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"Tests of Financial Markets' Efficiency for Thirteen Small European Countries

By

Yochanan Shachmurove

UNIVERSITY of PENNSYLVANIA

Center for Analytic Research

in Economics and the Social Sciences

McNEIL BUILDING, 3718 LOCUST WALK

PHILADELPHIA, PA 19104-6297

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Yochanan Shachmurove

Departments of Economics

The City College of the City university of New York, and

The University of Pennsylvania

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Please send all correspondence to Professor Yochanan Shachmurove, Department of Economics, University of Pennsylvania, 3718 Locust Walk, Philadelphia, PA 19104-6297. Fax: 215-573-2057. Telephone numbers: 215-898-1090 (O), 610-645-9235 (H). Electronic Mail: yochanan@econ.sas.upenn.edu

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Abstract

This paper studies the characteristics of thirteen small European stock markets, in order to find international support for the presence of efficiency in financial markets. The thirteen bourses are located in Belgium, Denmark, Finland, Greece, Ireland, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and Turkey. The paper tests the Overreaction and Uncertain Information Hypotheses by examining the behavior of these markets over a 60-day period following positive or negative market disruptions. The conclusions are that for this particular time lag most small European stock markets operate under efficient conditions.

Key Words: Financial Market Efficiency; Europe; Overreaction and Uncertain Information Hypotheses; Belgium, Denmark, Finland, Greece, Ireland, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and Turkey; World Stock Index.

JEL Classifications: C3, D8, F3, F4, G0, G1, L8, O5, O52.

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I. Introduction

Financial agents interact with each other in a rational and efficient manner. A competitive environment, such as the one governing financial markets, fosters efficiency. New information is constantly being absorbed by investors and reflected in security returns. The instantaneous processing of data means that future rates of return cannot be predicted by past returns. These postulations have been codified under the Efficient Market Hypothesis (EMH).

This paper studies the characteristics of thirteen small European stock markets, in order to find international support for the presence of efficiency in financial markets. The thirteen bourses are located in Belgium, Denmark, Finland, Greece, Ireland, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and Turkey.

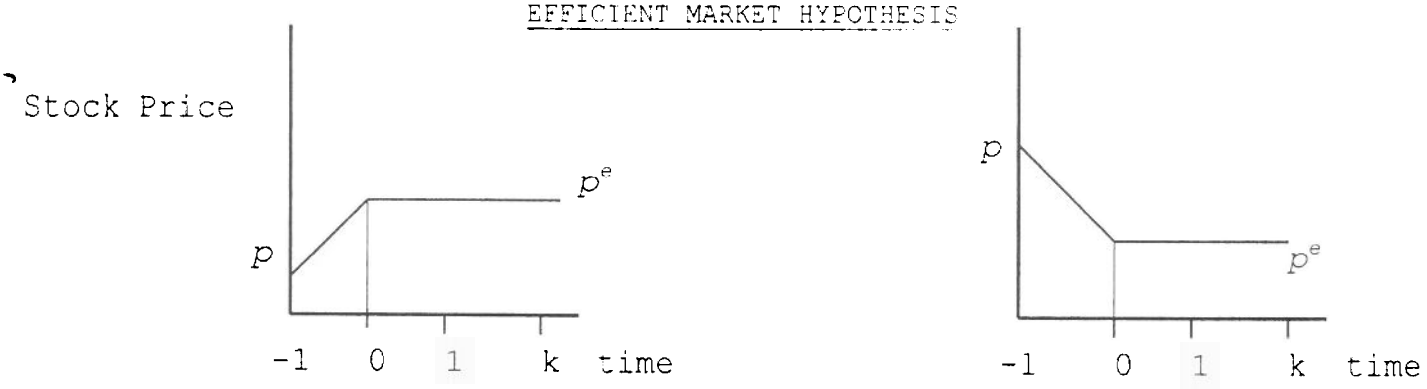
Attempts to consistently encounter the Efficient Market Hypothesis have failed. Faced with the arrival of unexpected information, agents do not adjust prices immediately in accordance with the news. The implications of new information on financial derivatives are often exaggerated and therefore, time for adjustment is required to equate the price level with the mean rate of return.

The Overreaction Hypothesis (OH) explains these inefficiencies by predicting that prices will be undervalued preceding unfavorable announcements. As Figure 1 indicates, favorable disclosures are foreseen to entice the market to establish equity prices above the average rate of return.

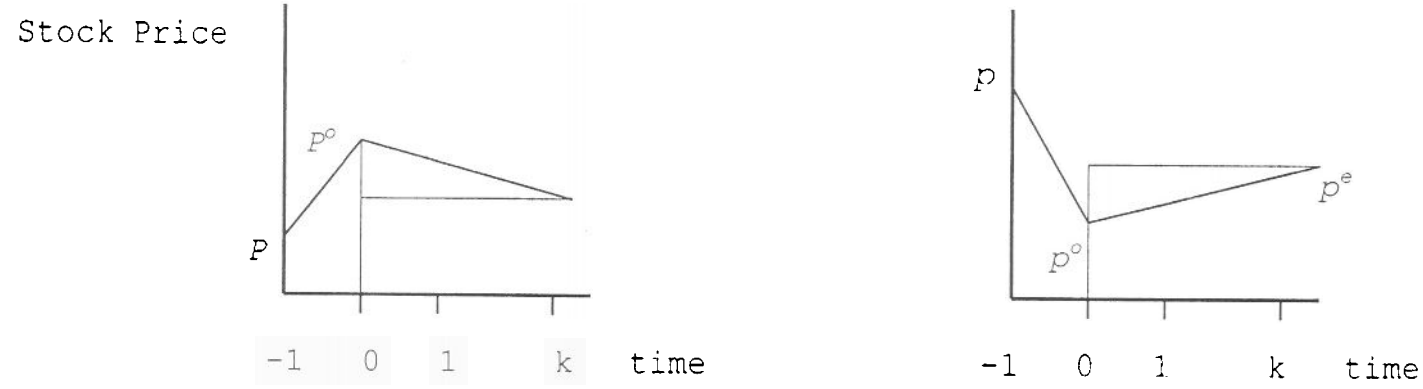
FIGURE 1. Stock Price Changes as Postulated by EMH, OH and UIH

Favorable Events | Unfavorable Events

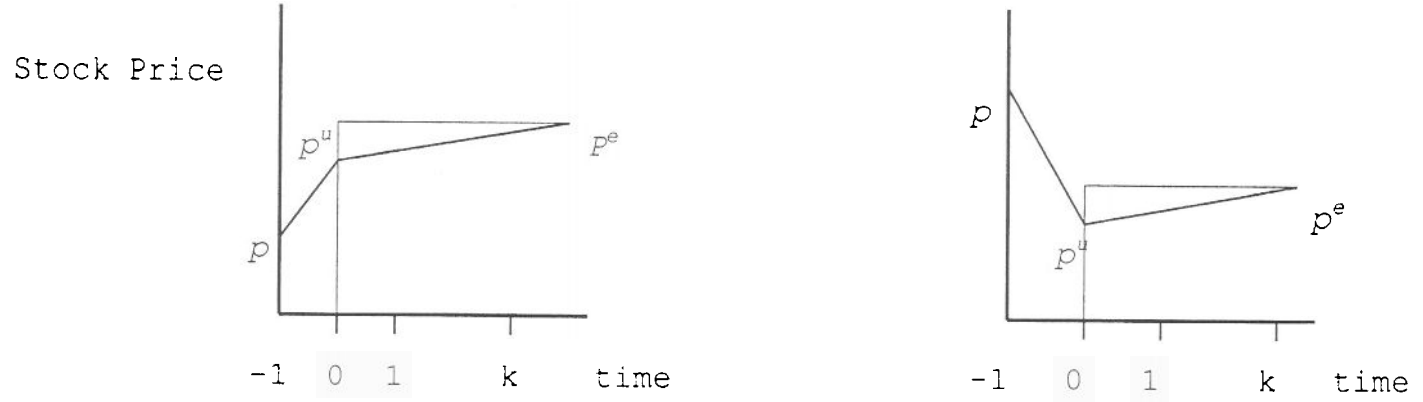
EFFICIENT MARKET HYPOTHESIS



OVERREACTION HYPOTHESIS



UNCERTAIN INFORMATION HYPOTHESIS



t = 0 represents the event day
p^e = equilibrium price
p^o = overreaction price
p^u = uncertain information price

Yet, the efficiency assumption retains its merit. In the face of abnormal returns and profiteering, the premise of efficiency is altered. Investors react to the arrival of unexpected information and the associated uncertainty rationally, by undervaluing the prices of securities. Therefore, the prediction in the event of negative announcements coincides with the one proposed by the Overreaction Hypothesis.

The Uncertain Information Hypothesis (UIH) models this rational behavior of agents in an uncertain environment. The theory predicts that return volatilities will increase following an announcement. Specifically, post-negative disclosure volatilities are greater than positive volatilities. The latter is a rational consequence of risk-averse agents attempting to err on the side of caution.

Although there has been intense scrutiny of American institutions and, foreign Asian markets, smaller stock markets have often been ignored.[1] This is especially pertinent to secondary European markets. Their diminutive size, in terms of both the number of securities listed and investors, implies a lack of efficiency and could explain the absence of interest. However, two factors might negate their disadvantage: the existence of the European Union (EU) and the increasing trend of financial globalization.

European Union regulations and monitoring have reformed many of these bourses, improving their operational efficiency and increasing their importance in the domestic financial sector. Among the countries studied, only Norway, Switzerland and Turkey are not members of the EU.

Globalization has encouraged domestic and foreign investors to diversify their portfolios across national borders. Legislation fostering foreign ownership and portfolio investment enacted in the 1980s and 1990s has permitted the exchanges surveyed to benefit from this trend.

Their proximity and dependence on the larger regional (London, Frankfurt, Paris, Milan) and North American (New York, Toronto) financial markets has accelerated the trend towards integration.

The study uses market indexes as a benchmark in order to eliminate stock specific anomalies and to scrutinize the operation of the entire market. The main purpose of the paper is to verify the consistency of the thirteen European markets with either the Efficient Market, Uncertain Information or Overreaction Hypothesis. The examination traces the effects of the passage of time on stock returns following favorable and unfavorable news.

The benchmark adapted for the purpose of generating excess returns for the European exchanges is the World Stock Index. The individual market rate of return is then regressed on the global rate of return to generate events. The market indexes for each country are listed in Table 1.

TABLE 1

Names of the Small European Stock Market Indexes

Country	Stock Index
Belgium	Cash Market Price Index
Denmark	The Copenhagen Stock Exchange Total Share Index
Finland	HEX Index
Greece	Athens Stock Exchange Share Price Index
Ireland	ISEQ Index
Luxembourg	Luxembourg Shares Index
Netherlands	Amsterdam EOE Index
Norway	The Oslo Stock Exchange Index
Portugal	Bolsa de Valores de Lisbona (BVL) Index - General
Spain	Madrid Stock Exchange Index
Sweden	SX – General Index
Switzerland	Swiss Market Index
Turkey	ISE Price Index

The remainder of the paper is organized as follows. Section II describes the data and methodology. Section III documents the empirical results. The study is concluded in Section IV.

II. Data and Methodology

The methodology introduced by Brown, Harlow and Tinic (1988) is followed to test the validity of the three hypotheses over sixty days following an unexpected disruption in the national, relative to the World Stock Index financial environment. The data are closing daily stock market indexes for thirteen European security markets.

Based on Blackwell Finance (1996) the exchanges selected for the study have unique characteristics. Their relatively small size refers to the number of companies listed, securities traded and a low market capitalization. Compared to their G7 counterparts, these markets have played lesser roles in their domestic financial structure. Taxes on transactions, capital gains and profits have hampered their development. However, Greece, the Netherlands, Spain, Sweden, Switzerland and Turkey do not subject foreigners to capital gains tax anymore.

In general, legislation preventing foreign portfolio investment has been abolished, due to the European Union's and the Organization of Economic Co-Operation and Development's (OECD) policies. Notable exceptions are Turkey and Norway, which are not members of the European Union. Norway is not member of the OECD either. In the case of foreigners, "income" duties are subject to revisions under the double taxation provisions of bilateral tax treaties, meaning that the majority of non-residents are subject to a tax levy of about 15 percent.

Foreign investors receiving dividends from Finnish securities are liable to pay tax, subject to discounts provided by bilateral treaties. Legislation repealed in 1993 placed ownership restrictions on non-residents.

The Athens Stock Exchange has been very thin and limited to a small equity market. Despite the reforms introduced in the 1990s, the bourse still plays a minor role in Greek corporate finance. Restrictions on capital mobility were abolished in 1994 although the legal framework intended to integrate the Greek market into the global financial network was concluded only in late 1995 [OECD, 1995].

The Brussels market is one of the most international of the exchanges studied. More than half of its listed shares have foreign issuers. Belgium does, however, levy a withholding tax on non-residents.

The foreign equities listed at the bourse in Luxembourg outnumber domestic issues by four to one. As in other European countries, Luxembourg does not employ regulations governing the repatriation of profits. Ireland does not make any distinctions between home and alien investors.

Switzerland constitutes along with Belgium, Luxembourg and Ireland a group of countries that have proceeded farthest with plans for global market integration. Over half of the companies and a third of the securities listed on the Zurich exchange are foreign owned. One caveat: the Swiss dividend and investment income tax rate stands at 35 percent, well above the European norm of 25-28 percent.

Portugal is one of the countries falling behind its European neighbors. Lisbon levies taxes on a number of items associated with foreign portfolio investment, including duties on transactions, investment income and capital gains. Furthermore, a system of government

regulations hampers foreign direct and portfolio investment originating outside the European Union. Spain imposes dividend and income taxes that are subject to alteration based on bilateral tax agreements.

Sweden is noted for offering a higher tax rate (30 percent) on dividends than the customary levy of other European countries. The final taxation level is subject to bilateral agreements between Sweden and the country of residence of the foreign investor.

To summarize, the majority of the bourses are open to foreign investment, despite their unflattering liquidity and size. The question remains whether this transparency is sufficient to produce efficient markets.

The calendar period and the total number of daily observations recorded for each country is presented in Table 2. Morgan Stanley Capital International Perspective, Geneva (MSCIP), compiled the indexes. These stock market indexes are converted into daily rates of return. The indexes calculated by MSCIP do not double-count those stocks that are multiple-listed on other bourses. Hence, any correlation in market behavior cannot be attributed to multiple listings [Shachmurove, 1996]. The MSCIP data was obtained through Datastream.

TABLE 2

Time Period and Total Observations

Country	Time Frame*	Total Observations
Belgium	01/01/73 - 02/12/96	5,578
Denmark	01/01/73 - 02/12/96	5,573
Finland	03/25/88 - 02/12/96	3,759
Greece	01/04/88 - 02/12/96	3,762
Ireland	01/01/73 - 02/12/96	5,602
Luxembourg	01/04/88 - 02/12/96	3,730
Netherlands	01/01/73 - 02/12/96	5,576
Norway	01/02/80 - 02/12/96	3,754
Portugal	01/02/90 - 02/12/96	3,763
Spain	03/02/87 - 02/12/96	5,318
Sweden	01/04/92 - 02/12/96	3,778
Switzerland	01/01/73 - 02/12/96	5,579
Turkey	01/04/88 - 02/12/96	3,754

All data begin at the earliest date recorded by Datastream.

The methodology employed to assess the empirical evidence in support of either one of the three hypotheses is similar to the procedure introduced by Brown, Harlow and Tinic (1988). The focus is on the measures of post-event volatility and the cumulative abnormal returns.

The World Stock Index is employed as the benchmark to generate the positive and negative excess returns for the thirteen small European markets. The rate of return of each market is regressed on the world rate of return, with the residual identified as an "event" if it is found to be greater than or equal to 2.5 percent in deviation. The exception is Turkey, in which case the adopted deviation percentage is ten percent, since lower percentages generated too many event days. Hence, t is by definition an event if,

$$\left| R_{it} - \overline{R_i} \right| \geq 0.025 \qquad (1)$$

the return (R_{it}) of stock price index i (i = 1, ..., 13) on day t is 2.5 percent larger than the mean return for the particular index ($\overline{R_i}$) over the sample time frame. As such, the event day is considered Day 0 and the relevant observations are obtained by examining subsequent Day 1 through Day 60. The variances are computed as follows:

$$Var = \frac{1}{N_j} \sum_{t=1}^{N_j} \left(R_{it} - \overline{R_{ij}} \right)^2 \qquad (2)$$

where N_j denotes the number of post-event days and $\overline{R_{ij}}$ represents the average return over N_j days, while j = 1,2,3 stand for bad, good and non-events, respectively. The differences between the daily return and ($\overline{R_i}$) and the average return ($\overline{R_{ij}}$) are squared, added together and divided by the number of post –event days (N_j). Two F-statistics are then calculated to ascertain a significant difference between positive or negative events and non-event returns (see Table 3).

Daily post-event abnormal returns for the two sets of events are computed and averaged cross-sectionally over the 60-day period following favorable and unfavorable observations. These 60-Day returns are then added to obtain the CARs for each type of news. Formally, this implies that the abnormal return for index i on day t (t = +1, ..., +60) following the unexpected event d, AR_{itd}, is calculated as by subtracting the mean return of index i ($\overline{R_{i3}}$) from the daily return on the same index:

$$AR_{itd} = R_{itd} - \overline{R_{i3}} \qquad (3)$$

where d = 1, ..., n, denotes the number of favorable or unfavorable events in index i. R_{itd} is the return of index i on day t for event d, and $\overline{R_{i3}}$ equals the mean return of index i for non-event days. The mean abnormal return ($\overline{AR_{it}}$) on day t is obtained as follows:

$$\overline{AR_{it}} = \frac{1}{n}\left(\sum_{d=1}^{n} AR_{itd}\right), (t = +1,\ldots,+60). \tag{4}$$

The abnormal return for every event ($\overline{AR_{it}}$) is added together and divided by the number of such events (n).

The Cumulative Abnormal Return (CAR_{it}) is calculated by adding the mean abnormal returns over t days ($\overline{AR_{it}}$), such that

$$CAR_{it} = CAR_{i(t-1)} + \overline{AR_{it}}. \tag{5}$$

The statistical significance of the CARs are determined through the application of the test proposed by Ruback [1982], to account for the presence of auto-correlation. The mathematical expression is:

$$t = \frac{CAR_{ipt}}{[Var(CAR_{ipt})]^{1/2}} \tag{6}$$

where the variance is computed by

$$Var(CAR_{ipt}) = d \cdot Var(AR_{itd}) + 2 \cdot (d-1) \cdot Cov(AR_{ipt}, AR_{ip(t+1)}). \tag{7}$$

III. Empirical Results

The current section summarizes the statistical results and is divided into three parts. The first segment is devoted to the comparison between post-event and non-event variances, as documented in Table 3. The following section scrutinizes the cumulative abnormal returns and analyzes each stock market's adherence to the Uncertain Information Hypothesis. This discussion is aided by Table 4 and Figure 2. The final part addresses the implications of the statistics.

IV.1. Statistical Interpretation of the Variances

The variances of the return volatilities following unexpected shocks represent an important test for the Uncertain Information Hypothesis. Brown, Harlow and Tinic [1988], Ajayi and Mehdian [1994, 1995], Corsetti, Pesenti, and Roubini [1998], and Fleming and Remolona [1999] find that unexpected announcements produce enhanced volatility statistics. Furthermore, variance volatilities following unfavorable disclosures should be greater than volatilities following positive news.

TABLE 3

Tabular Interpretation of Post-Event Return Volatilities

Country	Sample	OBS	Variance	F-Stats (a)		F-Stats (b)	
Belgium	No Event	4638	0.000044207				
	Positive	540	0.000058733	1.33	*		
						1.72	*
	Negative	600	0.000101035	2.29	*		
Denmark	No Event	4133	0.000083067				
	Positive	600	0.000089335	1.08			
						0.96	
	Negative	840	0.000085876	1.03			
Finland	No Event	2979	0.000062937				
	Positive	360	0.000211325	3.36	*		
						0.52	
	Negative	420	0.000109540	1.74	*		
Greece	No Event	3162	0.000310862				
	Positive	300	0.000466015	1.50	*		
						0.74	
	Negative	300	0.000345416	1.11			
Ireland	No Event	4057	0.000088198				
	Positive	720	0.000090355	1.02			
						1.64	*
	Negative	840	0.000148342	1.68	*		
Luxembourg	No Event	2980	0.000138429				
	Positive	360	0.000151672	1.10			
						0.89	
	Negative	420	0.000135663	0.98			
Netherlands	No Event	4316	0.000067166				
	Positive	540	0.000179723	2.68	*		
						0.33	
	Negative	720	0.000060109	0.89			

Norway	No Event	2134	0.000204649				
	Positive	780	0.000174278	0.85			
						3.91	*
	Negative	840	0.000681872	3.33	*		
Portugal	No Event	3223	0.000171202				
	Positive	240	0.000119406	0.70			
						1.13	
	Negative	300	0.000134902	0.79			
Spain	No Event	3713	0.000075819				
	Positive	780	0.000081812	1.08			
						1.83	*
	Negative	840	0.000149678	1.97	*		
Sweden	No Event	2713	0.000101741				
	Positive	540	0.000241021	2.37	*		
						0.35	
	Negative	540	0.000083385	0.82			
Switzerland	No Event	4499	0.000061543				
	Positive	540	0.000055552	0.90			
						0.79	
	Negative	540	0.000043959	0.71			
Turkey	No Event	2734	0.001242100				
	Positive	420	0.000633661	0.51			
						2.10	*
	Negative	600	0.001331800	1.07			

(a) F-statistic for equality of post-event and non-event variances.

(b) F-statistic for equality of post negative and positive event variances.

***** Significant at the 5% level or better.

The summary depicted in Table 3 exhibits weak statistical support for the Uncertain Information Hypothesis. For example, there are only nine significant cases of post-event variances out of a possible 26 (F-statistic (a), column five). Denmark, Luxembourg, Portugal, Switzerland and Turkey record no notable differences in any variances. Greece, the Netherlands and Sweden exhibit a significant spread only in the post-favorable case.

Belgium and Finland yield significant variability following both good and bad observations. The remaining countries, Ireland Norway and Spain, yield significant statistics only after unexpectedly unfavorable news.

The F-statistics (a) show that there is considerable adherence to the EMH and weak support for the UIH and OH. Only Belgium and Finland yield significant statistics following both negative and positive disturbances. Sixty days is evidently enough time for investors to digest the news and adjust their portfolios accordingly. The final answer to the question of efficiency depends on the results of the next column.

Column six shows that contrary to the Uncertain Information Hypothesis, most entries exemplify greater variances following favorable, rather than unfavorable news. Yet the UIH is supported by the Belgium, Ireland, Norway, Spain and Turkey indexes. Although the Istanbul bourse is apparently among the supporters of the Uncertain Information Hypothesis, it does not yield a notable difference between post-negative and non-event variances (see column five). However, it is still efficient because the returns are not more volatile after a fluctuation in the market index.

In summation, greater return variances than normal may in fact herald a rational response to uncertain announcements. Specifically, return variances should be larger following negative rather than positive reports. Belgium, Ireland, Norway and Spain follow this rule and they therefore sustain the Uncertain Information Hypothesis. However, Finland, Greece, the Netherlands and Sweden deviate from the aforementioned rule and display characteristics similar to the Overreaction Hypothesis.

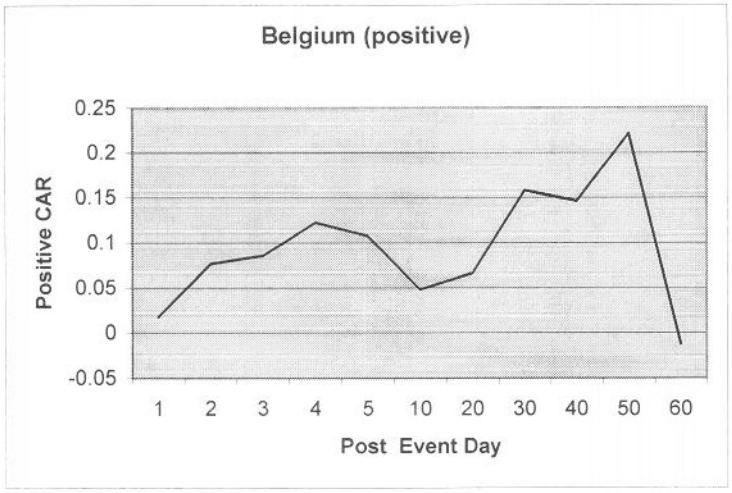
The arrival of unexpected information does not always translate into increased volatilities on the European markets. Denmark, Luxembourg, Portugal and Switzerland yield no significant variance statistics. This suggests the presence of the Efficient Market Hypothesis.

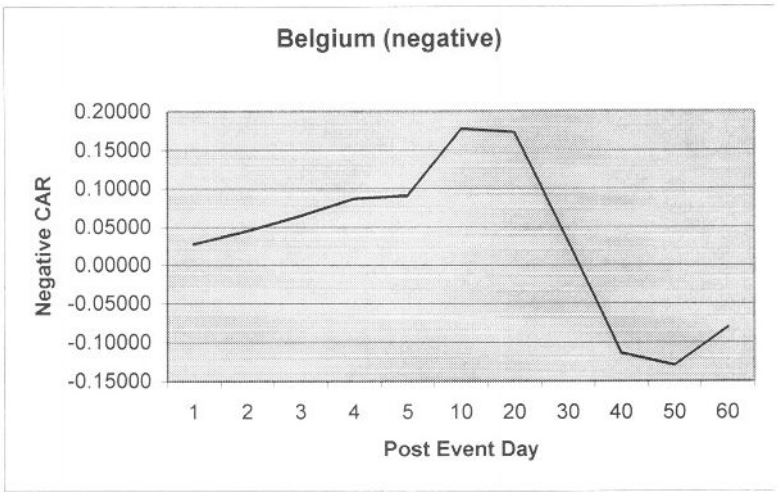
IV.2. Statistical Interpretation of the Cumulative Abnormal Returns

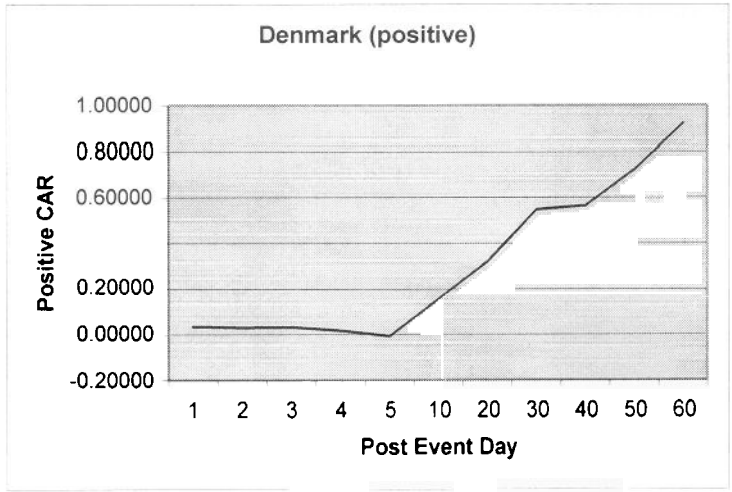
The cumulative abnormal return (CAR) data are more forthright than the variance volatility statistics, since they constitute the main test of market efficiency.

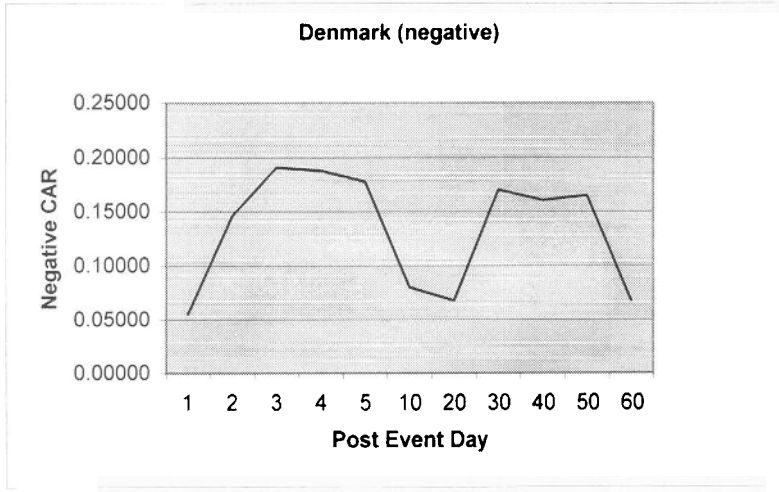
FIGURE 2

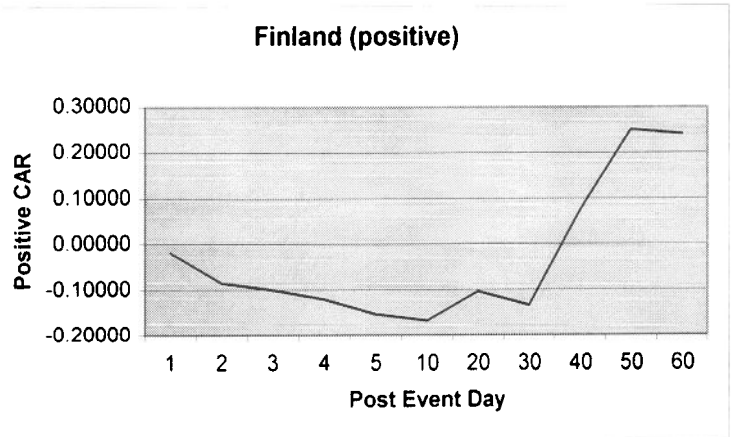
Graphical Representation of the Cumulative Abnormal Returns

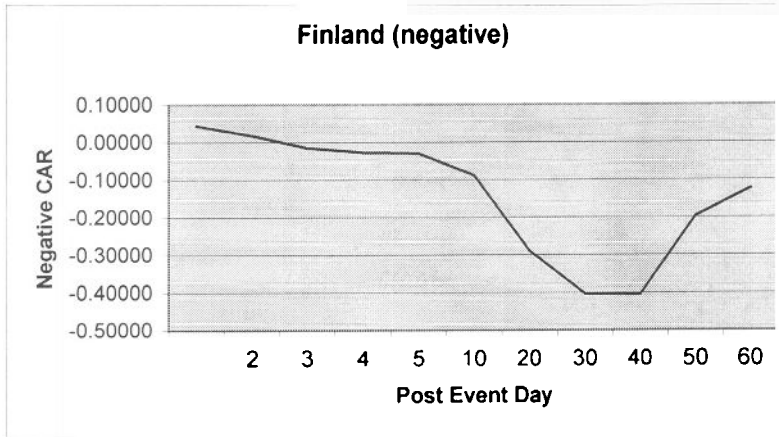


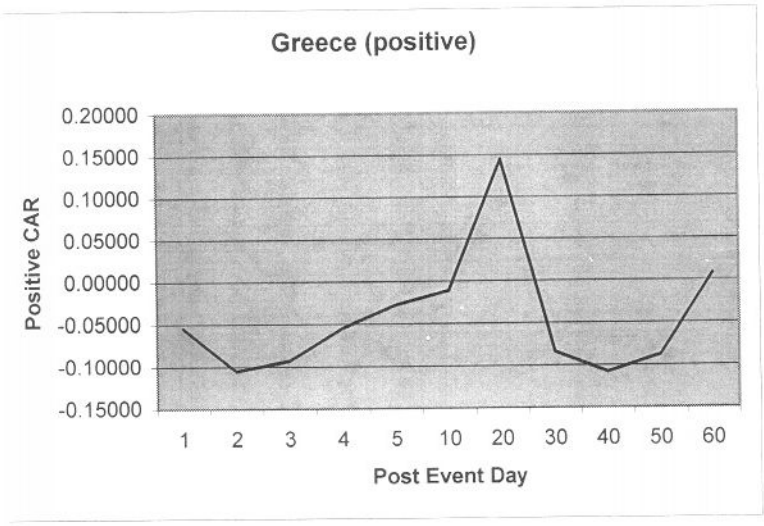


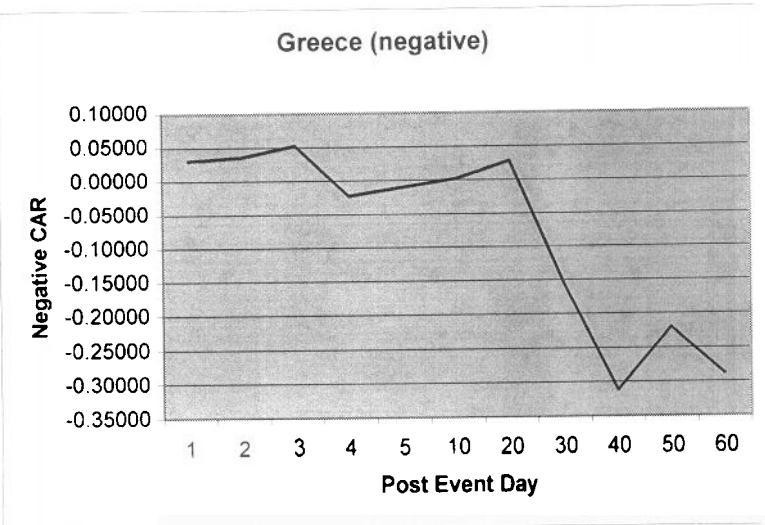


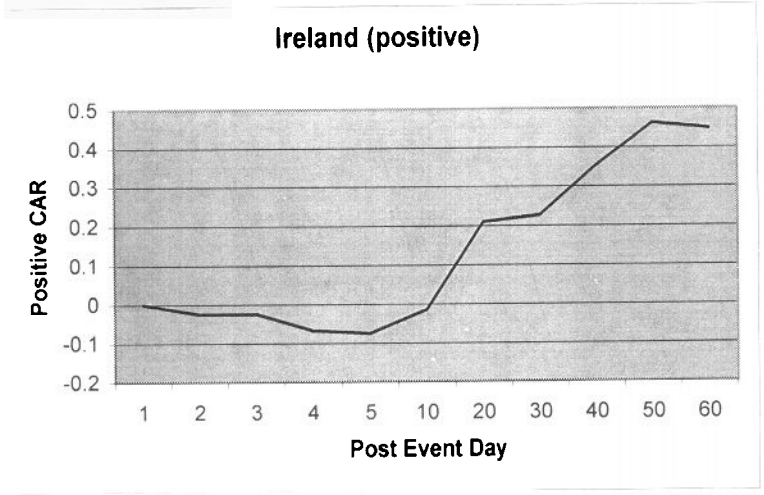


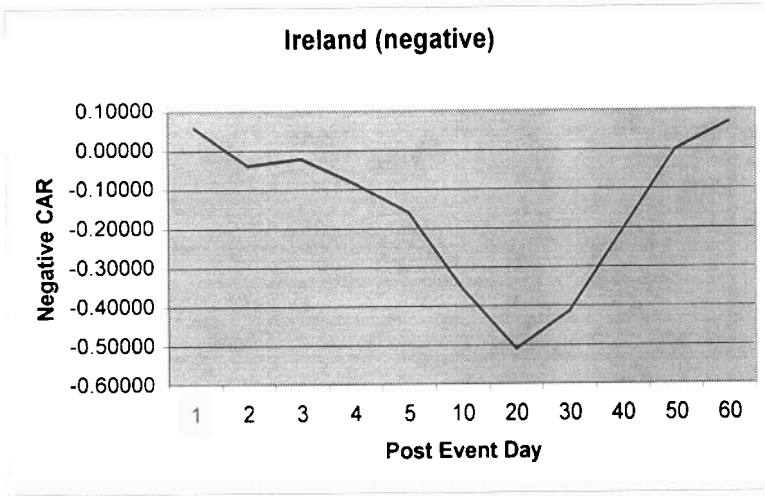


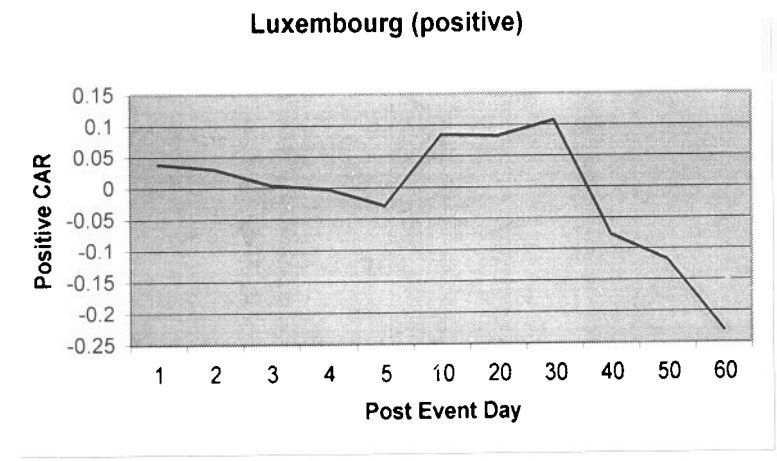


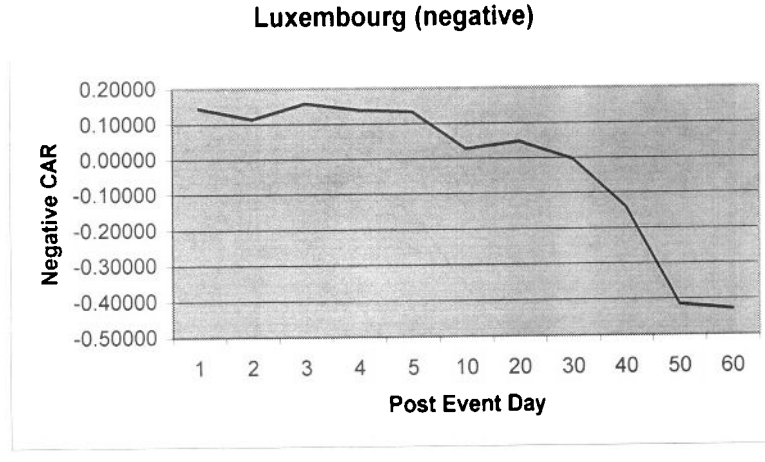

Greece (positive)
Positive CAR
0.20000
0.15000
0.10000
0.05000
0.00000
-0.05000
-0.10000
-0.15000
1 2 3 4 5 10 20 30 40 50 60
Post Event Day

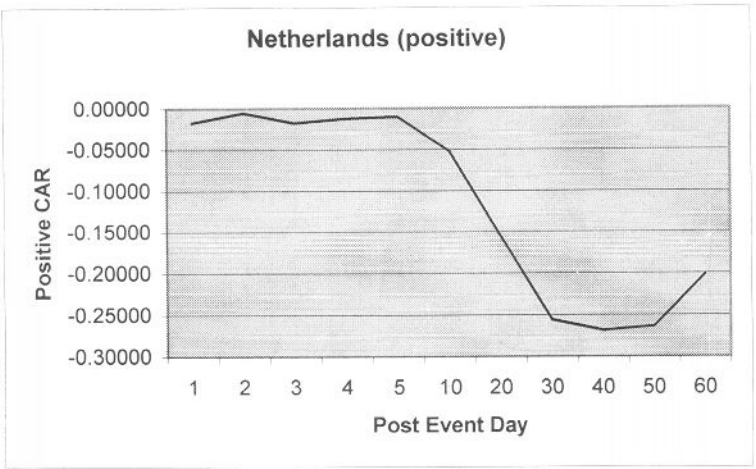

Greece (negative)
Negative CAR
0.10000
0.05000
0.00000
-0.05000
-0.10000
-0.15000
-0.20000
-0.25000
-0.30000
-0.35000
1 2 3 4 5 10 20 30 40 50 60
Post Event Day

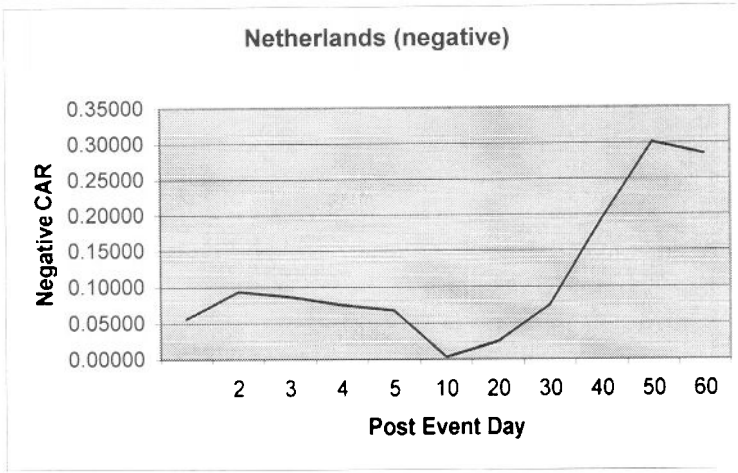

Ireland (positive)
Positive CAR
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
1 2 3 4 5 10 20 30 40 50 60
Post Event Day

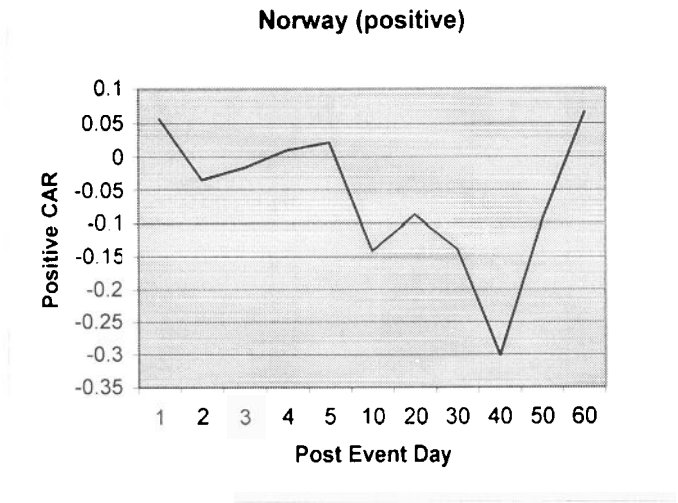

Ireland (negative)
Negative CAR
0.10000
0.00000
-0.10000
-0.20000
-0.30000
-0.40000
-0.50000
-0.60000
1 2 3 4 5 10 20 30 40 50 60
Post Event Day

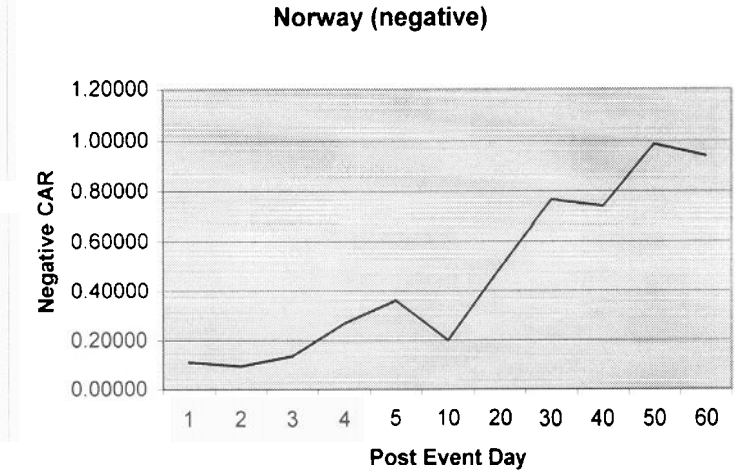

Luxembourg (positive)
Positive CAR
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
1 2 3 4 5 10 20 30 40 50 60
Post Event Day

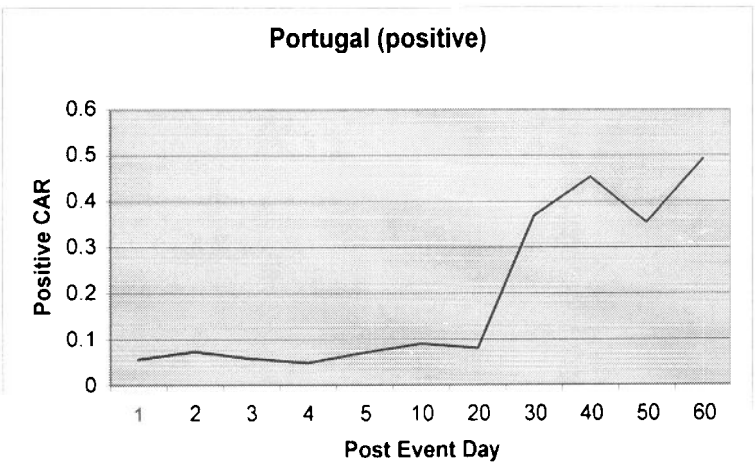

Luxembourg (negative)
Negative CAR
0.20000
0.10000
0.00000
-0.10000
-0.20000
-0.30000
-0.40000
-0.50000
1 2 3 4 5 10 20 30 40 50 60
Post Event Day

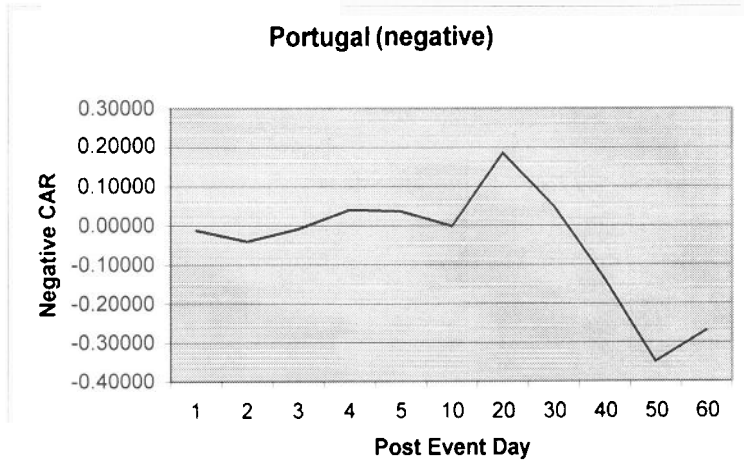

Netherlands (positive)
Positive CAR
0.00000
-0.05000
-0.10000
-0.15000
-0.20000
-0.25000
-0.30000
1 2 3 4 5 10 20 30 40 50 60
Post Event Day

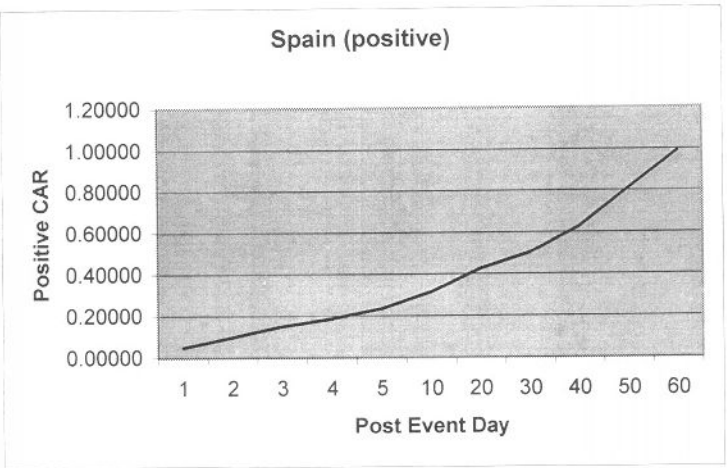

Netherlands (negative)
Negative CAR
0.35000
0.30000
0.25000
0.20000
0.15000
0.10000
0.05000
0.00000
2 3 4 5 10 20 30 40 50 60
Post Event Day

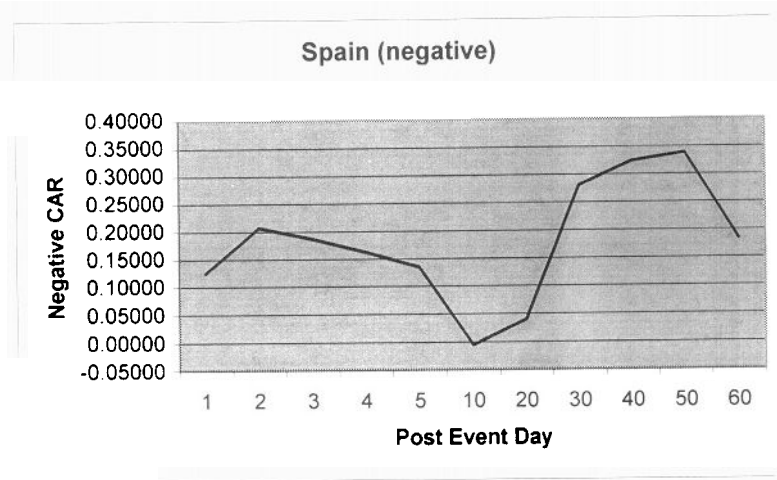

Norway (positive)
Positive CAR
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
-0.35
1 2 3 4 5 10 20 30 40 50 60
Post Event Day

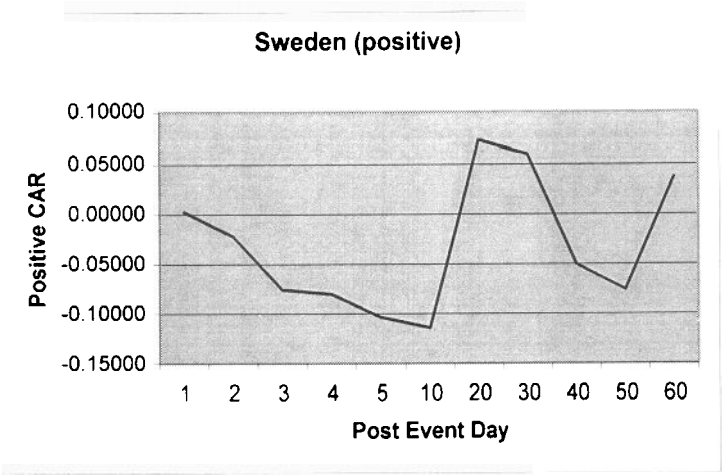

Norway (negative)
Negative CAR
1.20000
1.00000
0.80000
0.60000
0.40000
0.20000
0.00000
1 2 3 4 5 10 20 30 40 50 60
Post Event Day

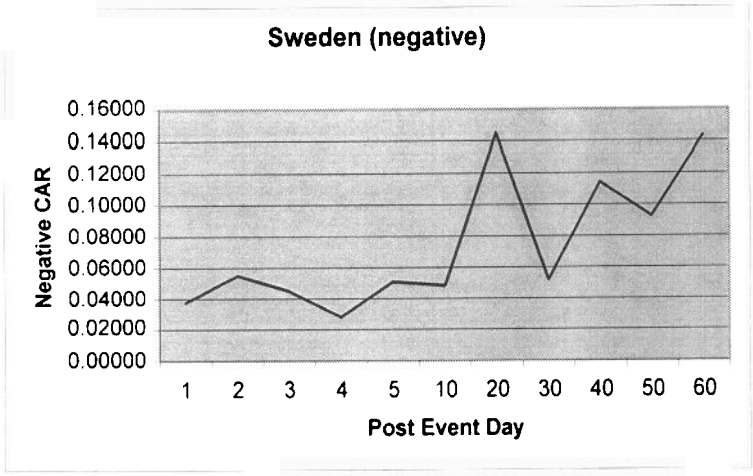

Portugal (positive)
Positive CAR
0.6
0.5
0.4
0.3
0.2
0.1
0
1 2 3 4 5 10 20 30 40 50 60
Post Event Day

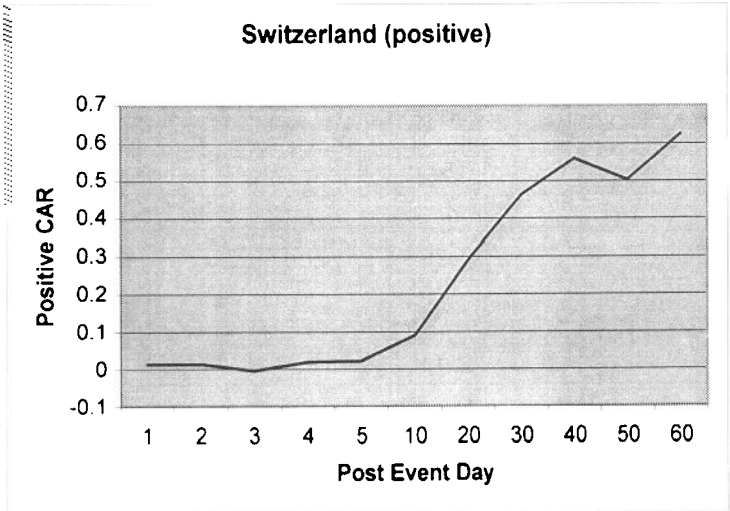

Portugal (negative)
Negative CAR
0.30000
0.20000
0.10000
0.00000
-0.10000
-0.20000
-0.30000
-0.40000
1 2 3 4 5 10 20 30 40 50 60
Post Event Day

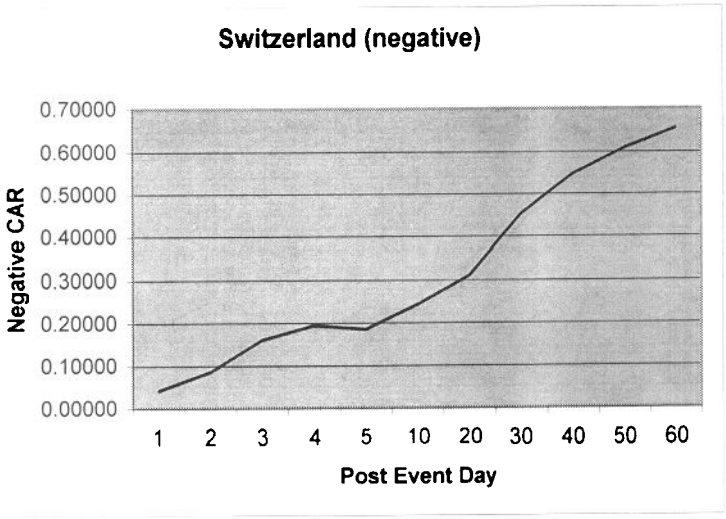

Spain (positive)
Positive CAR
1.20000
1.00000
0.80000
0.60000
0.40000
0.20000
0.00000
1 2 3 4 5 10 20 30 40 50 60
Post Event Day

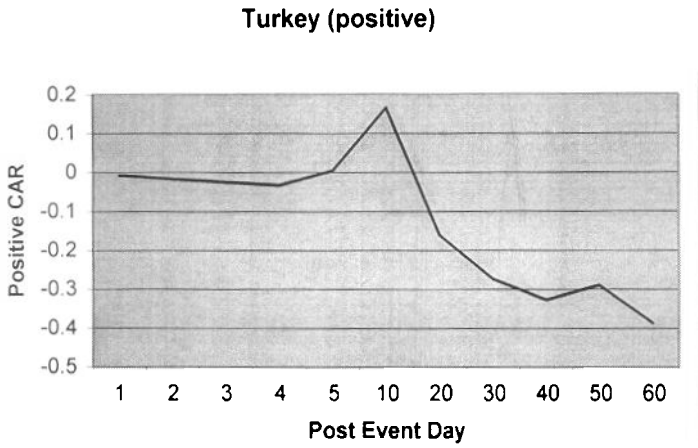

Spain (negative)
Negative CAR
0.40000
0.35000
0.30000
0.25000
0.20000
0.15000
0.10000
0.05000
0.00000
-0.05000
1 2 3 4 5 10 20 30 40 50 60
Post Event Day


Sweden (positive)
Positive CAR
0.10000
0.05000
0.00000
-0.05000
-0.10000
-0.15000
1 2 3 4 5 10 20 30 40 50 60
Post Event Day


Sweden (negative)
Negative CAR
0.16000
0.14000
0.12000
0.10000
0.08000
0.06000
0.04000
0.02000
0.00000
1 2 3 4 5 10 20 30 40 50 60
Post Event Day


Switzerland (positive)
Positive CAR
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
1 2 3 4 5 10 20 30 40 50 60
Post Event Day


Switzerland (negative)
Negative CAR
0.70000
0.60000
0.50000
0.40000
0.30000
0.20000
0.10000
0.00000
1 2 3 4 5 10 20 30 40 50 60
Post Event Day



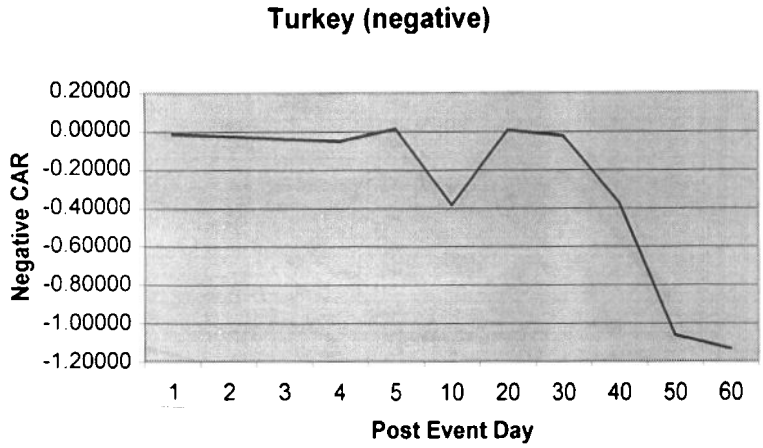


TABLE 4

Summary of the CAR Results and their Correlation to the Adjustment Hypotheses

Country	Positive CARs	Negative CARs*
Belgium	UIH	Mixed
Denmark	UIH	OH/UIH
Finland	Mixed	Mixed
Greece	Mixed	Mixed
Ireland	UIH	Mixed
Luxembourg	OH	Mixed
Netherlands	OH	OH/UIH
Norway	OH	OH/UIH
Portugal	UIH	Mixed
Spain	UIH	OH/UIH
Sweden	Mixed	OH/UIH
Switzerland	UIH	OH/UIH
Turkey	OH	Mixed

Recall that the overreaction and uncertain information hypothesis have the same characteristics following unfavorable events.

Figure 2 and Table 4 depict the results of the positive and negative events. There is some evidence supporting the Uncertain Information Hypothesis in the favorable scenario. Six of the thirteen markets record increasing or non-negative returns following positive news. Luxembourg, the Netherlands, Norway and Turkey, however, yield negative returns, implying that investors initially overreact to the favorable news and set stock prices too high. This observation is consistent with the Overreaction Hypothesis.

The remaining countries yield inconclusive results. For example, in the first six days following the disclosure of the favorable event, the Finnish index declines precipitously. Yet, from this point onward, the Helsinki bourse experiences a period of increasing returns, identical to the Uncertain Information Hypothesis. These returns eventually became positive around Day 40. Greece and Sweden exhibit the unpredictability associated with strict efficiency.

For the 60 days following an unfavorable disclosure, only six indexes (Denmark, the Netherlands, Norway, Spain, Sweden and Switzerland) increase. The Netherlands and Norway, however, must be classified as supporting the Overreaction Hypothesis, based on their CAR figures following bad shocks. Turkey declines, implying adherence to neither one of the three theories and hence inefficiency. The remaining bourses exemplify inconsistency in regards to both the Uncertain Information and Overreaction Hypotheses.

The stock indexes of Denmark, Spain and Switzerland are supportive of the UIH in both the post-favorable and unfavorable cases. The Netherlands and Norway are just as unwavering in their support for the OH. Greece, Luxembourg and Portugal are experiencing post-negative returns that cannot be classified under either hypothesis: they are continuously declining after a certain point.

The Belgian, Finnish and Irish post-unfavorable returns, as well as the Finish post-favorable statistics, manifest a pattern of reversal, unfamiliar to either the UIH or OH, yet reminiscent of efficiency. Furthermore, the Greek and Swedish positive abnormal returns are fluctuating randomly.

IV.3. Summation and Implication of the Results

The propensity for positive post-event variances to be more volatile than the variances following negative events, contrary to the Uncertain Information Hypothesis, may be related to the nature of the exchanges surveyed. Namely, these European markets are small in regards to the number of securities listed, investors and market capitalization. Usually, such exchanges are dominated by a small number of professionals who respond to long- rather than short-run market fluctuations.

However, if the favorable news generates a conspicuous increase in the rate of return, it may attract new deposits to the market. This is true for all the bourses polled except those of Belgium, Ireland, Spain and Turkey.

The Overreaction Hypothesis is most consistently supported by the Oslo and Amsterdam exchanges. The aforementioned bourses record the abnormal return patterns predicted by the OH, following both negative and positive shocks. Moreover, the variance volatilities of the two markets are significant only in the post-favorable case, implying a lack of compliance with the Uncertain Information Hypothesis.

Although the capital gains tax (28 percent) and the average withholding tax (15 percent) in Norway reflect the European mean, foreigners have faced barriers to investing before 1995.

Primarily, alien ownership, depending on the sector, was limited to between 33.3 and 40 percent of each firm [Blackwell Finance, 1996].

However, the same explanation does not apply to the Netherlands, which has one of the oldest and most active bourses in the world. Half of the listed securities are foreign. Furthermore, non-residents are not subject to either capital gains taxes or restrictions on the repatriation of profits.

The explanation for the presence of market inefficiencies rests with a distinction shared by both the Dutch and Norwegian exchanges. Primarily, a large percentage of the securities listed on the two markets are energy stocks: 43 percent of the Amsterdam and 41 percent of the Oslo market capitalization is owned by such equities [Shachmurove, 1996].

Turkish abnormal returns decline following positive shocks, in accordance with the Overreaction Hypothesis, as well. The Istanbul market is inefficient because it is generally more illiquid and restrictive than its continental counterparts, over the sample period. One hundred ninety one companies are traded on the national market and the market capitalization figure stood at a mere US$ 20 billion at the end of 1995 [Blackwell Finance, 1996].

Although there are no restrictions on foreign portfolio investment and capital or profit repatriation, a non-resident is faced with a phalanx of taxes. Ankara imposes specific transaction duties, usually directed at the volume of trade. Another impediment to the Istanbul market's integration into the global financial economy is a 44 percent corporation tax levied on the sale of securities and dividends owed to foreign financial intermediaries.

Whereas the European markets do not consistently exhibit increased variances following an announcement, there is ample support for the UIH. For example, the CAR statistics (Figure 2) for Denmark, Spain and Switzerland support the Uncertain Information Hypothesis over the

given interval. The first two countries have variance volatility levels reminiscent of the UIH's predictions. Belgium, Ireland and Portugal yield both return and variance statistics that lend further support to this altered efficiency model.

V. Conclusion

Economists assume that individuals behave rationally. Consequently, investors set stock prices to reflect all available information. However, the existence of efficiency in global security exchanges has been questioned. The critics point to the fact that the arrival of unexpected announcements leads investors to deviate from the efficiency paradigm.

Market disturbances prompt the financial agents to undervalue securities following negative news and overvalue stocks after positive announcements. The Overreaction Hypothesis rejects the tenets of the Efficient Market Hypothesis. Smaller markets should be more susceptible to this sort of irrational behavior. However, with the exception of the Netherlands, Norway and Turkey, evidence is lacking to support such a claim. Yet all three anomalies can be attributed to institutional factors.

An altered version of the EMH has been championed as offering an accurate explanation of financial markets. The Uncertain Information Hypothesis states that when faced with the arrival of unexpected information, foreshadowing increased insecurity and risk, investors protect their investment positions by initially undervaluing equity prices. In the following periods, the market experiences increasing or non-negative returns. This price adjustment should be accompanied by increased return variances.

This paper shows that the European investors operating in the small continental stock exchanges generally react to uncertain information in an efficient and rational manner. These

agents initially set stock prices below their market value. Despite the prevalence of institutional inefficiency, the markets subsequently experience increased or non-negative returns.

Moreover, the random patterns predicted by the Efficient Market Hypothesis are evident as well. Therefore, by adhering to the tenets of the Uncertain Information Hypothesis and the random course typical of the Efficient Market Hypothesis, the majority of the surveyed stock exchanges are efficient.

Note

1. For American institutions see: DeBondt and Thaler, 1985, 1987, 1990; Howe, 1986; Brown and Harlow, 1988; Brown, Harlow, and Tinic, 1988, 1989, 1993; Chan, 1988, Davidson and Dutia. 1989; Zarowin, 1989, 1990; Kaul and Nimalendran, 1990, Lo and MacKinlay, 1990, 1997, 1999, Aggarwal and Schrim, 1992, Conrad and Kaul, 1993, Dissanaike, 1994, 1996, Loughran and Ritter, 1996, Ketcher and Jordan, 1994, and Veronesi, 1999. For foreign markets see: Corsetti, Pesenti, and Roubini, 1998, 1999; Ratner and Leal, 1999; Gunaratne and Yonesawa, 1997, and Hogholm, 2000.

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STATISTICAL APPENDIX

TABLE A

60-Day Post-Event Cumulative Abnormal Returns

Belgium	Post Event Day	Positive Event CAR	t-value	Negative Event CAR	t-value
	1	0.01802	2.3513	0.02816	2.8015
	2	0.07664	10.0003	0.04497	4.4739
	3	0.08533	11.1342	0.06452	6.4189
	4	0.12245	15.9778	0.08709	8.6643
	5	0.10748	14.0245	0.09079	9.0324
	10	0.04822	6.2920	0.17741	17.6499
	20	0.06616	8.6329	0.17286	17.1972
	30	0.15777	20.5865	0.03106	3.0901
	40	0.14609	19.0625	-0.11350	-11.2917
	50	0.22116	28.8580	-0.12901	-12.8348
	60	-0.01225	-1.5984	-0.08060	-8.0186
	VAR	0.000058733		0.000101035	
Denmark	Post Event Day	Positive Event CAR	t-value	Negative Event CAR	t-value
	1	0.03514	3.7178	0.05544	5.9826
	2	0.02982	3.1550	0.14600	15.7549
	3	0.03323	3.5158	0.19074	20.5829
	4	0.01777	1.8801	0.18802	20.2894
	5	-0.00647	-0.6845	0.17762	19.1671
	10	0.15789	16.7049	0.08006	8.6393
	20	0.32105	33.9674	0.06772	7.3077
	30	0.54679	57.8508	0.17018	18.3642
	40	0.56383	59.6537	0.16046	17.3153
	50	0.72139	76.3237	0.16484	17.7880
	60	0.92080	97.4214	0.06774	7.3099
	VAR	0.000089335		0.000085876	

Finland	Post Event Day	Positive Event CAR	t-value	Negative Event CAR	t-value
	1	-0.01895	-1.3036	0.04490	4.2900
	2	-0.08594	-5.9118	0.01834	1.7523
	3	-0.10082	-6.9354	-0.01506	-1.4389
	4	-0.12102	-8.3250	-0.02668	-2.5492
	5	-0.15329	-10.5448	-0.02982	-2.8492
	10	-0.16769	-11.5354	-0.08804	-8.4119
	20	-0.10390	-7.1473	-0.28910	-27.6224
	30	-0.13438	-9.2440	-0.40357	-38.5596
	40	0.07406	5.0946	-0.40500	-38.6962
	50	0.25046	17.2291	-0.19661	-18.7853
	60	0.24091	16.5722	-0.12356	-11.8057
	VAR	0.000211325		0.000109540	

Greece	Post Event Day	Positive Event CAR	t-value	Negative Event CAR	t-value
	1	-0.05494	-2.5450	0.03017	1.6233
	2	-0.10539	-4.8820	0.03556	1.9133
	3	-0.09296	-4.3062	0.05203	2.7995
	4	-0.05493	-2.5445	-0.02270	-1.2214
	5	-0.02810	-1.3017	-0.01062	-0.5714
	10	-0.01089	-0.5045	0.00199	0.1071
	20	0.14480	6.7076	0.02776	1.4936
	30	-0.08391	-3.8870	-0.15655	-8.4233
	40	-0.10798	-5.0020	-0.31160	-16.7659
	50	-0.08772	-4.0635	-0.21999	-11.8367
	60	0.00757	0.3507	-0.28808	-15.5004
	VAR	0.000466015		0.000345416	

Ireland	Post Event Day	Positive Event CAR	t-value	Negative Event CAR	t-value
	1	-0.00061	-0.0642	0.05774	4.7407
	2	-0.02481	-2.6101	-0.03935	-3.2308
	3	-0.02412	-2.5375	-0.02176	-1.7866
	4	-0.06777	-7.1295	-0.08581	-7.0454
	5	-0.07461	-7.8491	-0.15966	-13.1088
	10	-0.0143	-1.5044	-0.35544	-29.1833
	20	0.21001	22.0935	-0.50865	-41.7625
	30	0.22701	23.8819	-0.41320	-33.9257
	40	0.35317	37.1542	-0.20594	-16.9086
	50	0.46211	48.6149	-0.00016	-0.0131
	60	0.44795	47.1252	0.06760	5.5503
	VAR	0.000090355		0.000148342	

Luxembourg	Post Event Day	Positive Event CAR	t-value	Negative Event CAR	t-value
	1	0.03814	3.0969	0.14486	12.4371
	2	0.02992	2.4295	0.11403	9.7901
	3	0.00384	0.3118	0.15795	13.5609
	4	-0.00273	-0.2217	0.13894	11.9288
	5	-0.02948	-2.3937	0.13346	11.4583
	10	0.08469	6.8767	0.02770	2.3782
	20	0.08235	6.6867	0.04761	4.0876
	30	0.10726	8.7093	-0.00374	-0.3211
	40	-0.07697	-6.2498	-0.14097	-12.1031
	50	-0.11805	-9.5855	-0.41589	-35.7065
	60	-0.23053	-18.7187	-0.42903	-36.8347
	VAR	0.000151672		0.000135663	

Netherlands	Post Event Day	Positive Event CAR	t-value	Negative Event CAR	t-value
	1	-0.01721	-1.2837	0.05642	7.2772
	2	-0.00544	-0.4058	0.09384	12.1037
	3	-0.01786	-1.3322	0.08667	11.1789
	4	-0.01255	-0.9361	0.07541	9.7266
	5	-0.01021	-0.7616	0.06744	8.6986
	10	-0.05165	-3.8527	0.00324	0.4179
	20	-0.15513	-11.5716	0.02465	3.1794
	30	-0.25575	-19.0772	0.07468	9.6324
	40	-0.26857	-20.0334	0.19200	24.7646
	50	-0.26380	-19.6776	0.30083	38.8018
	60	-0.20140	-15.0230	0.28413	36.6478
	VAR	0.000179723		0.000060109	

Norway	Post Event Day	Positive Event CAR	t-value	Negative Event CAR	t-value
	1	0.05698	4.2978	0.11083	8.3953
	2	-0.03496	-2.6369	0.09390	7.1129
	3	-0.01679	-1.2664	0.13505	10.2299
	4	0.00967	0.7294	0.26773	20.2804
	5	0.02116	1.5960	0.36093	27.3402
	10	-0.14157	-10.6781	0.19953	15.1143
	20	-0.08726	-6.5817	0.48923	37.0588
	30	-0.13915	-10.4955	0.76548	57.9846
	40	-0.30073	-22.6829	0.73792	55.8969
	50	-0.09660	-7.2862	0.98648	74.7252
	60	0.06635	5.0045	0.93939	71.1582
	VAR	0.000175775		0.000174278	

Portugal	Post Event Day	Positive Event CAR	t-value	Negative Event CAR	t-value
	1	0.05604	5.1284	-0.01235	-1.0633
	2	0.07287	6.6686	-0.04110	-3.5386
	3	0.05702	5.2181	-0.00883	-0.7602
	4	0.04785	4.3789	0.04105	3.5343
	5	0.07077	6.4764	0.03729	3.2106
	10	0.08988	8.2253	-0.00152	-0.1309
	20	0.07962	7.2863	0.18600	16.0141
	30	0.36935	33.8006	0.04949	4.2610
	40	0.45312	41.4668	-0.13842	-11.9176
	50	0.35422	32.4160	-0.34999	-30.1333
	60	0.49212	45.0358	-0.26942	-23.1964
	VAR	0.000119406		0.000134902	
Spain	Post Event Day	Positive Event CAR	t-value	Negative Event CAR	t-value
	1	0.05006	5.5346	0.12507	10.2229
	2	0.09909	10.9552	0.20661	16.8878
	3	0.15178	16.7805	0.18709	15.2923
	4	0.18680	20.6523	0.16225	13.2619
	5	0.23462	25.9392	0.13527	11.0566
	10	0.31448	34.7684	-0.00500	-0.4087
	20	0.42367	46.8403	0.03962	3.2384
	30	0.50177	55.4749	0.28092	22.9617
	40	0.62585	69.1929	0.32381	26.4674
	50	0.80950	89.4970	0.33819	27.6428
	60	0.98986	109.4373	0.18428	15.0626
	VAR	0.000081812		0.000149678	
Sweden	Post Event Day	Positive Event CAR	t-value	Negative Event CAR	t-value
	1	0.00249	0.1604	0.03754	4.1110
	2	-0.02164	-1.3939	0.05485	6.0067
	3	-0.07586	-4.8864	0.04495	4.9225
	4	-0.08023	-5.1678	0.02801	3.0674
	5	-0.10350	-6.6667	0.05071	5.5533
	10	-0.11446	-7.3727	0.04821	5.2795
	20	0.07316	4.7124	0.14502	15.8812
	30	0.05984	3.8545	0.05203	5.6978
	40	-0.05040	-3.2464	0.11424	12.5105
	50	-0.07571	-4.8767	0.09249	10.1286
	60	0.03747	2.4135	0.14311	15.6721
	VAR	0.000241021		0.000083385	

Switzerland	Post Event Day	Positive Event CAR	t-value	Negative Event CAR	t-value
	1	0.01279	1.7165	0.04204	6.3407
	2	0.01384	1.8574	0.08608	12.9831
	3	-0.00501	-0.6724	0.16028	24.1744
	4	0.01846	2.4775	0.19465	29.3583
	5	0.02179	2.9244	0.18587	28.0340
	10	0.08989	12.0639	0.24379	36.7699
	20	0.29025	38.9536	0.31059	46.8450
	30	0.46112	61.8855	0.45344	68.3905
	40	0.56061	75.2378	0.54714	82.5229
	50	0.50216	67.3934	0.60885	91.8304
	60	0.62622	84.0431	0.65578	98.9086
	VAR	0.00005552		0.000043959	

Turkey	Post Event Day	Positive Event CAR	t-value	Negative Event CAR	t-value
	1	-0.00857	-0.3397	-0.01225	-0.3357
	2	-0.01714	-0.6793	-0.02449	-0.6711
	3	-0.02572	-1.0194	-0.03674	-1.0067
	4	-0.03429	-1.3590	-0.04899	-1.3424
	5	0.00369	0.1462	0.01573	0.4310
	10	0.16533	6.5526	-0.38184	-10.4631
	20	-0.16113	-6.3862	0.00783	0.2146
	30	-0.27342	-10.8366	-0.02293	-0.6283
	40	-0.32687	-12.9550	-0.37184	-10.1891
	50	-0.28948	-11.4731	-1.06095	-29.0720
	60	-0.38619	-15.3061	-1.13152	-31.0058
	VAR	0.00063661		0.001331800	