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Dissertation

"The ex-dividend day stock price anomaly: Evidence from the Greek stock market"

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Abstract

The main objective of this dissertation is to analyze the ex-dividend day stock price behaviour on the Athens stock exchange for the period 2005-2011. The Greek capital market is considered an ideal case study because of the imposition of taxes on dividend income in last years and the consequent implications on ex-dividend days. Both the standard event-study methodology and cross-sectional regression analysis are used in order to examine the ex-dividend day phenomenon. The findings show that stock prices drop less than the dividend amount. The examination of abnormal returns around the ex-dividend day shows evidence of buying (selling) pressure created by short-term traders. Moreover, cross-sectional regression analysis discloses that both dividend yield and transaction costs appear to affect ex-dividend day returns significantly.

Keywords: Ex-dividend day, dividend, short term trading hypothesis, Athens Stock Exchange

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Chapter One

1. Introduction

Nowadays, the world economy is mainly affected by capital markets. The technological development and the globalised business environment have made stock markets the most significant financial tool for growth and prosperity. Stock market boosts, not only the finance industry, but other industries by increasing their funds and investors. More and more investors aim to gain profits by investing their savings in stock markets. Investors' decisions about further investment or cash and stock dividends depend on the information about stock price in the future. However, there is always a probability of loss, if stock price declines. This is the reason why dividend decision is very important. It affects both investors and companies, because it constitutes a company performance benchmark. The understanding of the factors that determine companies' dividend policy has questioned financial economists for various decades.

One of the most important issues is the behaviour of stock prices around ex-dividend days. The ex-dividend day is the day on which the right to the dividend is separated from the share. On the other hand, the day before the ex-day is the cum-dividend day and is the last day that someone has the right to receive a dividend. Under perfect capital markets with no taxes and other market frictions, the stock price should drop on the ex-day day exactly as the dividend amount. However, numerous studies find that stock prices drop is less than the dividend. This anomaly is known as the ex-dividend day phenomenon. There are three main explanations for the ex-dividend price anomaly. The first explanation lies on the different tax treatment of capital gains against to dividends (the tax – effect hypothesis). The second explanation relies on the existence of transaction costs. This means that, if transaction costs are low enough, any deviation from a one-for-one price drop-to dividend relationship creates an arbitrage opportunity (short-term trading hypothesis). The third explanation supposes that share price movements are discrete (tick size effect hypothesis or price discreteness hypothesis).

The current study examines the ex-dividend day phenomenon employing data from the Greek stock exchange during the period 2005-2011. During the period, significant alterations on dividend income took place. In specific, the Article 18 of Law 3697/2008

imposed a 10% flat tax on profits distributed by Greek listed firms since January 1, 2009. The 10 percent tax is withheld in final and interim dividends distributed to individual or institutional shareholders, in cash or in the form of shares (stock dividends). The Law 3842/2010 considered dividend income as personal income and tax it on the basis of tax brackets. The Law of 3842/2010 was recently amended by the Law.3943/2011 which introduced a 25% withholding tax rate on dividends. The imposition of taxes on dividends for first makes the investigation of ex-dividend day behaviour particularly interesting.

This study aims to answer the following research questions:

i. In what way and to what extend does ex-dividend day have an impact on stock prices?
ii. Which are the reasons for the ex-dividend day stock price anomaly?
iii. What is the ex-dividend stock price behaviour in the Greek stock market for the period 2005-2011?
iv. What are the effects of the taxation on dividend income on ex-dividend dates?

The structure of this study is as follows: In Chapter 2, previous literature in this topic is presented. Chapter 3 provides a general overview of Greek institutional environment and a deeper insight of dividend taxation. Chapter 4 describes the methodology employed and the data. The empirical results and the analyses of these are reported in Chapter 5. Finally, Chapter 6 contains the conclusions of the study.

Chapter Two

2. Literature Review

In this section we discuss previous studies that were conducted on ex-dividend days. This will give a clearer view of the subject and help us in our investigation in this master thesis.

There are several studies that have been conducted so far examining the ex–dividend day phenomenon and a lot of researchers have tried to understand what determines the share price behaviour around this day. According to Modigliani and Miller (1961) in perfect capital markets, dividend policy is irrelevant. This means that dividend policy does not affect the value of the company. Nevertheless, empirical research has shown that drops in share price are less than the dividend on ex-dates. Campbell and Beranek (1955) were the first who investigated the effects of dividend payments on stock prices. Using a small sample of companies quoted in the New York Stock Exchange, they observed that the ex-dividend price drop was on average less than the dividend (90%). After the publication of these results numerous studies have tried to explain ex-dividend stock price anomaly. Nevertheless, the question is still a puzzle. Bhattacharyya (2007) states: "Despite decades of study, we have yet to completely understand the factors that influence dividend policy and the manner in which these factors interact". There have been put forward three main hypotheses to construe the ex-dividend stock price behaviour.

2.1 Long-term trading hypothesis

According to the first school of thought, the different tax treatment of capital gains and dividends is the reason why the ex-dividend stock price presents this anomaly. Elton and Gruber (1970) tried to find out the relationship between the dividend yield and marginal tax rates, using the ex-dividend price data. The sample included 4,148 dividends of all companies on New York Stock Exchange, which had paid dividend during the period between the years 1966 and 1967.

According to their model, investors have two choices. They can sell their shares on cum-days or on ex-days. If the market is in equilibrium, an investor should be indifferent between these two choices, since the price adjustment on the ex-day should be equal to the dividend. If he holds the stock until the ex-date, he will receive the dividend, but should expect to sell it at a lower price. On the other hand, if he sells the stock on cum-day, he will loose the dividend, but this is counterbalanced with a higher selling price. This is valid, when the taxes on dividends and capital gains are the same. In case that the taxation of dividends and capital gains is different, an investor should not be indifferent between the choices, which are described above. He has to take into consideration the tax rate imposed on dividend income and capital gains, in order to maximize his wealth. The above relationship is given by:

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

where

- P_c is the price stock on cum-dividend day
- P_e is the price stock in ex-dividend date
- P_o is the price at which the stock was purchased
- t_g is the tax rate on capital gains
- t_d is the tax rate on dividends
- D is the amount of dividend

Rearranging (Eq. 1) we get

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

From the Equation (2), it is obvious that the price adjustment on the ex-day is not essentially equal with the dividend. According to Elton and Gruber (1970), if the tax on dividend income is higher than that on capital gains, the drop of the price in ex-dividend date is smaller than the dividend.

Furthermore, Elton and Gruber (1970) studied the clientele effect and found that $\Delta P/P$ positively correlates with the dividend yield. This means that the investors in high tax

brackets hold stocks with low dividend yield and vise versa. This result corroborated the study of Modigliani and Miller (1961) about the “dividend clientele effect”.

Thereafter, numerous papers examined the ex-dividend day behaviour of stock prices. Douglas and Hiemstra (1993) conducted a similar study and concluded that the different taxation affects the valuations of dividends and capital gains. Several researchers conducted similar studies, such as Litzenberger & Ramaswamy (1979), Poterba & Summers (1984) and Barclay (1987). The results of these studies substantiated the importance of the clientele effect. Litzenberger & Ramaswamy (1979), based on New York Stock Exchange (NYSE), accompliced a study, which demonstrated that there is a positive relationship between expected return and dividend yield (Islam and Jessie, 2010). Rantapuska (2007) examined the ex-dividend day trading behaviour of all investors in the Finnish stock market. His analysis showed that investors take advantage of the differences in tax rates by trading around the ex-dividend day and the dynamics dividend clientele models predict the trading behaviour of taxable investors. Moreover, Bali & Francis (2011) found that taxes may affect investor behaviour but price behaviour does not support tax clienteles. Table 2.1 presents some of the most significant studies, which indicate the long –term trading hypothesis, as the reason for the ex-dividend day stock price anomaly.

Table 2.1 Empirical studies on ex-dividend days

Study	Examined Period	Examined Market
Elton and Gruber (1970)	1966-1967	USA
Litzenberger and Ramaswamy (1979)	1936-1977	USA
Poterba and Summers (1984)	1955-1981	UK
Booth and Johnson (1984)	1970-1980	Canada
Barclay (1987)	1962-1985	USA
Hietala (1990)	1974-1985	Finland
Stickel (1991)	1972-1980	USA
Lamdin and Hiemstra (1993)	1982-1991	USA
Michaely and Murgia (1995)	1981-1990	Italy
Lansfer (1995)	1985-1994	UK
Kato and Loewenstein (1995)	1981-1991	Japan
Wu and Hsu (1996)	1984-1990	USA
Michaely and Vila (1996)	1963-1991	USA
Espitia and Ruiz (1997)	1980-1992	Spain
Bhardwaj and Brooks (1999)	1986-1989	USA
Liljeblom et al. (2001)	1994-1996	Sweden
McDonald (2001)	1989-1998	Germany
Bell and Jenkinson (2002)	1995-1999	UK, Italy, France
Lasfer and Zenonos (2003)	1988-2002	Germany
Graham et al. (2003)	1996-2001	USA
Milonas et al. (2006)	1996-1998	China
Farinha and Soro (2006)	1993-2002	Portugal
Daunfeldt et al.	1991-1995	Sweden

(Source: Dasilas, 2009)

2.2 Short-term trading hypothesis

The second school of thought refuted Elton and Gruber's (1970) findings that the price drop on the ex-dividend day determines the tax bracket of marginal stockholders. Kalay (1982) was among the first who offered an alternative explanation for the fact that stock price did not fully adjust the dividend paid. The main difference from the long-term trading hypothesis is the frequency of trading. According to Kalay (1970), investors

who face no different taxes on dividends and capital gains could reap arbitrage profits if the ex-dividend stock price drop is different from the dividend.

If the dividend per share is higher than the ex-dividend stock price drop by more than the total transaction costs, the investor can buy cum-dividend and sell ex-dividend, in order to have profit. This can be expressed as:

$$(1-t_0)*[D-(P_c-P_e)-\alpha*P]>0 \quad (3)$$

where

- $P=(P_c+P_e)/2$
- α is the expected transactions costs of a roundtrip trading
- t_o is the tax rate on ordinary income

Inversely, if the dividend per share is less than the ex-dividend stock price drop by more than the total transaction costs, the investor will have profit by selling short cum-dividend and buy back ex-dividend. This can be expressed as:

$$(1-t_O)*[(P_c-P_e-D)-\alpha*P]>0 \quad (4)$$

It is obvious that in both cases the short term arbitrageurs can make a profit regardless of the taxation on the ordinary income. By combing equations (3) and (4) we get:

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

As we see from the Equation (5) a profit opportunity for short-term traders is inversely proportional to the dividend yield. This happens, because, if the dividend yield of the stock is high, the drop in the stock is close to the amount of the dividend (Dasilas, 2009).

Eades et al. (1984) studied the behaviour of share prices around the ex-dividend day. Their results demonstrated the existence of abnormal returns on days different from the ex-day, which is opposed to the tax-induced clientele hypothesis. A study made by

Lakonishok and Vermaelen (1986) confirmed Kalay's (1982) results. Focusing on volumes instead of returns, they found that the short term hypothesis is held. Their results showed higher trading volume before and after ex-dividends days. They marked also that if stocks have higher yield, the increase of the trading volume is higher. Furthermore, there was an abnormal stock price increase before ex-days as well as an abnormal stock price decrease thereafter. The abnormal stock price increase was statistically significantly vis-à-vis to dividend yield and transaction costs in a positive way. On the other hand, there was a statistically significant positive relation between the abnormal trading volume and the dividend yield (transactions cost) (Dasilas, 2009). Naranjo et al. (2000) re-examined and extended the work of Eades et al. (1984) and found that the high-yield stock ex-day returns were highly influenced by corporate dividend capture. Castillo and Jakob (2006) examined the Chilean stock market, where there were no taxes on capital gains, but there were taxes on dividends. They argued that the ex-dividend stock price anomaly is the result of frictions that reduce the ex-dividend day price adjustment.

Table 2.2 presents some of the most significant studies which indicate the short –term trading hypothesis as the reason for the ex-dividend day stock price anomaly.

Table 2.2 Empirical studies on ex-dividend days

Study	Examined Period	Examined Market
Kalay (1982)	1966-1967	USA
Lakonishok and Vermalen (1986)	1970-1981	Canada
Grammatikos (1989)	1975-1985	USA
Michaely (1991)	1986-1989	USA
Hearth and Rimbley (1993)	1984-1988	USA
Boyd and Jagannathan (1994)	1962-1987	USA
Bowers and Fehrs (1995)	1976-1987	USA
Siddiqi (1997)	1987-1988	USA
Naranjo et al. (2000)	1962-1994	USA
Castillo and Jakob (2006)	1989-2004	Chile

(Source: Dasilas, 2009)

2.3 Microstructure effects

The most recent literature suggests that not only taxes and transaction costs affect the ex-dividend price adjustment, but also different factors related to the market microstructure. These papers focus on factors, such as the tick size, the bid-ask spread and the limit order adjustment mechanism. Bali and Hite (1998) stated that the ex-dividend stock price anomaly relies on price discreteness. In their study, they used a sample of both cash dividends and nontaxable distributions from the NYSE and AMEX. Bali and Hite (1998) argued that an investor is less likely to over-adjust for the dividend. According to them, this is the reason why the ratio between the dividend and the ex-dividend day price drop should be smaller than one. They also claimed that there is a negative relation between the dividend and the tick size, suggesting that the larger the former, the less important the latter. This argument is known as the "price-discreteness hypothesis".

Frank and Jagannathan (1998) also focused on microstructure arguments. According to them, investors prefer not to receive the dividend and they, usually, do not buy shares before the ex-dividend day. This happens, because the process of collecting and reinvestment of dividend is troublesome for the investors. On the other hand, market makers prefer to receive the dividend and they buy shares on the cum-dividend day. Frank and Jagannathan conclude that the price drop on the ex-dividend day is caused by the bid-ask bounce, because transactions occurred at the ask price before the ex-dividend date and at the bid price afterwards. Frank and Jagannathan (1998) studied the Hong Kong Stock Market (HKSE), where there were no taxes on dividends and capital gains, and they observed that stock prices dropped on the ex-dividend day by half of the dividend paid. Similar to the results of Frank and Jagannathan (1998) were the results of Yahyaee et al. (2007) for the Oman capital market, where neither dividends nor capital gains were taxed.

Dubofsky (1992) suggested that an ex-dividend premium below one may be explained by mechanical rules imposed by the NYSE and AMEX for the ex-day adjustment of open limit orders to buy stock. Graham et al. (2003) and Jakob and Ma (2004) supported the bid-ask bounce, as an explanation of the ex-dividend price anomaly. They found that, as discreteness was eliminated, the ex-dividend price drop anomaly was

actually increased, contrary to what the price discreteness hypothesis predicted. In a subsequent paper of Jakob and Ma (2005) the stocks listed on the Toronto stock exchange (TSX) was examined. The conclusion of the study was that the lack of an order adjustment mechanism, along with relatively low trading volume, leads to incomplete price adjustments on ex-dividend days. Moreover, Akhmedov & Jakob (2010) examined ex-dividend day behaviour on the Copenhagen Stock Exchange and their findings were consistent with limit order adjustment explanations from Dubofsky (1992) and Jakob & Ma (2004, 2005).

2.4 Studies using Greek data

The aforementioned studies related to the ex-day anomaly with various factors, such as market liquidity, market trading etc. All these factors can differ from country to country or from market to market within a particular country.

Milonas and Travlos (2001) made the first attempt to gauge the ex-dividend day stock price behaviour on the Athens stock exchange for the period 1994-1999. During the examined period there were no taxes on dividends or capital gains and the tick size was relatively small. They demonstrated that the ex-dividend day stock price did not drop by the full amount of the dividend paid using the classical $\Delta P/D$ ratio. Nevertheless, they did not examine the ex-dividend day abnormal return resulting and the abnormal trading volume around ex-dividend days.

Dasilas (2009) examined the ex-dividend stock price and trading volume behaviour in the Greek stock market for the period 2000-2004. He examined both the abnormal returns and trading volume around the ex-dividend day. He argued that short term trading hypothesis explains the ex-dividend day stock price anomaly in Greece. This result was also confirmed by the cross-sectional regression analysis.

Chapter Three

3. The Greek institutional environment

3.1 The Athens Stock Exchange

The Athens Stock Exchange was established in 1876 and started operating four years later in 1880. The first legal framework was posed based on the French commercial code. It is the only official market for shares, derivatives and bonds trading in Greece, both for individual and institutional investors. Government bonds and shares of National bank were the first stocks, which were traded in the ASE. Since 1992 all shares are traded electronically through the OASIS system.

Until the decade of ’90s, only few investors had chosen to invest their money in the companies listed on the Athens Stock Exchange. In 1928 the role and responsibilities of stockbrokers and intermediaries, in general, were specified and the situation was improved. Nevertheless, the ASE is small compared to other European stock exchange in terms of the number of firms listed, turnover volume and market capitalization. In 1995, it was observed an upward trend in the market capitalization, due to new seasoned equity offerings. The Greek stock market experienced its first phase of growth in the period between 1997 and 1999. The total value of listed companies reached 184,000 million Euros in 1999, an increase of 195% compared to that of 1998 (Owusu-Ansah and Leventis, 2006). Specifically, the market reached its peak in mid September 1999, when the General Index reached 6,355 points. Since then, it started falling for the following three years and, as a result, the savings of small individual investors were disappeared. The year 2004 signaled the beginning of a new era for the Greek capital market that lasted until the fall of 2007 (Dasilas, 2009).

The Athens Stock Exchange has witnessed an unprecedented fall in stocks during 2011 which was the worst during the last 20 years. The main composite index underwent heavy losses, reaching its lowest levels in the last 19 years. In fact, the main index plummeted to 680.42 points at the end of 2011, a decline of 733.52 points or 51.88% compared to 1,413.94 points at the end of 2010. In 2011, the total stock market

capitalization experienced a decrease of 27,633 billion euro, reaching 27,302 billion euro at the end of 2011 compared to 54,935 billion euro at the end of 2010.

3.2 Greek tax Law

The Greek legislative framework defines precisely the manner and the procedure of the taxation on stock sales, capital gains and dividends.

According to the Law 2579/1998 and 3296/2004, a flat tax is imposed on every stock sale equal to 0.15%. The tax is calculated on the basis of trade value of the shares sold and is withheld upon the settlement of the transactions by the ASE. According to the Law 3943/2011, the aforementioned tax rate has increased to 0.2% since 1 April 2011 (Ministerial Decision 1064/2011).

Until the end of December 2008, there were no taxes on capital gains and dividends,. However, the outbreak of the recent financial crisis forced Greece to adjust its tax policy in last years. So, Greece modified the tax treatment of dividends and of capital gains. More specifically, the implementation of the Law 3697/2008 imposed, for first time, a flat tax rate of 10% on dividends since 1 January 2009. In the case that the dividend recipient is a foreign firm established in a country, with which Greece has signed bilateral agreements for the avoidance of double taxation, is exempted from the tax provided that the enterprise does not maintain a permanent establishment in Greece and that the tax rate is more favorable in the country of origin (Law 3697/2008; Ministerial Decision 1180/2008; Ministerial Decision 1082/2009).

According to the Law 3842/2010, dividend income is added in personal income of dividend recipient and is taxed on the basis of the tax rate applicable per taxable bracket. The Law 3842/2010 amended the Law 3943/2011 introduced a 25% withholding tax rate on dividends since 1 January 2012. The immediate consequence of this taxation was the decrease in number of firms distributing dividends to shareholders. However, the Greek listed firms continue to offer high dividend yields relative to other European listed firms (Pitsilis, 2009).

Table 3.1 presents a comparative overview of the taxation imposed by a gamut of countries around the world.

Table 3.1 Market Taxes

	Capitan Gains	Dividends
Belgium	Capital gains tax is not applicable for non-residents, provided they invest for their own account	25 per cent is the maximum withholding tax on dividends
Denmark	There is no capital gains tax	A withholding tax of 28 per cent is deducted from dividend payments at source by the local CSD. The tax can be reclaimed according to double taxation treaties
France	Capital gains tax is non-applicable for non-residents	30 per cent tax rate on dividends. Reduced DTT rates: 15 per cent tax rate on dividends
Germany	Non-resident investors who own, or have owned, directly or indirectly at least 1 per cent of a company's stock in the last five years, must pay taxes on capital gains	26.375% for dividends
Netherlands	Capital gains tax is not applicable	15% tax on dividends
Norway	There is no Capital Gains Tax	A withholding tax of 25% is deducted at source on dividend payments to non-residents
Spain	Capital gains tax of 21%, although most DTT include exemption or reduction of this tax	A withholding tax on dividends is 21 per cent
United Kingdom	Capital Gains Tax local tax and DTT are not applicable for foreign investors	A Withholding Tax on dividends not applicable except for interest payments (in no exemptions apply
United States	Capital gains tax is 0% for proceeds on sales	The standard rate of withholding tax is 30 % on dividends. A withholding tax exemption applies to interest payments on most debt instruments issued after 18 July 1984.. Countries with a double tax treaty ("DTT") in place with the United States may benefit from a reduced withholding tax rate on dividends

(Source: HELEX 2012)

Chapter Four

4. Methodology and Data

In this Chapter we present the data and methodology employed. We define two discrete periods under examination based on the implementation of taxes on dividends. Until 2008 in the Greek stock market there were no taxes on dividends or capital gains, but after 2008 the new legislation introduced taxes on dividends. For the period 2009-2010, dividends were taxed at a flat rate of 10%. Since 2011, dividend income is taxed on the basis of the tax rate applicable per taxable bracket. Because of the difficulty to figure out the exact tax bracket of each dividend recipient, we assume that the tax rate on dividends is, on average, equal to 25%. This 25% is the withholding tax on dividends imposed on every eurocent distributed by Greek listed firms. Depending on the tax bracket of each investor, the tax rate may rise or fall subject to the total personal income and the applicable tax rate.

4.1 Ex-dividend stock price behaviour

According to Elton and Gruber (1970), shareholders may opt for selling their shares either before the ex-dividend day, without the right to receive the dividend, or on the ex-dividend day. In the second case, they maybe sell the stock at a lower price.

The price drop ratio of Elton and Gruber (1970) is used in order to investigate whether Greek equities adjust their share prices on ex-days. This ratio is called the "raw price ratio" (RPR) and measures the price change from the cum-dividend day to the ex-dividend day and should have the following equilibrium:

$$\frac{P_c - P_e}{D} = \frac{1 - t_d}{1 - t_g} \tag{6}$$

where P_c is the price on the cum-dividend day, P_e is the price on the ex-dividend day, t_d the tax rate on dividend income and t_g the tax rate on capital gains.

Provided that there is no tax on capital gains throughout the period under study, the price drop ratio is solely affected by the tax rate on dividends expressed as 1- t_d . During the period 2005-2008 the theoretical value of RPR should be equal to unity, because of the absence of taxes on both capital gains and dividends.

RPR ratio is calculated using closing prices both on cum- and ex-dividend days ($RPR_{c\text{-}c}$) and using closing prices on cum-dividend days and opening prices on ex-dividend days ($RPR_{c\text{-}o}$). Hence, our first two hypotheses for the Greek stock market are:

H_1: The mean of $RPR_{c\text{-}c}$ and $RPR_{c\text{-}o}$ should be equal to unity for the period 2005-2008.
H_2: The mean of $RPR_{c\text{-}c}$ and $RPR_{c\text{-}o}$ is less than unity and equal to 0.90 for 2009-2010 and 0.75 for 2011.

Market-adjusted price ratio (MAPR) is also calculated as follows:

$$MAPR = \frac{P_c - \left[P_e / (1 + R_m)\right]}{D} \tag{7}$$

Previous studies (i.e. Kalay 1982, Michaely 1991, Naranjo, 2000) argue that the stock's normal daily return influences the closing price on the ex-dividend day and for that reason they suggest the calculation of MARP. MAPR ratio solves this problem by adjusting the ex-day closing price by the daily market return (R_m), as it is proxied by the Composite Stock Index of the Athens Stock Exchange (Dasilas, 2009).

Moreover, the raw price drop ratio (RPDR) is also computed as follows (Milonas et al., 2006):

$$RPDR = \frac{P_c - P_e}{P_c} \tag{8}$$

This ratio measures the price change from the cum- to ex-dividend day in terms of the price on the last cum-day. It was considered appropriate to calculate the RPDR, because several papers (i.e. Eades et al. 1984, Bell and Jenkinson, 2002) suggest that RPR ratio suffers from the problem of heteroscedasticity.

Similar to RPR ratio, RPDR is computed using closing prices both on cum- and ex-dividend days ($RPDR_{c\text{-}c}$) and using closing prices on cum-dividend days and opening prices on ex-dividend days ($RPDR_{c\text{-}o}$). Furthermore, we adjust the ex-day closing price for the daily market return (R_m) as it is proxied by the Composite Stock Index of the Athens Stock Exchange (Dasilas, 2009). This ratio is called market-adjusted price drop ratio (MAPDR) and is calculated with the following formula:

$$MAPDR = \frac{P_c - \left[P_e / \left(1 + R_m\right)\right]}{P_c} \tag{9}$$

The theoretical value of the raw price drop ratio is equal to the dividend yield, which is calculated as follows:

$$DY = \frac{D}{P_c} \tag{10}$$

This leads to our third hypothesis:

H_3: The mean of RPDR and MAPDR should be equal to dividend yield throughout the whole period.

The standard event study methodology is conducted (see Dodd and Warner, 1983, Brown and Warner, 1985) in order to investigate the market reaction on and around ex-dividend days. According to Kothari and Warner (2005), the event study is useful since the magnitude of abnormal performance provides a measure of the (unanticipated) impact of this type of event, (in our case dividend payments) on stocks returns. An event window of 21 days around the ex-dividend day (day 0) is defined from day -10 to day +10. To calculate abnormal returns around ex-dividend days, we employ both the market model and the market-adjusted return model (Brown and Warner 1985). The estimation period for calculating the market model parameters, starts from 250 days prior to the event day and ends on day -11 (-250, -11). This means that 240 observations are used. The market return is proxied by the Athens Stock Exchange composite stock index.

The abnormal returns on and around ex-days are computed by subtracting the expected returns from actual returns as follows:

$$AR_{it} = R_{it} - E(R_{it}) \quad (11)$$

where,

- AR_{it} is the abnormal return of firm i on day t, where t= -10...+10
- R_{it} is the actual return of firm i on day t, where t= -10…+10
- $E(R_{it})$ is the expected return of firm i on day t, where t= -10…+10

The expected return on the market model is calculated using the following equation:

$$R_{it} = \alpha + \beta * R_{mt} \quad (12)$$

where,

- i= 1….N
- t= 1…N
- R_{it} is the actual return of firm i on day t
- R_{mt} is the market return as approximated by the ASE composite index on day t
- β is the systematic or undiversifiable risk $\beta = \frac{Cov(R_{it}, R_{mt})}{Var(R_{mt})}$
- $\alpha = E(R_{it}) - \beta * E(R_{mt})$

The abnormal returns on and around ex-days on market-adjusted returns are computed using the following equation:

$$AR_{it} = R_{it} - R_{mt} \quad (13)$$

where,

- AR_{it} is the abnormal return of firm i on day t, where t= -10...+10
- R_{it} is the actual return of firm i on day t, where t= -10…+10
- R_{mt} is the market return as approximated by the ASE composite index on day t

The market-adjusted returns model assumes that α = 0 and β = 1 for each stock.
The returns for both of methods are calculated using the following equation:

$$R_{it} = \ln(P_{it}) - \ln(P_{it-1}) \quad (14)$$

where,

- P_{it} is the stock price of firm i on day t
- P_{it-1} is the stock price of firm I on day t-1
- R_{it} is the logarithmic returns of the stock price of firm i on day t

The average abnormal returns for a 20 day-event window are calculated using the following equation:

$$AR_t = \frac{\sum_{t=1}^{N} AR_{it}}{N} \tag{15}$$

where,

- AR_t is the average abnormal returns on day t (-10, +10)
- AR_{it} is the abnormal returns of firm i on day t (-10, +10)
- N is the number of firms included in the sample

The analysis of abnormal returns, also, contains the computation of cumulated abnormal returns using the following equation:

$$CAR_{(t1,t2)} = \sum_{t=t1}^{t2} AR_t \tag{16}$$

Cumulative abnormal returns for various event windows around the ex-dividend day are calculated for both the whole period and sub-periods. Finally, different statistical tests were used, in order to evaluate the null hypothesis. T-statistics for abnormal returns are calculated as follows:

$$T_{AR} = \frac{AR_t}{\sigma(AR_t)} \tag{17}$$

The equation for CARs t-statistics is the following:

$$T_{CAR} = \frac{CAR_t}{\sqrt{T * \sigma(AR_t)}} \tag{18}$$

We expect a mean abnormal return on ex-days and a cumulative abnormal return pre- and post-ex-dividend period equal to zero. So, the null hypotheses are:
H_4: The mean of abnormal returns on ex-days (ARs) =0.
H_5: The cumulative abnormal returns pre-and post-ex-dividend period (CARs) =0.

4.2 Regression analysis

Following Kato and Loewenstein (1995), Michaely and Vila (1996), Wu and Hsu (1996), Naranjo et al. (2000), Lasfer and Zenonos (2003), Dhalival and Zhen Li (2006) and Yahyaee et al. (2007), we perform a regression analysis in order to investigate the ex-dividend stock price anomaly.

The dependent variable of the regression is the abnormal return on ex-days (AR_0) and the independent variables are the systematic risk (BETA), dividend yield (DY), transaction costs (TC) and firm size (SIZE). The regression analysis is performed using OLS estimators.

$$AR_{0,i} = \alpha_0 + \alpha_1 * BETA_i + \alpha_2 * DY_i + \alpha_3 * TC_i + \alpha_4 * SIZE_i + \alpha_5 * DUMMY \quad (19)$$

The BETA variable is calculated using the market model parameters using 240 days before the event window (-250, -11). We expect that the systematic risk has a negative effect on the ex-day abnormal returns. The dividend yield variable (DY) is computed dividing the annual dividend by the share price on the cum-dividend day. Following Karpoff and Walkling (1988), Naranjo et al. (2000), Dhalival and Zhen Li (2006) and Yahyaee et al. (2007), transaction costs are calculated as the inverse of the stock price on the cum-dividend day ($1/P_c$). We expect a positive impact of transaction costs on ex-day abnormal returns. This will lend support for short-term trading hypothesis of Lakonishok and Vermaelen (1986). Firm size is calculated as the log of market value of equity. According to Lasfer and Zenonos (2003), the variable SIZE is directly proportional to the ex-dividend day abnormal returns.

Finally, we include a "tax dummy' variable (DUMMY) to capture the effect of dividend taxation on abnormal returns. The "tax dummy" variable takes the value of one for the period of dividend taxation (2009-2011) and zero otherwise (2005-2008).

4.3 Data

Our sample includes all dividend-paying stocks listed on Athens Stock Exchange during the period 2005-2011.

Prior research on the ex-dividend phenomenon was focused on the period between 1994 and 1999 (Milonas and Travlos, 2001) and for the period between 2000 and 2004 (Dasilas, 2009). Our study complements these studies by investigating the ex-day phenomenon in a period that is characterised of the implementation of tax on dividends for first time in the Greek capital market. After excluding all firms omitting to distribute dividends, having missing data and having a delist for the ASE, we end up with a sample of 974 observations.

The daily adjusted closing and opening prices for each company are used to study the stock price behaviour around ex-days. Both closing and opening prices were obtained from the DataStream database. Data for ex-dividend dates and dividend amounts were extracted from the website of Athens Stock Exchange and were cross-checked by daily press releases.

Chapter Five

5. Empirical Results

In this Chapter we present our empirical findings from the ex-dividend day behaviour of stocks listed on Athens Stock Exchange. The results are organized as follows: First, the results about the ex-dividend drop-off ratios are presented. Second, the ex-dividend stock price behaviour is studied and finally the regression results are presented.

5.1 Ex-dividend drop-off ratios

Table 5.1 shows descriptive statistics for the three sub-periods under study. Panel A shows descriptive statistics for the period 2005-2008 where there were no taxes on dividends and capital gains. 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. It is obvious that the price drop is less than unity as the mean (median) RPR_{c-c}, RPR_{c-o}, MARP is 0.499, 0.787 and 0.525 (0.533, 0.476 and 0.558), respectively. The price drop is also less than the mean (median) dividend yield value of 0.033 (0.029) as the mean (median) RPD_{c-c}, RPD_{c-o}, and MAPD is 0.018, 0.019 and 0.018 (0.018, 0.014 and 0.017), respectively.

Panel B presents descriptive statistics for the period 2009-2010 in which a flat tax of 10% was imposed on dividends. The theoretical (implied) value of the mean and median raw price ratios is equal to 0.90 and the theoretical value of the mean and median raw price drop ratios is equal to the dividend yield. As we can see the mean (median) RPR_{c-c}, RPR_{c-o}, MARP is 0.375, 0.293 and 0.218 (0.333, 0.165 and 0.417), respectively, suggesting that the price drop is less than the theoretical value. Moreover, the mean (median) RPD_{c-c}, RPD_{c-o}, and MAPD is 0.018, 0.016 and 0.017 (0.014, 0.006 and 0.014), respectively, indicating that the price drop is less than the corresponding dividend yield of 0.041 (0.039).

Panel C of Table 5.1 shows descriptive statistics for 2011, in which the theoretical value of the mean and median raw price ratios is equal to 0.75 because of the 25% tax on dividends. The results are similar to the previous periods. The mean (median) RPR_{c-c},

RPR_{c-o}, MARP is 0.362, 0.462 and 0.702 (0.500, 0.320 and 0.607), respectively, indicating that the price drop is smaller than its theoretical value. Similarly, the mean (median) RPD_{c-c}, RPD_{c-o}, and MAPD is 0.021, 0.016 and 0.016 (0.020, 0.012 and 0.017), respectively, indicating that the price drop is smaller than the dividend yield value of 0.036 (0.0330).

Table 5.1 Descriptive statistics

Panel A Descriptive statistics for the period 2005-2008					
2005-2008	Mean	Median	St. Deviation	Maximum	Minimum
RPRc-c	0.499	0.533	1.800	16.000	-10.000
RPRc-o	0.787	0.476	1.997	17.000	-3.500
MARP	0.525	0.558	1.729	9.088	-9.734
RPDc-c	0.018	0.018	0.031	0.113	-0.091
RPDc-o	0.019	0.014	0.026	0.110	-0.040
MAPD	0.018	0.017	0.030	0.114	-0.096
DY	0.033	0.029	0.128	2.500	0.0003
Panel B Descriptive statistics for the period 2009-2010					
2009-2010	Mean	Median	St. Deviation	Maximum	Minimum
RPRc-c	0.375	0.333	2.016	8.696	-10.612
RPRc-o	0.293	0.165	1.154	8.571	-3.600
MARP	0.218	0.417	1.802	6.390	-8.606
RPDc-c	0.018	0.014	0.034	0.108	-0.070
RPDc-o	0.016	0.006	0.027	0.100	-0.038
MAPD	0.017	0.014	0.036	0.105	-0.078
DY	0.041	0.039	0.280	3.462	0.0003
Panel C Descriptive statistics for the year 2011					
2011	Mean	Median	St. Deviation	Maximum	Minimum
RPRc-c	0.362	0.500	0.905	2.385	-1.762
RPRc-o	0.462	0.320	2.389	11.111	-4.207
MARP	0.702	0.607	1.903	7.430	-2.893
RPDc-c	0.021	0.020	0.026	0.086	-0.030
RPDc-o	0.016	0.012	0.031	0.096	-0.035
MAPD	0.016	0.017	0.027	0.070	-0.034
DY	0.036	0.033	0.025	0.084	0.002

Table 5.2 presents the theoretical and observed mean and median values for raw price and raw price drop ratios, as well as the results from the tests of equality. The differences in means from their theoretical values are tested using the two-tail test, and

differences in medians from their theoretical values are tested using the Wilcoxon signed rank test.

Panel A presents the results for the period 2005-2008. Looking both at mean and median values in all ratios, the observed values are statistically significant at the 1% level as calculated by t-test and by the Wilcoxon sign rank test.

Panel B shows the results from the period 2009-2010. The t-statistic of RPR_{c-c}, RPR_{c-o}, MARP, RPD_{c-c}, RPD_{c-o}, and MAPD is -3.22, -6.42, -4.65, -8.44, -11.70 and -7.96 respectively, indicating that the mean of ratios are statistically different from their theoretical values at the 1% level. Similarly, looking at median values, all values are statistically significant at 1% level.

Finally, Panel C presents the results for the year 2011. The t-statistic of RPR_{c-c} is -2.23 indicating that the mean is statistically significant at the 5% level. On the other hand, the median is statistically significant at the 10% level. Based on their corresponding t-statistic, both RPR_{c-o} (-0.65) and MARP (-0.14) are not statistically smaller than its theoretical value at any conventional level of significance. The median of RPR_{c-o} is statistically significant at the 5% level, but the median of MARP is not significant at any conventional level. Looking at the mean values of RPD_{c-c}, RPD_{c-o}, and MAPD, we observe that all of them are statistically significant at the 1% level. Similarly, the median of RPD_{c-o} and MAPD is statistically different from its theoretical value at the 1% level. On the contrary, the median of RPD_{c-c} is not statistically different from its theoretical value at any level of significance.

In the light of the above empirical findings, the first three testable hypotheses H_1, H_2 and H_3 are all rejected for the three sub-periods. This means that stock prices drop less that the amount of the dividend on ex-days and an investor can take advantage of this price imbalance by buying shares on cum-days and selling them on ex-days. Our results are in line with the previous studies for the Greek market (Milonas and Travlos, 2001, Dasilas, 2009) despite the fact that in the years 2009, 2010 and 2011 taxes on dividends were imposed.

Table 5.2 Ex-dividend day stock price behaviour

Panel A Ex-dividend day stock price behaviour for the period 2005-2008						
2005-2008	Theoretical value	Mean	t-statistic	Theoretical value	Median	Wilcoxon signed rank P-value
RPRc-c	1.000	0.499***	-7.56	1.000	0.533***	0.000
RPRc-o	1.000	0.787***	-2.89	1.000	0.476***	0.000
MARP	1.000	0.525***	-7.46	1.000	0.558***	0.000
RPDc-c	0.033	0.018***	-12.30	0.029	0.018***	0.000
RPDc-o	0.033	0.019***	-13.74	0.029	0.014***	0.000
MAPD	0.033	0.018***	-13.31	0.029	0.017***	0.000
DY		0.033			0.029	
Panel B Ex-dividend day stock price behaviour for the period 2009-2010						
2009-2010	Theoretical value	Mean	t-statistic	Theoretical value	Median	Wilcoxon signed rank P-value
RPRc-c	0.900	0.375***	-3.22	0.900	0.333	0.000***
RPRc-o	0.900	0.293***	-6.42	0.900	0.165	0.000***
MARP	0.900	0.218***	-4.65	0.900	0.417	0.000***
RPDc-c	0.041	0.018***	-8.44	0.039	0.014	0.000***
RPDc-o	0.041	0.016***	-11.70	0.039	0.006	0.000***
MAPD	0.041	0.017***	-7.96	0.039	0.014	0.000***
DY		0.041			0.039	

Panel C Ex-dividend day stock price behaviour for the year2011

2011	Theoretical value	Mean	t-statistic	Theoretical value	Median	Wilcoxon signed rank P-value
RPRc-c	0.750	0.362**	-2.23	0.750	0.500*	0.052
RPRc-o	0.750	0.462	-0.65	0.750	0.320**	0.024
MARP	0.750	0.702	-0.14	0.750	0.607	0.584
RPDc-c	0.036	0.021***	-2.97	0.033	0.020	0.264
RPDc-o	0.036	0.016***	-4.04	0.033	0.012***	0.001
MAPD	0.036	0.016***	-3.88	0.033	0.017***	0.002
DY		0.036			0.033	

The Wilcoxon signed rank statistic is computed by summing the ranked differences of the deviation of each variable from the hypothesized median above the hypothesized value. T-statistics are calculated for the differences of the mean values from their corresponding theoretical values.

* Denotes statistically significant at the 0.1 level

** Denotes statistically significant at the 0.05 level

*** Denotes statistically significant at the 0.01 level

5.2 Ex-dividend stock price behaviour

We use the standard event study methodology to investigate deeply the ex-dividend day stock price anomaly. The event window is 21 days around the ex-dividend day (the ex-dividend day is 0) and the abnormal returns are calculated by the market model and the market adjusted returns model.

Table 5.3 ARs and CARs around ex-dividend days for the full sample

Panel A Abnormal returns around ex-dividend days				
Full sample	Market model		Market-adjusted model	
Days	Ars%	t-statistic	Ars%	t-statistic
-10	0.081	0.76	0.077	0.36
-9	0.138	1.30	0.125	1.53
-8	0.201	1.89	0.312	3.34
-7	0.061	0.57	0.131	1.70
-6	0.097	0.91	0.096	1.15
-5	0.086	0.81	0.129	1.55
-4	0.252	2.37	0.278	3.30
-3	0.098	0.92	0.101	1.12
-2	0.407***	3.83	0.372***	4.59
-1	0.270**	2.54	0.261***	3.17
0	1.829***	17.21	1.833***	3.08
1	-0.334	-3.14	-0.363	-4.16
2	-0.220	-2.07	-0.216	-2.38
3	-0.173	-1.63	-0.211	-2.49
4	-0.132	-1.24	-0.121	-1.43
5	-0.105	-0.99	-0.137	-1.42
6	-0.075	-0.71	-0.114	-1.40
7	-0.054	-0.50	-0.046	-0.52
8	-0.052	-0.49	-0.048	-0.58
9	-0.102	-0.96	-0.058	-0.65
10	-0.037	-0.34	-0.048	-0.51
Panel B Cumulative abnormal returns around ex-dividend days				
Full Period	Market model		Market-adjusted model	
Event Periods	CAR%	t-statistic	CAR%	t-statistic
CAR (-10 -1)	1.690***	5.03	1.884	1.36
CAR (+1 +10)	-1.285***	-3.82	-1.361	-0.98
CAR (-5 -1)	1.113***	4.68	1.142	1.17
CAR (+1 +5)	-0.965***	-4.06	-1.047	-1.07
CAR (-1 +1)	1.765***	9.59	1.731**	2.28
CAR (-1 0)	2.099***	13.96	2.094***	3.38

Panel A of Table 5.3 presents the results from the stock price behaviour for the entire examined period. The abnormal return on the ex-dividend day (t=0) is equal to 1.829% estimated by the market model and 1.833% estimated by the market-adjusted model. Both of them are statistically significant at the 1% level. However, two days prior to ex-dividend date, positive and significant abnormal returns are noticed. On day -2 the mean abnormal return is equal to 0.407% according to the market model and 0.372% according to the market adjusted model. On day -1 is equal to 0.270 and 0.261 respectively. This result indicates that on and two days before the ex-dividend date there there are significant abnormal returns for exploitation.

Panel B of Table 5.3 shows the cumulative abnormal returns (CARs) over the period [-10 to +10]. We observe positive and statistically significant at the 1% level CARs in the pre-event periods. Over the periods [-10 -1] and [-5 -1] the CARs are 1.690% (t=5.03) and 1.113 (t=4.68) respectively. On the contrary, the CARs in the post-event period are negative and statistically significant at the 1% level. Over the periods [+1 +10] and [+1 +5] the CARs are -1.285 (t=-3.82) and -0.965 (t=-4.06), respectively. This result suggests that investors buy shares in the pre-event period and sell their shares after the ex-dividend day because they want to capture the dividend.

Table 5.4 reports the ARs and the CARs for the period 2005-2008. There are positive and statistically significant abnormal returns on ex-dividend days. According to the market model, on day 0 the AR is equal to 1.700 (t=15.02) and according to the market adjusted model, it is equal to 1.684 (t=2.81). During the period examined there are no taxes on dividends and capital gains. We examine the returns around the ex-dividend date, in order to confirm the short-term trading hypothesis. We can confirm that investors could make an arbitrage profit by buying in the pre-event period and selling in the post-event period, if the returns before the ex-dividend day are positive and after the ex-dividend day are negative. This result is in line with those found by Lasfer and Zenonos (2003).

Panel B displays the cumulative abnormal returns (CARs) for various event periods. In the pre-event periods [-10 -1] and [-5 -1] the CARs are 1.657% (t=4.63) and 1.069 (t=4.22), respectively. In the post-event periods [+1 +10] and [+1 +5], the CARs are -1.056 (t= -2.95) and -0.851 (t= -3.36), respectively. All these CARs are statistically

significant at the 1% level. It is important to mention the result in the period [-1 0], where the CARs are 1.949 and statistically significant at the 1% level.

Table 5.4 ARs and CARs around ex-dividend days for the period 2005-2008

Panel A Abnormal returns around ex-dividend days				
2005-2008	Market model		Market-adjusted model	
Days	Ars%	t-statistic	Ars%	t-statistic
-10	0.065	0.57	0.077	0.29
-9	0.096	0.85	0.124	1.38
-8	0.243	2.15	0.319	3.27
-7	0.135	1.19	0.159	1.90
-6	0.050	0.44	0.042	0.46
-5	0.116	1.02	0.129	1.41
-4	0.278	2.45	0.311	3.36
-3	0.087	0.77	0.107	1.10
-2	0.340***	3.00	0.309***	3.53
-1	0.249**	2.20	0.245***	2.68
0	1.700***	15.02	1.684***	2.81
1	-0.266	-2.35	-0.312	-3.21
2	-0.210	-1.86	-0.227	-2.28
3	-0.197	-1.74	-0.224	-2.37
4	-0.124	-1.10	-0.124	-1.32
5	-0.053	-0.47	-0.063	-0.61
6	-0.102	-0.90	-0.103	-1.17
7	-0.037	-0.33	-0.049	-0.48
8	0.037	0.33	0.039	0.43
9	-0.128	-1.13	-0.093	-0.96
10	0.024	0.22	0.000	0.00
Panel B Cumulative abnormal returns around ex-dividend days				
2005-2008	Market model		Market-adjusted model	
Event Periods	CAR%	t-statistic	CAR%	t-statistic
CAR (-10 -1)	1.657***	4.63	1.821	1.43
CAR (+1 +10)	-1.056***	-2.95	-1.157	-0.91
CAR (-5 -1)	1.069***	4.22	1.100	1.22
CAR (+1 +5)	-0.851***	-3.36	-0.950	-1.06
CAR (-1 +1)	1.682***	8.58	1.617**	2.32
CAR (-1 0)	1.949***	12.18	1.929***	3.39

Note: *, **, *** denote statistical significance at the 10%, 5% and 1% level, respectively

Table 5.5 presents the ARs and CARs for the period 2009-2010. According to the market model (Panel A), there are statistically significant abnormal returns on ex-day equal to 2.395 (t=10.56). Moreover, on day -2 and day -1 there are also positive and

statistically significant abnormal returns equal to 0.670% and 0.425%, respectively. This suggests that investors' interest to capture dividends commences at least two days before the ex-dividend day.

Table 5.5 ARs and CARs around ex-dividend days for the period 2009-2010

Panel A Abnormal returns around ex-dividend days				
2009-2010	Market model		Market-adjusted model	
Days	Ars%	t-statistic	Ars%	t-statistic
-10	0.130	0.57	-0.028	-0.09
-9	0.308	1.36	0.075	0.33
-8	0.066	0.29	0.264	0.91
-7	-0.230	-1.01	0.031	0.14
-6	0.178	0.78	0.142	0.65
-5	-0.053	-0.23	0.091	0.41
-4	0.142	0.63	0.070	0.32
-3	0.139	0.61	0.073	0.28
-2	0.670***	2.96	0.606	2.72
-1	0.425*	1.87	0.323	1.46
0	2.395***	10.56	2.405	1.17
1	-0.672	-2.97	-0.551	-2.48
2	-0.452	-2.00	-0.386	-1.59
3	-0.028	-0.13	-0.184	-0.86
4	-0.083	-0.37	-0.056	-0.28
5	-0.278	-1.23	-0.436	-1.90
6	0.061	0.27	-0.205	-0.93
7	-0.136	-0.60	-0.121	-0.61
8	-0.334	-1.47	-0.371	-1.76
9	0.038	0.17	0.091	0.39
10	-0.135	-0.59	-0.211	-0.93
Panel B Cumulative abnormal returns around ex-dividend days				
2009-2010	Market model		Market-adjusted model	
Event Periods	CAR%	t-statistic	CAR%	t-statistic
CAR (-10 -1)	1.774**	2.48	1.647	0.87
CAR (+1 +10)	-2.020***	-2.82	-2.430	-1.28
CAR (-5 -1)	1.323***	2.61	1.164	0.87
CAR (+1 +5)	-1.514***	-2.99	-1.613	-1.20
CAR (-1 +1)	2.147***	5.47	2.178**	2.10
CAR (-1 0)	2.820***	8.80	2.729***	3.22

Note: *, **, *** denote statistical significance at the 10%, 5% and 1% level, respectively

Looking at Panel B, we observe that the cumulative abnormal returns (CARs) are positive and statistically significant in the pre ex-dividend date and negative in the post

event period. Specifically, over the period [-10 -1], [+1 +10], [-5 -1], [+1 +5], [-1 +1] and [-1 0] the CARs are equal to 1.774, -2.020, 1.323, -1.514, 2.147 and 2.820, respectively.

Table 5.6 ARs and CARs around ex-dividend days for the year 2011

Panel A Abnormal returns around ex-dividend days				
2011	Market model		Market-adjusted model	
Days	Ars%	t-statistic	Ars%	t-statistic
-10	0.270	0.61	0.567	1.63
-9	0.092	0.21	0.539	1.53
-8	0.231	0.52	0.631	1.35
-7	-0.255	-0.57	-0.030	-0.08
-6	0.574	1.29	1.002	2.43
-5	0.240	0.54	0.359	0.81
-4	0.333	0.75	0.519	1.01
-3	0.145	0.33	0.158	0.31
-2	0.438	0.99	0.487	1.14
-1	0.212	0.48	0.424	1.57
0	2.246***	5.06	2.317***	4.98
1	-0.177	-0.40	-0.546	-1.48
2	0.499	1.12	0.749	2.09
3	-0.422	-0.95	-0.061	-0.17
4	-0.935	-2.11	-0.572	-1.01
5	-0.969	-2.18	-1.070	-1.17
6	-0.028	-0.06	0.311	0.62
7	-0.199	-0.45	0.374	0.84
8	-0.387	-0.87	-0.140	-0.22
9	-0.045	-0.10	-0.017	-0.04
10	-0.791	-1.78	-0.446	-1.03
Panel B Cumulative abnormal returns around ex-dividend days				
2011	Market model		Market-adjusted model	
Event Periods	CAR%	t-statistic	CAR%	t-statistic
CAR (-10 -1)	2.280	1.62	4.656**	2.13
CAR (+1 +10)	-3.454**	-2.46	-1.418	-0.65
CAR (-5 -1)	1.369	1.38	1.947	1.26
CAR (+1 +5)	-2.003**	-2.02	-1.500	-0.97
CAR (-1 +1)	2.282***	2.97	2.195	1.83
CAR (-1 0)	2.458***	3.91	2.741***	2.81

Note: *, **, *** denote statistical significance at the 10%, 5% and 1% level, respectively

Finally, Table 5.6 displays the results from stock price behaviour for the year 2011. Similar to previous periods, the mean abnormal return on the ex-dividend day (t=0) is

2.246%, statistically significant at the 1% level. However, two days before the ex-dividend day, abnormal returns are positive but not statistically significant.

The CARs for the periods [-10 -1] and [-5 -1] are positive but not statistically significant and over the period [+1 +10] and [+1 +5] are negative and statistically significant at the 5% level. During the period [-1 0], the CARs are statistically significant at the 1% level and equal to 2.458%. This result indicates once again that in Greece dividend capture is prevalent.

It is important to mention that during the periods 2009-2010 and 2011 there are differential tax treatment of dividends compared to the period 2005-2008. Hence, these periods are characterized by a tax advantage of capital gains compared to dividends. Elton and Gruber (1970) suggested that if the tax on dividends is higher than the tax on capital gains, the stock price drop is less than the dividend amount. Our results imply under periods of heterogeneous taxation on dividends and capital gains, still there are opportunities for arbitrage profits for someone trading around the ex-dividend day. These results confirm the short-trading hypothesis and the fact that in Greece dividend capture is prevalent. Therefore, we argue that investors prefer to capture the dividend and thus they buy the shares on the cum-day and sell them after the ex-dividend day.

5.3 Regression Analysis Results

Table 5.7 presents the results from the regression analysis. First, we checked for the presence of heteroskedasticity and multicollinearity and we found no such problems.

The independent variable is the abnormal return on ex-dividend day (AR_0). We use as control variables the systematic risk (BETA), the transaction costs (TC), the firm size (SIZE), the dividend yield (DY) and a dummy variable (TAX DUMMY).

As we can see from the Table 5.7 the coefficient of variable BETA is negative (-0.098) and statistically significant at the 1% level (t= -3.19). This result is line with those found by Michaely and Vila (1996) and Dhaliwal and Zhen Li (2006). The coefficient of variable TC is positive and statistically significant at the 1% level (t= 2.87). This finding is consistent with the results of previous studies (i.e. Wu and Hsu, 1996,

Naranjo et al., 2000) and with the short term trading hypothesis. The coefficient of dividend yield (DY) has the expected positive sign, in line with the short term trading hypothesis. It is equal to 0.059 and statistically significant to the 1% level (t= 3.81). This result confirms the results of several previous studies, such as Kato and Loewenstein (1995), Michaely and Vila (1996) and Lasfer and Zenonos (2003). Hence, both the dividend yield and transaction costs appear to influence the ex-dividend day returns. Finally, the tax dummy, which implies the imposition of taxes on dividends, is statistically significant at the 5% level. This is evidence that the taxes affect the ex-dividend day returns for the examined period.

Table 5.7 Regression analysis of abnormal returns on ex-dates

Regression Analysis	Model
BETA	-0.098
	(-3.19)***
TC	0.080
	(2.87)***
SIZE	0.037
	(2.65)***
DY	0.059
	(3.81)***
TAX DUMMY	-0.061
	(-2.15)**
YEAR DUMMIES	YES
R^2 - adjusted	0.267
F - statistic	36.45***
DW	1.88
No. obs.	974

Note: *, **, *** denote statistical significance at the 10%, 5% and 1% level, respectively

Chapter Six

6. Conclusion

6.1 Concluding Remarks

The ex-dividend day stock price anomaly constitutes one of the most important issues in corporate finance. There are a lot of papers, which studied this anomaly, but the reason of this phenomenon is far from being found.

In this study we analyse the stock price behaviour around the ex-dividend day for a sample firms listed on the Athens Stock Exchange for the period 2005-2011. The idiosyncrasies of the Greek tax system during the period 2005-2011 makes the Greek stock market an interesting setting for analyzing the ex-dividend phenomenon. For the period 2005-2008 there were no taxes on dividends and capital gains. However, for the period between 2009-2011, taxes on dividends were imposed. Furthermore, the absence of microstructure barriers in the Greek market rejects the tick size effect and bid-ask spread hypotheses.

The main purpose of our study is to investigate whether the fall in stock prices is the same as the amount of dividend paid out and whether there are any arbitrage opportunities during ex-dividend days. We found that the ex-day returns are positive and statistically significant. This fact implies that ex-day prices decrease by less than the amount of the dividend distributed. For the periods 2005-2008, 2009-2010 and 2011 the abnormal returns on the ex-dividend day are 1.700, 2.395 and 2.246, respectively and all statistically significant at the 1% level. Moreover, we find a positive stock price trend before the ex-day and a negative one thereafter. Our results suggest that the price drop to dividend ratio is consistently less than the theoretical value in all periods and it does not depend on the differential tax treatment. This result is in line with the results of Shantanu et al. (2004). The short-term trading around the ex-dividend day seems the most plausible explanation for the ex-dividend stock price anomaly. Furthermore, the results from the cross-sectional regression analysis support the short-term trading hypothesis. The results from the regression analysis reveal that transaction costs and

dividend yield have a positive and significant impact on stock prices on ex-dividend days.

In sum, the ex-dividend day stock price anomaly is present for the Greek stock market despite the changes in the dividend taxation. However, taxation seems not to be the sole explanation for the ex-dividend day phenomenon. The results signify buying pressure before the ex-dividend day and selling pressure after the ex-dividend day. An investor can gain excess returns by buying the stocks prior to ex-dividend day and selling them afterwards.

6.2 Suggestions for further research

The current study contributes to the existing literature on the ex-dividend day anomaly, since it examines a market with an interesting institutional environment. Nevertheless, further research could be made to investigate not only the abnormal returns but also the trading volume in a period surrounding the ex-dividend day. This would give a better and more accurate view of the price anomaly on ex-dividend day. Moreover, it would be interesting to identify the identity of those who trade around ex-dividend days. Finally, it would be interesting to investigate the presence or not of dividend clienteles in the Greek capital market.

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