Dissertation

Underpricing of IPOs: Empirical Evidences from Eastern Europe

A thesis submitted in fulfillment of the requirements for the degree of Master of Science in Banking and Finance, School of Economics and Business Administration

Author: Giorgos Chaitas
Supervisor: Chris Gross

International Hellenic University
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Abstract

This thesis attempts to investigate if the stock prices of companies, which are in the Eastern Europe, are underpriced in the short-run. In specific, we examined the stock returns 6, 12, 18, 24 and 30 months after their initial public offerings. In addition, we investigated the companies after categorizing them in three main groups (according to Country, industry and IPO period). We used a sample of 209 companies when their IPO occurred after 2007. In addition, we utilized CAR and BHAR methodology in order to estimate the abnormal returns. The empirical analysis took place by using descriptive statistics. Overall, we may conclude that the majority of the stock returns of companies, which are in Eastern Europe, are underpriced 6 to 18 months after their initial public offering (IPO). In addition, we discovered that there are different abnormal returns between the examined countries for a period of 6 and 24 months after the IPO. Also, the abnormal returns are different between the eras before and after of financial crisis for a period of 6 months after the IPO. At the end, we found out that there are different abnormal returns between the examined industries for a period 6 and 12 months after the IPO.
Chapter 1 - Introduction

The initial public offering (IPO) is an important financing tool and it is in the interest of issuers and investors alike that there is an efficient IPO market. The high complexity of the interactions between issuers, intermediaries and investors provides an interesting and challenging field to study. In particular, underpricing and long-term underperformance are two intriguing phenomena associated with IPOs that receive a lot of academic interest. The research to date has been very US focused and, especially early studies, suffer from methodological flaws. The current market environment, shaped by the recent financial crisis and the ongoing integration of European markets, combined with the lack of a comprehensive European study justifies the research in this area.

A firm’s decision to go public is a truly entrepreneurial activity. The process of taking the firm public enables firms to sell some of their shares to receive a reward from previous effort. Hence, going public is a cheap way to collecting funds and pursue growth opportunities.

An initial public offering (IPO), occurs when a firm decide to go public. The initial public offering is the issuing firm’s first offer to sell stock to the public. Firms have interest to going public out of many reasons, and some of the most common are that they want to increase the liquidity of the firm and therefore they want to raise more equity capital, which is referred to as the primary market. To increase capital in the firm is beneficial, of course for the firm itself, but also for the founders and other stakeholders. Since, in the future, they might convert their contribution for their own winning as profit or return on stock. Another reason is tied to the secondary market, which is referred to the ability of further stock trading. Actually, there are not only reasons to understand why a firm decided to go public (Jenkinson, 2001).
During this section, we analyze and support the reasons which led us to occupy with this specific financial matter. It was observed that the return of the stocks is very negative during their initial public offering. The majority of companies consult a big financial institution (investment bank) in order to assist them to make their initial public offering. For instance, Shearman & Sterling helped Aegean Airlines to achieve its international IPO in 2007. Also, the investors/shareholders purchase a numbers of stocks at a price where the contractor company is proposed. However, it was observed that the majority of stock prices increased significantly at the first days of public trading achieving high returns. However, the stock prices begin to fall continuously in the future creating negative returns for the initial stake holders who did not sell their stocks after the first days of IPO.

In addition, we discovered that there is a vast range of bibliography which supports that the returns of stock prices are underpricing after their initial public offerings. It means that the stock returns are negative especially in a short-term period after the occurrence of initial public offering. For instance, European Central Bank’s working papers (Pons-Sanz, 2005) support that the stock prices of companies collapsed after their IPO. This effect was observed in the United States, the European Union and Japan.

Furthermore, it is believed that IPOs are often underpriced because of concerns relating to liquidity and uncertainty about the level at which the stock will trade. The less liquid and less predictable the shares are, the more underpriced they will have to be in order to compensate investors for the risk they are taking. Because an IPO’s issuer tends to know more about the value of the shares than the investor, a company must underprice its stock to encourage investors to participate in the IPO (Loughran, 2004).
The aim of this thesis is to explore if there are abnormal returns of companies stock prices after their initial public offerings. We decided to collect empirical evidences from countries of Eastern Europe. In specific, we examined the initial public offerings of companies which are located in Poland, Russia, Ukraine, Turkey, Slovenia, Slovakia, Romania, Estonia, Latvia, Lithuania and Bulgaria. All this countries, except Turkey, used to be members of Former Soviet Union are they operated as client states of Communism. There are plenty of researches which have discovered that the stock price returns are usually underpriced after the initial public offering. It occurred at the developed countries, such as United States, European Union, Japan and etc. However, there are limited researches for countries of Eastern Europe. Therefore, we decided that it is a good opportunity to explore if a similar effect exists.

In conclusion, we decide that it is important to inform the reader about the aim and the techniques of our empirical research in order to take a first sense of our work. In specific, we investigate three cases if the stock returns are underpriced. Firstly, we categorized the companies according to the country where they are. Secondly, we categorized the firms according to the era where their initial public offering took place. At the end, we categorized the companies according to the sector where they belong to. In addition, we utilize cumulative abnormal returns (CAR) and buy-hold abnormal returns (BHAR) in order to discover if their stock returns are underpriced. Also, we explored this effect by using 5 time groups (6,12,18,24 and 30 months after the initial public offering).
Chapter 2 - Literature Review

At this chapter we attempt to gather the appropriate information from past researches concerning of the abnormal activity of stock prices of IPO companies, and especially the firms which are in the Eastern Europe. We have used academic papers from ScienceDirect webpage which have been published after the millennium (2000). ScienceDirect is website operated by the Anglo-Dutch publisher Elsevier containing (as of 2013) about 11 million articles from 2,500 journals and 6,000 e-books, reference works, book series and handbooks. This website is approved by each university across the globe.

Otchere (2013) et al examined the underpricing grade as well as the stock market performance of IPO’s in the long run. They gathered data from 20 stock exchange markets across the globe between 1998 and 2007. They used cumulative abnormal returns (CAR) and buy-hold abnormal returns (BHAR) methodology in order to calculate their results. In addition, they utilized the statistical procedures of descriptive statistics and regression analysis in order to estimate their empirical evidences. Their results indicate that the stocks of IPO companies are underpriced but they outperform instead of the return of the stock market indexes.

Bhargava (2003) investigated the differences in underwriting costs of commercial and investment banks at initial public offerings (IPOs). He gathered data for 4,556 IPOs underwritten between 1991 and 1997. Also, he utilized econometric and sensitivity analysis. In specific, he used descriptive statistics and regression analysis in order to discover his empirical results. The findings of his research show that total underwriting costs are lower for commercial banking institutions. In
addition, he found out that the stock price performance of commercial banks is higher than the investment banks in the long-run.

Brooks et al (2009) investigated how important is timing for initial public offerings (IPOs). They collected data from 834 IPOs which took place in Australia between 1994 and 2004. They data were in monthly basis. They utilized Kaplan-Meier method in order to estimate their results. At the end, their empirical evidences show that a shorter time to listing is related with bigger issue prices.

Holmen and Hogfeldt (2004) examined the importance of ownership type at the initial public offerings. The case study took place in Sweden. In specific, they investigated the security design and choice of initial ownership structure, the takeover frequency and ownership dynamics and the investment behavior. They used 233 IPOs and 199 equity carve-outs from 1979 until 1997. They utilized descriptive statistics and regression analysis in order to estimate their results. The empirical findings indicate that there is a positive linkage between security designs also they found no differences between legal regimes. Therefore, the type of ownership does not influence the stock returns of at initial public offerings.

According to Cheng et al (2004), initial public offerings are generally underpriced. This phenomenon is more usual in the short-run. Hence, they decided to examine the attitude of stock price performance of IPOs in Hong Kong. They collected data in daily basis from 159 IPOs for the period of September 1995 and December 1998. They used Parkinson methodology in order to estimate the volatility of IPOs. Also, they utilized only descriptive statistics in order to estimate the behavior of stock returns in three periods. They findings show that IPO’s underpricing exists at the stock market of Hong Kong.

Moreover, Lundtofte (2010) examined a theoretical model when an investment bank offers superior information to some investors.
According to this model, he attempts to discover if this event influences the stock performance of IPOs. He made four propositions and he provided the appropriate proofs. He discovered that there is a positive relationship between the performance of IPOs stocks and the provided information.

In addition, Lian et al (2012) examined how a withdrawal of an IPO influences the stock performance. The basic condition is that the potential withdrawal will be followed by a merge or an acquisition of the firm. They gathered a sample of 2940 IPO withdrawals across the globe. They examined the period from 1984 to 2009. Their statistic methodology includes t-test, Wilcoxon test and regression analysis. Their empirical evidences indicate that there is a positive linkage between the performance of IPOs stocks when the IPO withdrawal took place before the announcement of the potential merge or acquisition.

Schultz and Zaman (1994) examined if the underwriters quote higher bid prices at initial public offerings (IPOs) instead of other investors. They gathered data from 72 IPOs which took place in the United States. The IPOs issued from 31/03/1992 until 01/06/1992 and the firms belong to NASDAQ stock index. They utilized descriptive statistics methodology and t-test in order to estimate their results. Finally, they discovered that underwriters bid higher prices during IPOs than the other market makers.

In addition, Bessler and Kurth (2007) examined how the agency problems influence the venture-backed initial public offerings (IPOs). The sample contains each IPO of ‘Neuer Markt’ in Germany between 1998 and 2001. Also, they used buy and hold abnormal methodology in order to estimate their results. In specific, they used Mann-Whitney U test and Fama-French three factor model (regression analysis). They discovered that the agency costs influence negative the stock performance at the IPOs.
Also, Aggarwal (2003) explored the flipping accounts phenomenon during the first days of IPOs trading. The flipping phenomenon is more usual to institutions than the retail customers. Therefore, he created two group (one group with institutions and one group with retailers) in order to discover which group is more flipping. He collected 617 observations (IPOs) from Securities Data Company (SDC) which took place between May 1997 and June 1998. He used descriptive statistics and t-test in order to estimate his results. The empirical evidences show that the institutions have more flipping behavior in IPOs in order to gain more profits. The retail investors have lower reaction in flipping.

Furthermore, Eng and Aw (2000) explored the effects of initial public offerings (IPOs) on small and large investors. The sample consists of 63 IPOs which took place in Singapore from January 1993 until January 1997. He used descriptive statistics and multiple regression analysis by using as independent factors the earnings per stock ratio, the book to market ratio and the size of the company. The empirical results indicated that the choice of large investors to buy IPOs is positively related with the EPS ratio, the size of a firm and underpricing. In addition, it is negatively related to book to market value. On the other hand, the will of small investors to purchase IPOs is negatively related to EPS ratio, the firm size and the underpricing.

Moreover, Brau and Rodríguez (2009) investigated the stocks’ performance of close-end fund and non-fund IPOs in Mexico. They collected data from 505 close- end and non-funds IPOs between 1994 and 2003. They used buy and hold abnormal returns (BHAR) in order to estimate abnormal activity in the Mexican stock market. Also, they used descriptive statistics and multiple regression analysis in order to estimate their empirical evidences. At the end, they found out that Mexican IPOs are not underpricing. Also, the Mexican close-end fund IPOs face positive performance in the long-run as well as Mexican non-fund IPOs meet negative return in the long-run.
According to Su and Fleisher (1999) the IPOs underpricing is able to be explained as an asymmetric information strategy for firms in order to signal their value to the potential investors. The researchers gathered data from 308 Chinese initial public offerings from 01 January 1987 until 31 December 1995. They used descriptive statistics and regression analysis methodology. They used as independent factors the following variables. For example, they variables were the total number of domestic shares at the IPO date, the number of days elapsed between the IPO date and the first day of market trading and etc.

Moreover, Zheng (2007) examined if the initial public offerings are overpriced. They collected data of IPOs from 1980 to 1997. They utilized buy and hold abnormal returns process as well as regression analysis, descriptive statistics and Fama-French three factors methodology. He discovered that IPOs are not overvalued. Also, he found that IPOs are not underperformed in the long-run, especially five years after their IPO.

Additionally, Degeorge et al (2010) examined the investors ‘behavior at the initial public offerings (IPOs). It was observed that plenty of big investors bid higher prices at the IPOs in order to free-ride the process. The sample includes 19 auctioned IPOs between 1999 and 2007 which took place in WR Hambrecht in the United States. The researchers used descriptive statistics and regression analysis in order to calculate the results. In specific, they utilized as independent variables the IPO market conditions, the bid size, the deal rank and etc. They find out that big investors (investment institutions) achieved more profits and they had higher 10-day underpricing.

Slovin and Young (1990) investigated if the relationships with banks influenced the value of IPOs. There are firms which have borrowed plenty of loans from banking institutions. Therefore, the researchers examined if the leverage level of a firm plays important role to the performance of IPOs. In addition, they collected data from National
OTC stock Journal of the United Stated between September 1980 and March 1984. The sample consists of 147 observations. They used descriptive statistics and multiple regression analysis in order to examine their results. They findings indicate that firms which have lower leverage achieve higher stock performance at the IPOS.

In addition, Li (2010) examined the impact of discretionary current accruals on the pricing of IPOs. He used data from 1926 until 1998 and he divided the sample into two groups, covering two different periods. He utilized descriptive statistics and multivariate regression analysis as independent factors, lowest share turnover, highest share turnover and etc. The empirical results show that there was a positive linkage between discretionary current accruals and subsequent price performance for the 1926-1971 period. Also, the results indicate evidences of predictable negative performance attributable to IPO discretionary current accruals between 1972 and 1998.

Furthermore, Lombardo and Boreiko (2011) explored the behavior of retail investors and institutional investors at initial public offerings in Italy. They gathered a sample of 176 IPOs which took place in the stock exchange market in Milan. The data covered a period of 10 years (1999-2008). In addition, they utilized multiple regression analysis and they used as independent factors, the offer size, the reputation, the spread and etc. The empirical results show that the institutional investors' behavior was more arbitraging and free-ride instead of the retail investors.

Additionally, Brooks and Guo (2009) examined that factors which influence the performance of IPOs. In specific, they searched if the duration of IPOs, the allocation mechanism, the stock exchange market has any impact. They collected data from 1062 IPOs which took place in the Chinese stock exchange market. In specific, the sample covers the period of 01 January 1994 to 31 December 2005.
They used descriptive statistics as well as Cox proportional hazard regression analysis in order to include the impact of time in the model. The empirical results show that the majority of the endogenous factors influenced the performance of IPOs. For instance, the effects of underwriter, allocation mechanism, offering price and floatation size diminish in favor of the effect of issuing year.

On the other hand, Gounopoulos and Dorsman (2013) investigated the impact of the European sovereign debt crisis on the performance of IPOs in the Netherlands. They collected data from January 1990 to May 2012. The sample consists of 144 new companies listed at the stock exchange market of Amsterdam. They utilized cumulative abnormal returns (CAR) and buy-hold cumulative abnormal returns (BHAR) as dependent variables. The independent variables were the rise of capital, the reputation of underwriters, the age of issuing and etc. Also, they used regression analysis and descriptive statistics in order to estimate their results. Their empirical evidences show that there is an emerging level of underpricing at the Dutch IPOs as a result of the current debt crisis in the Eurozone.

Also, Durukan (2006) explored if the ownership structure on IPO influences the underpricing of stock returns. He collected data from the Istanbul Exchange market in Turkey. He collected daily observations of stock return from 200 IPOs in Istanbul stock market. He used descriptive statistics and t-test methodology in order to calculate the results. The abnormal returns were calculated by using CAR and BHAR process. The empirical findings indicate that there are weak linkages between the ownership structure and the stocks’ underpricing.

Moreover, Chan (2013) investigated how retail sentiment has impact on the returns of IPOs. He collected a sample from the United States between 1994 and 2004. He used BHAR methodology in order to estimate the abnormal returns. In addition, the empirical results were
found by using descriptive statistics and t-test for independent samples. His empirical evidences show that retail sentiment influences positive the return volatility of IPOs. The effect is stronger especially during the 1999-2000 internet bubble period.

According to Yuksel (2006), IPO underpricing is related with high liquidity for issuing companies. He attempted to investigate if this effect exists on the Turkish stock market in Istanbul. His sample covers a period of 13 years (from January 1990 through December 2002). The sample includes 298 IPOs which took place during this period. The empirical results were produced by using descriptive statistics and regression analysis only. Therefore, he discovered that there is an asymmetric linkage between underpricing and trading volume in the short run. Also, a positive impact exists between underpricing and liquidity in the long run.

At the end, Filsaraei and Azarberahman (2013) attempted to investigate if there are abnormal returns from IPOs in listed firm in Tehran stock market. The researchers explored only the oil and chemical sector. They collected a sample of 29 companies which made initial public offering between 2001 and 2012. They utilized t-test, ANOVA and regression analysis in order to estimate their empirical results. Hence, the findings indicate that there is a positive abnormal return for the stock price of the oil companies in Tehran stock market. In addition, the company size is the only factor which influences the stock price abnormal return.

In conclusion, we may mention that the aim of the literature review is to explore the empirical results of previous researchers. In addition, it is needed to analyze the nature of the results in order to utilize a specific empirical methodology to our research and compare their findings with our own. For instance, it was taken place plenty of researches for the United States, the old European Union (16 members) and Japan.
However, there are limited researches for the Eastern European. Therefore, the literature review will assist us in order to compare and contrast our empirical results with the empirical evidences of these researches.
Chapter 3 – Methodology and Research Aims

3.1 Introduction

The current empirical analysis consists of two parts, a theoretical and an empirical. The theoretical part includes the aims, the terminology of the variables and the methodology that is used in the analysis. In specific, it is utilized the statistical method of descriptive statistics, the t-test for independent samples and analysis of variance test (One-way ANOVA). Additionally, it is included in the methodology which was used in order to calculate the abnormal returns. In specific, we have utilized two ways of abnormal returns (CAR and BHAR). The empirical part has the examined variables, tests and the findings that are utilized in the statistical analysis.

3.2 Theoretical Part

Before starting the presentation of the statistical procedures, it is important to display some information about the aims of this research and the nature of the variables which are utilized. In specific, the terms of the examined variables are presented below.

3.2.1 Hypotheses of the Research

The aims of this empirical research are to compare and contrast the abnormal returns using the BHAR and CAR methodology. In specific, we attempt to compare the abnormal returns between the countries, the industries and periods before and after the financial crisis of 2008. We used descriptive statistics methodology in order to calculate our results.
The research hypotheses are presented below:

**Hypothesis 1**

Ho: The stock prices of companies are underpriced in the short-run across the countries of the Eastern Europe.

Ha: The stock prices of companies are not underpriced in the short-run across the countries of the Eastern Europe.

**Hypothesis 2**

Ho: The stock prices of companies are underpriced in the short-run across the industries of the economy.

Ha: The stock prices of companies are not underpriced in the short-run across the industries of the economy.

**Hypothesis 3**

Ho: The stock prices of companies are underpriced in the short-run between the two examined eras (before and after the financial crisis)

Ha: The stock prices of companies are not underpriced in the short-run between the two examined eras (before and after the financial crisis)

**Hypothesis 4**

Ho: The stock prices of companies will have similar abnormal returns in a period of 6,12,18,24 and 30 months after their initial public offering (IPO).
Ha: The stock prices of companies will have different abnormal returns in a period of 6, 12, 18, 24 and 30 months after their initial public offering (IPO).

### 3.2.2 Descriptive Statistics

The purpose of descriptive statistical analysis is to describe the data that is possessed. Sometimes people distinguish between descriptive statistics and exploratory data analysis. Exploratory data analysis helps to understand what is happening in the data, while descriptive statistics aid to explain to other people what is happen in the data. While these two are closely related, they are not quite the same thing, and the best way of looking for something is not necessarily the best way of presenting it to others. In descriptive statistics analysis, we have used past trends in a timeline or we present basic statistical measures for the data (e.g. mean, standard deviation, percentages) (Ioannidis, 2011).

### 3.2.3 t-test for independent samples

T-test is a simple statistical test when it is required to investigate the difference of the mean between two groups of a panel data or time series variable. The hypotheses of the test are presented below:

Ho: $\mu_1 = \mu_2$ (the mean of first group is equal to another)
Ha: $\mu_1 \neq \mu_2$ (the mean of first group is different to another)

### 3.2.4. Analysis of Variance (ANOVA)

A One-Way Analysis of Variance is a way to test the equality of three or more means at one time by using variances. The hypotheses of the test are presented below:
Ho: $\mu_1 = \mu_2 = \mu_3 = \mu_k$ (the mean of first group is equal to another)
Ha: $\mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_k$ (the mean of first group is different to another)

3.3 Terminology

During this section, we consider that it is important to inform the reader about the nature of the methodology that we use. In specific, we provide information about the terminology of abnormal returns and IPOs. We describe the way where we calculate the abnormal returns by using cumulative abnormal returns and buy-hold abnormal returns methodology. Also, we analyze what an initial public offering is and why the firms use it.

3.3.1 Abnormal Returns

According to global literature, abnormal returns are the returns of a security or a portfolio over a period of time which generate totally different behavior comparing to the expected returns. It is used an asset pricing model (CAPM), multiple valuation or the historical average in the long run. There are two appropriate indicators in order to examine and observe abnormal behavior of an asset (Damodaran, 2012).

a) Average Cumulative Abnormal Return (ACAR) indicator is calculated by using the formula:

$$ACAR = \frac{\sum CAR}{n}$$

where CAR is the cumulative abnormal return of each stock in the portfolio

$$CAR_t = u_{it} = R_{it} - R_{mt}$$
where uit is the market-adjusted abnormal return of stock i in day t, Rit is the daily monthly continuously compounded return on stock i in day t and Rmt is the daily continuously compounded return on an equally weighted index of all stocks in day t.

b) Average Buy and Hold Abnormal Return (ABHAR) indicator is calculated by using the formula:

\[
ABHAR = \frac{\sum BHAR}{n}
\]

where BHAR is the buy and hold abnormal return of each stock in the portfolio according to Conrad and Kaul (1993).

The BHAR of a stock i over t day is calculated by compounding single period returns (Damodaran, 2012).

3.3.2 Initial Public Offering (IPO)

An Initial Public Offering (IPO) is one of the most common routes taken by a company to raise capital from the markets. When the company offers its shares for the first time to raise money, it’s called an IPO. IPOs are generally issued by young and growing firms looking to raise capital to expand. However, large private firms can also issue an IPO so as to become publicly traded. An IPO is issued in the primary market, and its shares are thereafter traded in the secondary market (Gregoriou, 2005).

3.4 Empirical Part

The empirical part consists of three parts. Firstly, we attempt to compare the abnormal returns of IPO companies across the countries of Eastern Europe. Secondly, we attempt to discover any differences between the abnormal returns of IPO companies across the industries of the economy. At the end, we try to compare if there are any
similarities between the period before the financial crisis and the period after the financial crisis. The methodology and the empirical evidences are displayed below in details.

3.4.1 Methodology

We collected data from the countries of Eastern Europe. In specific, the data is from Poland, Russia, Ukraine, Turkey, Slovenia, Slovakia, Romania, Estonia, Latvia, Lithuania and Bulgaria. We gathered a sample from IPO companies which locate to this area. The abnormal returns were calculated by using the appropriate methodology which are presented above. In addition, we collected data from 209 firms. The sample of each company starts after the end of its initial public offer. Hence, we collected daily observations for each company for a period of 30 months. The daily observations concerns of the value of each firm’s stock price. Also, we calculate the returns of the stock price in order to discover the abnormal returns by using the appropriate methodology which is described above. Furthermore, we created five periods of abnormal returns in order to explore what happened at each examined period. In specific, we categorized the group according to specific criteria:

a) **Country:** We collected the abnormal returns of each company according to the country which belong to. In specific, we categorized the companies in four main groups (Turkey, Poland, Russia and Other countries) and 5 sub-groups (6m, 12m, 18m, 24m 30 m). The sub-groups includes the observations of abnormal returns of companies after the end of IPO (after 6 months, 12 months, 18 months, 24 months, 30 months).

b) **Industry:** We gathered the abnormal returns of each company according to the industry of the economy which belong to. In specific, we categorized the companies in five main groups (Financial-Banking sector, industrial sector, Technological sector,
Retail sector and Pharmaceutical sector) and 5 sub-groups (6m, 12m, 18m, 24m 30 m). The sub-groups includes the observations of abnormal returns of companies after the end of IPO (after 6 months, 12 months, 18 months, 24 months, 30 months).

c) Crisis: We gathered the abnormal returns of each company according to era in which the initial public offering took place. In specific, we categorized the companies in two main groups, (firms which made IPO before financial crisis and firms which made IPO after financial crisis) and 5 sub-groups (6m, 12m, 18m, 24m 30 m). Also, we should point out that the break point is the beginning of 2010. Therefore, the first group includes IPOs were taken place until 31.12.2009. The second group contains IPOs were happened after 01.01.2010. The sub-groups includes the observations of abnormal returns of companies after the end of IPO (after 6 months, 12 months, 18 months, 24 months, 30 months).

3.4.2 Sample and Statistical Programs

The sample consists of 209 firms which made initial public offering from 2007 until now. Daily observations were collected from DataStream® in order to have high validity of the data. Datastream is a global financial and macroeconomic database covering equities, stock market indices, currencies, company fundamentals, fixed income securities and key economic indicators for 175 countries and 60 markets (Datastream,2013). In addition, the statistical analysis of the sample was made by using IBM-SPSS 20 and MS Office (Dafermos, 2011).

3.4.3 Empirical Results

The current empirical analysis utilizes descriptive statistics methodology, t-test for independent samples and analysis of variance. In specific, the
t-test was utilized in the case study of before and after of financial crisis 2008. In addition, the one-way ANOVA was used in the case of Country as well as the case of industry. Moreover, we produced results which include the mean in order to observe the main tendency of the variables across the countries, the eras and the industries. The statistical test of t-test and ANOVA were utilized in order to produce more valid results for the total population of each case. The empirical results are displayed below in more details.

**Case 1 – Country**

The table below presents the results of each country. In specific, the descriptive statistics findings are displayed for a period of 6,12,18,24 and 30 months after the occurrence of initial public offering. Firstly, we examine the case of each country (Turkey, Poland, Russia, Other).

<table>
<thead>
<tr>
<th>Table 1</th>
<th>BHAR6m</th>
<th>CAR6m</th>
<th>CAR12m</th>
<th>BHAR12m</th>
<th>CAR18m</th>
<th>BHAR18m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean - Turkey</td>
<td>0.000185</td>
<td>-0.000743</td>
<td>-0.001050</td>
<td>0.001000</td>
<td>-0.001016</td>
<td>-0.000139</td>
</tr>
<tr>
<td>Mean - Poland</td>
<td>-0.001273</td>
<td>0.000326</td>
<td>-0.002116</td>
<td>0.000409</td>
<td>-0.002325</td>
<td>9.74E-06</td>
</tr>
<tr>
<td>Mean - Russia</td>
<td>-0.001525</td>
<td>0.083296</td>
<td>-0.002351</td>
<td>-0.000516</td>
<td>-0.001427</td>
<td>-0.000439</td>
</tr>
<tr>
<td>Mean - Other</td>
<td>-0.004662</td>
<td>-0.381996</td>
<td>0.001350</td>
<td>-6.80E-05</td>
<td>-0.001123</td>
<td>-0.000269</td>
</tr>
</tbody>
</table>

The current tables describes the basic statistical indicators of descriptive statistics methodology. For Turkey, we observe that abnormal returns for IPOs are higher between the period of 12 and 18 months (according to CAR process). The same effect was produced when we follow the buy and hold abnormal returns procedure (BHAR). Furthermore, for Poland we observe that the abnormal returns are higher between the periods of 12 and 18 months (according to CAR). The effect is higher especially at the period of 18m. The BHAR methodology supports that the abnormal returns are higher at the period of 12 months.
Moreover, we display the empirical results for Russian Federation. We discover that the higher abnormal returns exist after 12 months and 30 months of the initial public offering according to CAR criterion. On the other hand, the BHAR criterion supports that the higher abnormal returns took place six months after the initial public offering. At the end, we examine the case of other countries in the Eastern Europe. The remaining countries are Ukraine, Slovenia, Slovakia, Romania and Bulgaria. We observe that there are high positive abnormal returns 12 months after the IPO. In addition, we found high negative abnormal returns 6 months after the initial public offering according to CAR criterion. The same findings are discovered using the BHAR methodology.

**Analysis of Variance**

ANOVA is the most suitable statistical test if it is needed to check for the means’ equality of a variable, especially when a variable has more than two subgroups. The procedure is very easy and it takes no time. It is needed a group variable in order to use this statistical test. The group variable takes four values (1= Turkey, 2=Poland, 3 = Russia, 4=Other countries). For instance, it is examined any mean’s difference between ACAR or BHAR value of each country. However, it is very important to point out that it must be used similar historic data for each variable. The empirical results of the test are presented below.

<table>
<thead>
<tr>
<th>Table 3</th>
<th>6m</th>
<th>12m</th>
<th>18m</th>
<th>24m</th>
<th>30m</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CAR (F-statistic)</strong></td>
<td>19.915</td>
<td>0.407</td>
<td>0.123</td>
<td>22.298</td>
<td>1.019</td>
</tr>
<tr>
<td><strong>Sig</strong></td>
<td>0.005</td>
<td>0.748</td>
<td>0.947</td>
<td>0.000</td>
<td>0.383</td>
</tr>
<tr>
<td><strong>BHAR (F-statistic)</strong></td>
<td>1276</td>
<td>2.425</td>
<td>0.224</td>
<td>22.735</td>
<td>0.882</td>
</tr>
<tr>
<td><strong>Sig</strong></td>
<td>0.000</td>
<td>0.064</td>
<td>0.880</td>
<td>0.000</td>
<td>0.450</td>
</tr>
</tbody>
</table>
Before analyzing the results of the Anova test, it is important to mention how we translate the current table. If the probability value of F-statistic is below 5%, then we assume that the null hypothesis is rejected. Therefore, the CAR and BHAR value for each country are totally different. In contrast, when the probability value is above 5%, then we assume that the null hypothesis is accepted. Hence, the CAR and BHAR value of each country are the same. In specific, we discover that the value of CAR and BHAR are statistically different for the period of 6 and 24 months (Sig=0%). It means that the abnormal returns are totally different between the examined countries for the period of 6 and 24 months. In addition, we found that there is not statistically difference between the values of CAR and BHAR for the period of 12, 18 and 30 months (Sig>5%). It means that there are similar abnormal returns between the examined countries for these periods.

**Case 2 – Before and after the financial crisis of 2008.**

The table below presents the results of each era (before and after financial crisis). We took as break point the end of 2009. In specific, the descriptive statistics findings are displayed for a period of 6, 12, 18, 24 and 30 months after the occurrence of initial public offering. Firstly, we present the evidences for the period before the occurrence of financial crisis. We included to the sample each company where its IPO took place before the start of the current financial crisis.

<table>
<thead>
<tr>
<th>Table 4</th>
<th>CAR6m</th>
<th>BHAR6m</th>
<th>CAR12m</th>
<th>BHAR12m</th>
<th>CAR18m</th>
<th>BHAR18m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean – Before Crisis</td>
<td>-0.001202</td>
<td>-0.000995</td>
<td>-0.000740</td>
<td>0.000529</td>
<td>-0.003291</td>
<td>-0.000163</td>
</tr>
<tr>
<td>Mean – After Crisis</td>
<td>-0.004961</td>
<td>-0.166072</td>
<td>-0.004641</td>
<td>-0.001350</td>
<td>-0.001186</td>
<td>0.000890</td>
</tr>
</tbody>
</table>

The current table displays the findings of abnormal returns. We observe that the higher negative abnormal returns occurred 18 months after the initial public offering (CAR methodology). In addition, the BHAR
methodology shows that the most negative abnormal returns happened 6 months after the IPO.

<table>
<thead>
<tr>
<th>Table 5</th>
<th>CAR24m</th>
<th>BHAR24m</th>
<th>CAR30m</th>
<th>BHAR30m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean – Before Crisis</td>
<td>-0.002255</td>
<td>-0.000149</td>
<td>-0.001120</td>
<td>-0.000158</td>
</tr>
<tr>
<td>Mean – After Crisis</td>
<td>-0.002413</td>
<td>0.000694</td>
<td>-0.002404</td>
<td>0.000764</td>
</tr>
</tbody>
</table>

In addition, we examine the case after the beginning of the current financial crisis. We included to the sample its company where its IPO took place after the beginning of the current financial crisis.

We observe that the higher negative abnormal returns happened 6 and 12 months after the initial public offering (CAR method). In addition, the same results were produced when we follow the BHAR methodology.

T-test for independent samples

T-test is the most suitable statistical test if it is needed to check for the means' equality of a variable. The procedure is very easy and it takes no time. It is needed a group variable in order to use this statistical test. The group variable takes two values (1= after crisis, 2=before crisis). For instance, it is examined any mean's difference between ACAR and BHAR value of era after crisis and before crisis. However, it is very important to point out that it must be used similar historic data for each variable. The empirical evidences of the test are presented below.

<table>
<thead>
<tr>
<th>Table 6</th>
<th>6m</th>
<th>12m</th>
<th>18m</th>
<th>24m</th>
<th>30m</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAR (t-statistic)</td>
<td>7.473</td>
<td>5.696</td>
<td>0.049</td>
<td>0.506</td>
<td>0.857</td>
</tr>
<tr>
<td>Sig*</td>
<td>0.000</td>
<td>0.000</td>
<td>0.961</td>
<td>0.714</td>
<td>0.391</td>
</tr>
<tr>
<td>BHAR (t-statistic)</td>
<td>7.445</td>
<td>-5.013</td>
<td>-1.145</td>
<td>-0.797</td>
<td>-0.880</td>
</tr>
<tr>
<td>Sig*</td>
<td>0.000</td>
<td>0.000</td>
<td>0.252</td>
<td>0.425</td>
<td>0.379</td>
</tr>
</tbody>
</table>

*95% confidence interval
Before analyzing the results of the Anova test, it is important to mention how we translate the current table. If the probability value of \( t \)-statistic is below 5\%, then we assume that the null hypothesis is rejected. Therefore, the CAR and BHAR value for each era (before and after crisis 2008) are totally different. In contrast, when the probability value is above 5\%, then we assume that the null hypothesis is accepted. Hence, the CAR and BHAR value of each era are the same. In specific, we discover that the value of CAR and BHAR are statistically different for the period of 6 and 12 months (Sig=0\%). It means that the abnormal returns are totally different between the examined eras for the period of 6 and 24 months. In addition, we found that there is not statistically difference between the values of CAR and BHAR for the period of 18, 24 and 30 months (Sig>5\%). It means that there are similar abnormal returns between the examined eras for these periods.

**Case 3 – Industry**

During the last case, we examine the abnormal returns of IPOs between the industries of the economy. In specific, we investigate the financial, the technological, the industrial, the retail and the pharmaceutical sector of the economy.

<table>
<thead>
<tr>
<th>Table 7</th>
<th>CAR6m</th>
<th>BHAR6m</th>
<th>CAR12m</th>
<th>BHAR12m</th>
<th>CAR18m</th>
<th>BHAR18m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean - Financial</td>
<td>-0.003508</td>
<td>-0.000983</td>
<td>-0.002587</td>
<td>-0.000641</td>
<td>-0.001530</td>
<td>-0.000367</td>
</tr>
<tr>
<td>Mean - Technological</td>
<td>0.000378</td>
<td>-0.004339</td>
<td>0.000539</td>
<td>0.000122</td>
<td>0.000345</td>
<td>-0.001148</td>
</tr>
<tr>
<td>Mean - Industrial</td>
<td>-0.000117</td>
<td>-0.002260</td>
<td>3.19E-05</td>
<td>-0.001611</td>
<td>-0.000561</td>
<td>-0.000829</td>
</tr>
<tr>
<td>Mean - Retail</td>
<td>-0.003365</td>
<td>-0.002377</td>
<td>6.84E-05</td>
<td>-0.000717</td>
<td>-3.47E-05</td>
<td>-0.001041</td>
</tr>
<tr>
<td>Mean - Pharmaceutical</td>
<td>0.001439</td>
<td>0.000802</td>
<td>0.000196</td>
<td>0.000557</td>
<td>-4.26E-05</td>
<td>-0.003151</td>
</tr>
</tbody>
</table>

For financial sector, it is observed that there are high negative abnormal returns six months after the initial public offering concerning of the banking sector in Eastern Europe (based on CAR criterion). In
addition, the BHAR indicator shows the same results. It is important to point out that the effect becomes lower as we move from 6 months to 30 months.

In addition, for the technological sector, the findings show that there are high negative abnormal returns 6 months after the occurrence of IPO, as well as 12 months after. The CAR and BHAR methodology support these results. However, we found that the abnormal returns for the technological sector remained negative for the rest examined periods. The most negative effects were observed 6, 12 and 30 months after the IPO.

Also, the CAR methodology shows that there are higher positive abnormal returns 12 months after the IPO. In addition, the BHAR indicator shows that the same results. On the other hand, CAR and BHAR methodology shows that there are higher negative abnormal returns 24 months after the initial public offering at the industrial sector.

Moreover, we examine the retail sector. The results show that there are very high negative abnormal returns 6 months after the initial public offerings in the retail sector. The effect seems to be lighter when we move from 6 months to 30 months.

At the end, we investigated the pharmaceutical sector. This sample includes each company where its activity is related to the health services. The current tables indicate the results of descriptive statistics methodology. The empirical findings show that the higher positive
abnormal returns took place six months after the initial public offering at the pharmaceutical sector. The two methodologies (CAR and BHAR) support these results. The effect becomes more negative when we move from 6 months to 30 months.

Analysis of Variance

ANOVA is the most suitable statistical test if it is needed to check for the means’ equality of a variable, especially when a variable has more than two subgroups. The procedure is very easy and it takes no time. It is needed a group variable in order to use this statistical test. The group variable takes five values (1= Financial sector, 2=Industrial sector, 3 = Technological sector, 4=Retail sector, 5=Pharmaceutical sector). For instance, it is examined any mean’s difference between ACAR or BHAR value of each industry. However, it is very important to point out that it must be used similar historic data for each variable. The empirical findings are presented below.

<table>
<thead>
<tr>
<th>Table 9</th>
<th>6m</th>
<th>12m</th>
<th>18m</th>
<th>24m</th>
<th>30m</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAR (F-statistic)</td>
<td>4.178</td>
<td>0.785</td>
<td>0.439</td>
<td>1.095</td>
<td>0.290</td>
</tr>
<tr>
<td>Sig*</td>
<td>0.006</td>
<td>0.502</td>
<td>0.725</td>
<td>0.350</td>
<td>0.832</td>
</tr>
<tr>
<td>BHAR (F-statistic)</td>
<td>5.021</td>
<td>0.202</td>
<td>0.092</td>
<td>1.185</td>
<td>0.921</td>
</tr>
<tr>
<td>Sig*</td>
<td>0.000</td>
<td>0.895</td>
<td>0.965</td>
<td>0.314</td>
<td>0.430</td>
</tr>
</tbody>
</table>

*95% confidence interval

Before analyzing the results of the Anova test, it is important to mention how we translate the current table. If the probability value of F-statistic is below 5%, then we assume that the null hypothesis is rejected. Therefore, the CAR and BHAR value for each industry are totally different. In contrast, when the probability value is above 5%, then we assume that the null hypothesis is accepted. Hence, the CAR and BHAR value of each industry are the same. In specific, we discover that the value of CAR and BHAR are statistically different for the period of 6 months only (Sig=0%). It means that the abnormal returns are totally
different between the examined industries for the period of 6 months. In addition, we found that there is not statistically difference between the values of CAR and BHAR for the period of 12, 18, 24 and 30 months (Sig>5%). It means that there are similar abnormal returns between the examined industries for these periods.

In conclusion, we mention that this chapter includes every empirical result of our research. The analysis of them and the comparison with previous researches is provided at the next chapter.
Chapter 4 - Discussion and Implications

During this final chapter, we include a comprehensive and detailed analysis of the empirical results. In specific, we compare and contrast the findings of past researches. Also, we provide the findings of our empirical research and we attempt to analyze them. At the end, we propose some implications about potential researches who wish to investigate the underpricing of stock prices after their initial public offerings.

4.1 Empirical Conclusion

This empirical research attempted to investigate if the stock price returns of Eastern Europe companies are underpriced. Therefore, we explored three main case. Firstly, we collected the abnormal returns of each company according to the country which belong to. In specific, we categorized the companies in four main groups (Turkey, Poland, Russia and Other countries) and 5 sub-groups (6m, 12m, 18m, 24m 30m). The sub-groups includes the observations of abnormal returns of companies after the end of IPO (after 6 months, 12 months, 18 months, 24 months, 30 months). Secondly, we gathered the abnormal returns of each company according to the industry of the economy which belong to. In specific, we categorized the companies in five main groups (Financial-Banking sector, industrial sector, Technological sector, Retail sector and Pharmaceutical sector) and 5 sub-groups (6m, 12m, 18m, 24m, 30m). The sub-groups includes the observations of abnormal returns of companies after the end of IPO (after 6 months, 12 months, 18 months, 24 months, 30 months). At the end, we gathered the abnormal returns of each company according to era in which the initial public offering took place. In specific, we categorized the companies in two main groups, (firms which made IPO before financial crisis and firms which made IPO after financial crisis) and 5 sub-groups
(6m, 12m, 18m, 24m, 30m). Also, we should point out that the break point is the beginning of 2010. Therefore, the first group includes IPOs were taken place until 31.12.2009. The second group contains IPOs were happened after 01.01.2010. The sub-groups includes the observations of abnormal returns of companies after the end of IPO (after 6 months, 12 months, 18 months, 24 months, 30 months).

In the beginning we provide the results of the descriptive statistics analysis. Secondly, we present and interpret the empirical evidences of t-test and analysis of variance test for each case.

Our empirical results show the following:

1) **Case 1: Country**

**Descriptive Statistics**

a) **Turkey:** We observe that abnormal returns for companies are higher between the period of 12 and 18 months after their initial IPO.

b) **Poland:** We found that the abnormal returns are higher between the periods of 12 and 18 months. The effect is higher especially at the period of 18 months.

c) **Russia:** We discover that the higher abnormal returns exist after 12 months and 30 months of the initial public offering

d) **Other Eastern Europe Countries:** We observe that there are high positive abnormal returns 12 months after the IPO.

**ANOVA analysis**

The analysis of variance show that there are different values of abnormal returns (both methodologies CAR and BHAR support it) between the examined countries. It is important to mention that this phenomenon exists only in the periods of 6 and 24 moths. In contrast, we discover that there are similar abnormal returns for the periods of 12, 18 and 30 months according to statistical criteria of the test. It
means that there is high volatility between the examined countries. Also, it is important that this phenomenon took place after 6 months of the initial public offering as well as 24 months after IPO.

2) Case 2 - Before and after the financial crisis of 2008.

a) Before Crisis: We observe that the higher negative abnormal returns occurred 18 months after the initial public offering.

b) After Crisis: We found that the higher negative abnormal returns happened 6 and 12 months after the initial public offering.

The results of t-test show that there is not, in general, difference of abnormal returns between the period before the crisis of 2008 and the period after the crisis of 2008. However, it is observed that there is difference of the abnormal returns between the two eras, only in the period of 6 months after the initial public offering.

3) Case 3 – Industry

a) Financial-Banking Sector: It is observed that there are high negative abnormal returns six months after the initial public offering concerning of the banking sector in Eastern Europe.

b) Industrial Sector: It is discovered that there are higher positive abnormal returns 12 months after the IPO for the industrial sector.

c) Technological Sector: The findings show that there are high negative abnormal returns 6 months after the occurrence of IPO, as well as 12 months after for the technological sector.

d) Retail Sector: The findings show that there are very high negative abnormal returns 6 months after the initial public offerings in the retail sector. The effect seems to be lighter when we move from 6 months to 30 months.
e) Pharmaceutical Sector: The empirical findings show that the higher positive abnormal returns took place six months after the initial public offering at the pharmaceutical sector.

The analysis of variance show that there are different values of abnormal returns (both methodologies CAR and BHAR support it) between the examined industries. It is important to mention that this phenomenon exists only in the periods of 6 and 12 months. In contrast, we discover that there are similar abnormal returns for the periods of 18, 24 and 30 months according to statistical criteria of the test. It means that there is high volatility between the examined industries. Also, it is important that this phenomenon took place after 6 months of the initial public offering as well as 12 months after IPO.

Overall, we may conclude that the majority of the stock returns of companies, which are in Eastern Europe, are underpriced 6 to 18 months after their initial public offering (IPO). In addition, it is important to point out that the results support every null hypothesis that we made in the beginning of this empirical research.

In conclusion, we discovered that there are difference between the abnormal returns of each case (country, era, industry). Also, there not are similar abnormal returns between the examined periods (6,12,18,24 and 30 months) after the initial public offering (IPO). Therefore, the fourth null hypothesis is rejected.

4.2 Implications

Plenty of researches investigated the underpricing of firms’ stock prices in the European Union or the United States after their initial public offerings, such as Pons-Sanz (2005) or Loughran (2004). However, limited researchers attempted to examine if the stock prices of Eastern Europe companies are underpriced especially after their IPOs. On the other hand, Yuksel (2006) examined if the IPO underpricing is related
with high liquidity for issuing companies in Turkey. Also, Filsarai and Azarberahman (2013) attempted to investigate if there are abnormal returns from IPOs in listed firm in Tehran stock market. The researchers explored only the oil and chemical sector. At the end, Durukan (2006) explored if the ownership structure on IPO influences the underpricing of stock returns of companies in Turkey. However, none researcher were found to explore the underpricing of IPOs between the Eastern Europe countries. Therefore, this research is an innovative and fresh work which is needed to be compared with potential researches. For instance, it would be interesting to discover if there are the same results for Arabic countries or Scandinavian states. At the end, the potential researchers should follow a similar methodology in order to discover if the same results exist to other countries. However, this kind of empirical research is beyond the initial aims of this master thesis.
Bibliography


