-6.014]*	0.9222 (0.0164) [56.052]*
ITALY EGARCH	0.00086 (0.00039) [2.155]**	0.00121 (0.00051) [2.369]**	0.00017 (0.00056) [0.312]	0.00052 (0.00054) [0.973]	-0.00029 (0.00057) [-0.514]	-0.00056 (0.00053) [-1.052]	-0.00033 (0.00053) [-0.620]	-4.50e-05 (0.00049) [-0.092]	0.00036 (0.00055) [0.819]	0.00052 (0.00051) [1.028]	0.00064 (0.00046) [1.397]	0.00059 (0.00045) [1.291]	-0.1991 (0.0290) [-6.848]*	0.0846 (0.0169) [4.985]*	-0.1124 (0.0103) [-10.90]*	0.9861 (0.0025) [395.62]*
JAPAN EGARCH	0.00030 (0.00035) [0.844]	0.00081 (0.00039) [2.060]**	0.00165 (0.00035) [4.695]*	0.00050 (0.00044) [1.124]	5.46e-05 (0.00044) [0.123]	9.32e-07 (0.00039) [0.002]	-0.000101 (0.00039) [-0.255]	2.23e-05 (0.00040) [0.055]	4.49e-05 (0.00037) [0.119]	3.68e-06 (0.00039) [0.009]	0.00045 (0.00040) [1.114]	0.00079 (0.00041) [1.936]***	-0.3215 (0.0298) [-10.76]*	0.1681 (0.0133) [12.554]*	-0.0918 (0.0085) [-10.772]*	0.9784 (0.0028) [344.85]*
JORDAN EGARCH	0.00026 (0.00031) [0.841]	0.00015 (0.00031) [0.495]	-0.00074 (0.00027) [-2.681]*	-0.00031 (0.00033) [-0.949]	0.00057 (0.00033) [1.710]	-0.00018 (0.00031) [-0.581]	-0.00075 (0.00033) [-2.248]**	-1.86e-05 (0.00028) [-0.065]	0.00027 (0.00029) [0.944]	-0.00013 (0.00030) [-0.428]	0.00011 (0.00030) [0.372]	0.00012 (0.00029) [0.415]	-0.9031 (0.088) [-10.26]*	0.4637 (0.0299) [15.478]*	0.0128 (0.0151) [0.852]	0.9412 (0.0080) [117.10]*
KUWAIT EGARCH	0.00092 (0.00042) [2.208**	0.00073 (0.00045) [1.638]	0.00180 (0.00051) [3.515]*	0.00208 (0.00056) [3.672]*	0.00090 (0.00057) [1.563]	0.00071 (0.00048) [1.481]	0.00082 (0.00052) [1.569]	0.00078 (0.00049) [1.590]	0.00067 (0.00044) [1.505]	0.00104 (0.00046) [2.254]**	0.00098 (0.00050) [1.959]**	0.00117 (0.00043) [2.742]*	-1.0117 (0.1430) [-7.072]*	0.3711 (0.0397) [9.327]*	-0.1072 (0.0213) [-5.032]*	0.9246 (0.0136) [67.797]*
LATVIA EGARCH	0.00070 (0.00048) [1.456]	-0.00031 (0.00053) [-0.578]	0.00084 (0.00055) [1.548]	0.00098 (0.00050) [1.933]***	-0.00077 (0.00052) [-1.473]	0.00054 (0.00046) [1.179]	0.00114 (0.00055) [2.086]**	0.00064 (0.00059) [1.092]	0.00078 (0.00055) [1.434]	3.37e-05 (0.00054) [0.062]	0.00070 (0.00059) [1.194]	0.00101 (0.00050) [2.009]**	-1.0211 (0.1337) [-7.635]*	0.4843 (0.0485) [9.979]*	-0.0324 (0.0255) [-1.271]	0.9209 (0.0134) [68.376]*
LITHUANIA GJR-	0.00097 (0.00048)	0.00087 (0.00056)	0.00161 (0.00050)	0.00002 (0.00053)	-0.00046 (0.00052)	-0.00027 (0.00052)	0.00015 (0.00050)	0.00094 (0.00049)	0.00174 (0.00054)	0.00053 (0.00052)	0.00136 (0.00055)	0.00094 (0.00053)	1.56e-05 (2.83e-06)	0.2184 (0.0460)	0.1643 (0.0633)	0.5666 (0.0512)

GARCH	[2.019]**	[1.544]	[3.223]*	[0.037]	[-0.894]	[-0.524]	[0.300]	[1.923]***	[3.242]*	[1.020]	[2.479]**	[1.785]***	[5.513]*	[4.748]*	[2.595]*	[11.072]*
LUXEMBURG	-0.00124	-0.00086	-0.00023	0.0003	9.20e-05	0.00017	-0.0005	-7.54e-05	6.98e-05	-2.83e-05	0.00283	0.00305	4.92e-08	0.1620		0.8771
	(0.00045)	(0.00068)	(0.00061)	(0.00055)	(0.00055)	(0.00057)	(0.00039)	(0.00075)	(0.00047)	(0.00044)	(0.000108)	(0.00043)	(7.42e-09)	(0.0007)		(0.0035)
GARCH	[-2.744]*	[-1.258]	[-0.379]	[0547]	[0.167]	[0.309]	[-1.281]	[-0.001]	[0.148]	[-0.063]	[26.256]*	[7.117]*	[6.634]*	[23.186]*		[244.61]*

Table 3. (cont.) GARCH estimations of equations (2-4)

Countries	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8	β_9	$\beta 10$	$\beta 11$	$\beta 12$	ω	α_1	γ	α_2
MALAYSIA	0.00098	0.00038	-0.00055	0.00050	-0.00050	9.36e-06	0.00027	-0.00015	-0.00020	0.00024	0.00027	0.00091	-0.3382	0.2373	-0.0580	0.9821
EGARCH	(0.00045)	(0.00054)	(0.00042)	(0.00045)	(0.00047)	(0.00045)	(0.00044)	(0.00039)	(0.00039)	(0.00036)	(0.00040)	(0.00046)	(0.0374)	(0.0202)	(0.0105)	(0.0033)
	[2.172]**	[0.702]	[-1.313]	[1.124]	[-1.077]	[0.020]	[0.615]	[-0.395]	[-0.505]	[0.699]	[0.674]	[1.965]**	[-9.027]*	[11.743]*	[-5.509]*	[296.99]*
MEXICO	0.00141	0.00085	0.00125	0.00011	0.00043	3.45e-05	0.00042	0.00016	0.00073	0.00138	0.00172	0.00201	-0.4344	0.1921	-0.1041	0.9663
EGARCH	(0.00058)	(0.00061)	(0.00065)	(0.00062)	(0.00062)	(0.00062)	(0.00054)	(0.00061)	(0.00062)	(0.00062)	(0.00065)	(0.00060)	(0.0483)	(0.0180)	(0.0102)	(0.0049)
	[2.409]**	[1.373]	[1.907]***	[0.181]	[0.700]	[0.055]	[0.783]	[0.262]	[1.174]	[2.209]**	[2.658]	[3.329]*	[-8.978]*	[10.667]*	[-10.191]*	[194.62]*
NETHERLANDS	0.00034	0.00090	0.00024	0.00062	0.00002	0.00045	0.00097	0.00032	-0.00016	0.00031	0.00069	0.00128	1.55e-06	0.0243	0.1084	0.9095
	(0.00043)	(0.00047)	(0.00046)	(0.00051)	(0.00048)	(0.00048)	(0.00046)	(0.00048)	(0.00048)	(0.00045)	(0.00049)	(0.00046)	(2.82e-07)	(0.0098)	(0.0134)	(0.0083)
GJR-GARCH	[0.777]	[1.939]***	[0.525]	[1.210]	[0.044]	[0.944]	[2.142]**	[0.655]	[-0.343]	[0.699]	[1.421]	[2.785]*	[5.477]*	[2.477]**	[8.116]*	[109.07]*
NEW ZEALAND	-0.0002	0.0007	0.0010	0.0007	0.0000	0.0002	0.0005	-0.0010	0.0011	-0.0001	0.0005	0.0011	-0.2321	0.0694	-0.0669	0.9824
EGARCH	(0.0006)	(0.0005)	(0.0006)	(0.0008)	(0.0004)	(0.0005)	(0.0006)	(0.0005)	(0.0006)	(0.0006)	(0.0005)	(0.0006)	(0.0700)	(0.0244)	(0.0152)	(0.0062)

	[-0.282]	[1.254]	[1.558]	[0.856]	[-0.058]	[0.437]	[0.770]	[-1.94]***	[1.959]***	[-0.088]	[1.006]	[1.820]***	[-3.313]*	[2.839]*	[-4.415]*	[158.16]*
NORWAY	0.00081	0.00114	0.00047	0.00161	0.00165	0.00095	0.00011	-0.00005	0.00012	0.00197	0.00106	0.00121	1.31e-05	0.0188	0.2099	0.7819
GJR-GARCH	(0.00081)	(0.00083)	(0.00077)	(0.00075)	(0.00082)	(0.00084)	(0.00077)	(0.00080)	(0.00088)	(0.00084)	(0.00086)	(0.00086)	(2.45e-06)	(0.0215)	(0.0359)	(0.0294)
	[1.004]	[1.370]	[0.605]	[2.154]**	[2.011]**	[1.133]	[0.148]	[-0.059]	[0.135]	[2.347]**	[1.228]	[1.405]	[5.361]*	[0.878]	[5.852]*	[26.617]*
PAKISTAN	0.00342	0.00180	0.00107	0.00226	-0.00032	0.00175	0.00044	0.00076	0.00107	0.00308	0.00108	0.00308	1.24e-05	0.1801	0.0860	0.7526
	(0.00081)	(0.00082)	(0.00088)	(0.00072)	(0.00087)	(0.00098)	(0.00070)	(0.00074)	(0.00075)	(0.00070)	(0.00088)	(0.00078)	(2.40e-06)	(0.0323)	(0.0388)	(0.0250)
GJR-GARCH	[4.230]*	[2.190]**	[1.217]	[3.124]*	[-0.364]	[1.788]***	[0.638]	[1.031]	[1.417]	[4.381]*	[1.230]	[3.940]*	[5.157]*	[5.584]*	[2.215]**	[30.118]
PERU	0.00246	0.00111	0.00079	-0.00018	0.00051	-0.00075	0.00029	0.00061	0.00193	0.00081	0.00103	0.00063	8.13e-06	0.2203	0.0631	0.7096
	(0.00064)	(0.00060)	(0.00053)	(0.00068)	(0.00058)	(0.00059)	(0.00053)	(0.00058)	(0.00060)	(0.00058)	(0.00056)	(0.00063)	(1.43e-06)	(0.0331)	(0.0375)	(0.0266)
GJR-GARCH	[3.860]*	[1.847]***	[1.497]	[-0.258]	[0.882]	[-1.264]	[0.544]	[1.045]	[3.223]*	[1.399]	[1.846]***	[0.997]	[5.691]*	[6.665]*	[1.682]***	[26.652]*
PHILLIPINE	0.00160	-0.00053	-0.00035	0.00017	-0.00047	-0.00029	-0.00106	-0.00139	0.00057	-0.00082	-0.00059	0.00178	1.36e-05	0.1197	0.0760	0.7893
	(0.00081)	(0.00086)	(0.00079)	(0.00077)	(0.00078)	(0.00082)	(0.00074)	(0.00080)	(0.00077)	(0.00078)	(0.00080)	(0.00080)	(2.73e-06)	(0.0221)	(0.0280)	(0.0244)
GJR-GARCH	[1.986]**	[-0.612]	[-0.438]	[0.221]	[-0.600]	[-0.352]	[-1.436]	[-1.72]***	[0.746]	[-1.054]	[-0.732]	[2.231]**	[4.993]*	[5.413]*	[2.712]*	[32.300]*
PORTUGAL	0.00103	0.00197	0.00036	0.00081	0.00130	-0.00015	0.00039	0.00098	0.00097	0.00006	0.00072	0.00160	1.83e-06	0.0066	0.2763	0.8330
	(0.00052)	(0.00058)	(0.00060)	(0.00046)	(0.00046)	(0.00069)	(0.00055)	(0.00049)	(0.00058)	(0.00052)	(0.00053)	(0.00050)	(5.00e-07)	(0.0185)	(0.0581)	(0.0255)
GJR-GARCH	[1.977]**	[3.389]*	[0.596]	[1.761]***	[2.802]*	[-0.211]	[0.711]	[1.995]**	[1.676]***	[0.106]	[1.364]	[3.226]*	[3.669]*	[0.357]	[4.751]*	[32.634]*
RUSSIA	0.00111	0.00334	0.00040	0.00175	0.00155	0.00209	0.00088	0.00290	0.00002	0.00245	0.00158	0.00191	2.07e-05	0.1757	0.0384	0.7892
	(0.00096)	(0.00122)	(0.00124)	(0.00106)	(0.00134)	(0.00122)	(0.00119)	(0.00126)	(0.00117)	(0.00107)	(0.00117)	(0.00098)	(1.95e-06)	(0.0150)	(0.0161)	(0.0103)

GJR-GARCH	[1.158]	[2.746]*	[0.319]	[1.647]***	[1.159]	[1.710]***	[0.736]	[2.300]**	[0.017]	[2.290]**	[1.354]	[1.940]***	[10.607]*	[11.688]*	[2.382]**	[76.414]*
SINGAPORE	0.00189	-0.00068	-0.00029	-0.00021	-0.00022	-0.00059	-0.00095	-0.00142	0.00046	-0.00063	-0.00084	0.00187	1.34e-05	0.1213	0.0731	0.7900
	(0.00078)	(0.00084)	(0.00078)	(0.00076)	(0.00078)	(0.00083)	(0.00073)	(0.00081)	(0.00076)	(0.00079)	(0.00079)	(0.00080)	(2.76e-06)	(0.0222)	(0.0280)	(0.0243)
GJR-GARCH	[2.427]**	[-0.813]	[-0.372]	[-0.277]	[-0.284]	[-0.708]	[-1.308]	[-1.75]***	[0.607]	[-0.802]	[-1.060]	[2.349]**	[5.001]*	[5.451]*	[2.613]*	[32.551]*
SOUTH KOREA	0.00020	0.00143	-0.00020	0.00165	0.00164	0.00019	0.00111	0.00044	0.00040	0.00037	0.00274	0.00062	2.27e-06	0.0400	0.0606	0.9256
	(0.00093)	(0.00100)	(0.00099)	(0.00090)	(0.00098)	(0.00094)	(0.00090)	(0.00089)	(0.00090)	(0.00108)	(0.00102)	(0.00101)	(7.40e-07)	(0.0109)	(0.0139)	(0.0095)
GJR-GARCH	[0.214]	[1.434]	[-0.198]	[1.838]***	[1.677]***	[0.198]	[1.232]	[0.501]	[0.440]	[0.341]	[2.681]*	[0.613]	[3.067]*	[3.669]*	[4.348]*	[97.619]*
SPAIN	0.00051	0.00169	-0.00030	0.00083	0.00045	0.00016	-0.00014	-0.00054	0.00127	0.00088	0.00118	0.00135	-0.2737	0.1694	-0.0757	0.9842
EGARCH	(0.00052)	(0.00051)	(0.00061)	(0.00060)	(0.00056)	(0.00055)	(0.00054)	(0.000570	(0.00048)	(0.00055)	(0.00053)	(0.00058)	(0.0392)	(0.0178)	(0.0101)	(0.0036)
	[0.975]	[3.303]*	[-0.487]	[1.371]	[0.801]	[0.293]	[-0.254]	[-0.947]	[2.673]*	[1.604]	[2.226]**	[2.350]**	[-6.989]*	[9.518]*	[-7.477]*	[271.77]*
SRI LANKA	-0.00002	0.00125	-0.00041	0.00061	0.00036	-0.00023	0.00052	-0.00082	0.00143	-0.00011	0.00054	0.00060	-1.6124	0.5905	-0.0358	0.8729
EGARCH	(0.00051)	(0.00049)	(0.00042)	(0.00052)	(0.00048)	(0.00048)	(0.00043)	(0.00046)	(0.00044)	(0.00047)	(0.00053)	(0.00051)	(0.1751)	(0.0435)	(0.0238)	(0.0173)
	[-0.038]	[2.575]*	[-0.961]	[1.171]	[0.751]	[-0.487]	[1.203]	[-1.80]***	[3.292]*	[-0.240]	[1.022]	[1.190]	[-9.210]*	[13.566]*	[-1.501]	[50.323]*

Table 3. (cont.) GARCH estimations of equations (2-4)

Countries	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8	β_9	β_{10}	β_{11}	β_{12}	ω	α_1	γ	α_2
	0.00047	0.00152	0.00004	0.00017	-0.00028	-0.00077	0.00042	-0.00040	0.00114	0.00003	0.00061	0.00030	1.71e-06	-0.0163	0.1265	0.9402
SWEDEN	(0.00063)	(0.00064)	(0.00080)	(0.00067)	(0.00069)	(0.00082)	(0.00069)	(0.00067)	(0.00066)	(0.00070)	(0.00079)	(0.00080)	(2.89e-07)	(0.0082)	(0.0121)	(0.0075)

GJR-GARCH	[0.754]	[2.390]**	[0.054]	[0.246]	[-0.405]	[-0.948]	[0.604]	[-0.603]	[1.722]***	[0.041]	[0.767]	[0.375]	[5.913]*	[-1.993]**	[10.484]*	[124.87]*
SWITZERLAND EGARCH	0.00036 (0.00041) [0.889]	0.00108 (0.00040) [2.689]*	0.00033 (0.00044) [0.755]	0.00023 (0.00044) [0.536]	0.00084 (0.00042) [1.994]**	-0.00004 (0.00039) [-0.106]	0.00078 (0.00039) [2.026]**	0.00013 (0.00041) [0.324]	0.00030 (0.00041) [0.724]	0.00070 (0.00045) [1.544]	0.00069 (0.00043) [1.608]	0.00142 (0.00041) [3.443]*	-0.3229 (0.0414) [-7.805]*	0.1516 (0.0162) [9.334]*	-0.0868 (0.0094) [-9.222]*	0.9781 (0.0037) [261.73]*
TAIWAN EGARCH	0.00104 (0.00080) [1.307]	0.00136 (0.00091) [1.496]	-0.00015 (0.00081) [-0.186]	-0.00009 (0.00079) [-0.108]	-0.00019 (0.00078) [-0.238]	0.00149 (0.00074) [2.009]**	0.00006 (0.00072) [0.080]	-0.00043 (0.00080) [-0.542]	-0.00118 (0.00080) [-1.477]	0.00006 (0.00078) [0.082]	0.00110 (0.00080) [1.382]	0.00112 (0.00081) [1.389]	-0.2839 (0.0451) [-6.297]*	0.1443 (0.0189) [7.652]*	-0.0753 (0.0112) [-6.743]*	0.9796 (0.0045) [216.25]*
THAILAND GJR-GARCH	0.00265 (0.00129) [2.058]**	-0.00151 (0.00137) [-1.097]	-0.00276 (0.00137) [-2.019]**	0.00004 (0.00135) [0.027]	0.00055 (0.00146) [0.377]	0.00129 (0.00142) [0.912]	-0.00340 (0.00143) [-2.372]**	-0.00092 (0.00132) [-0.696]	-0.00156 (0.00130) [-1.202]	0.00079 (0.00136) [0.577]	0.00065 (0.00129) [0.506]	0.00131 (0.00146) [0.896]	1.53e-05 (4.48e-06) [3.426]*	0.0882 (0.0200) [4.420]*	0.0744 (0.0304) [2.445]**	0.8381 (0.0270) [31.087]*
TURKEY GARCH	0.0074 (0.00147) [0.545]	0.00112 (0.00148) [0.757]	-0.00148 (0.00141) [-1.047]	0.00282 (0.00168) [1.680]***	-0.00128 (0.00151) [-0.845]	-0.00028 (0.00147) [-0.195]	0.0024 (0.0013) [1.851]***	-1.13e-05 (0.0015) [-0.007]	0.00342 (0.0011) [3.116]*	0.00351 (0.00105) [3.323]*	0.00058 (0.00148) [0.395]	0.003 (0.00176) [1.698]***	8.65e-06 (1.90e-06) [4.540]*	0.1029 (0.0083) [12.305]*		0.8920 (0.0076) [116.93]*
UK-FTSE 100 GJR-GARCH	0.00054 (0.00033) [1.670]***	0.00047 (0.00036) [1.319]	0.00023 (0.00034) [0.675]	0.00047 (0.00038) [1.225]	0.00016 (0.00036) [0.456]	-0.00008 (0.00034) [-0.249]	0.00042 (0.00035) [1.208]	0.00068 (0.00037) [1.843]***	-0.00009 (0.00035) [-0.263]	0.00050 (0.00036) [1.390]	0.00035 (0.00037) [0.950]	0.00101 (0.00038) [2.637]*	1.62e-06 (2.64e-07) [6.120]*	0.0341 (0.0078) [4.347]*	0.0786 (0.0104) [7.560]*	0.9087 (0.0078) [116.82]*
UK-FTSE 250	0.00027	0.00075	0.00025	0.00036	0.00088	0.00026	0.00009	0.00123	0.00007	0.00067	0.00073	0.00126	-0.3986	0.2017	-0.0863	0.9749

EGARCH	(0.00037) [0.734]	(0.00047) [1.589]	(0.00052) [0.471]	(0.00050) [0.717]	(0.00048) [1.822]***	(0.00052) [0.497]	(0.00047) [0.180]	(0.00051) [2.435]*	(0.00046) [0.146]	(0.00058) [1.160]	(0.00054) [1.353]	(0.00055) [2.281]*	(0.0595) [-6.700]*	(0.0247) [8.178]*	(0.0134) [-6.451]*	(0.0054) [181.42]*
US DOW JONES COMPOSITE EGARCH	0.00085 0.00028 (3.002)*	0.00056 (0.00031) [1.794]***	0.00031 (0.00029) [1.052]	0.00060 (0.00032) [1.893]***	0.00042 (0.00030) [1.388]	-0.00007 (0.00030) [-0.247]	0.00055 (0.00030) [1.833]***	0.00015 (0.00030) [0.509]	-0.00036 (0.00031) [-1.167]	0.00083 (0.00030) [2.801]*	0.00073 (0.00032) [2.251]**	0.00049 (0.00030) [1.631]	-0.2232 (0.0278) [-8.018]*	0.1007 (0.0102) [9.861]*	-0.0579 (0.0068) [-8.493]*	0.9846 (0.0026) [384.87]*
US NASDAQ 100 EGARCH	0.00148 (0.00026) [5.726]*	0.00080 (0.00027) [2.935]*	0.00087 (0.00024) [3.568]*	0.00117 (0.00023) [5.023]*	0.00081 (0.00024) [3.333]*	0.00062 (0.00024) [2.616]*	0.00056 (0.00023) [2.469]**	0.00072 (0.00024) [3.052]*	0.00030 (0.00024) [1.263]	0.00046 (0.00025) [1.849]***	0.00125 (0.00028) [4.508]*	0.00104 (0.00026) [3.983]*	-0.2231 (0.0181) [-12.298]*	0.1721 (0.0101) [16.994]*	-0.0425 (0.0051) [-8.289]*	0.9905 (0.0015) [645.22]*
US NEW YORK COMPOSITE EGARCH	0.00062 (0.00020) [3.106]*	0.00028 (0.00022) [1.292]	0.00045 (0.00021) [2.132]**	0.00062 (0.00022) [2.816]*	0.00026 (0.00022) [1.199]	-0.00004 (0.00022) [-0.173]	0.00027 (0.00022) [1.221]	0.00022 (0.00021) [1.035]	0.00021 (0.00021) [0.997]	0.00025 (0.00021) [1.195]	0.00076 (0.00024) [3.209]*	0.00060 (0.00022) [2.706]*	-0.2259 (0.0199) [-11.338]*	0.1144 (0.0083) [13.760]*	-0.0653 (0.0050) [-12.971]*	0.9857 (0.0018) [562.61]*
US – S&P 500 EGARCH	0.00061 (0.00017) [3.508]*	-0.00003 (0.00018) [-0.162]	0.00041 (0.00017) [2.503]**	0.00075 (0.00017) [4.404]*	0.00037 (0.00017) [2.175]**	0.00007 (0.00018) [0.390]	0.00056 (0.00018) [3.092]*	0.00014 (0.00018) [0.783]	0.00034 (0.00017) [2.018]**	0.00041 (0.00017) [2.347]**	0.00072 (0.00019) [3.695]*	0.00053 (0.00018) [2.946]*	-0.2107 (0.0158) [-13.305]*	0.1235 (0.0072) [17.166]*	-0.0663 (0.0044) [-15.086]*	0.9881 (0.0014) [721.77]*
YUGOSLAVIA GJR-GARCH	0.00142 (0.00121) [1.169]	0.00126 (0.00115) [1.098]	0.00104 (0.00115) [0.910]	-0.00080 (0.00133) [-0.600]	-0.00168 (0.00123) [-1.375]	-0.00230 (0.00106) [-2.165]**	0.00172 (0.00116) [1.485]	-0.00068 (0.00095) [-0.711]	-0.00106 (0.00122) [-0.868]	-0.00004 (0.00084) [-0.048]	0.00066 (0.00102) [0.643]	0.00196 (0.00097) [2.022]**	1.54e-05 (4.39e-06) [3.498]*	0.4828 (0.1048) [4.608]*	0.0433 (0.1182) [0.366]	0.5110 (0.0582) [8.775]*
ZAMBIA EGARCH	0.00278 (0.00034)	0.00375 (0.00042)	0.00053 (0.00072)	0.00109 (0.00027)	0.00164 (0.00033)	0.00145 (0.00050)	-0.00039 (0.00052)	0.00388 (0.00039)	0.00008 (0.00107)	-0.00108 (0.00049)	0.00096 (0.00056)	0.00001 (0.00063)	-0.9933 (0.0805)	0.2945 (0.0179)	-0.0818 (0.0150)	0.9075 (0.0084)

[8.284]*	[8.910]*	[0.728]	[4.020]*	[4.973]*	[2.907]*	[-0.752]	[9.914]*	[0.077]	[-2.200]**	[1.703]***	[0.009]	[-12.334]*	[16.420]*	[-5.454]*	[107.67]*	

*denotes significance in 0.01 level , **denotes significance in 0.05 level *** denotes significance in 0.10 level - standard errors in parentheses, z-statistics in brackets.

Table 4. Diagnostic tests of GARCH estimations

Countries	R^2adj.	AIC	SBC	LL	$LBQ^2(12)$	ARCH-LM (5)	Countries	R^2adj.	AIC	SBC	LL	$LBQ^2(12)$	ARCH-LM (5)
ARGENTINA GJR-GARCH	0.0001905	-5.160	-5.125	7664.433	14.161 {0.291}	1.102 {0.3562}	INDIA GJR-GARCH	0.001094	-5.593	-5.557	7808.594	9.204 {0.685}	0.332 {0.8935}
AUSTRALIA EGARCH	-0.000303	-6.890	-6.871	21081.61	6.9416 {0.861}	1.389 {0.2246}	INDONESIA GJR-GARCH	0.005046	-5.555	-5.518	7608.255	5.217 {0.950}	0.418 {0.8365}
AUSTRIA GJR-GARCH	0.004281	-6.418	-6.391	12622.61	9.651 {0.646}	0.780 {0.5634}	IRELAND EGARCH	-0.000083	-6.721	-6.703	22001.48	1047.8 {0.000}	107.472 {0.000}

BELGIUM					17.508	1.459	ISRAEL					13.675	1.833
EGARCH	-0.004098	-6.602	-6.515	3117.079	{0.131}	{0.2007}	EGARCH	0.005664	-5.796	-5.754	6770.230	{0.316}	{0.1029}
BRAZIL					15.103	1.355	ITALY					10.437	0.694
GJR-GARCH	0.000555	-4.878	-4.850	9327.323	{0.236}	{0.2380}	EGARCH	0.000296	-6.491	-6.448	7326.350	{0.578}	{0.6278}
CANADA					13.640	0.423	JAPAN					5.360	0.927
EGARCH	-0.000579	-6.542	-6.498	7252.581	{0.324}	{0.8324}	EGARCH	-0.000533	-6.066	-6.047	18485.11	{0.945}	{0.4616}
CHILE					13.369	0.939	JORDAN					6.581	0.839
EGARCH	0.001048	-6.672	-6.599	4007.030	{0.343}	{0.4544}	EGARCH	-0.002495	-6.943	-6.917	14262.29	{0.884}	{0.5215}
CHINA					8.779	0.197	KUWAIT					7.943	0.369
EGARCH	-0.000383	-5.723	-5.685	7539.898	{0.722}	{0.9635}	EGARCH	0.000475	-6.912	-6.862	6552.565	{0.790}	{0.8698}
CROATIA					1.315	0.125	LATVIA					3.220	0.294
EGARCH	0.001665	-5.856	-5.821	8569.988	{1.000}	{0.9867}	EGARCH	0.002417	-6.401	-6.357	7163.862	{0.994}	{0.9160}
DENMARK					11.445	1.071	LITHUANIA					1.282	0.202
GJR-GARCH	-0.000127	-6.403	-6.375	12256.91	{0.490}	{0.3741}	GJR-GARCH	-0.000020	-6.783	-6.738	7444.488	{1.000}	{0.9614}

EGYPT EGARCH	0.002470	-6.884	-6.840	7596.527	9.468 {0.663}	1.102 {0.3569}	LUXEMBURG GARCH	-0.001806	-5.306	-5.279	11316.96	1.3854 {1.000}	0.072 {0.9963}
ESTONIA EGARCH	0.003567	-6.850	-6.796	5912.008	5.187 {0.951}	0.155 {0.9784}	MALAYSIA EGARCH	0.001960	-6.316	-6.287	11570.24	8.552 {0.741}	1.209 {0.3020}
FINLAND EGARCH	0.000329	-5.317	-5.280	7084.155	4.905 {0.961}	0.648 {0.6630}	MEXICO EGARCH	0.001734	-5.686	-5.661	12007.48	21.384 {0.045}	3.064 {0.0091}
FRANCE EGARCH	0.002269	-6.059	-6.035	14229.10	8.778 {0.722}	1.304 {0.2589}	NETHERLAN DS GJR-GARCH	0.001468	-6.280	-6.253	12775.54	11.034 {0.526}	1.335 {0.2458}
GERMANY EGARCH	0.002016	-6.085	-6.060	13717.76	1.209 {1.000}	0.099 {0.9922}	NEW ZEALAND EGARCH	0.002838	-7.313	-7.231	3706.905	16.020 {0.190}	0.397 {0.8505}

GREECE GJR-GARCH	0.002824	-5.653	-5.616	7575.885	24.876 {0.015}	3.231 {0.0065}	NORWAY GJR-GARCH	0.002330	-6.081	-6.032	5870.386	9..838 {0.630}	0.163 {0.9759}
HONG KONG EGARCH	0.000714	-5.806	-5.786	15669.69	252.26 {0.000}	54.707 {0.000}	PAKISTAN GJR-GARCH	0.001115	-5.676	-5.637	7265.310	7.209 {0.843}	0.400 {0.8491}

Table 4. (cont.) Diagnostic tests of GARCH estimations

Countries	R^2adj.	AIC	SBC	LL	$LBQ^2(12)$	ARCH-LM(5)	Countries	R^2adj.	AIC	SBC	LL	$LBQ^2(12)$	ARCH-LM(5)
PERU GJR-GARCH	-0.000233	-6.367	-6.327	7836.431	12.074 {0.440}	1.095 {0.3605}	THAILAND GJR-GARCH	0.005109	-5.205	-5.148	4207.102	12.454 {0.410}	0.628 {0.6781}
PHILLIPINE GJR-GARCH	0.004395	-5.790	-5.752	7703.279	21.180 {0.048}	3.459 {0.0040}	TURKEY GARCH	0.005586	-4.574	-4.541	6081.203	14.358 {0.278}	0.900 {0.4794}
PORTUGAL GJR-GARCH	-0.005169	-7.192	-7.104	3386.642	11.639 {0.475}	1.036 {0.3945}	UK-FTSE 100 GJR-GARCH	0.001180	-6.583	-6.564	20389.16	25.488 {0.013}	3.255 {0.0061}
RUSSIA GJR-GARCH	-0.000042	-4.753	-4.723	7783.382	9.485 {0.661}	0.352 {0.8808}	UK-FTSE 250 EGARCH	0.002036	-6.793	-6.749	7523.809	8.577 {0.740}	0.448 {0.8149}
SINGAPORE					21.479	3.555	US DOW JONES					12.386	1.395

GJR-GARCH	0.005666	-5.798	-5.760	7714.159	{0.044}	{0.0033}	COMPOSITE EGARCH	0.001140	-6.683	-6.666	23424.66	{0.415}	{0.2224}
SOUTH KOREA GJR-GARCH	-0.000650	-5.198	-5.161	7203.808	5.258 {0.949}	0.386 {0.8584}	US NASDAQ 100 EGARCH	-0.000599	-6.634	-6.622	31522.97	71.570 {0.000}	12.500 {0.000}
SPAIN EGARCH	0.000909	-6.110	-6.079	10239.49	14.533 {0.268}	2.301 {0.0424}	US NEW YORK COMPOSITE EGARCH	0.000625	-6.883	-6.872	37052.48	16.776 {0.158}	2.369 {0.0217}
SRI LANKA EGARCH	0.002140	-6.644	-6.604	8295.616	21.645 {0.042}	1.685 {0.1346}	US – S&P 500 EGARCH	0.000722	-6.936	-6.927	51267.24	26.926 {0.008}	4.551 {0.0004}
SWEDEN GJR-GARCH	-0.002850	-6.061	-6.016	6095.232	8.439 {0.750}	0.612 {0.6902}	YUGOSLAVIA GJR-GARCH	0.005578	-6.173	-6.069	2341.67	8.176 {0.771}	1.247 {0.2852}
SWITZERLAND EGARCH	0.000447	-6.456	-6.432	14537.16	1.142 {1.000}	0.043 {0.9989}	ZAMBIA EGARCH	-0.003332	-6.229	-6.174	4902.757	12.983 {0.370}	0.270 {0.9293}
TAIWAN EGARCH	0.002320	-5.618	-5.581	7775.845	19.689 {0.073}	2.973 {0.0111}							

p-values in {}. AIC and SBC refer to Akaike and Schwarz information criteria, LL is the Log Likelihood, LBQ^2 is the Ljung-Box test on squared standardized residuals.