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Turn Of the Month Effect and Financial Crisis: A new explanation from the Greek Stock Market (2002-2012)

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Abstract. *This study's main objective is to examine the turn of the month (TOM) effect under changing financial trends. For this reason we need to focus on a stock market which (i) does not present significant structural changes, and (ii) presents clear and long term periods of financial growth and recession. The Greek stock market during the period 2002-12 is the most appropriate. We applied a TGARCH asymmetry model which best fits to our data sample due to the leverage effect. The empirical findings suggest that: (i) there is a strong predisposition in favour of the TOM effect, (ii) the financial trend and the volatility shifts influence the TOM effect, and (iii) the TOM days do not present negative returns even during the long term recession period. Moreover, this approach may pave the way for an alternative explanation as to why the TOM effect fades of persists through time.*

Keywords: TOM effect, financial crisis, Greek stock market, investment strategy .

JEL Classification: G01, G15.
REL Classification: 11B.

1. Introduction

Sharpe (1964) and Lintner (1965) present the Asset Pricing Model (APM), while a few years later Fama (1970) presents the Efficient Market Hypothesis (EMH). These seminal papers constitute some of the most important studies in contemporary financial literature. However, scholars document some stock patterns which are widely known as "calendar effects (or anomalies)" and document unexpected or anomalous regularities in security rates of return. The calendar anomalies indicate either market inefficiencies or inadequacies in the underlying asset-pricing model (Schwert, 2003). The fact that the calendar anomalies (CA): (i) call into question the APM and the EMH, and (ii) the important practical implications for traders and investors, may be some of the reasons why there is a vast amount of literature in this specific area of study.

The CA that are most often mentioned in the international literature are: (i) the Day of the Week (DOW) effect which is the tendency for significantly different returns amongst weekdays(1), (ii) the Month of the Year (MOY) effect according to which there are significantly different returns depending on the month(2), (iii) the Trading Month (or fortnight) effect (TM), which emphasizes the increased returns during the first fortnight compared to the second one and (iv) the Turn of the Month (TOM) effect according to which the returns are statistically higher on the turn of the month days rather than other days of the same month(3).

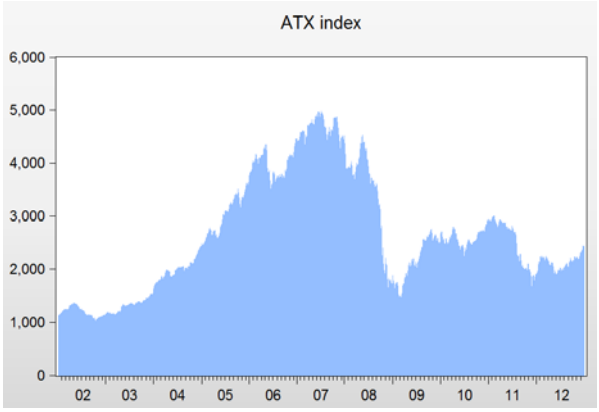
There are conflicting empirical findings regarding the calendar effects (CE) fade or persist. In particular, some scholars suggest that when CA were first documented and entered the realm of public discourse, the market responded efficiently by trading them out of existence (Agrawal and Tandon, 1994), Schwert (2003)). On the other hand there are other studies which question them due to the violations of the OLS assumptions in the returns' time series (Connoly, 1989, Alford and Guffey, 1996).

The questions above have focused not only the financial trend, but also on the economy's cycle, because the international literature suggests that the stock market performance is a leading indicator for economic growth/recession (Levine, 2005, Levine and Zervos, 1998 etc.). Therefore, in order to select a country which meets these requirements we examine most of the European Monetary Union's (EMU) countries and the US economic performance during the period 2002-2012(4) (Table 1). The results suggest that among all these, the country which presents the most clear and long term economic cycles is Greece. Furthermore, we examine the main stock indexes from the specific countries (Figure 1). The results also suggest that the Greek stock market (ASE GI) presents long term financial trends which are consistent with the aforementioned theories and satisfy our assumptions. Therefore, at this point we present some of the initial reasons that

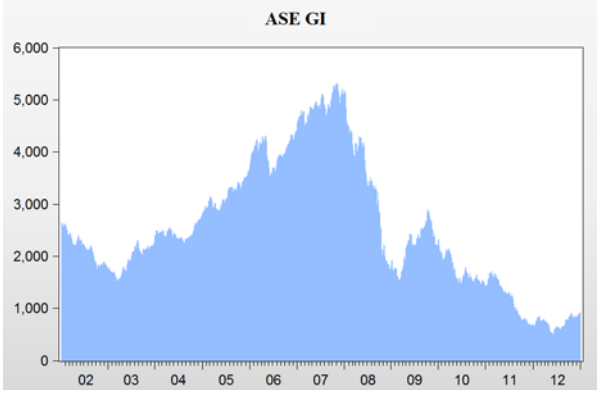
make the Greek case suitable for our study (in the next sections we analytically present our evidence).

Figure 1. *First EMU's countries (those who firstly adopted Euro as official currency) and US stock indexes performance*

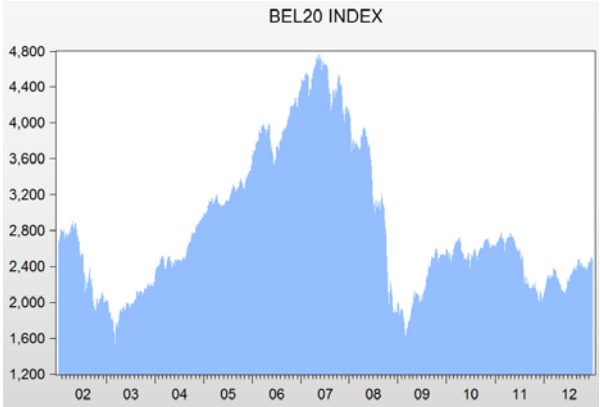
Austria



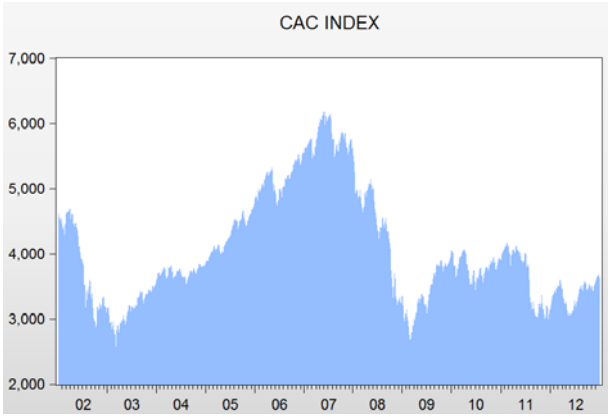
Greece



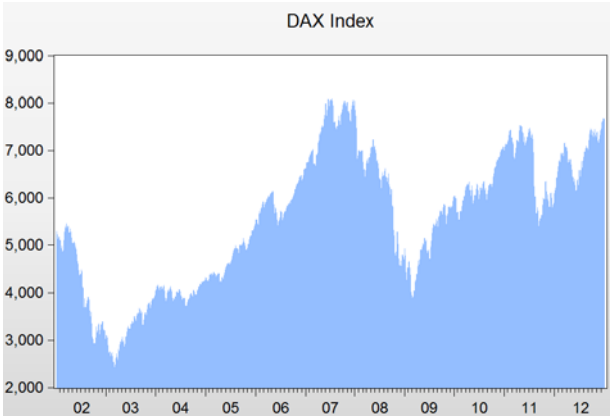
Belgium



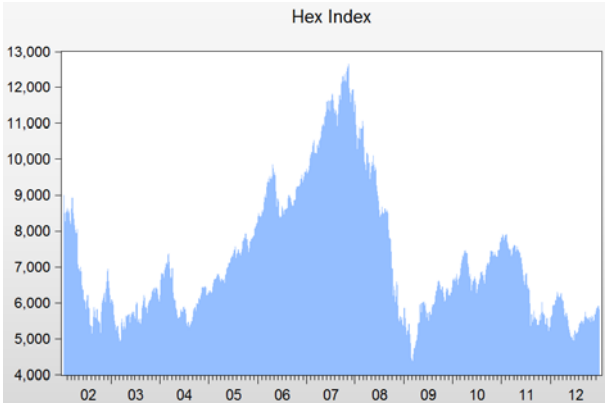
France



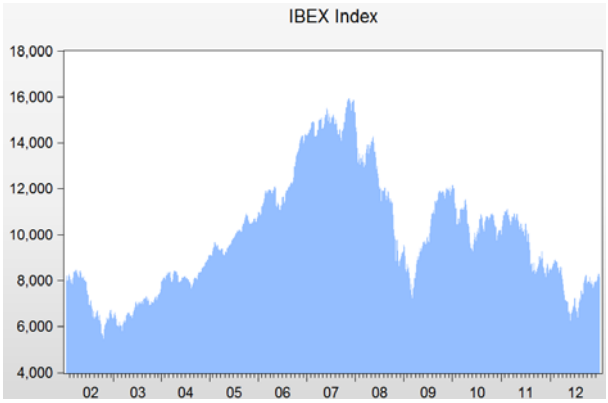
Germany



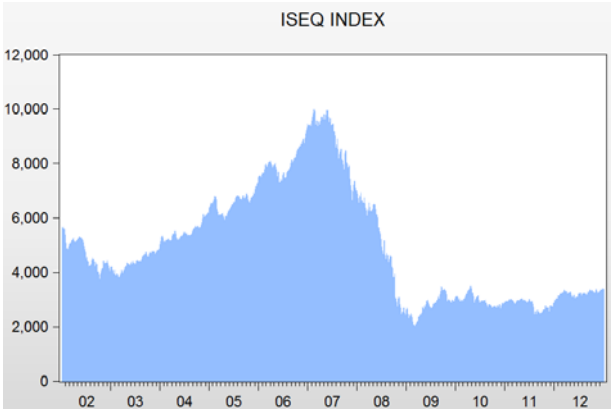
Finland



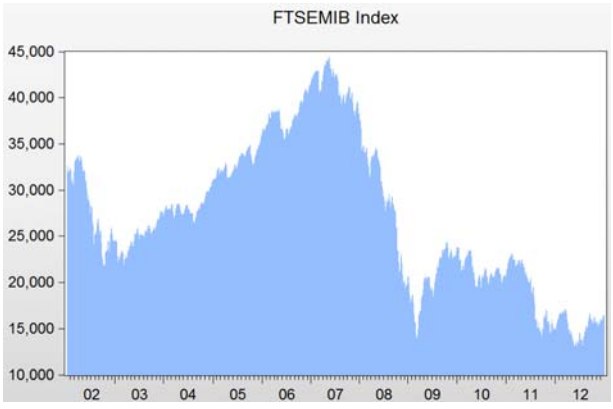
Spain



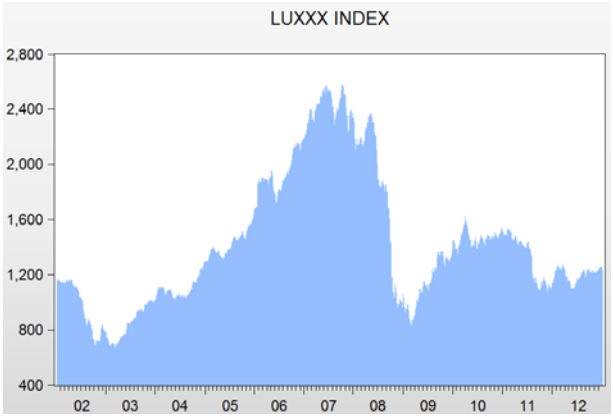
Ireland



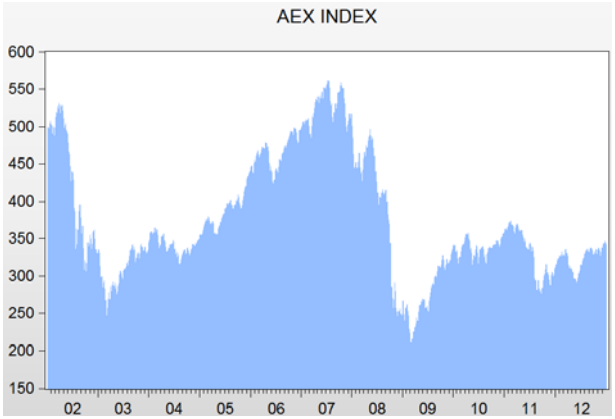
Italy



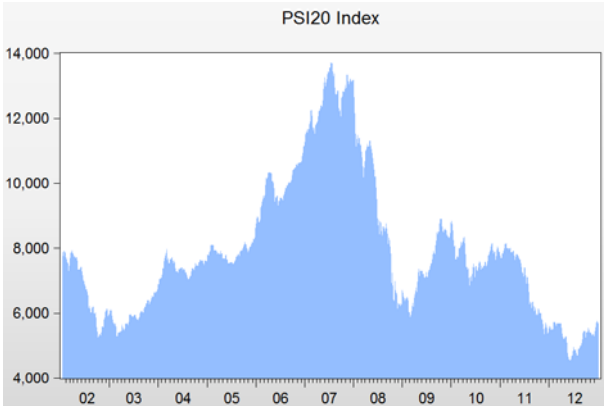
Luxemburg



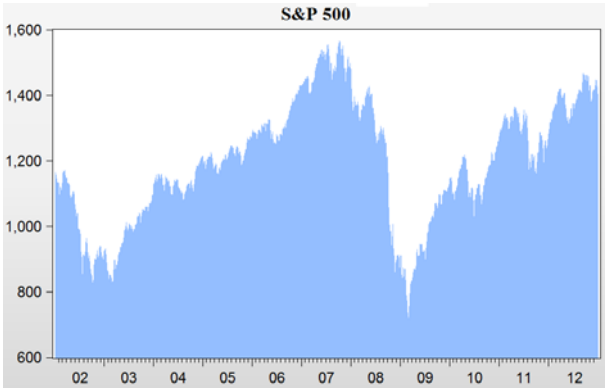
Netherlands



Portugal



USA



Source: Bloomberg.

Table 1. *Gross domestic product annual percentage growth in constant prices for the 2002-2012 period in the sample countries*

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Austria	1.694	0.866	2.590	2.401	3.670	3.706	1.436	-3.822	1.769	2.834	0.871
Belgium	1.359	0.807	3.274	1.752	2.666	2.883	0.985	-2.787	2.416	1.840	-0.281
Finland	1.834	2.012	4.126	2.915	4.411	5.335	0.294	-8.539	3.363	2.726	-0.827
France	0.929	0.899	2.545	1.826	2.467	2.285	-0.081	-3.147	1.725	2.027	0.014
Germany	0.030	-0.387	0.694	0.846	3.886	3.389	0.807	-5.085	3.857	3.399	0.896
Greece	3.440	5.944	4.368	2.280	5.511	3.536	-0.214	-3.136	-4.943	-7.105	-6.389
Ireland	5.417	3.730	4.200	6.080	5.505	4.970	-2.160	-6.384	-1.063	2.169	0.157
Italy	0.451	-0.047	1.731	0.931	2.199	1.683	-1.156	-5.494	1.723	0.374	-2.369
Luxembourg	4.088	1.669	4.376	5.253	4.933	6.588	-0.735	-4.073	2.891	1.656	0.336
Malta	2.434	0.716	-0.289	3.585	2.580	4.073	3.881	-2.812	3.189	1.819	1.039
Netherlands	0.076	0.336	2.237	2.046	3.394	3.921	1.804	-3.668	1.528	0.945	-1.247
Portugal	0.764	-0.911	1.560	0.775	1.448	2.365	-0.009	-2.908	1.936	-1.288	-3.238
Slovak Republic	4.583	4.775	5.058	6.655	8.346	10.494	5.751	-4.936	4.382	3.226	2.027
Slovenia	3.827	2.930	4.402	4.007	5.850	6.960	3.383	-7.943	1.258	0.709	-2.543
Spain	2.707	3.088	3.257	3.588	4.075	3.479	0.893	-3.832	-0.203	0.052	-1.643
United States	1.776	2.791	3.798	3.351	2.667	1.790	-0.291	-2.802	2.507	1.847	2.779

Source: International Monetary Fund (IMF), World Economic Outlook Database, October 2013.

Definition: Gross domestic product, constant prices.

The main objective of our study is to provide evidence for an alternative explanation on the conflicting findings in the CA literature. The Greek stock market, during the examined period (2002-2012), shows clear and long term financial trends: a growth sub period (2002-2007) and a recession sub-period (2008-2012).

As we mention above, a possible counterargument that can be put forth relates to the applied methodology. In order to avoid such counterarguments, when we examine the TOM effect we employ all the models that are usually used in these studies such as the OLS and GARCH family models. We select the TGARCH model, since it better fits our sample (in the next sections we analytically present the reasons).

In addition, the TOM literature mainly presents two equation variations (version) of the TOM effect. There is one version that focuses on the difference between the mean return of TOM and NTOM days, while the other version focuses on the returns during the TOM and the NTOM periods. In order to examine the TOM effect in detail, we present the results applying both of them.

This paper contributes to the literature by examining the TOM pattern(5) in a mature market under different and long term financial and economic trends. As we present in the literature there have been documented conflicting findings regarding the TOM effect's existence. Could the financial trend (positive/negative) influence the TOM pattern? If the answer is positive the empirical findings should present different TOM patterns depending on the financial trend during each of the examined periods. Therefore, this approach may pave the way for an alternative TOM approach and an alternative explanation for the calendar anomalies' persistence or fading through the time. Finally, we would like to mention that this is the second study regarding the TOM effect for the Greek stock market, and the first study which examines the TOM effect including the pre- and the post- Greek crisis period.

The rest of this paper is organised as follows: Section 2 presents the literature review for the TOM effect, Section 3 briefly provides the market information and describes the data, Section 4 analyses the methodology and presents the empirical results, Section 5 discusses the findings and Section 6 concludes the study.

2. Literature review(6)

The first studies focusing on the Turn of the Month effect (TOM) examine the US stock market. In particular, Ariel (1987) first observes the TOM effect for the US market. He defines TOM as being the last trading day of the previous month and the first nine trading days of the following month. Lakonishok and Smidt (1988) provide evidence for significant TOM effects in the US market, even when the turn of the year effect is excluded. They define TOM as being the last trading day of the previous month and the first three trading days of the next month(7). Ogden (1990) suggests that the TOM effect exists in the US because of the accumulation of cash at the month's end by large institutional investors.

The TOM research begins, but is not limited to the US case. The following years presented studies which examine the TOM effect using as a sample either a group of countries or each country individually. Presented in this section are selected studies from the first category in order to briefly show the TOM's international results(8). Cadsby and Radner (1992) examine a sample of 10 countries, finding that the TOM effect exists in the US, Canada, the UK, Australia, Switzerland and

West Germany; there is no evidence for the TOM effect in Japan, Hong Kong, Italy and France. They documented that the TOM effect exists independently of the Turn of the Year effect. Regarding the non-existence of that calendar effect they suggest that it may be caused by the different sequence days that occur with the TOM effect[9].

Kunkel et al. (2003) document that the TOM effect still exists in 16 out of the 19 sample countries, using data for the 1988-2000 period. They divide their sample into continents and suggest that the TOM exist in: European markets (Austria, Belgium, Denmark, France, Germany, the Netherlands, Switzerland, and UK), Asian countries (Japan and Singapore), America (Canada, Mexico and United States), Australia and Oceania (Australia and New Zealand) and Africa (South Africa) [10].

Several explanations are proposed for existence of the Turn of the Month effect: (i) companies usually declare profits during the first fortnight of the month and investors may take their positions even before the announcements, (ii) the end of the month prices increase is attributed to better purchasing power resulting from salaries that are usually paid at the end of the month, (iii) the foreign investors' (institutional and individuals) behaviour, which influences the financial markets etc.

However, international literature reports a calendar effects fade after their first documentation, because investors take them into consideration and trade them away (Schwert (2003)). On the other hand, there are studies which call this theory in questions due to the violation of the OLS assumptions (Alford and Guffey (1996)).

Examining the TOM effect for the Greek case, the only study which examines and confirms the TOM effect existence, to the best of our knowledge, is Georgantopoulos et al. (2011). However, for the examined period 2000-2008 there are two significant structural and regulatory changes that may influence the TOM effect: (i) in 2001 the Greek market upgrades from the emerging to the mature markets, which is a significant financial change and (ii) in 2001 Greece enters the Eurozone, which influences the Greek economy's perspectives in general. In order to avoid similar counterarguments that may emerge: (i) we use several econometric models that are usually applied in the specific literature, and (ii) we use data from the Euro period (2002-2012) during which there are no similar changes (Greece is still an EMU member and the Greek stock market downgraded to the emerging markets in 2013).

However, as we present above and to the best of our knowledge, there is no study which examines whether the TOM is influenced by financial trends, because this may give us an explanation for the conflicting findings. For example, we assume

that the TOM effect exists in a specific stock market and the home country is in a negative trend of the economic cycle or presents severe financial crisis; is the TOM effect strong enough to make the TOM days profitable even in this case? Alternatively, during a growth or a recession period are the TOM day returns significantly higher than the returns during the non-turn of the month (NTOM) days? This study tries to answer to these questions and by this way tries to contribute to the TOM literature, by introducing an alternative explanation regarding the TOM effect's presence/fade through the time.

3. Market information and descriptive statistics

3.1. Market information

In this sub-section we would like to provide some information about the Greek economy, which is a special case and an appropriate sample for our study. It is widely known that the Greek issue has been puzzling the EU authorities in the last years. In the summer of 2007 the US begins the sub-prime mortgage crisis which quickly evolves into a full-blown crisis. In the European Monetary Union (EMU) the first crisis-recession signs begin in 2008 (Table 1). The US recession lasts for two years; however for the EMU the financial crisis follows a different pattern for the Eurozone members. The imbalances within the EMU increase and for some countries the consequences of the financial crisis are severe. The Greek economy faces the longest lasting recession and seems to be affected the most amongst the countries included in this sample[(11)], therefore for the Greek economy the economic cycle has the clearest sub-periods of economic growth and economic recession, among the countries we include in Table's 1 sample.

In order to examine the TOM effect in the Greek stock market we should find the indicator that best presents the Greek stock market's performance. Among several financial indices we use the ASE general index (ASEGI)[(12)], because it adequately represents the stock market's capitalisation and the average daily trading value (Tsangarakis, 2007). Indicatively, in Table 2 we present the ratio of the ASEGI stocks capitalisation and the average trading value to the total market's respective size. So, we may assume that the chosen ratio adequately represents the Greek stock market. Moreover, the specific ratio is used in many similar ASE studies (Kenourgios and Samitas, 2008, Georgantopoulos et al., 2011 etc.). Therefore, we may assume that ASEGI is a reliable indicator for the Greek stock market's performance and we are able to present some ASEGI's information.

Table 2. *Athens Stock Exchange General Index participation to the Total Market Capitalisation and the Average Daily Trading Value*

Year	2009	2010	2011	2012
Market Capitalisation (%)	76.95%	78.60%	80.61%	85.80%
Average Daily Trading Value %)	87.87%	92.02%	91.09%	76.50%

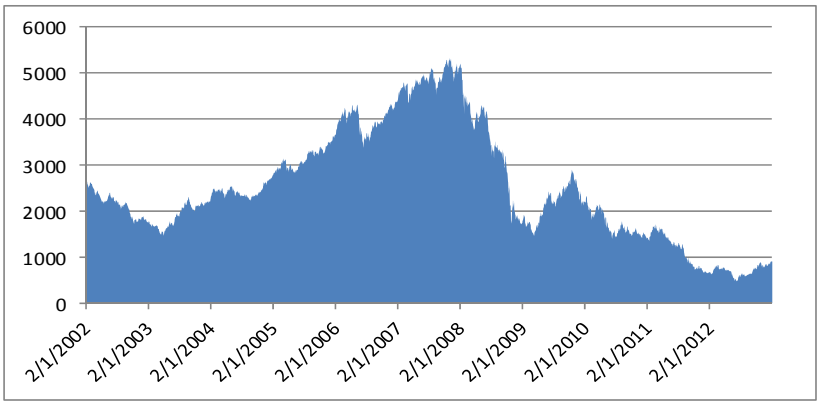
Source: www.helex.gr

The ASEGI's purpose is to be a reliable measure for the listed companies' trend. ASEGI consists of the 60 largest companies (blue chips) stock, which are listed on the main market, which is being calculated daily. It is a market capitalisation weighted-index, while there are specific criteria (e.g. increased liquidity) in order for a stock to be included in the ASE general index. The ASEGI's base year is December 31st 1980, and it is yearly reviewed in April and October(13).

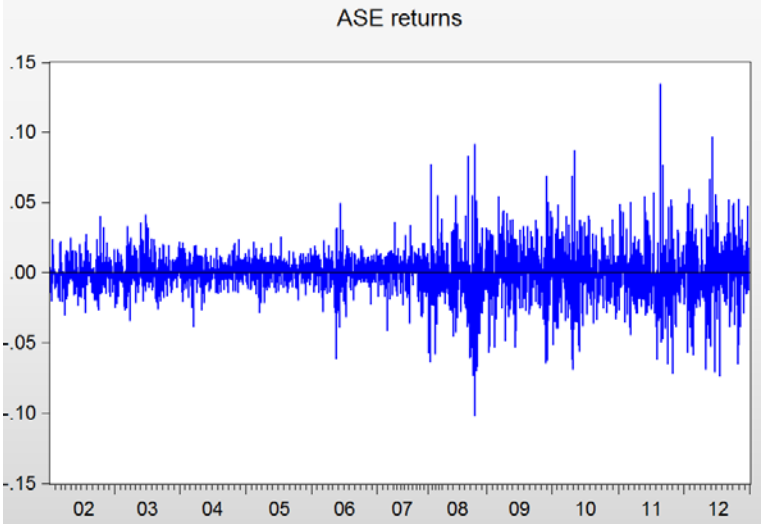
In order to graphically present the ASEGI's performance during the 2002-12 period, we collect from the Bloomberg database daily closing prices (P_i) of the ASEGI for the time span 2nd January 2002 to 31st December 2012. Furthermore, the daily returns which are used in the specific study are given by the equation $R_t=Ln(P_t/P_{t-1})$, where P_t and P_{t-1} are the current and the previous day's index prices respectively. Figure 2(a) presents the ASEGI chart, while Figure 2(b) displays the daily returns volatility for the whole period.

Figure 2. *ASE index and ASE returns chart*

(a) The ASE Index from 3rd January 2002 to 31 December 2012



(b) Returns from 3rd January 2002 to 31 December 2012



Source: Bloomberg and author's calculations.

As we have mentioned in section 1, international literature suggests that the stock market performance is a leading indicator for economic growth/recession (Levine (2005), Levine and Zervos (1998) etc.). Taking into account the financial theory and the statistics in Table 1 we may assume that the end of 2007 would be the period in which the financial trend changes, therefore the period we should divide our sample into growth and recession sub-periods. In the aforementioned theory, the Table 1 data and Figure 2 partly confirm that the Greek case may be a typical case for our study, because not only the stock index (for which we present analytical data below), but also the Greek economy in total presents long term and clear economic cycles. In particular, looking at Figure 2 we may note following: firstly, the ASEGI figure confirms our assumption that for the period 2002-2007 there is a long term growth, but from 2008 up to 2012 there is a period of long term reduction in the stock values, and secondly, the volatility figure suggests that periods of high (low) volatility are followed by periods of high (low) volatility(14).

3.2. Descriptive statistics

Table 3 presents the ASEGI descriptive statistics, which quantitatively confirm that in our sample there is a growth sub-period during 2002-07 and a recession sub-period during 2008-12 (positive and negative mean returns, respectively). We briefly outline three main results. First, there is increased kurtosis and the Jarque-Bera test confirms that our sample does not follow the normal distribution(15). Second, the correlation tests using the Ljung-Box (Q) statistics reject the hypothesis of first and second-order independencies, which means that the conditional mean is a function of past returns and/or past errors and the conditional variance of returns is time-dependent and heteroscedastic. Third, we

use the augmented Dickey and Fuller (1981) and the results suggest that the time series is stationary.

Table 3. *Summary statistics for the ASE General Index returns in period 2002-2012*

	Total Period (2/1/2002-31/12/2012)	**Growth Sub-Period (2/1/2002-31/12/2007)**	**Recession Sub-Period (2/1/2008-31/12/2012)**
Mean	-0.000474	0.000355	-0.001470
Median	3.79E-05	0.000642	-0.001225
Maximum	0.134311	0.049736	0.134311
Minimum	-0.102140	-0.061067	-0.102140
Std. Dev.	0.017633	0.010558	0.023431
Skewness	0.044502	-0.202179	0.165723
Kurtosis	7.512207	4.908667	5.084514
Jarque-Bera	2,292.241	233.7835	227.7648
Probability	0.000000	0.000000	0.000000
Q(1)*	8.1863 (0.004)*	5.7029 (0.017)**	3.0962 (0.078)***
Q(2)	13.396 (0.001)*	6.6605 (0.036)**	8.1906 (0.017)**
Q(5)	15.172 (0.010)*	8.2529 (0.143)	8.6209 (0.125)
Unit root tests for (R_t) Augmented Dickey-Fuller (ADF)	-49.15423 (0.0001)*	-36.04059 (0.0000)*	-33.26899 (0.0000)*
Days with positive returns	1,355	895	690
Percentage of positive trade sessions	50,17%	60,72%	56,23%
Days with negative returns	1,346	579	537
Percentage of negative trade sessions	49,83%	39,28%	43,77%
Observations	2,701	1,474	1,227

Notes: We exclude the turn of the year effect. *, **, *** indicate the level of statistical importance 1%, 5% and 10% respectively. The p-values are given in parentheses.

In Table 4 we provide some further descriptive statistics, which are focused in the TOM and non-Turn of the Month (NTOM) days during the sample's total period and its sub-periods. As TOM days we use the Lakonishok and Smidt (1988) definition for the TOM period (the last and the first three days of the month) and we exclude the December to January TOM days in order to exclude the turn of the year effect.

Table 4. *The Trading Month Effect: Descriptive Statistics*

	Total Period (2/1/2002-31/12/2012)		**Growth Sub-Period (2/1/2002-31/12/2007)**		**Recession Sub-Period (2/1/2008-31/12/2012)**	
	TOM	**NTOM**	**TOM**	**NTOM**	**TOM**	**NTOM**
Mean	0.001045	-0.000806	0.001178	0.000176	0.000885	-0.001985
Median	0.000419	-5.72E-05	0.001032	0.000562	-0.000395	-0.001593
Maximum	0.069058	0.134311	0.041005	0.049736	0.069058	0.134311
Minimum	-0.071679	-0.102140	-0.033930	-0.061067	-0.071679	-0.102140
Std. Dev.	0.017561	0.017635	0.011114	0.010429	0.023060	0.023491
Skewness	-0.053440	0.066127	0.077811	-0.282984	-0.046566	0.212414
Kurtosis	5.373034	7.996567	4.140111	5.087937	3.725088	5.390882
Jarque-Bera	113.7947	2307.820	14.56480	235.9399	4.898902	247.4196

	Total Period (2/1/2002-31/12/2012)		Growth Sub-Period (2/1/2002-31/12/2007)		Recession Sub-Period (2/1/2008-31/12/2012)	
	TOM	NTOM	TOM	NTOM	TOM	NTOM
Probability	0.000000	0.000000	0.000688	0.000000	0.086341	0.000000
Days with positive returns	254	1101	146	631	108	470
Percentage of days with positive returns	52.48%	49.66%	55.30%	52.15%	49.09%	46.67%
Days with negative returns	230	1116	118	579	112	537
Percentage of days with negative returns	47.52%	50.34%	44.70%	47.85%	50.91%	53.33%
Observations	484	2,217	264	1,210	220	1,007

Note: We exclude the turn of the year effect.

The mean returns during the TOM days are always positive either we examine the growth either the recession sub-period. Moreover, there are increased possibilities for positive returns sessions during the growth period (55.03%), but these possibilities are reduced during the crisis period (49.09%). On the other hand, the NTOM are highly influenced by the financial trend. In particular, during the growth period the mean returns are positive and during the recession period change to negative. Furthermore, the possibilities for positive returns session are highly influenced by the financial trend. The 52.15% session days are positive during the growth period, while this ratio falls to 46.67% when the financial trend shifts.

Finally, regarding the descriptive statistics we present a binary approach which gives us the opportunity to present in an alternative and a systematic way, when there are increased possibilities for positive (negative) returns stock sessions during each period either for TOM or for NTOM days. The Probit/Logit equation for the TOM effect is

$$Y_i = D_{1i} + D_{2i} , \quad (1)$$

where: $Y_i=1$ if there are positive returns and $Y_i=0$ otherwise. D_{1i} and D_{2i} are dummy variables which belong to the TOM and NTOM time span, respectively. If the day i belongs to the TOM days the dummy variables are $D_{1i}=1$ and $D_{2i}=0$. For the NTOM days the dummy variables values are reversed.

Table 5. *Probit/Logit Analysis for the trading month effect*

	Probit			Logit		
	Total Period (2/1/2002-31/12/2012)	**Growth Sub-Period (2/1/2002-31/12/2007)**	**Recession Sub-Period (2/1/2008-31/12/2012)**	**Total Period (2/1/2002-31/12/2012)**	**Growth Sub-Period (2/1/2002-31/12/2007)**	**Recession Sub-Period (2/1/2008-31/12/2012)**
TOM	0.062188 (0.2753)	0.133321 (0.0849)***	-0.022790 (0.7874)	0.099255 (0.2755)	0.212922 (0.0854)***	-0.036368 (0.7874)
NTOM	-0.008480 (0.7501)	0.053888 (0.1350)	-0.083485 (0.0348)**	-0.013532 (0.7501)	0.086003 (0.1351)	-0.133265 (0.0349)**

Notes: We exclude the turn of the year effect.
*, **, *** indicate the level of statistical importance 1%, 5% and 10% respectively.
The p-values are given in parentheses.

The results suggest that the TOM days present increased possibilities for positive return sessions during the growth period, while the NTOM days present increased possibilities for negative sessions during the recession period.

The descriptive statistics and the binary analysis we present above may be a first indication that financial trend influences the TOM effect, because the differences between the TOM and NTOM returns are influenced from the economic cycle. Particularly, the descriptive statistics suggest that the TOM returns are positive in both sub-periods, but during the growth years the mean return is significantly higher. On the other hand the NTOM returns are strongly influenced from the financial trend. During the growth years the mean returns are positive, but lower in comparison to the respective TOM returns. In contrast, during the recession years the NTOM mean returns are significantly negative (in absolute value higher than the TOM returns during the growth period).

The economic environment and the market's psychology may be depicted in the positive or negative return sessions. Therefore, apart from the descriptive statistics (Table 4), binary analysis enables us to present these statistics in a more systematic way (Table 5). During the growth period not only the mean returns are positive, but also the most stock sessions days are positive. Especially the TOM days during the growth period present increased possibilities for positive returns. However, during the recession period the results are almost the opposite. The most TOM days, even if they present positive mean returns, are not positive, while the NTOM days not only present negative returns, but also there are increased possibilities for negative return sessions.

From the above statistical analysis we highlight the following: (i) the TOM days present a predisposition for positive returns (even during the long term recession period the mean TOM returns are positive), (ii) the NTOM days are significantly influenced from the financial trend, (iii) the positive/negative return sessions may be an indicator for the economic climate, and (iv) this section's results enable us

to assume that in the Greek stock market there is a predisposition in favour of the TOM effect, but the financial trend influences it. In the next section we apply the methodological approaches that are used in the specific literature in order to confirm (or not) these assumptions.

4. Methodological issues and results presentation

The calendar anomalies are usually examined using either an OLS or a GARCH family model. As we mention in the introduction, a major methodological counterargument in the specific are of study is that the OLS may not be appropriate due to the violations of the OLS assumptions (Connolly (1989), Alford and Guffey (1996)). Financial econometrics theory suggests that the linear models may be inappropriate when the sample's distribution may be charactirised as leptokurtic, and when there is leverage effect, which is the tendency for volatility to rise more following a large price fall than following a price rise of the same magnitude (Brooks (2008, p.380)). Moreover, as Kenourgios and Samitas (2008) suggest the error variances may not be constant over time; therefore using a GARCH family model we allow variances of errors to be time dependent to include a conditional heteroskedasticity that captures time variation of variance in stock returns.

The aforementioned features exist in our sample: (i) the distribution is leptokurtic, (ii) during the recession period the volatility raises significantly (Table 3), and (iii) periods of high (low) volatility are followed by periods of high volatility (Figure 2). Therefore, theoretically the GARCH family models may be more appropriate for our sample. We empirically confirm our assumption, because when we run a regression using the OLS approach we find an ARCH effect.

The next step of our "methodological exploration" is to find the most appropriate GARCH family model. We apply several GARCH models that usually are used in the respective literature (GARCH, EGARCH and TGARCH). Among the GARCH family models we finally choose the T-GARCH (or GJR model, named from the authors' initials Glosten, Jagannathan and Runkle (1993) model, because this model: (i) enables as to include the leverage effect in our findings, and (ii) fits better to our sample according to the Akaike and Swartz criteria.

However, the exploration does not finish here. We examine the TOM effect using two versions that are usually used in the international literature and focus on the TOM-NTOM returns relationship from two slightly different views. In this way we try to completely examine the TOM effect.

4.1.1. First version of the TOM effect: Methodological issues

The first TOM effect version focuses on the difference between the mean return of TOM and NTOM days. The mean equation result this case is the following

$R_t = a + b*TOM_D + c*R_{t-1} + \varepsilon_t$ (2a),

where Rt=Ln(Pt/Pt-1), TOM_D is a dummy variable taking the value 1 for the TOM days (otherwise takes the value zero), and ε_t is an is an iid~$(0,\sigma^2)$ error term. The *a* term indicates the mean daily return for the NTOM day, the *b* term measures the difference between the mean TOM and the mean NTOM return. R_{t-1} is the previous day's return, which enables us to resolve the autocorrelation issues and to include the non-synchronous trading effect (different trader types) in our analysis. In order to examine which is the crisis influence into the total period's mean equation we include the crisis dummy variable, which takes the value 0 for the pre-crisis period (2002-07) and the value 1 for the post-crisis period. Therefore, only when the total period is examined the equation is the following:

$R_t = a + b*TOM_D + c*R_{t-1} + crisis + \varepsilon_t$. (2b).

The conditional variance for the total period is given by the equation (3)

$$\sigma_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2 + \alpha_2 u_{t-2}^2 + \beta_1 \sigma_{t-1}^2 + \gamma_1 u_{t-1}^2 I_{t-1} + \delta crisis_i \,, \quad (3)$$

where u_{t-1}^2 and u_{t-2}^2 are the ARCH terms, which captures the volatility during the previous period (order 1 and 2 respectively), and σ_{t-1}^2 is the GARCH term, which indicates that the value of the variance depends on the past value of the variance itself. The difference between a simple GARCH and the T-GARCH model is the dummy variable I_{t-1} which takes the value 1, if $u_{t-1} < 0$, and zero otherwise. The crisis dummy variable indicates how the crisis influences on the volatility (this variable is included only when the total period is examined). Positive δ coefficient means that crisis increases the volatility (and vice versa). In this case positive returns will have impact α_1, and negative returns will have impact $\alpha_1+\gamma$. If $\gamma > 0$ we conclude that there is asymmetry and that a negative return tends to increase subsequent volatility much more than a positive return of the same magnitude.

For the total and the growth period we use a TGARCH (2,1) model in order to eliminate the ARCH effect. Therefore, the conditional variance for the first period is given by the equation

$$\sigma_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2 + \alpha_2 u_{t-2}^2 + \beta_1 \sigma_{t-1}^2 + \gamma_1 u_{t-1}^2 I_{t-1}, \quad (4)$$

while in the second period the variance equation is a simple TGARCH (1,1) model

$$\sigma_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2 + \beta \sigma_{t-1}^2 + \gamma_1 u_{t-1}^2 I_{t-1}, \quad (5)$$

4.1.2. First version of the TOM effect: Empirical results' presentation

The findings are presented in Table 6. The mean return's results suggest the following. In the Greek stock market there is a long tern tendency in favour the TOM effect. The TOM term (coefficient b) is always positive either we examine the whole period or each sub-period individually. However, the strength of the TOM is influenced by the financial trend. In particular, during the growth period the TOM effect is not statistically significant, probably because the TOM and the NTOM returns are both positive. In this case, the returns' difference is not statistically significant. In contrast, when the recession years come the NTOM returns are negative and the TOM returns are positive. This contrast in the returns may be the reason for the increased significance that the b term represents. Therefore, we may assume that in the Greek stock market a TOM effect predisposition may exists, which is stronger during the crisis due to the opposite results that TOM and NTOM days present.

The previous day's returns coefficients (x) are positive and statistically significant during the total and the growth (or pre-crisis) periods. This means that previous days' returns influence the current returns and this may be due to non-synchronous trading (different trader types), which is likely to characterize the less developed markets. However, these results are not empirically confirmed during the recession (or post crisis) period. Finally, as it is expected the crisis reduces the returns (crisis coefficient is negative and statistically significant).

According to the variance equation, the results suggest the following: (i) the crisis increases the ASE volatility (δ coefficient is positive and statistically significant), (ii) the leverage holds in the Greek stock market (γ is positive and statistically significant), which means that bad news has larger effects on the volatility of the series than good news, therefore the asymmetry models are more appropriate, and (iii) the sum of the coefficients in the volatility equation, which is less than 1, suggests stationary and not explosive variance.

Table 6. *The turn of the month effect: first version's empirical findings*

Mean Equation			
	Total Period (2/1/2002-31/12/2012)	**Growth (or Pre-Crisis) Period (2/1/2002-31/12/2007)**	**Recession (or Post-Crisis) Period (2/1/2008-31/12/2012)**
Constant	0.000232 (0.3983)	0.000190 (0.4877)	-0.001717 (0.0105)**
TOM	0.001281 (0.0219)**	0.000759 (0.1806)	0.003079 (0.0563)***
$Return_{t-1}$	0.055935 (0.0044)*	0.087914 (0.0002)*	0.027976 (0.3450)
Crisis	-0.001721 (0.0064)*		

Mean Equation			
	Total Period (2/1/2002-31/12/2012)	**Growth (or Pre-Crisis) Period (2/1/2002-31/12/2007)**	**Recession (or Post-Crisis) Period (2/1/2008-31/12/2012)**
Volatility Equation			
Constant	6.83E-06 (0.0000)*	7.58E-06 (0.0000)*	3.26E-05 (0.0000)*
α_1	-0.002316 (0.7805)	-0.066008 (0.0000)*	0.039433 (0.0054)*
α_2	0.051848 (0.0001)*	0.100931 (0.0000)*	
γ	0.105504 (0.0000)*	0.130941 (0.0000)*	0.095563 (0.0003)*
β	0.832068 (0.0000)*	0.827474 (0.0000)*	0.853617 (0.0000)*
δ	3.05E-05 (0.0000)*		

Notes: *, **, *** indicate the level of statistical importance 1%, 5% and 10% respectively.

The p-values are given in parentheses.

4.2.1. Second version of the TOM effect: Methodological issues

Equation 6 is the second version of the TOM model. This approach focuses on the returns' during the TOM and the NTOM periods

$$R_t = a*TOM_D + b*NTOM_D + c*R_{t-1} + \varepsilon_t, \quad (6a)$$

where TOM_D dummy takes the value 1 if the corresponding day is a TOM day and zero otherwise. The $NTOM_D$ is exactly the opposite from the TOM_D, therefore we do not use an intercept in order to avoid the dummy variable trap. Similar to the previous case, when the total period is examined we include the crisis variable and the equation is

$$R_t = a*TOM_D + b*NTOM_D + c*R_{t-1} + crisis + \varepsilon_t. \quad (6b)$$

The conditional variance equations are the same as in the previous version.

4.2.2. Second version of the TOM effect: Empirical results' presentation

Table 7 presents the results and confirms our previously mentioned assumptions (in version 1). The returns during the TOM period are constantly positive, but only during the growth period are statistically significant. The positive NTOM returns during the growth period does the difference between TOM and NTOM mean returns lower. On the other hand, during the recession period the TOM returns are positive, but statistically not significant, while the NTOM returns present increased negative significance (almost 1%). For this reason the difference between TOM and NTOM returns during the recession period is statistically significant.

The results according to the crisis variable, the previous day's returns and the variance equation are similar to the results we previously present; therefore it is not necessary to repeat them.

Table 7. *The turn of the month effect: second version's empirical findings*

Mean Equation			
	Total Period (2/1/2002-31/12/2012)	**Growth (or Pre-Crisis) Period (2/1/2002-31/12/2007)**	**Recession (or Post-Crisis) Period (2/1/2008-31/12/2012)**
TOM	0.001514 (0.0030)*	0.000952 (0.0687)***	0.001361 (0.3618)
NTOM	0.000232 (0.3983)	0.000200 (0.4675)	-0.001717 (0.0105)**
$Return_{t-1}$	0.055937 (0.0044)*	0.086568 (0.0003)*	0.027972 (0.3450)
Crisis	-0.001721 (0.0064)*		
Volatility Equation			
Constant	6.83E-06 (0.0000)*	7.65E-06 (0.0000)*	3.26E-05 (0.0000)*
α1	-0.002315 (0.7806)	-0.066446 (0.0000)*	0.039431 (0.0054)*
α2	0.051848 (0.0001)*	0.102269 (0.0000)*	
γ	0.105504 (0.0000)*	0.130593 (0.0000)*	0.095552 (0.0003)*
β	0.832067 (0.0000)*	0.826583 (0.0000)*	0.853624 (0.0000)*
δ	3.05E-05 (0.0000)*		

Notes: *, **, *** indicate the level of statistical importance 1%,5% and 10% respectively.

The p-values are given in parentheses

4.3. Econometric validity

Finally, Table 8 presents the autocorrelation and ARCH effect tests in order to complete our models' econometric analysis and to confirm their validity. We report the Ljung-Box Q statistics for the normalized residuals and Engle's (1982) ARCH-LM test at 1-, 10-, and 15-day lags[(16)]. None of these coefficients are statistically significant. Therefore, we cannot reject the null hypothesis that the residuals are not autocorrelated and there is no significant ARCH effect[(17)].

Table 8. *Autocorrelation and ARCH-LM tests*

	Total Period (2/1/2002-31/12/2012)	**Growth (or Pre-Crisis) Period (2/1/2002-31/12/2007)**	**Recession (or Post-Crisis) Period (2/1/2008-31/12/2012)**
Wald	4.584 (0.0103)**	1.800 (0.1658)	3.782 (0.0230)**
Q(1)	1.0760 (0.300)	0.0661 (0.797)	0.8396 (0.359)
Q(10)	8.7716 (0.554)	5.5944 (0.848)	9.7088 (0.466)
Q(15)	19.116 (0.209)	8.3280 (0.910)	18.491 (0.238)
ARCH(1)	0.236899 (0.6265)	0.019926 (0.8878)	1.482062 (0.2237)
ARCH(10)	0.627266 (0.7917)	0.651222 (0.7703)	0.969877 (0.4679)
ARCH(15)	0.711635 (0.7750)	0.640537 (0.8430)	0.834564 (0.6392)

Note: We present Q statistic for the autocorrelation test and the F-statistics of the ARCH- LM test. The p-values are given in parentheses.

5. Discussion

In this study we try to present detailed examination of the TOM effect in the Greek stock market taking as sample the period 2002-2012, because during this period there are no significant economic or financial reforms (e.g. Euro adoption, market upgrade etc.), which may influence the results (Alexakis and Xanthakis, 1995, Kenourgios and Samitas, 2008). During the sample's period the ASE presents long term financial trends, which enables us to examine the TOM effect in a period of long term growth and in a period of long term recession (Table 1 and Figure 2). The descriptive statistics suggest that the TOM days' returns are positive (even during the recession period), but the financial trend influences the NTOM days' returns (Table 4). Moreover, the TOM days present increased possibilities for positive sessions during the growth period and resist during the recession period (Table 5). Using a binary approach we are able to quantitatively present and confirm the economic climate in each period.

Apart from the descriptive statistics, we examine the TOM effect by employing the most appropriate methodology from those that are usually used in the respective literature. Furthermore, we examine the TOM effect using the two versions that are mainly presented in the international literature and complement each other (Tables 6 and 7).

The first version focuses on the returns' difference between TOM and NTOM days. In this case the empirical findings suggest that there is a long term

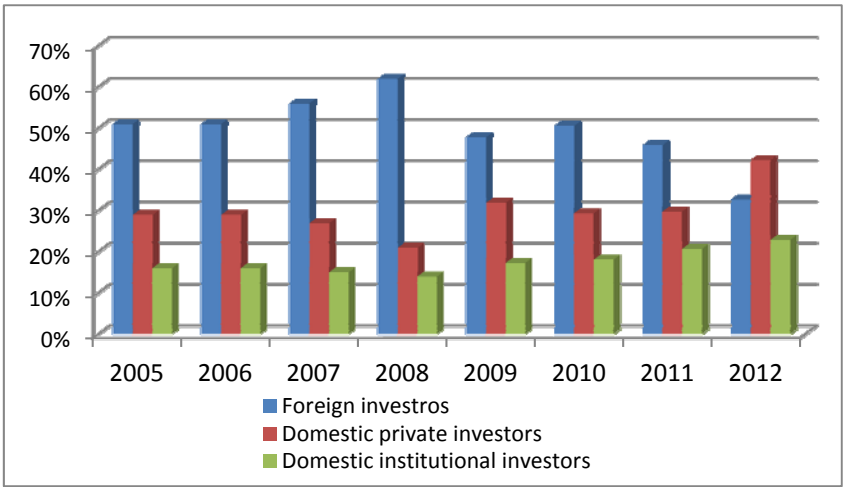
predisposition in favour of the TOM effect (TOM is positive and statistically significant during the total period), however the TOM existence is highly influenced by the financial trend. In particular, TOM days are positive, but statistically significant only during the recession period. So we may assume that during the TOM days there is a tendency for increased returns relative to the NTOM days, but only during the recession period this difference is statistically significant. Therefore, if somebody should invest in the Greek stock market (e.g. the manager of a Greek mutual fund) in order to achieve significantly increased returns (s)he should buy when the returns are relatively lower (NTOM days) and sell during the increased returns days (TOM).

The second version focuses on the returns during the TOM and the NTOM days. There is a long term predisposition in favour of the positive TOM days (see the TOM coef. when the total period is examined, Table 6), but the returns are significantly positive only during the growth period. Therefore, similar to the previously mentioned results an individual investor has increased possibilities for increased profits if (s)he buys stocks during the NTOM days and sells them during the TOM days, when there is a growth period. On the other hand, during the recession period a short sales strategy during the NTOM days using futures it could be profitable (or such a strategy could hedge the recession's influence on a Greek mutual fund) [(18)].

The aforementioned versions are complementary to each other. Both of them suggest that there is a long term predisposition in favour of the TOM effect and that the financial trend influences the TOM effect. Particularly, during the growth period the TOM days present significantly positive returns, the NTOM days are also positive due to the positive financial environment, therefore the returns' difference between TOM and NTOM days is not significant. In contrast, the negative financial and economic environment turn the NTOM returns to be significantly negative, but the TOM days still present positive returns (even if there are not statistically significant). The TOM days' resistance during this long term recession period and this makes the TOM-NTOM returns' difference significant.

Moreover, the results suggest that (i) the crisis reduces returns and increases the volatility, (ii) there are volatility asymmetries and the leverage effect is present, regardless of the financial trend, (iii) generally, there is a predisposition for positive returns during the TOM days, and (iv) the previous day's returns influence the current returns, and as Vasileiou (2014) suggests this may be due to probably due to the changes in the participation ratios of domestic private investors, foreign investors and domestic institutional investors (Figure 3).

Figure 3. *Investors' Participation in ASE (% of total turnover)*



Source: www.helex.gr

6. Conclusions

This article's objective is to examine whether the calendar anomalies are influenced by the financial trend. The empirical findings suggest that the recent financial crisis influences not only the stock market's returns and volatility, but also the TOM effect. In other words, the economic crisis and the changing financial trend influence not only the ASE returns, but also its anomalies.

The conflicting results, according to the existence of the TOM effect in the Greek stock market during periods of growth and recession, confirm our assumption that the fading or persistence of the calendar anomalies may be dependent on the financial trend. Therefore, future calendar effects studies, which examine the specific relationship, may help establish whether calendar anomalies are influenced by financial trends and thus pave the way for a new explanation for the fading of calendar anomalies over time[19].

Moreover, if the calendar anomalies existence suggests that the market is inefficient, since investment results could be predicted from the historical returns, the findings for the Greek stock market suggest that it is inefficient. If we examine the total period, the results suggest that the TOM effect exists, while the results regarding the sub-period depend on the version of the TOM we apply. In any case there is a clear predisposition for positive returns during the TOM days[20]. Further studies which use a similar approach may be useful for examining whether the economic environment and financial trends influence the markets' efficiency. Practically, the results may be useful for investors and professionals who deal with the Greek stock market and take into account the TOM effect in their investment strategy.

A very significant result (as far as the Greek case is concerned) is that there is a predisposition in favour of the calendar effects, but a strategy based on this effect may be profitable during the growth period and no-profitable during the recession period. The reasoning, which was the primary assumption of our study, is quite simple: if we know that a country will face long term recession would it be a profitable investment strategy during the TOM days? The results confirm our assumption that increased profitability are presented on TOM days only during the growth period and that in general the TOM effect is influenced by the financial trends.

If these results are confirmed in a group of countries, future research may focus on whether the TOM fade or persistence may be a leading indicator for a change in the financial trend (e.g. if the TOM returns turn to be positive and statistically significant (2nd version) this may be an indicator for an upward financial trend). Finally, a notable find is that the TOM days are positive even during severe financial crisis. This may be the objective of new research which examines the TOM in a group of countries and if the results are confirmed a detailed examination for the reasons why this effect exists may be further developed (e.g. institutional or/and foreign investors funds create the conditions for the TOM effect).

Notes

(1) In most of the cases is mentioned as Monday or turn of the week effect; higher returns on Fridays and lower returns on Mondays.

(2) Most frequently it is examined the January effect which is the tendency for increased returns during the January.

(3) Through the years scholars document more CAs such as the week of the year, May to October, the time of the month etc., but the aforementioned CAs are the most popular.

(4) We examine the EMU's stock markets during the years after the Euro era (2002), because significant economic reforms that may influence the financial market's performance and anomalies. Alexakis and Xanthakis (1995) and Kenourgios and Samitas (2008) present that the day of the week calendar effect is influenced when significant structural reforms take place. We may assume that some significant regulatory and economic reforms, such as the Euro adoption or a market upgrade or downgrade, may violate the *ceteris paribus* principle. If we include in this sample other EMU countries which adopted the Euro during the next years, their time span would be significantly reduced in a level which could make it inappropriate for a similar study.

(5) Vasileiou and Samitas (2014) and Vasileiou (2013) present that the financial trend changes influence the month and the trading month, and the day of the week patterns, respectively.

(6) There is vast calendar anomalies literature (for the DOW, MOY, TM etc.), but our study focuses on the TOM effect, therefore we present only the specific literature review.

(7) In our study, as in most studies, we use this definition for the TOM effect.

(8) There is a vast literature which examines if the TOM exists. Most studies main contribution to the international literature is the TOM effect documentation for the sample they examine. In order to save space we choose to present only some of them from which we use some features in our study.

(9) Characteristically, Ziemba (1989) shows that for the Japanese case, the TOM effect runs over the last five and first two trading days of the month.
(10) The other three sample's countries are: Brazil, Hong-Kong and Malaysia).
(11) Many times, since the Greek entrance to the European Stability Mechanism, the term "Grexit" often mentions, because some analysts and EU authorities believe that Greece cannot stand to the EMU environment, and indicates the severity of the Greek financial crisis.
(12) We use the ASE which the historical name. The current name (since 2002) is Athens Exchange (ATHEX), however both acronyms (ASE, ATHEX) are widely known and indicate the Greek Stock market.
(13) More information from the section "Indicators" on ASE website: http://www.ase.gr/default_en.asp.
(14) We mention this information at this point because, as we present below, it is very crucial for our analysis.
(15) The leptokurtosis of these three distributions is a sign that linear models may not be appropriate for the specific time series. The descriptive statistics we present are derived from time series which follow the Lakonishok and Smidt (1988) definition for the TOM period (the last and the first three days of the month) and we exclude the December to January TOM days in order to exclude the turn of the year effect. Similar results present the raw time series (data available upon request).
(16) We randomly present some of the values we check, in order to save space. More results are available upon request.
(17) The final results do not change whether we use equation 2 or the equation 6 for the mean return. Therefore, we present the first version's tests, but not the second one in order to save space.
(18) The Greek stock market does not have future contracts on the AGI, but there are other indexes, with present increased correlation with the AGI. e.g. the returns on AGI and the FTSE/ASE-20 present 0.9866 correlation. However, we present the AGI because better represents the Greek stock market (Table 1).
(19) If a study examines the TOM effect during the growth period and another study examines the TOM effect during the recession period the results are conflict.
(20) We present a briefly analysis for the TOM effect during the sub-periods if we use the first version of the TOM equation: during the growth period the stock market is efficient, but during the crisis period there are inefficiency signs.

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