UNIVERSITY OF GOTHENBURG

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The Ex-dividend effect during a crisis

An analysis of the Swedish stock market

NEG300 V 12 Project Paper with Discussant - Finance

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Abstract

The previous years have been turbulent for the financial sector. Major banks and financial institutions have filed for bankruptcy and some were taken over by governments. Europe has seen a deepening of the crisis and now whole countries are at the brink of ruin.

With this financial turmoil in mind we wanted to see how the market efficiency was affected and in specific how the ex-dividend effect had been during these years. Had there been an ex-dividend effect? We sought our answers in Sweden examining all stocks listed on OMX Stockholm Large Cap. We found that there had been an average abnormal return of 0,64% on the ex-dividend day. Since our data was leptokurtic and skewed we chose to use the median as our measure for central tendency, which in our investigation was 0,23%. We cannot draw the conclusion that the recent financial crisis has affected the abnormal returns on the ex-dividend day.

Contents

1. Introduction

1.1 Background

During the aftermath of the financial crisis, there has been some discussion about the validity of the efficient market hypothesis (Siegel, n.d.) The efficient market hypothesis´ intermediately restricted component is the semi strong-form efficiency; this states that for a market to be semi strong- efficient, a share's price has to fully absorb all new public information as well as all historical information (Bodie, Kane, & Marcus, 2011). If this were true, the prices would drop with the exact amount of the dividend when corrected for the price impacts during the day. This effect will be referred to as the ex-div effect, the ex-dividend day will hence be called the ex-day and the four following days shall be referred to as the ex-div period.

There has been studies done that have shown that during previous years, there have been excess returns on the ex-day on the Swedish stock market (De Ridder & Sörensson, 1995) and we see the need for an update of the results.

1.2 Purpose

The market efficiency is claimed to be affected negatively in a financial crisis. Since the ex-div effect could be claimed to be a symptom of market inefficiency we saw it fit to investigate the effect during the recent crisis. The nature of the subject also makes it interesting to update earlier research.

1.3 Problem specification and delimitation

Our paper will focus the answering of the two following questions;

1) **Are there any arbitrage opportunities on the ex-day during a crisis?**

Has it been possible to gain profit whilst maintaining a consistent investment strategy for stocks on the ex-day?

2) Are there any arbitrage opportunities on the ex-div period during a crisis?

Has it been possible to gain profits whilst maintaining a consistent investment strategy for stocks on the ex-div period which we here will define as the ex-day and the four forthcoming trading days?

We define the financial crisis as the fall of Lehman Brothers and the aftermath spanning from September 2008 until now and we will therefore study the pay outs made 2009, 2010 and 2011. The reason why we do not include 2008 is because the dividends in 2008 should reflect the previous year and thus would not be affected too much of the financial crisis. Our view of when the crisis started could surely be discussed and there is no common definition to be found.

We are not looking for arbitrage opportunities on the days before the ex-day. Since there often is a general meeting of the shareholders the days prior to the ex-day we thought that the returns in that period would say little of the ex-div effect. However that would be an interesting thing to study as well but we leave that for others. We are also not searching for the reason as to why the effect can be found or how different tax systems might affect the effect. We only included companies who paid dividends in SEK since we preferred not to incorporate exchange rate risk into our research.

2. Theory and Earlier research

2.1 Efficient Market Hypothesis (EHM)

The efficient market hypothesis claims that for a market to be fully efficient, the prices have to "fully reflect" all the relevant cost efficient information that is available. There are three different types of efficiency: weak-form, semi strong-form and strong-form efficiency.
(Fama, 1970) (Bodie, Kane, & Marcus, 2011)

2.1.1 Weak-form efficiency

If a capital market exhibits weak-form efficiency it means that all of the historical data are already reflected in the securities price. This includes historical price, seasonality, trading volume etc. The weak form efficiency is tightly linked with the technical analysis, where technical analysts try to take advantages of possible situations where the weak-form efficiency does not hold.

2.1.2 Semi strong-form efficiency

Semi strong-form efficiency describes a market, in addition to the weak-form efficiency, where all the new public data is reflected into the price of the security. This would include the latest quarterly report, current product line, managerial competence and so forth. Fundamental analysts are trying to exploit opportunities where the semi strong efficiency is failing and is constantly challenging this segment of efficiency.

2.1.3 Strong-form efficiency

This form of efficiency is the most constrained one; it implies that all information is reflected in the securities price. This can be interpreted as that not only are all historical and new public information reflected in the price, all new private information is reflected as well.
(Bodie, Kane, & Marcus, 2011)

2.2 Dividends

2.2.1 Dividends

A firm faces two alternatives concerning the use of its free cash flow[1]. Either the managers decide to retain the funds, for investing in new projects or to increase its cash reserves, or they distribute it to the firm's investors (i.e. the shareholders) (Berk & DeMarzo, 2011, p. 552). The distribution of these earnings, either current or accumulated, to the firm's shareholder is commonly referred to as dividends. Dividends can come in three forms; stock dividends, stock split or the most common type, which also will be the subject of this thesis, cash dividends. Stock dividends and stock split both include increasing the number of outstanding stock with the difference being that stock splits are often larger quantities of new stock released. A firm can also repurchase stocks which can be seen as a form of dividends. There are some benefits to stock repurchases over dividends e.g. tax advantages, lower distribution costs and, which some claim to be the most significant, the firm can use these repurchased stocks in incentive plans for their employees. Another reason to why a company may do a

[1] Free Cash flow is here regarded as net cash flows after ensuring that the firms operating activities are covered, for an all equity firm or for a levered firm with outstanding debt but where interest, taxes and other relevant financial obligations has been withdrawn from the earnings

stock repurchase is that they expect that the value of the remaining stocks will increase. In Sweden stock repurchases was illegal until 2000 (Simkovic, 2007) (Tivéus, 2000) (Hillier, Ross, Westerfield, Jaffe, & Jordan, 2010, p. 488).

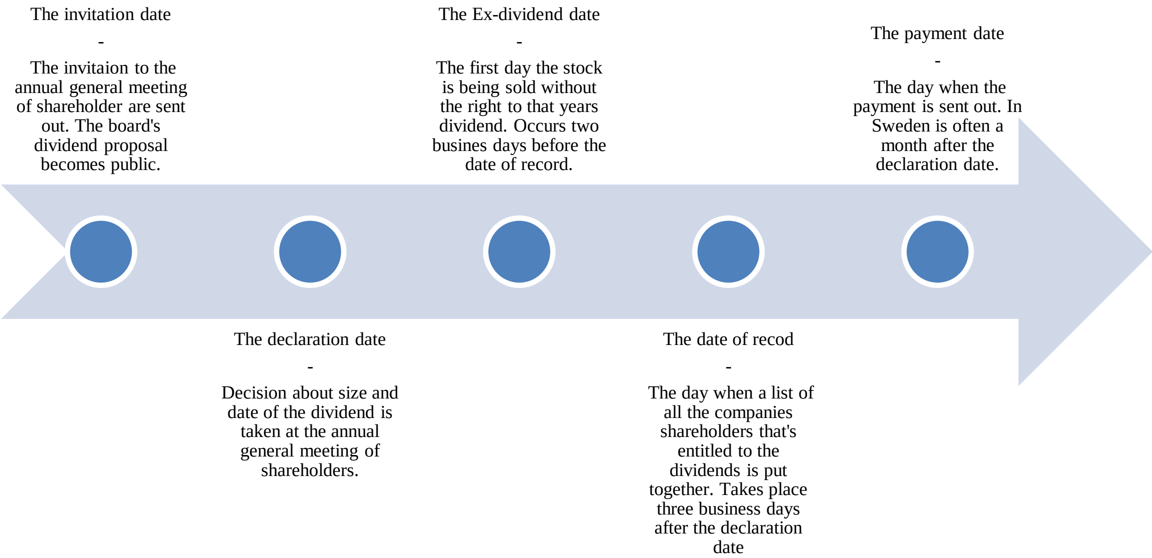
The cash dividends, its size and when it is going to be paid is suggested by the board of directors and decided at the annual meeting of shareholders (Euroclear, 2012).
The value of an asset is determined by the present value of its future cash flows. The dividends of a firm are an important tool for setting its stock price. However, dividends are not the only cash flow to the shareholders as they also can receive capital gains by selling the asset. (Hillier, Ross, Westerfield, Jaffe, & Jordan, 2010)

A question is whether or not a firm's dividends policy matters to its stock price or to its shareholders. Modigliani and Millers *Irrelevance theory* states that, in a efficient market and without allowing a change in capital structure, a firm's dividend policy does not matter for the value of the firm. They show this by arguing that an increase in dividends would have to come from raising new equity or detaining less funds. Both actions would reduce the value of the stock by the exact same amount and making the new dividends policy irrelevant (Pinches, 1996, pp. 377-378).

It is possible to argue that shareholders, if they in fact prefer dividends, can produce their own dividends by simply selling of the amount of equity that would represent the firm's dividends. Then why do so many firms pay dividends? There are several reasons it seems. One of the more powerful arguments is that people have a desire for current income. In the case of homemade dividends lack of self-control becomes the argument to paying out dividends. In addition to these reasons as to why shareholders might prefer dividends there are benefits for managers and firms as well. Dividends policies can be used by managers to signal future cash flows and thus an effort to control the value of the firm. The signaling effect makes dividends quite a powerful tool for managers to try to affect the value of the firm. (Hillier, Ross, Westerfield, Jaffe, & Jordan, 2010, pp. 492-493)

2.2.2 The procedure of dividends pay out

There are four important dates concerning dividends which are, in chronological order; *the declaration date*, *the ex-dividend date*, *the date of record* and *the date of payment* (Hillier, Ross, Westerfield, Jaffe, & Jordan, 2010). Another date of interest is the day when the proposal of dividends becomes public. In Sweden this occurs six to four weeks before the annual general meeting of shareholders (Aktiespararna, 2006). The declaration date is day when the dividend resolution is passed at the general meeting. The ex-dividend date occurs two business days before the date of record and is the first day that the stock is no longer traded cum dividend. On the date of record the firm prepares a list of everyone believed to be a shareholder as of that day. The date of payment is as one might expect the day when the firm pay out the dividends (Hillier, Ross, Westerfield, Jaffe, & Jordan, 2010). The procedure may differ between markets but in Sweden it is as described above and shown below (Euroclear, 2012).



2.2.3 Ex-dividend day

On the ex-day a stock is traded without the right to obtain that year's dividend and it is believed that, not considering taxes, the price of the stock should drop approximately with the amount of the dividend (Beranek & Campbell, 1955). However it has been found that this is not always the case and the occurrence of an ex-div effect has been shown.

2.3 Event Studies

An event study is a method in which the goal is to examine the effect of a special, predetermined event. This could e.g. be to measure the price effect of a merger announcement on the company's share. (Bodie, Kane, & Marcus, 2011)

The event study is divided in three different time periods in order to measure the effects of the event. First you have the estimation window in which you use data prior to your event. This data is then used as a basis for the calculations of the securities "normal" behaviour. Secondly, you have the time of the event, this "event window" is smaller and here one is supposed to measure the effect of the event. (MacKinley, 1997)

At last you have the "post-event window" where you measure the post effects of the event. Research has shown that the market underreacts to earnings reports. This means that the cumulative abnormal returns continued to rise up to 60 days after the announcement (Bernard & Thomas, 1989). This is one example of how one can use the post-event window.

2.4 Abnormal Return

The abnormal return is a measure that is derived from the difference between the security's theoretical return and its actual return. This theoretical return is often based on a market proxy e.g. the S&P 500 and in our case the OMX100. The abnormal return would then be the difference between the actual return and the return calculated using the above mentioned proxy. Here is an example of how one can estimate the abnormal return with the market model:

$$r_t = a + br_{Mt} + e_t \qquad (1)$$

$$e_t = r_t - a - br_{Mt} \qquad (2)$$

$r_t = Actual\ return\ at\ time\ t$

$a = Averge\ return\ when\ the\ market\ offers\ no\ return$

$r_{Mt} = Return\ of\ the\ market\ at\ time\ t$

$b = The\ securities\ specific\ sensetivity\ to\ the\ market$

$e_t = The\ abnormal\ return$

(Bodie, Kane, & Marcus, 2011) (MacKinley, 1997)

2.5 Tests

2.5.1 Shapiro-Wilk test for normality

$$W = \frac{(\sum_{i=1}^{n} a_i y_i)^2}{\sum_{i=1}^{n} (y_i - \bar{y})^2} \qquad (3)$$

$$y_i = The\ ith\ observation\ of\ y$$

$$\bar{y} = Sample\ mean\ of\ y$$

$$a = \frac{m'V^{-1}}{(m'^{V^{-1}V^{-1}}m)^{\frac{1}{2}}} \qquad (4)$$

This test returns a value for the W-statistic which is to be compared to a table with corresponding level of significance and number of observations[2].

The null hypothesis for this test is that the population is normally distributed, which means that if you receive a p-value that is smaller than you chosen significance level, then you can reject the null hypothesis that the population is normally distributed.
(Shapiro & Wilk, 1965)

2.5.2 Wilcoxons signed rank test

$$E(T) = \mu_T = \frac{n(n+1)}{4} \qquad (5)$$

$$Var(T) = \sigma_T^2 = \frac{n(n+1)(2n+1)}{24} \qquad (6)$$

$$Z = \frac{T - \mu_T}{\sigma_T} \qquad (7)$$

$$Reject\ if\ Z_{Observed} < -Z_{\alpha/2}$$

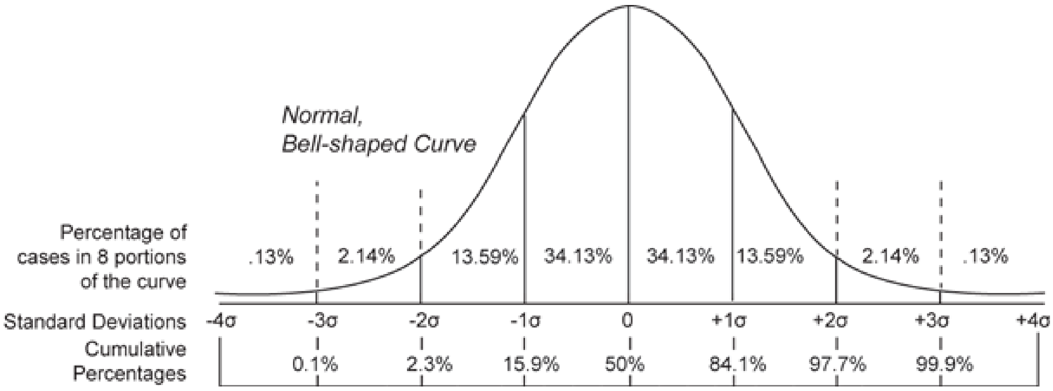
[2] The table can be viewed in appendix 2

The Wilcoxon signed-rank test checks if the median is statistically significant different from a chosen value. It is the nonparametric equivalent to a t-test. (Newbold, Carlson, & Thorne, 2010, pp. 657-661)

2.6 Distribution

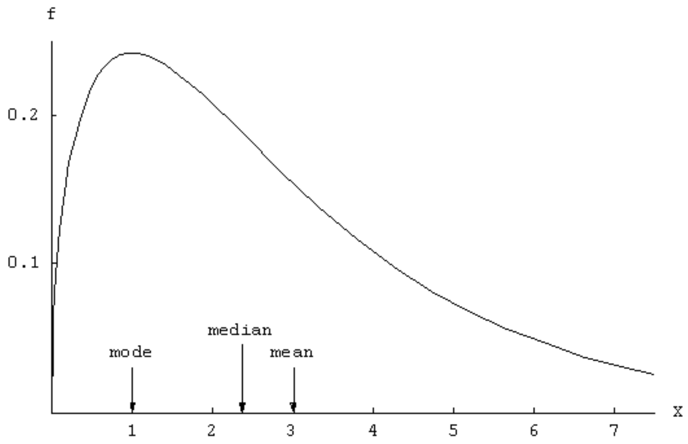
2.6.1 Normal distribution

In statistics the central limit theorem is one of the most important pillars. The basic principle being that with growing number of observations in your sample the distribution becomes approximately normal. The properties of normal distributions are that the expected value of the random variable is equal to the mean, the variance is σ^2 and the distribution is symmetric around its mean, µ. The percentages in the graph below show the probabilities of a sample drawn from the population. There is 68,26% probability that the mean of the population will lie within one standard deviation from the sample mean. (Newbold, Carlson, & Thorne, 2010)



2.6.2 Skewness

Skewness is a measure of how skewed the distribution is, i.e. how symmetric it is around its mean and a skewed distribution has a longer tail on one of the sides which the normal distribution do not exhibit. (Brooks, 2002)



When having a positive skew like this, the order from left to right is always mode, median to mean.

$$Skewness = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^3}{ns^3} \tag{8}$$

(von Hippel, 2005)

2.6.3 Kurtosis

Kurtosis is another measure of the distribution which measures the fatness of the tails. The normal, bell shaped distribution will have a measure of the kurtosis of 3 and is called mesokurtic. A distribution with a kurtosis coefficient that is larger than 3 is called leptokurtic and is higher at the mean and has fatter tails, compared to the normal distribution. A platykurtic distribution is a distribution that is lower at the mean and has thinner tails, this distribution would have a kurtosis coefficient smaller than 3. In the case of a leptokurtic distribution the probability of finding extreme values is larger (McDonald, 1991).

$$Kurtosis = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^4}{ns^4} \tag{9}$$

(Brooks, 2002)

2.7 Earlier research

There have been several researches of the ex-div effect, both international and in Sweden. One of the first published researches was a study by James A. Campbell & William Beranek called *Stock price behaviour on ex-dividends date* in which they confirmed that the ex-div price only dropped by approximately 90% of the dividend size (Beranek & Campbell, 1955).

Elton and Gruber wrote a paper in 1970 where they tried to explain the ex-div effect by differences in taxation on capital gains and on that of ordinary income. They claim that "in a rational market the fall in price on the ex-dividend day should reflect the value of dividends vis-à-vis capital gains to the marginal stockholders" and then go on to show that using following reasoning:

$$P_B - t_c(P_B - P_c) = P_A - t_c(P_A - P_c) + D(1 - t_0) \quad (10)$$

$$\frac{P_B - P_A}{D} = \frac{1 - t_0}{1 - t_c} \quad (11)$$

$P_B = Price\ on\ the\ day\ before\ the\ stock\ goes\ ex - dividend$

$P_A = Price\ of\ the\ stock\ on\ the\ ex - dividend\ day$

$P_c = Price\ at\ which\ the\ stock\ was\ purchased$

$t_0 = The\ tax\ rate\ on\ ordinary\ income$

$t_c = The\ capital\ gains\ tax\ rate$

$D = The\ amount\ of\ the\ dividend$

$$\frac{P_B - P_A}{D} = Dividend\ Ratio \quad (12)$$

The abnormal returns they found in their study were then explained by the differences in taxes. (Elton & Gruber, 1970)

Adri de Ridder and Tomas Sörensson wrote a report in 1995 which aimed to evaluate the Swedish tax reform that took place in 1991. The reform made the taxation on dividends equal to that of capital gains. They investigated if this reform had any effect on the ex-day behavior on the Swedish stock market. Their findings were that there was no evidence supporting that the tax reform hade any effects on the ex-day behavior. Instead they found that between 1980-1984 the prices on the ex-day was determined by "corporate traders" while the long-term investors determined the ex-day prices in 1985-1993. Furthermore they found that the average abnormal returns for the ex-day was 0,51% for the stock exchange as a whole. (De Ridder & Sörensson, 1995)

Kerstin Claesson wrote a PhD thesis in 1987 about the efficiency on the Stockholm stock exchange in which the ex-div effect was studied in one section. The study followed 49 stocks between 1978 and 1985 with a total of 350 dividend pay outs. To calculate the return on the ex-day she divides the price drop by the stock price of the day before. She does the same for the dividend and calculates a mean for both statistics and takes the ratio between the two. This ratio was also calculated with a price that was adjusted by price movements during the ex-day. These price movements were calculated as an average of the movements for her chosen stock that day. Hence she did not take into account that different stocks have different sensitivity to market movements. Claesson found that for the adjusted model there were abnormal returns about 0.07% on the ex-day. For the unadjusted model she found no evidence of abnormal returns (Claesson, 1987).

Alm and Arefjäll investigated all the Swedish dividend paying stocks during 1994-1998 in order to find out if there was any arbitrage opportunities related to the ex-dividend day. Their results for the ex-div effect is that they found an average abnormal return of 0,89%. They also examined the effect of the change of the Swedish taxation on dividends and furthermore they examined companies there were listed on both the Swedish stock exchange and the New York Stock Exchange in order to see if there was any difference between them. Their findings were that there was an arbitrage opportunity, as a result of the share price not dropping as much as the dividend. When examining the difference between the shares listed on both markets, they did not find any significant differences in arbitrage opportunities between the American and Swedish stock exchange. In the thesis, they found that there was a larger arbitrage opportunity in the OTC-markets. Alm and Arefjäll also concludes that they experienced some clientele effect, in "the sense that higher dividend yield stocks attracted more short-term traders than the low dividend yield stocks" (Alm & Arefjäll, 1999).

Frank and Jagannathan investigated the price drop of shares listed on Hong Kong stock exchange, a stock market where there is no taxation on dividends or on capital gains. They chose this market in order to investigate if the dividend effect is related to taxes as Elton and Gruber claims in their study[3]. The time period that they choose to investigate is 1980-1993. During this time, they saw the same things that Elton and Gruber found on the American stock market, i.e. that the stock price did not drop by the same size as of the dividend. On average, the price drop was HK $0.06 on the ex-day whereas the average dividend was HK $0.12, so the price drop was half the size of the dividend on average. Since there is not any taxation that can explain this, they sought another explanation. Their method of explaining this involves that they developed a model of "investor behaviour" with 2 prices, one for the buyers, one for the sellers and with four types of market participants. These four types are buyers, sellers, market makers and noise traders. The buyers are actors on the market that already have decided to buy. The decision they face is when to buy which would be most profitable to do on the ex-day. When looking at the sellers, they face the same problem except, when to sell and this would be most profitable to do so on the day prior to the ex-day. Their definition of market makers is "active and sophisticated traders who put in limit orders specifying the quantities and prices". Noise traders are those who are not updated with information about ex-day dates and therefore they do not face the same problem that the buyers and sellers do, i.e. which day to sell or buy. These circumstances lead to a small rise of the price on the ex-day which they contribute to the size of the bid-ask spread. Their explanation to the ex-day effect is that rational investors prefer to trade on different days depending on whether they are a seller or a buyer. (Frank & Jagannathan, 1998)

3. Method

We will use the dividends for the companies listed on OMX Stockholm Large Cap as of 2012-04-09 and only for the years 2009-2011. We chose to include those shares who paid dividends for the chosen years and who paid their dividends in SEK, this to exclude the exchange rate risk, this adds up to 181 observations. We used the OMX100 index as our proxy. The choice seemed natural since our research contained the 80 largest Swedish stocks. All stock prices are the closing prices.

[3] Short summary of the study is described earlier in this section; for further readings see reference at the end of this thesis

We extracted the price data, the size and the dates for the ex-day from *Thompson Reuters Datastream*. *Datastream* is a computer software database that offers statistical and financial historical data for 180 markets in 60 countries. To ensure that the dividend reports were right, we randomly chose 20 dividends from *Datastream* and double-checked it against the company's communiqué from their annual general meetings and found that both the date and size corresponded to the figures that we received from *Datastream*. When receiving the raw data from the software, we noticed that not every data point was a trading day and therefore we deleted those from the spread sheet to make sure that we would not make our data biased. To know which data to delete we looked for dates when none of the stock prices had moved, we assumed that no trading had taken place those days. We deleted stocks that did not pay out any dividends during the period. These were Alliance Oil, Lundin Mining, Lundin Petroleum, Swedbank Pref SEB A (2009), SEB C (2009) Swedbank A (2010-2011), Trelleborg (2009), Volvo A (2010), Volvo B (2010), Husqvarna A (2009), Husqvarna B (2009), Electrolux A (2009) and Electrolux B (2009). The companies that we chose to exclude due to different dividend currency were ABB, AstraZeneca, Autoliv, Millicom, Nordea, Semafo, Stora Enso A, Stora Enso R, Tieto and Oriflame. Huvudstaden C was removed due to lack of trading volume. We also chose to exclude Skanska because of irregular dividend pay outs during the time period. The companies that we used in our research were those that we found on the OMX Large Cap list (Affärsvärlden).

To carry out our research we needed the returns for all our chosen stock as well as for the market proxy. We also needed to adjust for the dividends on the ex-day and so we derived the returns from the stock prices using the following formulas;

$$r_{it} = \left(\frac{P_{it}}{P_{it-1}}\right) - 1 \tag{13}$$

$$r_{it} = \left(\frac{P_{it} + Div_{it}}{P_{it-1}}\right) - 1 \tag{14}$$

$r_{it} = Return\ for\ share\ i, at\ time\ t$

$P_{it} = Price\ for\ share\ i, at\ time\ t$

$P_{it-1} = Price\ for\ share\ i, at\ time\ t-1$

$Div_{it} = Dividend\ for\ share\ i, at\ year\ t$

All the calculations of the returns, abnormal returns, betas and alphas were done in Excel. The betas were calculated using the formula *Slope*[4], and the alphas were calculated using the formula *intercept*. We ensured that these figures were correct by executing a regression in STATA[5]. We chose Excel as our foundation because we are more comfortable with using Excel than STATA or SPSS, which were our two alternative choices when it came to statistical software.

The betas and alphas were calculated during the event window, which we chose to define as 110 trading days prior to the ex-day to 5 days prior to the ex-day. We chose to use this number of days as a compromise between two different methodologies that say that you should use at least 126 observations in order to have an good approximation of the true values (Benninga, 2008), and another that says that one should use a narrower estimation period. The narrower period is explained by that the beta values fluctuate frequently over time and that one therefore should use an estimation window closer to the event window to get a more accurate measure (Claesson, 1987). The reason why we chose to end our estimation window 5 days prior to the event window is because we believe that the annual report would bias our estimations.

We suspected that the abnormal returns would not be normally distributed (The Economist, 2010) (Fuenzalida, Nongrut, Nash, & Tapia, 2006). Because of our beliefs we performed some tests to ensure whether or not it was normally distributed. First we plotted a histogram with our measure for abnormal returns on the horizontal axis and the frequency on the vertical axis. After plotting the abnormal returns we executed the Shapiro-Wilk test for normality in STATA to verify that the sample did not exhibit normality and created a table for our abnormal returns.

After conducting the Shapiro-Wilk test for normality and receiving p-values between 0 – 0.0085 we could reject the null hypothesis that the population was normally distributed. This has some effect on the proceedings of this investigation. Since our data was not normal we could not use traditional tests that assume normality and therefore we had to use a non-parametric test.

[4] The formula we used to test the Betas calculated by excel was $\beta_i = \frac{Cov(r_i, r_m)}{\sigma_m}$

[5] The regression model we used was $r_{it} = \alpha_i + \beta_{it} \times r_{Mt} + e_{it}$

We evaluated different nonparametric methods to test the central tendancy. One of the alternatives was the sign test but we chose the Wilcoxons signed-rank. The reason was that the signed-rank test regards the magnitude of the differences between the observations and the theoretical value. The variables that we chose to test with the Wilcoxon signed-rank test are the abnormal returns for the ex-day, the separate days for the ex-div period, the accumulated abnormal returns and the dividend ratio. Since we wanted to examine whether there existed any abnormal returns or not, we chose to test the variables with the null hypothesis that they are zero and chose to have a significance level of 0.05.

After receiving our results, we computed a table showing the kurtosis, skewness, minimum, maximum, mean and median for our investigated variables. The measures for the skewness were important to establish in order to be able to make a statement whether our mean was to the left or to the right of our median.

4. Data

4.1 Overview

Hereby follow the results from our research. We studied the abnormal returns for the ex-day called Art in our tables, the four following days called Artplus1-4, the cumulative abnormal return called Car and the ratio between the price fall and the dividend called DividendRatio. We will present tables and graphs displaying some characteristics and statistics for our variables as well as results from different tests.

4.2 Characteristics and statistics

stats	Art	Artplus1	Artplus2	Artplus3	Artplus4	Car	DivRatio
mean	.0064462	-.0011957	-.0005512	-.0002218	-.0014795	.0029981	.7831593
p50	.0023344	-.0012695	-.0021236	-.0001825	-.0015379	-.000141	.8133333
skewness	.9827966	-.7462807	-.4142073	.2990007	-.9807604	.3700499	.3807043
kurtosis	5.499468	5.907932	8.713625	5.934321	9.446858	4.154681	7.441137
min	-.0563435	-.0978094	-.1101159	-.0651349	-.099228	-.1095893	-3
max	.107667	.0495328	.080048	.0625634	.0686925	.1271705	5.1

The mean of Art is positive and quite large. This would mean that there have been, on average, abnormal returns on the ex-day of 0,64%. For all the consecutive days there were negative abnormal returns. The variable Car is telling us that there have been positive abnormal returns for the ex-day period even though there have been negative returns for all other days than the ex-day. Looking at the median (‘p50’) for Art it seems to be more modest than the mean which suggests that the variable might be skewed. This is confirmed by the positive skewness for the variable. The dividend ratio[6] was also of our interest since it has been measured in previous studies and so gave us a variable to compare. During the years we studied it seems as if the price drop on average was about 78% of the dividend size. However the standard deviation is quite large and the range of outcomes is between raise in price three times the dividend to a price fall that was five times as big as the dividend.

4.3 Tests

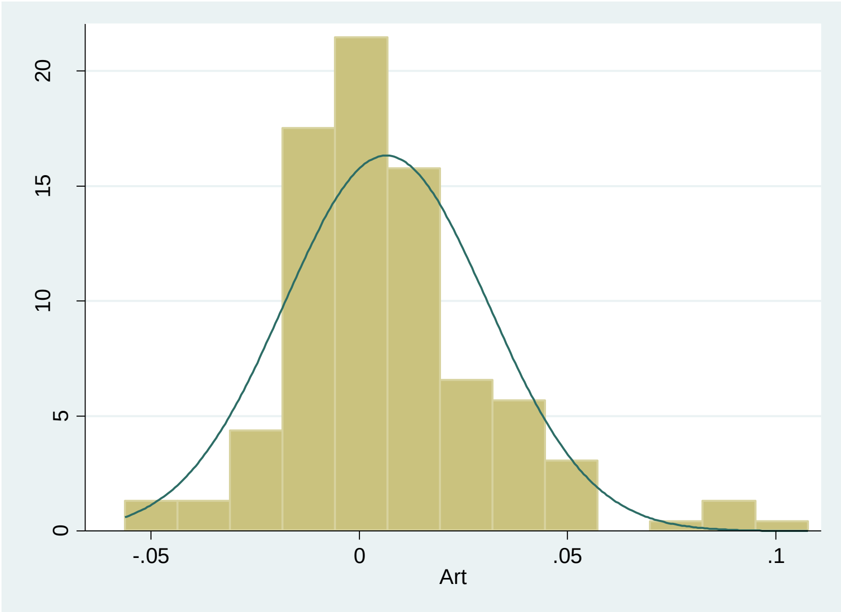
Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
Art	181	0.93588	8.771	4.971	0.00000
Artplus1	181	0.95980	5.499	3.902	0.00005
Artplus2	181	0.91511	11.613	5.613	0.00000
Artplus3	181	0.93580	8.782	4.974	0.00000
Artplus4	181	0.87378	17.266	6.521	0.00000
Car	181	0.97927	2.835	2.386	0.00852
DivRatio	181	0.87556	17.024	6.489	0.00000

We tested all the variables for distributional normality and found that none seemed to have such a distribution. At a 5% significance level we could, in all cases, reject the null hypothesis that the distributions were normal. The p-values show us that even at a 1% level we could reject normality for all variables. As could be seen in the above all the variables were skewed and had some form of kurtosis[7].

[6] The dividend ratio is defined as in previous section $\frac{(P_E - P_B)}{D}$

[7] Histogram with the plotted distributions for all variables are found in the appendix




```
. signrank Art=0

Wilcoxon signed-rank test

        sign |      obs   sum ranks    expected
-------------+---------------------------------
    positive |      104       10207      8235.5
    negative |       77        6264      8235.5
        zero |        0           0           0
-------------+---------------------------------
         all |      181       16471       16471

unadjusted variance   498247.75
adjustment for ties       -0.38
adjustment for zeros       0.00
                     ----------
adjusted variance     498247.38

Ho: Art = 0
             z =   2.793
    Prob > |z| =   0.0052
```

Since none of the variables had normal distribution we performed the non-parametric Wilcoxons signed-rank test instead of a t-test. We found that neither Artplus1-4 nor Car were statistically significant different from zero[8] and so we could not draw the conclusion that there had been any abnormal returns in the ex-day period except for the ex-day itself. For the ex-day we found that at a 5% significance level we would reject the null hypothesis that the median for Art is zero.

[8] Test results for all other variables than Art are found in the appendix

5. Analysis

Earlier research has shown that there is an ex-div effect even under “normal” market conditions. We suspected to find even larger abnormal returns during a crisis. Our argument was that the market would suffer from poor efficiency and thereby a greater ex-div effect.

We found that there has been, on average, an abnormal return of 0,64% during the financial crisis in the Swedish stock market. For the subsequent days we did not find any statistical significant abnormal returns. We also found that our sample for the ex-day lacked a normal distribution; it was positively skewed and had a positive kurtosis. For these reasons we could not rely on the usual t-tests to see whether our mean was significant or not. Instead we had to use a slightly weaker test, the nonparametric Wilcoxons signed rank test, where only the median could be tested. The test found that the median is statistically different from zero. Even though the median (0,2%) was less than the mean we still could see abnormal returns on the ex-day. Due to the positive skewness in our sample we can conclude that the mean is greater than the median but unfortunately we cannot say by how much. The positive kurtosis however tells us that they should be quite close. We will lead all further discussion for both the mean and the median.

If the mean is true for the population we get an ex-div effect that lies between the different studies that has been performed in the past. It would therefore be unwise to draw the conclusion that the recent crisis has affected the ex-div effect.

The answer to our second question is a negative one. It seems as if there were no arbitrage possibilities on the ex-div period. All our tests showed that none of the days had abnormal returns that were significantly different from zero. This was also true for the cumulative abnormal return. We also feel that there were no economic significance neither since transaction costs would have made arbitrage profits almost impossible.

The median for the ex-day was 0,2% and so our findings seems to fairly match those of earlier research. If we compare to the report that was given by De Ridder & Sörensson, we received quite similar results, they chose to use the mean and therefore to use a t-test to test the significance of their abnormal returns. Since we chose to test the median instead of the mean, due to our leptokurtic and skewed distribution our measure for central tendency is different. If we were to use the same methods as they used, we would get a similar result of 0,64% compared to 0,51%.

When looking at the PhD thesis performed by Claesson, we can say with certainty that our results differ from the results the she found. Since she found an average abnormal return of 0, 07% and our median was 0,23% and the median is further from the tail than the mean. We can conclude that our mean is different from the mean that she found and we can also say that it is greater than in her research.

This would suggest that there is an excess return on the Swedish stock market on the ex-day when there is some sort of financial crisis on the market. Compared to earlier studies it seems as if the abnormal returns are not as different as we expected. The abnormal returns were lower compared to those Alm & Arefjäll found. They did not use betas and thereby ignored the different stocks sensitivity to the market. This makes it a bit difficult to compare our results.

The median for the Art was considerably lower than our average which is to expect since we observed such skewness in our sample. The question is whether the whole population exhibits the same skewness as our sample.

When looking at the research performed by Elton and Gruber, we should expect to have a dividend ratio of 1. This, since their explanation to why the price drop is smaller than the dividend is taxation. As mentioned earlier we have the same taxation for capital gains as dividends. If Elton and Gruber's theory would be true, then the left side of the equation would sum to 1 and therefore to retain equality, the left side also has to equal 1. This would imply that the price drop should be the same as the size of the dividend.

In our study we find that we have a dividend ratio of 0,78 which suggests that there are other things that determine the ex-day effects than the taxation. This result of a price drop smaller than the dividend is not a farfetched idea. Frank and Jagannathan experienced the same thing in Hong Kong; their dividend ratio was 0,5 since the prices of the shares only dropped with half the size of the dividend.

What truly causes the ex-day effect still lies in doubt so we think that it would be interesting to study the ex-div effect using a slight more sophisticated model than the basic market model. Adding other explanatory variables like size and industry to control for normal return might have got us closer to the true normal return. It would also be of interest to examine how the bid/ask spread and transaction costs affect the ex-div effect. However, time was ever a scarce resource so we left that for others to investigate.

6. Summary

We started by asking two questions, are there any ex-div effect during a crisis on the ex-day and are there any effect on the whole period. We considered it likely that the crisis would somehow affect the market efficiency and thereby the ex-div effect. We gathered data and carried out tests to see if our principle ideas were correct. The results were ambiguous, we found rather large average abnormal return on the ex-day but they were not as extreme as we had hoped. The sample was not normally distributed so we had to test and analyse the more robust median instead. We still had positive abnormal returns on the ex-day but compared to earlier studies we could not say that the crisis made them much larger. There were no abnormal returns during the days following the ex-day.

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Appendix 1

-> year = 2009

Variable	Obs	Mean	Std. Dev.	Min	Max
Art	56	.0076351	.0325152	-.0563435	.0856369
Artplus1	56	-.0061377	.0226007	-.0509769	.0372468
Artplus2	56	.0018609	.0298956	-.1101159	.080048
Artplus3	56	.0034655	.0252754	-.0651349	.0625634
Artplus4	56	-.002632	.0264577	-.099228	.0686925
Car	56	.0041919	.0449393	-.1095893	.1271705

-> year = 2010

Variable	Obs	Mean	Std. Dev.	Min	Max
Art	61	.0046219	.0220672	-.0290692	.107667
Artplus1	61	.0025094	.0177799	-.0490876	.0495328
Artplus2	61	-.0010087	.0168572	-.0364211	.0523613
Artplus3	61	-.0025944	.0146476	-.0426967	.0319761
Artplus4	61	-.000835	.0157613	-.0543366	.0383557
Car	61	.0026932	.0381765	-.0997736	.1171348

-> year = 2011

Variable	Obs	Mean	Std. Dev.	Min	Max
Art	64	.0071447	.0177511	-.0287801	.0845322
Artplus1	64	-.0004028	.0178633	-.0978094	.0412918
Artplus2	64	-.0022257	.011931	-.0444695	.0444999
Artplus3	64	-.0011868	.0101401	-.0230799	.0320298
Artplus4	64	-.0010853	.0117427	-.0455084	.0392573
Car	64	.002244	.0277816	-.0582399	.1084796

A summary of the means of our variables divided into the years investigated.

Appendix 2

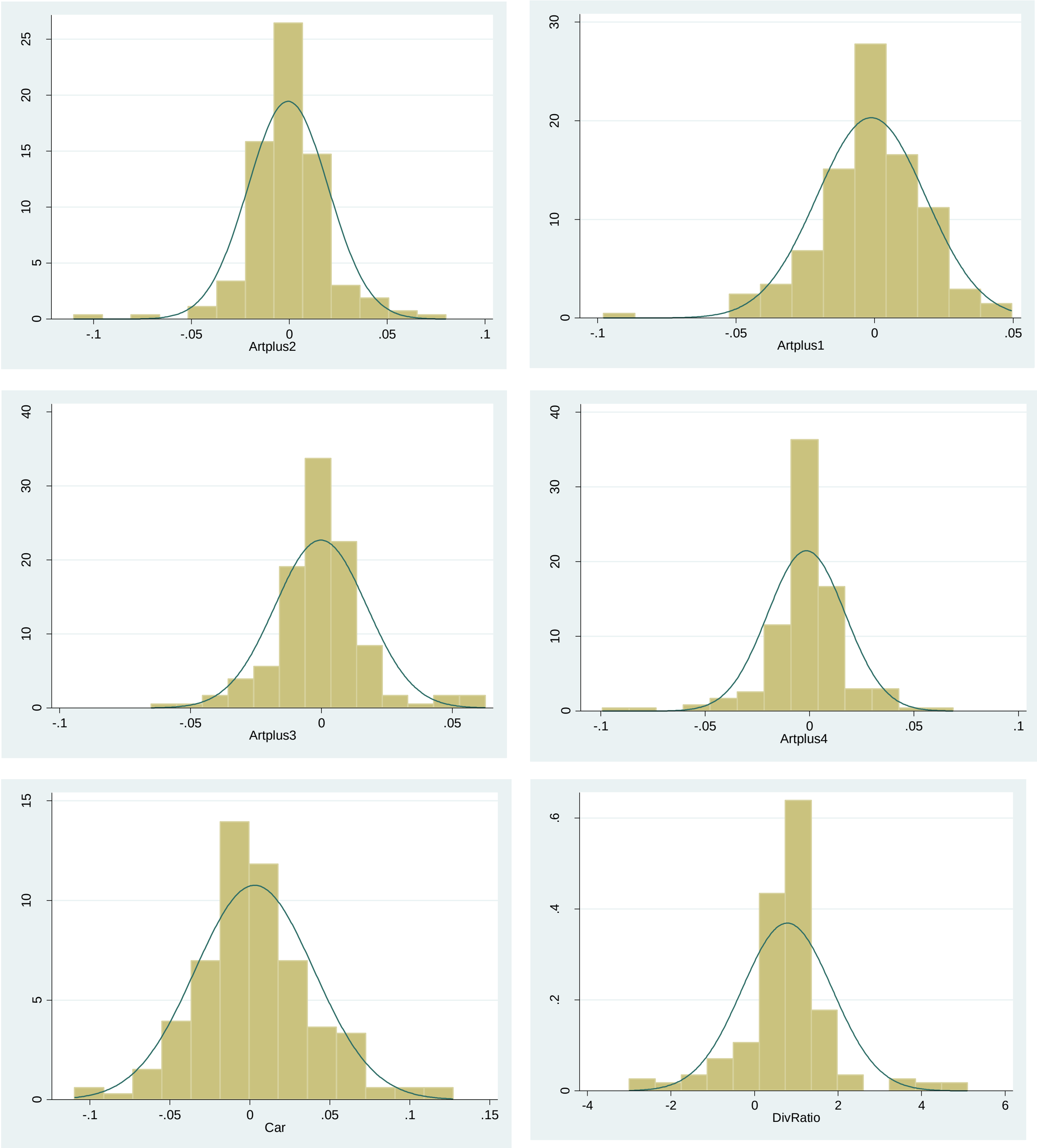
Table 6. *Percentage points of the W test* for n = 3(1) 50*

	Level								
n	**0·01**	**0·02**	**0·05**	**0·10**	**0·50**	**0·90**	**0·95**	**0·98**	**0·99**
3	0·753	0·756	0·767	0·789	0·959	0·998	0·999	1·000	1·000
4	·687	·707	·748	·792	·935	·987	·992	·996	·997
5	·686	·715	·762	·806	·927	·979	·986	·991	·993
6	0·713	0·743	0·788	0·826	0·927	0·974	0·981	0·986	0·989
7	·730	·760	·803	·838	·928	·972	·979	·985	·988
8	·749	·778	·818	·851	·932	·972	·978	·984	·987
9	·764	·791	·829	·859	·935	·972	·978	·984	·986
10	·781	·806	·842	·869	·938	·972	·978	·983	·986
11	0·792	0·817	0·850	0·876	0·940	0·973	0·979	0·984	0·986
12	·805	·828	·859	·883	·943	·973	·979	·984	·986
13	·814	·837	·866	·889	·945	·974	·979	·984	·986
14	·825	·846	·874	·895	·947	·975	·980	·984	·986
15	·835	·855	·881	·901	·950	·975	·980	·984	·987
16	0·844	0·863	0·887	0·906	0·952	0·976	0·981	0·985	0·987
17	·851	·869	·892	·910	·954	·977	·981	·985	·987
18	·858	·874	·897	·914	·956	·978	·982	·986	·988
19	·863	·879	·901	·917	·957	·978	·982	·986	·988
20	·868	·884	·905	·920	·959	·979	·983	·986	·988
21	0·873	0·888	0·908	0·923	0·960	0·980	0·983	0·987	0·989
22	·878	·892	·911	·926	·961	·980	·984	·987	·989
23	·881	·895	·914	·928	·962	·981	·984	·987	·989
24	·884	·898	·916	·930	·963	·981	·984	·987	·989
25	·888	·901	·918	·931	·964	·981	·985	·988	·989
26	0·891	0·904	0·920	0·933	0·965	0·982	0·985	0·988	0·989
27	·894	·906	·923	·935	·965	·982	·985	·988	·990
28	·896	·908	·924	·936	·966	·982	·985	·988	·990
29	·898	·910	·926	·937	·966	·982	·985	·988	·990
30	·900	·912	·927	·939	·967	·983	·985	·988	·900
31	0·902	0·914	0·929	0·940	0·967	0·983	0·986	0·988	0·990
32	·904	·915	·930	·941	·968	·983	·986	·988	·990
33	·906	·917	·931	·942	·968	·983	·986	·989	·990
34	·908	·919	·933	·943	·969	·983	·986	·989	·990
35	·910	·920	·934	·944	·969	·984	·986	·989	·990
36	0·912	0·922	0·935	0·945	0·970	0·984	0·986	0·989	0·990
37	·914	·924	·936	·946	·970	·984	·987	·989	·990
38	·916	·925	·938	·947	·971	·984	·987	·989	·990
39	·917	·927	·939	·948	·971	·984	·987	·989	·991
40	·919	·928	·940	·949	·972	·985	·987	·989	·991
41	0·920	0·929	0·941	0·950	0·972	0·985	0·987	0·989	0·991
42	·922	·930	·942	·951	·972	·985	·987	·989	·991
43	·923	·932	·943	·951	·973	·985	·987	·990	·991
44	·924	·933	·944	·952	·973	·985	·987	·990	·991
45	·926	·934	·945	·953	·973	·985	·988	·990	·991
46	0·927	0·935	0·945	0·953	0·974	0·985	0·988	0·990	0·991
47	·928	·936	·946	·954	·974	·985	·988	·990	·991
48	·929	·937	·947	·954	·974	·985	·988	·990	·991
49	·929	·937	·947	·955	·974	·985	·988	·990	·991
50	·930	·938	·947	·955	·974	·985	·988	·990	·991

* Based on fitted Johnson (1949) S_B approximation, see Shapiro & Wilk (1965*a*) for details.

A table with critical values for the Shapiro-Wilks W statistic. The rows represent the number of observations and the columns represent the chosen level of significance.

Appendix 3



Histogram with a normal distribution curve embedded for the different abnormal returns and the dividend ratio.

Appendix 4

```
Wilcoxon signed-rank test

        sign |      obs   sum ranks    expected
-------------+---------------------------------
    positive |       83        7907      8235.5
    negative |       98        8564      8235.5
        zero |        0           0           0
-------------+---------------------------------
         all |      181       16471       16471

unadjusted variance   498247.75
adjustment for ties       -0.50
adjustment for zeros       0.00
                     ----------
adjusted variance     498247.25

Ho: Artplus1 = 0
             z =  -0.465
    Prob > |z| =   0.6417
```

```
Wilcoxon signed-rank test

        sign |      obs   sum ranks    expected
-------------+---------------------------------
    positive |       81        7673      8235.5
    negative |      100        8798      8235.5
        zero |        0           0           0
-------------+---------------------------------
         all |      181       16471       16471

unadjusted variance   498247.75
adjustment for ties       -0.50
adjustment for zeros       0.00
                     ----------
adjusted variance     498247.25

Ho: Artplus2 = 0
             z =  -0.797
    Prob > |z| =   0.4255
```

```
. signrank Artplus3=0

Wilcoxon signed-rank test

        sign |      obs   sum ranks    expected
-------------+---------------------------------
    positive |       88        7928      8235.5
    negative |       93        8543      8235.5
        zero |        0           0           0
-------------+---------------------------------
         all |      181       16471       16471

unadjusted variance   498247.75
adjustment for ties       -0.50
adjustment for zeros       0.00
                     ----------
adjusted variance     498247.25

Ho: Artplus3 = 0
             z =  -0.436
    Prob > |z| =   0.6631


Wilcoxon signed-rank test

        sign |      obs   sum ranks    expected
-------------+---------------------------------
    positive |       86        7455      8235.5
    negative |       95        9016      8235.5
        zero |        0           0           0
-------------+---------------------------------
         all |      181       16471       16471

unadjusted variance   498247.75
adjustment for ties       -0.50
adjustment for zeros       0.00
                     ----------
adjusted variance     498247.25

Ho: Artplus4 = 0
             z =  -1.106
    Prob > |z| =   0.2688
```

```
. signrank Car=0

Wilcoxon signed-rank test

        sign |      obs   sum ranks    expected
-------------+---------------------------------
    positive |       90        8675      8235.5
    negative |       91        7796      8235.5
        zero |        0           0           0
-------------+---------------------------------
         all |      181       16471       16471

unadjusted variance   498247.75
adjustment for ties       -0.38
adjustment for zeros       0.00
                     ----------
adjusted variance     498247.38

Ho: Car = 0
             z =   0.623
    Prob > |z| =   0.5335

. signrank DivRatio=1

Wilcoxon signed-rank test

        sign |      obs   sum ranks    expected
-------------+---------------------------------
    positive |       63        5396        8228
    negative |      113       11060        8228
        zero |        5          15          15
-------------+---------------------------------
         all |      181       16471       16471

unadjusted variance   498247.75
adjustment for ties      -11.00
adjustment for zeros     -13.75
                     ----------
adjusted variance     498223.00

Ho: DivRatio = 1
             z =  -4.012
    Prob > |z| =   0.0001
```

Tests results for all variables with null hypothesis that the abnormal returns are equal to zero and in the last case if the dividend ratio is equal to one.