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"ON INTERPRETING MARKET REACTION TO INTERIM DIVIDENDS DURING EX-DIVIDEND PERIOD: GREEK EVIDENCE"

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The paper analyzes the ex-dividend day stock price and trading volume behaviour of firms listed on the Athens Stock Exchange (ASE) that distribute interim dividends from 1993 to 2004. Interim dividends are rare distributions which are the consequence of an excellent performance during the current financial year. Furthermore, no tax is imposed on dividends and capital gains. The findings display that stock prices drop less than the amount of interim dividend on the ex-dividend day resulting in abnormal returns and abnormal trading volume on this day. Cross-sectional tests reveal that dividend yield, systematic risk and transactions cost explain the stock price behaviour on ex-days. The overall findings are in line with the short-term trading hypothesis.

Keywords: *Interim Dividends, Ex-dividend day, Short-term trading, Athens Stock Exchange.*

JEL classification: *G12; G3*

I. INTRODUCTION

In a perfect Walrasian market with no taxes or transaction costs, stock prices on the ex-dividend date would decline by exactly the dividend amount that is paid on each share. In other words, the stock price change between the cum-dividend day[2] (one day just before the ex-dividend day) and the ex-dividend day should be equal to the distributed dividend. However, this is not the case in reality, where significant deviations of stock price changes on ex-days are observed from the dividend amount. More specifically, several studies reveal that stock prices drop less than the amount of the dividend on ex-days, a phenomenon (the ex-dividend phenomenon) that attracted much attention among academics and practitioners alike.

Campbell and Beranek (1955) were the first who observed the ex-dividend phenomenon based on US data and evidenced that the average stock price drop-off was 90 percent of the amount of the dividend. Since then, numerous studies and various models have been developed in order to explain this unexpected drop in stock prices on the ex-dividend day. Elton and Gruber (1970) attributed this drop to the tax factor and particularly, to the differential tax treatment of income from dividends relative to income from capital gains. On the other hand, Kalay (1982) attributed this finding to the tax change in code, or to the presence of transaction costs while Frank and Jagannathan (1998) and Bali and Hite (1998) reported the existence of microstructure

impediments in the market such as the tick size effect and the bid-ask spread that hinder the stock prices to adjust to dividend amount.

Whereas the above explanations have been developed to explain the smaller drop of stock prices on ex-dates under the institutional arrangements of developed capital markets, and especially those of the USA, the market and institutional environment of other markets may not justify these explanations. The distribution of dividends in Greece, in particular, presents certain interesting differences in comparison to similar distributions in other capital markets like those in the USA, Canada, UK and other European countries. First, unlike the distribution of a regular dividend that, under specific circumstances, is compulsory in terms that results from legislative decrees, the distribution of interim dividends in Greece are always initiated by firms. Interim dividends are declared by very few firms listed on the Athens Stock Exchange (ASE) that face highly increased profits during the first nine months (three quarters) of the fiscal year compared to the corresponding last period's profits. In the case of interim dividend distributions, the amount, the number of firms and the ex-dividend day cannot be estimated precisely, as in the case of regular dividends. This implies that the new information release through interim dividends is in most cases surprising. Second, unlike the USA, UK, Canada or other European countries, but similar to Hong Kong, in Greece there is neither tax on dividends nor on capital gains. Finally, tick size is 7 to 8 times less than that of the other markets and the bid-ask spread has been recently in effect in the Athens Stock Exchange.

Under such unique institutional environment, the investigation of market reaction to interim dividends during ex-dates seems to be very interesting. To the best of our knowledge, previous studies examining the ex-dividend behaviour of stock prices and trading volume to interim dividends in other markets and in Greece, in particular, do not exist.

The objective of this study is the investigation of the ex-dividend day stock price and trading volume behaviour of interim dividends, using data from a market where neither tax on dividends, nor on capital gains is imposed, nor do microstructure impediments observed in other markets exist. We contribute to the extant literature by providing empirical results for the stock price and trading volume behaviour on ex-days from a market that is deprived from any tax effects and microstructure impediments.

Consistent with previous studies, the empirical findings show that stock prices, on the ex-dividend day, fall by an amount that is less than the dividend paid resulting in an abnormal return of approximately 8% on the ex-dividend day. At the same time, the trading volume increases during the ex-dividend period. Cross-sectional regression analysis supports the short-term trading hypothesis.

The remainder of the study is organized as follows: Section 2 reviews the pertinent literature. Section 3 describes the institutional environment that applies to interim dividends in Greece. Section 4 discusses the research design and Section 5 explains the data. Section 6 presents the empirical findings and Section 7 summarizes and concludes.

II. LITERATURE REVIEW

One of the most known studies is the one by Elton and Gruber (1970). They attempted to explain the equilibrium price behavior of securities on the ex-dividend day by using the marginal tax rates prevailing on that date. This model has become known as "the long-term trading hypothesis" or "the tax-effect hypothesis". Using this model, Elton and Gruber (1970) stated that an investor who decides to sell a share around its ex-dividend date faces a timing decision of whether to sell on cum or ex-dividend day. If he decides to sell on the cum dividend day (one day before stock goes ex-dividend), he will receive the cum-dividend price (P_c) and he will pay tax at the capital gains rate (t_g) on the excess of the cum dividend price over to the price at which the share was bought (P_o). On the other hand, if he decides to sell ex-dividend, he receives a dividend and the ex-dividend price (P_e) but he will now pay tax on the dividend at the dividend tax rate (t_d) and he will pay tax on the excess of the ex-dividend price (P_e) over to the price at which the share was bought at the capital gains tax rate (t_g). Therefore, the unfavorable treatment of dividends relative to capital gains will affect the decision of an investor to sell on the ex-dividend day. For an investor to be indifferent to timing, the following equation can be established:

$$P_c - (P_c - P_o)\, t_g = P_e - (P_e - P_o)\, t_g + D\,(1 - t_d) \quad (1)$$

where P_c is the price per share cum dividend, P_o is the price at which the share was bought, P_e is the price per share ex-dividend, t_g is tax rate on capital gains, t_d is the tax rate on dividend income and D is the dividend per share.

Rearranging Equation (1) we get:

$$\frac{P_c - P_e}{D} = \frac{1 - t_d}{1 - t_g} \quad (2)$$

Elton and Gruber (1970) argued that the statistic[3] $(P_c - P_e)/$ D must then reflect the marginal tax rates of the marginal stockholders and one should be able to infer these tax rates by observing the above ratio.

Elton and Gruber (1970) used data over the period 1966-1967 and measured the ex-dividend price drop ratio (ÄP/D) using closing prices from cum to ex-dividend days. Furthermore, they adjusted the ex-dividend price drop ratio with the market index changes. They observed that stock prices on the ex-dividend day fall by a smaller amount than the dividend paid and the differential taxation of dividends and capital gains is the given explanation.

While most studies agree with Elton and Gruber's (1970) findings, some disagree that the ex-dividend day price drop can be attributed to tax effects. Kalay (1982) was among the first researchers who suggested that the price drop on the ex-dividend day was not related to tax effects. He presented an alternative argument, which is known as the "short-term trading hypothesis". According to this hypothesis, an investor[4] with the same tax rate on dividends and capital gains can buy cum-dividend and sell ex-dividend if the ex-dividend stock price drop is less than the dividend. In this case if the dividend receivable and the tax savings from the capital loss exceed

the round trip transaction costs such a strategy will be profitable. This can be expressed as:

$$(1 - t_o)[D - (P_c - P_e) - a\,P] > 0 \quad (3)$$

where $P = (P_c - P_e)/2$, = expected transactions costs of a round trip trading and t_o = tax rate on ordinary income.

If the expected price drop is greater than the dividend, then the investor could sell short cum-dividend and buy back ex-dividend. In this case, the investor gains the amount of the price drop since he buys back at a lower price to close the short position. This can be expressed in the following way:

$$(1 - t_o)\,[P_c - P_e - D - P] > 0 \quad (4)$$

According to Menyah, (1993) profit may only be realized if arbitrageurs do not operate to wipe it out. Kalay (1982) demonstrated the above proposition by setting the no-profit opportunities condition as follows:

$$1 - \frac{aP}{D} \le \frac{P_c - P_e}{D} \le 1 + \frac{aP}{D} \quad (5)$$

The Equation (5) implies that the higher the dividend yield of the stock the closer to the full amount of the dividend the drop in the stock price must be to prevent a profit opportunity arising for short-term traders. In addition, $\frac{P_c - P_e}{D}$ ratio would be one in the absence of transaction cots ($a = 0$) and assuming risk neutrality, but if there were transaction costs ($a > 0$), the ratio could be less or more than one without causing arbitrage opportunities for short-term traders, provided that the deviation remains within the no-profit opportunities bounds. If transaction costs are prohibitively high short-term traders will be deterred from trading and the $\frac{P_c - P_e}{D}$ ratio will reflect the tax rate of the marginal long-term investor.

Kalay (1982) used a sample of 2,540 cash dividends paid for the period from April 1st, 1966 to March 31st, 1967 for firms traded on the NYSE. Unlike Elton and Gruber (1970) who used closing prices to compute cum and ex-dividend stock prices, Kalay (1982) used closing prices on cum-days and opening prices on ex-days. Furthermore, the stock prices on ex-dividend days were adjusted by market movements, using the market model. He concluded that the marginal tax rates of stockholders could not be inferred, in general, from the ex-dividend price drop ratio if the ratio was outside the no-profit opportunities bounds.

Lakonishok and Vermaelen (1986) investigated both the trading volume and the stock prices behaviour around ex-dividend days. They used data for trading volume and stock prices for all cash dividends (taxable distributions) as well as stock splits and stock dividends (non-taxable distributions) for the period 1970-1981 from both the NYSE and AMEX. Their results showed that, for taxable distributions, trading volume increased significantly before and after ex-dividends. This increase was more

pronounced for high yield, actively traded stocks and during the period following the introduction of negotiable brokerage commissions. Moreover, stocks experienced abnormal price increases before ex-days and abnormal price decreases afterwards. The abnormal price increases were positively related to the dividend yield and transactions cost. On the other hand, the abnormal trading volume was positively (negatively) related with the dividend yield (transactions cost). These results were consistent with the hypothesis that short-term traders have impact on ex-day price behaviour, at least for taxable distributions. For non-taxable distributions, the authors found significantly positive abnormal returns in days –5 through +2 with a CAR equal to 2.38%, but negative abnormal volume the other days.

Bali and Hite's (1998) sample consisted of both cash dividends and non-taxable distributions, such as stock dividends and stock splits, and covered the period from July 2, 1962 to December 31, 1994. The data referred to the NYSE and AMEX firms. They offered an explanation of the ex-dividend day stock price behavior that relied on different arguments that so far had been provided. They investigated the effects of discreteness in trading prices on observed ex–dividend day stock price changes and demonstrated why prices declined by less than dividends and why this was attributed to the tax-induced dividend clienteles. This hypothesis is known as the price discreteness hypothesis.

Frank and Jagannathan (1998) examined the ex-dividend day stock price behavior in the market of Hong Kong, where neither dividends nor capital gains were taxed and unlike in the NYSE, in the Hong Kong Stock Market (HKSE) there were no market makers until 1993. They found that for the period 1980-1993 the stock prices dropped, on average, by less than the dividend on the ex-dividend day with an ex-dividend day abnormal return of 1.3%. Frank and Jagannathan (1998) argued that the unexpected price drop on the ex-dividend day was the result of the transactions on the cum-day occurring at the bid price, while transactions on the ex-dividend day took place at the asked price (microstructure effect). That is, since for the average investor it is a burden to receive the dividend and then go through the process of collecting it, most investors prefer not to receive it. Market makers, instead, find themselves in a better position to collect the dividend, so they buy the stock on the last cum day (the day before the ex-dividend day). As a consequence, on the last cum day most trades occur at the bid price, while on the ex-dividend day most trades occurred at the asked price.

III. THE GREEK INSTITUTIONAL ENVIRONMENT

Following standard corporate practice, in Greece, cash dividend distributions are proposed by the board of directors and must be approved at the stockholders general meeting along with the definition of the ex-dividend day. However, the amount distributed to shareholders is not within a company's absolute freedom. The legislation defines the minimum amount of profits that must be distributed, which a company almost always has to retain. According to the corporate Law 2190/1920, a company listed on the ASE should distribute its profits in the following order:

(a) At least 5% of the net profits are withheld for the formation of regular reserves. This obligation ceases to exist when the amount of the stock in formation reaches the 1/3 of the stock capital.

(b) The amount that must be distributed in the form of cash dividends amount has to be equal either to 6% of the stock capital or to 35% of the net profits minus the amount kept for the formation of regular reserves, whichever of the two amounts is larger.

In case that the dividend which corresponds to the 6% of the stock capital is smaller than the one that corresponds to the 35% of the net profits, then the company can distribute the smaller amount only by the decision of the 95% of shareholders' votes at the relevant general meeting. Dividends may not be distributed only when there is a unanimous decision of 80% of shareholder's votes at the general meeting. The rest of the profits are distributed in accordance to the aim of the corporate memorandum (i.e remuneration of the board of directors, additional wages for employees, distribution of additional dividends, formation of emergency stock, etc.).

Based on the institutional environment just described, one can conclude that the distribution of a regular dividend is quite predictable in Greece in terms of the fact that the minimum distributed amount can be precisely predicted as determined by the corporate law. Furthermore, the traditional corporate practice of Greek listed firms is to convene the shareholders general meeting within June of the following fiscal year[5], where the shareholders' approval of the final financial statements of the last financial year and other significant corporate events, such as the distribution of regular cash dividends take place. At the same date, the board of directors defines the ex-dividend day which is usually the next weekday.

Unlike regular dividends, in Greece, interim dividends are not obligatorily distributed. No law determines the distribution of a minimum or regular interim dividend. The distribution of an interim dividend is at the company's discretion. Moreover, unlike regular dividends which are declared and paid within the following financial year, interim dividends are declared and paid during the current financial year. Common practice of the companies listed on the ASE is to distribute an interim dividend after the release of highly increased profits for the first three quarters of the current financial year. Therefore, the declaration of an interim dividend takes place between October and December of the current financial year. The amount of the interim dividend should not exceed 50% of the final dividend.

The Greek tax system does not impose any personal taxes on dividends. Corporate dividends are determined after corporate taxes have been deducted from profits before taxes (Law 2065/1992). Therefore, the shareholders are not subject to any taxes on received dividends, that is, dividends are not double-taxed as in the USA. Similarly, no taxes are imposed on capital gains. The only tax that exists is a flat tax of 0.3% imposed on every stock sale proceeds.

Commission costs in the ASE have been deregulated in 1996. Since then, fees imposed by brokerages are set freely, but not above a maximum of 1% set by the

Association of Securities Firms. Finally, tick sizes are very small and are scaled as follows: If the stock price is between 0.01 and 3.00 Euros, the tick size is equal to 0.01 Euro, if the stock price is between 3.01 and 60 Euros, the tick size is equal to 0.05 Euro and if the stock price is more than 60.01Euros, the tick size is equal to 0.1 Euro.

In the light of this unique institutional environment, the analysis of market reaction on ex-days seems to be very interesting.

IV. RESEARCH DESIGN

According to Elton and Gruber (1970), a stockholder selling his stock before a stock goes ex-dividend has not the right to receive the dividend. On the other hand, if he chooses to sell the stock on the ex-dividend day, then he has the right to receive the dividend, but he might expect to sell the stock in a lower price. In other words, a shareholder who decides to sell the stock on the ex-dividend day, his wealth on the ex-dividend day from holding one share will be consisted of its price on that day plus the amount of the cash dividend he is entitled to receive.

In a market without transactions cost and taxes the price fall on the ex-dividend day (P_e) should be equal to the amount of dividend (D), that is, $P_e - P_c = D$, where P_c is the price on the cum-dividend day. Dividing both sides by D, we get the classical ex-dividend drop ratio which is called raw price ratio (RPR):

$$\text{RPR} = \frac{P_c - P_e}{D} = \frac{D}{D} = 1 \tag{7}$$

The raw price ratio (RPR) measures the price change from the cum-dividend day to the ex-dividend day in terms of the dividend paid. RPR is calculated with three ways[6]. First, we calculate RPR using closing prices both on cum and ex-dividend days ($RPR_{c\text{-}c}$). Second, by using closing prices on cum-dividend days and opening prices on ex-dividend days ($RPR_{c\text{-}o}$) and third, using closing prices both on cum and ex-dividend days, however, adjusting the latter for the stock market movements. Kalay (1982), Michaely (1991) and Naranjo et al. (2000) recognized that the closing price on the ex-dividend day is affected by the stock's normal daily return and attempted to adjust for this drift. Following prior research, we address this problem by adjusting the ex-day closing price for the daily market return (R_m) as it is proxied by the Athens Stock Exchange (ASE) composite stock index. This ratio is called market-adjusted price ratio (MAPR) and is calculated as follows:

$$\text{MAPR} = \frac{P_c - [P_e / (1 + R_m)]}{D} \tag{8}$$

The theoretical value of RPR and MAPR equals one. In other words, we test the following null hypotheses:

H_{1a}: The mean of $RPR_{c\text{-}c}$ =1.

H_{1b}: The mean of $RPR_{c\text{-}o}$ =1.

H_{1c}: The mean of MARP =1.

Following Milonas et al. (2006), we compute the raw price drop ratio (RPDR) which measures the price change from the cum-dividend day to the ex-dividend day in terms of the price on the last cum-dividend day:

$$\text{RPDR} = \frac{P_c - P_e}{P_c} \tag{9}$$

Similar to RPR, RPDR is calculated with three ways. First, we calculate RPDR using closing prices both on cum and ex-dividend days ($RPDR_{c\text{-}c}$). Second, by using closing prices on cum-dividend days and opening prices on ex-dividend days ($RPDR_{c\text{-}o}$) and third, using closing prices both on cum and ex-dividend days, however, adjusting the latter for the stock market movements. We adjust the ex-day closing price for the daily market return (R_m) as it is proxied by the Athens Stock Exchange (ASE) composite stock index. This ratio is called market-adjusted price drop ratio (MAPDR) and is calculated as follows:

$$\text{MAPDR} = \frac{P_c - [P_e / (1 + R_m)]}{P_c} \tag{10}$$

All raw price drop ratios have a theoretical value equal to the dividend yield (DY) which is computed as the dividend per share divided by the stock price on the last cum-dividend day.

$$\text{DY} = \frac{D}{P_c} \tag{11}$$

Finally, the raw return (RR) on ex-dividend days is calculated as follows:

$$\text{RR} = \frac{P_e + D - P_c}{P_c} \tag{12}$$

In summary, we test the following null hypotheses:

H_{1d}: The mean of $RPDR_{c\text{-}c}$ =DY.

H_{1e}: The mean of $RPDR_{c\text{-}o}$ =DY.

H_{1f}: The mean of MAPDR =DY.

H_{1g}: The mean of raw returns (RR) =0.

To examine the market reaction on and around ex-dividend days, we employ the standard event study methodology. First, we estimate the stock price reaction for an event window of 40 days around the ex-dividend day (day 0), that is, from the day -20 to the day +20. Following Brown and Warner (1985), we estimate the market reaction by calculating the abnormal returns (AR) using the market model, the market-adjusted return model and the raw returns model. The market model parameters are estimated using 200 observations, commencing 220 days prior to the event day (day 0) and ending on day -21. The market return is proxied by the Athens Stock Exchange (ASE) composite stock index.

We anticipate a mean abnormal return on ex-days and a cumulative abnormal return pre and post-ex-dividend period equal to zero. That is, the null hypotheses are:

H_{1h}: The mean of abnormal returns on ex-days (ARs) =0.

H_{1i}: The cumulative abnormal returns pre and post-ex-dividend period (CARs) =0.

Lakonishok and Vermaelen (1986) proposed that the investigation of stock price reaction alone cannot provide undoubted and clear conclusion for which one of the long-term and short-term trading hypotheses fully explains the abnormal stock price behaviour on ex-days. They suggested that trading volume investigation would add new evidence regarding the group of investors that influence stock price behaviour on ex-days. According to Lakonishok and Vermaelen (1986), if short-term traders have a major impact on ex-days stock prices, one should observe a net increase in trading volume around ex-days. Following their methodology, we estimate abnormal trading volume (AV) using the mean-adjusted model using 100 observations prior to the event day (day 0), that is, from day -120 to day -21 and 100 observations after the event day, that is, from day +21 to day +121.

Similar to abnormal returns, we anticipate a mean abnormal volume on ex-days and a cumulative abnormal volume pre and post-ex-dividend period equal to zero. That is, the null hypotheses are:

H_{1j}: The mean of abnormal volume on ex-days (AV) =0.

H_{1k}: The cumulative abnormal volume pre and post-ex-dividend period (CAV) =0.

Following Kato and Loewenstein (1995), Michaely and Vila (1996), Wu and Hsu (1996), Naranjo et al. (2000), Lasfer and Zenonos (2003) and Dhalival and Zhen Li (2006), we regress abnormal returns on ex-days (AR_0) against a number of independent variables such as systematic risk as (BETA), dividend yield (DIV. YIELD), transactions cost (TRANS. COST), size (SIZE), average (normal) volume (AVVOL) and abnormal volume (AV).

According to Michaely and Vila (1995 and 1996) ex-day abnormal volume should be decreasing in risk. They argue that both systematic risk and idiosyncratic risk will dampen trading activities around ex-dividend days. In our study, we control for systematic risk and we expect it to have a negative effect on ex-day abnormal returns. The variable BETA is estimated 200 days before the event window (-220, -21) employing the market model.

According to Lakonishok and Vermaelen (1986), if the short-term trading hypothesis is valid, ex-day abnormal returns are positively related to transaction costs and dividend yield. As in Karpoff and Walkling (1988), Naranjo et al. (2000) and Dhalival and Zhen Li (2006), we use the inverse of stock price as a measure of transaction costs ($1/P_{cum}$). The dividend yield variable (DIV. YIELD) is estimated as the ratio of dividend for the year over the price at cum-dividend date (D/P_{cum}).

According to Lasfer and Zenonos (2003), if the firm size effect is valid, that is, smaller firms experience larger abnormal returns than bigger firms, we anticipate an inverse relation between the variable SIZE and the ex-day abnormal returns. We estimate firm size as the log of market value of equity at cum-dividend date price [Ln (P_{cum})].

If dividend capture occurs, we expect abnormal returns to be positively related to liquidity [see Lakonishok and Vermaelen (1986), Karpoff and Walkling (1990)]. Similar to Kato and Loewenstein (1995), we use a measure of average volume (AVVOL) during our estimation period as a proxy for liquidity. Therefore, we expect a positive sign for the variable AVVOL. Average volume is measured by the mean-adjusted model during the estimation period (-120, -21 και +21, +121).

Finally, we include the variable abnormal volume on ex-days (VOL) in our regression analysis. The explanation behind the inclusion of that variable is the presence of dividend capture by some groups of investors. If short-term trading occurs around ex-dividend days, then a positive relation between abnormal returns and volume is expected.

We employ the OLS method to analyze the impact of independent variables on ex-day abnormal returns. Our regression model is the following:

$$AR_0 = a_0 + a_1 * BETA + a_2 * DIV.YIELD + a_3 * TRANS.\ COST + a_4 * SIZE + a_5 * AVVOL + a_6 * VOL + e_i \quad (13)$$

V. DATA

The sample data includes all firms traded in the Athens Stock Exchange (ASE) that distributed interim dividends for the period from January 1993 to December 2004. There were a total of 47 interim dividends distributions in the examined period. Only stocks traded with more than 150 trading days in the estimation period were included in the sample in order to avoid thin trading problems. To avoid confounding effects, we excluded concurrently announced corporate events (such as announcements of equity increases, stock splits, mergers and acquisitions, financial results etc.) from the sample 20 days of both sides of the event window. Nine cases were deleted from the initial sample due to the lack of publicly available information, reducing the sample to 38 interim dividends.

Stock prices and trading volume data were provided by the Dissemination Information Department of the ASE. Ex-dividend days and other significant corporate events were extracted from the Greek daily and periodical press releases.

Table 1 presents the sample distribution of interim dividends by year of announcement. The majority of the interim dividends declared after 2000. More specifically, the last three years of the examined period, that is, 2002, 2003 and 2004 have 7, 6 and 9 interim distributions, respectively. Ten out of thirty-eight interim distributions were declared by the firms belonging to financial sector (banks, insurances and investment companies) and the rest twenty to the industrial sector.

Table 2 shows descriptive statistics (mean, median, standard deviation, minimum, maximum, first quartile and third quartile) of the entire sample of 38 interim dividends. The mean (median) dividend is 0.312 (0.205) Euros and the corresponding dividend yield is 0.103% (0.027%). The mean (median) price on cum-days is 8.92 Euros (7.92) and the mean (median) price on ex-days is 8.78 Euros (7.67). All the raw price ratios (RPR) are below their theoretical value of unity and same is valid for all raw price

drop ratios (RPDR). Finally, the mean (median) raw return on ex-days is positive and equal to 0.083% (0.013%).

Table 1
Sample Distribution

Year	*N*	*Fraction (%)*
1993	2	5.3
1994	2	5.3
1995	0	0.0
1996	0	0.0
1997	3	7.9
1998	1	2.6
1999	3	7.9
2000	2	5.3
2001	3	7.9
2002	7	18.4
2003	6	15.9
2004	9	23.7
TOTAL	38	100

Distribution of the sample of interim dividends by the fiscal year of the announcement. N is the number of observations.

Table 2
Descriptive Statistics

	Mean	*Median*	*STD*	*Minimum*	*Maximum*	*1st Quartile*	*3rd Quartile*
Dividend	0.312	0.205	0.346	2.000	0.010	0.140	0.328
Div. Yield	0.103	0.027	0.248	0.010	1.189	0.020	0.040
P_{cum}	8.920	7.920	6.510	0.160	22.02	2.920	13.95
P_{ex}	8.780	7.670	6.510	0.160	22.60	2.890	13.80
RPR_{c-c}	0.688	0.610	1.362	-1.227	9.667	0.000	1.009
RPR_{c-o}	0.624	0.440	1.624	-1.667	9.000	0.000	0.877
MARP	0.775	0.676	1.674	-1.610	9.991	0.153	0.986
$RPDR_{c-c}$	0.020	0.019	0.029	-0.050	0.114	0.000	0.034
$RPDR_{c-o}$	0.018	0.014	0.035	-0.050	0.143	0.000	0.026
MAPDR	0.023	0.019	0.031	-0.066	0.118	0.008	0.030
Raw Returns	0.083	0.013	0.247	-0.102	1.186	0.000	0.033

Dividend (D) is the amount of the dividend per share in Euros. Dividend yield is measured as the ratio of D over the price on the last cum-dividend day (P_{cum}). P_{ex} is the price on the ex-dividend day. RPR_{c-c} denotes the raw price ratio using closing prices on both cum and ex-days. RPR_{c-o} denotes the raw price ratio using closing prices on cum- days and opening prices on ex-days. MAPR denotes the market-adjusted price ratio. $RPDR_{c-c}$ denotes the raw price drop ratio using closing prices on both cum and ex-days. $RPDR_{c-o}$ denotes the raw price ratio using closing prices on cum- days and opening prices on ex-days. MAPDR denotes the market-adjusted price drop ratio. Raw returns are the abnormal returns on ex-days.

VI. EMPIRICAL RESULTS

1. Stock Price Reaction

Table 3 reports mean and median raw price ratios (RPR), raw price drop ratios (RPDR), raw returns (RR), dividend yields (DY), t-statistics and p-values. The theoretical value of the mean and median raw price ratios is equal to unity and the theoretical value of

the mean and median raw price drop ratios is equal to the dividend yield. Finally, the theoretical value of raw returns (RR) on the ex-dividend day is equal to zero. The results from Table 3 show that the raw price ratio measured in three ways is lower than unity. Specifically, the raw price ratio using closing prices on both cum and ex-days (RPR_{c-c}) is equal to 0.688, the raw price ratio using closing prices on cum-days and opening prices on ex-days (RPR_{c-o}) is equal to 0.624, while the market-adjusted price ratio (MAPR) is equal to 0.775. However, no raw price ratio is statistically different from unity. On the other hand, all the raw price drop ratios are lower and statistically different from the dividend yield (10.3%). In particular, the raw price drop ratio using closing prices on both cum and ex-days ($RPDR_{c-c}$) is equal to 0.020, the raw price drop ratio using closing prices on cum-days and opening prices on ex-days ($RPDR_{c-o}$) is equal to 0.018 and the market-adjusted price drop ratio (MAPDR) is equal to 0.023. The raw return on the ex-dividend day is equal to 8.3%, statistically significant at the 10% significance level. These results are line with those of Elton and Gruber (1970), Kalay (1982), Lakonishok and Vermaelen (1986) etc. who found that the stock prices drop less than the amount of the dividend on ex-days, resulting in significant abnormal returns. As far as the no significance of raw price ratios is concerned, it should be attributed to the small number of observations.

Table 3
Ex-dividend Day Price Behaviour for the Firms listed on the ASE that Distribute Interim Dividends for the Period 1993-2004

Ratios	*Theoretical Values*	*Mean*	*t-Statistic*	*p-value*	*Theoretical Values*	*Median*	*p-value*
97-04 RPR c-c	1.000	0.688	-1.18	0.246	1.000	0.610***	0.000
97-04 RPR c-o	1.000	0.624	-1.35	0.186	1.000	0.440***	0.000
97-04 MAPR	1.000	0.775	-0.83	0.412	1.000	0.676***	0.000
97-04 RPDR c-c	0.103	0.020***	-18.03	0.000	0.027	0.018***	0.028
97-04 RPDR c-o	0.103	0.018***	-14.17	0.000	0.027	0.014***	0.004
97-04 MAPDR	0.103	0.023***	-16.14	0.000	0.027	0.019**	0.070
97-04 RR	0.000	0.083**	2.08	0.045	0.000	0.013***	0.000
97-04 DY		0.103				0.027	

Dividend yield is measured as the ratio of D over the price on the last cum-dividend day (P_{cum}). P_{ex} is the price on the ex-dividend day. RPR_{c-c} denotes the raw price ratio using closing prices on both cum and ex-days. RPR_{c-o} denotes the raw price ratio using closing prices on cum- days and opening prices on ex-days. MAPR denotes the market-adjusted price ratio. $RPDR_{c-c}$ denotes the raw price drop ratio using closing prices on both cum and ex-days. $RPDR_{c-o}$ denotes the raw price ratio using closing prices on cum- days and opening prices on ex-days. MAPDR denotes the market-adjusted price drop ratio. Raw returns are the abnormal returns on ex-days.

*** Statistically significant at the 0.01 level,

** Statistically significant at the 0.05 level,

* Statistically significant at the 0.1 level.

P-values for the median values are calculated by the Wilcoxon Signed Rank Test.

Table 4 presents the results from the stock price behaviour of 38 firms listed on the ASE distributing interim dividends. The event window is 40 days around the ex-dividend day (day 0) and the abnormal returns are calculated by the market model (column 2), the market-adjusted return model (column 4) and the raw returns model

(column 6). Similar to other studies, there are statistically significant abnormal returns on ex-dividend days equal to 8.357% estimated by the market model, 7.950% estimated by the market-adjusted returns model and 8.282% by the raw returns model. These results imply that an investor who buys shares on the cum-dividend day and sells on ex-dividend day can gain very significant returns[7].

Table 4
Mean Abnormal Returns (AR) on Ex-dividend Days for the Firms Listed on the ASE that Distribute Interim Dividends for the Period 1993-2004.

N=38	*Market Model*		*Market-Adjusted*		*Raw Returns*	
Day	*AR (%)*	*t-value*	*AR (%)*	*t-value*	*AR (%)*	*t-value*
-20	-0.345	-0.89	-0.420	-1.23	0.084	0.18
-19	-0.420	-1.08	-0.274	-0.95	-0.322	-1.13
-18	0.373	0.96	0.386	1.04	0.132	0.31
-17	0.177	0.46	0.421	1.02	0.311	0.70
-16	0.311	0.80	0.320	1.03	0.462	1.11
-15	0.308	0.79	0.279	0.82	0.456	1.03
-14	0.091	0.23	0.093	0.32	-0.007	-0.02
-13	-0.342	-0.88	-0.254	-0.90	-0.218	-0.53
-12	0.243	0.63	0.121	0.28	0.269	0.47
-11	0.120	0.31	0.502	1.10	0.325	0.88
-10	0.718*	1.85	0.808	1.60	0.454	0.81
-9	0.875**	2.25	0.855**	2.46	0.594	1.41
-8	-0.291	-0.75	-0.424	-1.08	-0.270	-0.49
-7	0.477	1.23	0.444	0.96	0.341	0.74
-6	0.098	0.25	-0.079	-0.28	-0.141	-0.36
-5	0.530	1.36	0.462	1.26	0.616	1.51
-4	0.021	0.06	0.105	0.29	0.283	0.73
-3	0.209	0.54	0.244	0.65	0.504	1.02
-2	-0.614	-1.58	-0.251	-0.63	-0.555	-1.09
-1	-0.471	-1.21	-0.548	-1.38	-0.559	-1.22
0	8.357***	21.50	7.950**	1.99	8.282**	2.06
1	0.619	1.59	0.356	1.16	0.650*	1.89
2	-0.223	-0.57	0.087	0.29	0.143	0.44
3	-0.079	-0.20	0.294	0.59	0.374	0.78
4	-0.196	-0.50	-0.085	-0.24	0.124	0.29
5	0.123	0.32	-0.279	-0.62	-0.201	-0.51
6	-0.162	-0.42	-0.302	-0.84	-0.070	-0.24
7	-0.315	-0.81	-0.313	-0.86	-0.001	0.00
8	-0.113	-0.29	0.087	0.22	0.459	1.16
9	-0.072	-0.18	0.114	0.40	0.226	0.65
10	0.186	0.48	0.057	0.29	0.126	0.47
11	-0.043	-0.11	-0.055	-0.15	0.184	0.44
12	0.122	0.31	0.339	0.96	0.389	1.05
13	-0.168	-0.43	0.182	0.69	-0.012	-0.03
14	-0.446	-1.15	-0.763**	-2.13	-0.398	-0.98
15	-0.371	-0.95	-0.643**	-2.16	-0.164	-0.37
16	-0.450	-1.16	-0.555	-1.46	-0.404	-0.89
17	-0.033	-0.08	-0.210	-0.52	0.351	0.77
18	-0.646*	-1.66	-0.648*	-1.75	-1.070**	-2.06
19	-0.471	-1.21	-0.447	-1.10	-0.801**	-2.24
20	-0.289	-0.74	-0.109	-0.30	0.091	0.22

Note: *** Statistically significant at the 0.01 level, ** statistically significant at the 0.05 level, * statistically significant at the 0.1 level

Due to the absence of taxes on dividends and capital gains in Greece, the tax effect hypothesis of Elton and Gruber (1970) could not find empirical support in our sample. We can conclude the same for the price discreteness hypothesis of Bali and Hite (1998) and the bid-ask spread hypothesis of Frank and Jagganathan (1998), due to the very small tick size and the absence of market making for the majority of Greek listed firms for the examined period. However, we assess the impact of short-term trading hypothesis of Kalay (1982) on ex-day returns by analyzing the behaviour of share prices around the ex-dividend dates. If short-term traders capture dividends then ex-day returns should not be confined solely to the ex-dividend dates; they should be positive in the pre-event dates and negative after ex-dividend dates to reflect the buying (selling) behaviour in the pre- (post-) event periods (Lasfer and Zenonos, 2003). Table 5 reports the cumulative abnormal returns (CARs) over the period [-20 to +20] for our sample. There seems to be a positive trend in share prices before the ex-dividend dates and a downward trend in the post ex-dividend dates. Over the period [-20, -1] and [-10, -1] the CARs[8] are positive but not statistically significant. However, the CARs for the period [-5, -1] are negative but not statistically significant. On the other hand, over the periods [+1, +20] and [+1, +10] the CARs are negative and statistically significant for the first period (t = -1.74). The most interesting result, however, comes from the period [-1, 0] where the CARs are 7.885% and statistically significant at the 1% level (t = 14.34). These results indicate that, in Greece, dividend capture is predominant and the ex-day returns reflect the short-term trading. They suggest that investors buy shares in the pre-event period, mainly on the cum-day and sell their shares after the ex-dividend day in order to capture the dividend. These investors are likely to be corporate and individual investors who face no taxes on dividends and capital gains. These results are consistent with those of Lakonishok and Vermaelen (1986) Kato and Loewenstein (1995), McDonald (2001) etc.

Table 5
Cumulative Abnormal Returns (CAR) on Ex-dividend Days for the Firms Listed on the ASE that Distribute Interim Dividends for the Period 1993-2004.

N=38	*Market Model*		*Market-Adjusted*		*Raw Returns*	
Period	*CARs (%)*	*t-value*	*CARs (%)*	*t-value*	*CARs (%)*	*t-value*
CAR (-20 -1)	2.070	1.19	2.789	0.48	2.759	0.46
CAR (+1 +20)	-3.026*	-1.74	-2.894	-0.50	-0.006	0.00
CAR (-10 -1)	1.553	1.26	1.616	0.39	1.267	0.30
CAR (+1 +10)	-0.232	-0.19	0.015	0.00	1.829	0.43
CAR (-5 -1)	-0.325	-0.37	0.012	0.00	0.289	0.10
CAR (+1 +5)	0.243	0.28	0.373	0.13	1.090	0.36
CAR (-1 0)	7.885***	14.34	7.402***	4.02	7.723***	4.07

Note: *** Statistically significant at the 0.01 level, ** statistically significant at the 0.05 level, * statistically significant at the 0.1 level.

2. Trading Volume Reaction

We further test the short-term trading hypothesis by analyzing the behaviour of trading volume around ex-dividend dates as Lakonishok and Vermaelen (1986) suggested.

Table 6 presents the trading volume behaviour around the event widow [-20, +20]. The results confirm the predictions of short-term trading hypothesis, that is, there is a net increase in trading volume around ex-days. On the cum-dividend day, the abnormal trading volume (AV) is equal to 1,631,318.2 Euros, statistically significant at the 10% significance level (t = 1.87) and equal to 97.81% of the normal trading volume of the estimation period [-120, -21 and +21, +120]. On the ex-dividend day, the abnormal trading volume (AV) is equal to 821,382.63 Euros, statistically insignificant and equal to 49.25% of the normal trading volume of the estimation period. These results corroborate those of stock prices which suggest that investors buy shares on cum-dates and sell on ex-dates or later.

Table 6
Mean Abnormal Volume (AV) in Euros on Ex-dividend Days for the Firms Listed on the ASE that Distribute Interim Dividends for the Period 1993-2004.

N=38		*Mean-Adjusted Model*	
Day	*AV in EUROS*	*t-value*	*AV (%)*
-20	-534,075.71***	-2.73	-32.02
-19	-264,458.83	-1.28	-15.86
-18	-171,934.48	-0.67	-10.31
-17	-141,834.83	-0.72	-8.50
-16	964,875.49	1.36	57.85
-15	307,974.79	0.70	18.47
-14	821,121.17	0.91	49.23
-13	567,008.35	0.81	34.00
-12	591,839.99	1.57	35.48
-11	-84,550.43	-0.46	-5.07
-10	470,593.86	0.92	28.22
-9	355,394.19	1.21	21.31
-8	538,552.31	0.93	32.29
-7	820,534.42	1.05	49.20
-6	3,547,071.17	1.34	212.67
-5	1,599,401.96	1.23	95.90
-4	1,145,608.37	1.37	68.69
-3	850,054.27	1.24	50.97
-2	515,549.06	1.02	30.91
-1	1,631,318.19*	1.87	97.81
0	821,382.63	1.04	49.25
1	481,076.19	1.26	28.84
2	-30,592.70	-0.10	-1.83
3	1,008,209.01	1.21	60.45
4	355,192.08	0.92	21.30
5	116,388.36	0.31	6.98
6	923,560.74	1.04	55.37
7	404,519.80	0.91	24.25
8	2,244.56	0.01	0.13
9	230,746.54	1.21	13.83
10	59,748.01	0.28	3.58
11	164,218.03	0.81	9.85
12	845,855.24	1.49	50.71
13	1,134,398.64	0.85	68.02

contd.

N=38		Mean-Adjusted Model	
Day	AV in EUROS	t-value	AV (%)
14	1,857,553.25	0.95	111.37
15	984,443.87	0.90	59.02
16	334,053.34	0.68	20.03
17	351,882.42	0.72	21.10
18	287,321	0.55	17.23
19	-207,827.52	-0.50	-12.46
20	243,118.67	0.53	14.58

Note: *** Statistically significant at the 0.01 level, ** statistically significant at the 0.05 level, * statistically significant at the 0.1 level.

Table 7 documents the cumulative abnormal volume (CAV) over the period [-20 to +20]. In all pre- and post-event periods, CAV is positive and statistically significant, except for the [+1, +10] and [+1, +5] periods. These results are consistent with those of Lakonishok and Vermaelen (1986) and Kato and Loewenstein (1995), lending support for the short-term trading hypothesis.

Table 7
Cumulative Abnormal Volume (CAV) in Euros on Ex-dividend Days for the Firms Listed on the ASE that Distribute Interim Dividends for the Period 1993-2004.

N=38	Mean-Adjusted Model	
Period	CAV in EUROS	t-value
CAV (-20 -1)	13,530,043.28***	4.25
CAV (+1 +20)	9,546,109.54***	3.00
CAV (-10-1)	11,474,077.79***	5.10
CAV (+1 +10)	3,551,092.59	1.58
CAV (-5 -1)	5,741,931.84***	3.61
CAV (+1 +5)	1,930,272.94	1.21
CAV (-1 0)	2,452,700.81**	2.44

Note: *** Statistically significant at the 0.01 level, ** statistically significant at the 0.05 level, * statistically significant at the 0.1 level.

3. Regression Analysis

Table 8 displays the findings from various regression models. In model (1) we observe that the variable BETA has the opposite sign from that was expected, however, without being statistically significant. In model (2), the coefficient of independent variable DIV. YIELD is positive, implying a positive relation between ex-day returns and dividend yield. This result is consistent with the predictions of short-term trading hypothesis. In model (3), the coefficient of independent variable TRANS. COST appears to have the expected (positive) sign consistent with the predictions of short-term trading hypothesis. In model (4) the coefficient of independent variable SIZE is negative and statistically significant at the 1% level. This result corroborates the firm size effect which suggests smaller firms display higher returns than bigger firms. However, the coefficient of independent variables AVVOL and VOL are statistically insignificant implying no explanation power.

In model (7), we regress the abnormal return on ex-days against all independent variables. DIV. YIELD has positive sign and is the only independent variable that is statistically significant at the 1% level. Apart from BETA, the other independent variables have the expected signs, however, without being statistically significant. After a numerous attempts, we find that two independent variables combined provide statistically significant coefficients. Specifically, in model (8) BETA and TRANS. COST have both positive and statistically significant coefficients. The coefficient of BETA has no the predicted sign. On the other hand, the (positive) sign of the coefficient of TRANS. COST is in line with prior research, such as Lakonishok and Vermaelene (1986), Kato and Lowenstein (1995), Naranjo et al. (2000). Finally, in model (9), even though statistically significant, the coefficient of BETA still has no the predicted sign. The coefficient of SIZE is negative and statistically significant, consistent with the study of Laser and Zenonos (2003).

Overall, the findings from the regression analysis confirm the predictions of short-term trading hypothesis of Kalay (1982).

Table 8
Regression Analysis of Abnormal Returns on Ex-dates

	Model (1)	*Model (2)*	*Model (3)*	*Model (4)*	*Model (5)*	*Model (6)*	*Model (7)*	*Model (8)*	*Model (9)*
Intercept	-0.022	-0.177***	-0.016	0.341***	0.086**	0.114**	-0.044**	-0.077**	0.179**
	(-0.18)	(-3.84)	(-1.44)	(7.21)	(2.11)	(2.40)	(-2.03)	(-2.46)	(2.07)
Beta	0.149						0.014	0.087**	0.241**
	(0.88)						(0.67)	(2.07)	(2.19)
Div. Yield		0.982***					0.913***		
		(6.79)					(10.19)		
Trans. Cost			0.184***				0.020	0.183***	
			(2.90)				(0.95)	(23.75)	
Size				-0.148***			0.010		-0.154***
				(-6.64)			(1.19)		(-7.18)
Avvol					0.001		$0.001E^{-5}$		
					(-0.36)		(0.10)		
Vol						0.002	$0.002E^{-5}$		
						-1.17	(-1.26)		
R^2	2.1%	98.9%	93.6%	55%	0.4%	3.6%	99%	94.3%	60.4%

The dependent variable is the mean abnormal return on ex-dividend day (AR_0). The independent variables are BETA which denotes the systematic risk estimated 200 days before the event window (-220, -21), DIV. YIELD which denotes the dividend yield estimated as the ratio of dividend per share over the price on the cum-dividend day (D/P_{cum}), TRANS. COST which denotes the transactions cost estimated as the reverse of price at cum-dividend date ($1/P_{cum}$), SIZE which denotes the size as measured by the log of market value of equity at cum-dividend date price [Ln (P_{cum})], AVVOL which denotes the normal volume as measured by the mean-adjusted model in the estimation period (-120, -21 και +21, +121), and VOL which denotes the abnormal volume on ex-dividend day.
T-values are in parentheses.
*** Statistically significant at the 0.01 level, ** statistically significant at the 0.05 level, * statistically significant at the 0.1 level.

VII. CONCLUSIONS

In this paper we analyze the ex-dividend day stock price and trading volume behavior of firms listed on the Athens Stock Exchange (ASE) that distribute interim dividends. Greek firms distribute interim dividends after an excellent corporate performance in the first three quarters of the current financial year. Greek market distinguishes from other markets because no tax is imposed on dividends and capital gains. Therefore, in Greece, the stock returns on the ex-dividend day should not reflect any tax effects.

We find that ex-day returns are positive and statistically significant in our sample, suggesting that ex-day prices decrease by less than the amount of the dividend paid. We also find significant increase of trading volume around the ex-day, consistent with the suggestions of the short-term trading hypothesis as developed by Kalay (1982) and Lakonishok and Vermaelen (1986). Regression analysis provides further support for the short-term trading hypothesis. Dividend yield, systematic risk and transactions costs appear to explain the stock price behaviour on ex-days. We believe that our analysis contributes to the controversial debate on the market behaviour on the ex-dividend dates by offering empirical support from a market with unique and interesting institutional environment.

Notes

1. Correspondence address: University of Macedonia, Department of Accounting and Finance, 156 Egnatia str, Thessaloniki, Greece, Tel:+30-2394-71359, email: *tdasilas@hotmail.com*
2. Cum-dividend day is the last day that a share trades with right to get the declared dividend.
3. This statistic is known as ex-dividend price drop ratio, drop-off ratio, premium, price change to dividend drop ratio ÄP/D and etc.
4. Investors with the same tax rates on dividends and capital gains are security dealers, stockbrokers, arbitrageurs and some corporations. All these kinds of investors are called "short-term traders".
5. 95% of the Greek listed firms have fiscal year that begins on 1st January and ends on 31st December of the same year.
6. See Milonas and Travlos (2001).
7. These returns are gross returns. To estimate the net returns, one should deduct the flat tax of 0.3% on every stock sale proceeds and the commissions.
8. CARs are from the market model.

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