“BABEŞ-BOLYAI” UNIVERSITY CLUJ-NAPOCA
FACULTY OF ECONOMICS AND BUSINESS ADMINISTRATION
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PhD THESIS

- SUMMARY -

INVESTIGATIONS REGARDING THE PORTFOLIO MANAGEMENT STRATEGY – BUCHAREST STOCK EXCHANGE CASE

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Introduction

Developments in capital markets reflect investor perceptions about the prospects of development of national financial and economic environment, assessed in a given reference system of economic performance of other countries. Last decades have brought changes due to the globalization of markets, which is a process that gradually led to an increase competitiveness, but also to significant changes.

After 1989, the Romanian capital market is presented as a regulated system, with an appropriate institutional framework. It was, however, transformed beginning with 1995.

Subsequently Rasdaq was created, a trading mechanism was improved and in 2002 entered into force a new legislative framework that sought the efficiency market institutions, the information transparency and also the investor protection.

The capital market law appearance (Law 297/2004) was the expression of the Romanian legislative compliance in the integration of Romania into the European Union.

The thesis aims to analyze the component of the capital market, which is called in the Anglo-Saxon literature "equity market". To understand a capital market, in our case the Romanian capital market, you must first go through economic and financial models that describe her balance. These models do not provide the ideal solution, but they will be analyzed through the results that they generate on the Romanian market. These models will be measured by the market, and the acceptance or the rejection of a model is a consequence of the confrontation with data collected from reality. A model can be considered a success if it delivers results as close as possible to the actual market conditions than other existing model.

Modern portfolio theory was developed based on the idea that changes in courses of actions are totally unpredictable. This idea can be seen in the efficient market theory, which states that at some point, the price reflects all the available information, which led to its formation.

The efficient market theory has become controversial, especially after detecting certain anomalies of the capital market, such as the size effect, the PER effect and the January effect.

Regarding the definition of the portfolio, this represents a group of assets. The portfolio management is the establishment of such groups of assets, so that the evolution of their market prices will ensure the profitability goals set by the investor, by respecting the risk restrictions, determined by the asset allocation.

However, an efficient management of a portfolio may not have foundation problems without taking into account the profitability and the risk of individual assets. The profitability is defined based on gain / loss arising out of owning of certain securities for a certain period of time. In terms of risk, a measure of its volatility is the coefficient β of the asset. This coefficient measures the sensitivity of such shares to the change of the market return. According to modern portfolio theory, β is the central element because it measures the systematic risk of the title or of the portfolio. A portfolio is more risky once it contains titles that have a higher β.

The study of portfolio management models show that the portfolio management analysis can be performed using the Markowitz model (1952), which allows, as a result of the pair correlation of the portfolio's existing assets, the determination of the portfolio that registered the minimum variance, having as a starting point the risk and the profitability of a diversified portfolio of securities. It represents the best known model to describe an investment return and risk. The idea is that the variation of the rate/ price/ value of a security or portfolio of securities are determined by the market, on one hand, and other specific causes, on the other. Markowitz believes however that the rates of return varies according to risk, and by combining several titles in the portfolio, one can achieve superior returns for the taken risk. The most important conclusion is that an investor can reduce the portfolio volatility (its risk) and can (simultaneously) to increase profitability.

However, the large number of data needed to implement the model, led to the development of a simplified portfolio analysis by Sharpe (1964), which aims to establish a correlation between the returns of individual securities and macroeconomic factors and also aims to provide total risk stratification. The model proposes a new method for assessing the financial assets in accordance with the financial market objective. Thus it will be used a single factor model which assumes that the return of any financial basis is a linear relationship with macroeconomic variables.

Another thing that has to be taken into consideration is the volatility of a security, or the sensitivity to the market movements. The volatility measures the sensitivity of the title to market movements. It can be positive (most often) or negative (rarely) and more or less strong, as the market fluctuations can emphasize or attenuate those of the title. The relationship between return of the title and the one of the market is highlighted by the market model (Sharpe, 1964). The market model is a linear relationship between the profitability of individual securities and the one of the stock market. The function that approximates the correlation between the two returns is a straight right, called regression. The most important parameter of the regression function is the beta coefficient (the volatility coefficient). In order to test whether the model is actually applicable, it can be checked whether the market registered return coincides with the estimated return of the title.

The risk of a security consists, according to Sharpe's theory of two parts, namely the systematic risk for the capital market as a whole and explained by the dependence to the macroeconomic factor and the risk that is specific to each title, which can be eliminated through diversification. This model, known as the diagonal model, has enabled further development of the CAPM model (Sharpe, 1964), which establish that the possibility of a capital market investment in assets with zero risk and a characteristic risk. In developing this model it was taken into consideration the combination of two investments: a risk-free asset and risky portfolio. In the conventional manner, CAPM is an equilibrium model, the value represents a function which depends on the expected return and risk assumed by investors. CAPM is an ex-ante model: the possible states of the market are imagined and also the returns associated with each state, for each market asset it was anticipated a value for the free-risk rate of return and for the expected return on the financial market.

Improving the above models was achieved by introducing a new model APT - Arbitrage Price Theory - (Ross, 1976) as a development of the single factor CAPM model. In other words, the CAPM model is only a particular form of the APT model, aiming to link the individual profitability of a security within the portfolio and several macroeconomic variables. The basic idea of this theory is that a financial asset should be evaluated the same on the different markets on which it is traded. Each title has to offer investors a return to compensate for the risk assumed by that investment, starting, as in the CAPM, from the risk-free rate. Also, this model involves identifying macroeconomic variables influencing the profitability of individual titles and setting the influence of these variables by applying the APT model and also provides a rigorous foundation for measuring risk-return relationship. The APT is considered the most rigorous multidimensional model of risk. He starts from the consideration that the return of every title is a linear function of the changes of a number of factors which are common to all titles. The original APT model developed by Stephen Ross (1976) does not specify the risk factors that should be considered when analyzing the efficiency of a title. Subsequent studies have shown that among the elements considered by investors would be included: unanticipated changes in inflation, the risk premium, exchange rate and interest rates. Identifying these factors is made by using factor analysis, namely principal component analysis. All predictions about the value of an asset are already included in the price of this asset, so that this model yields a security measure sensitivity to unexpected changes in risk factors. The APT also has some disadvantages, such as that it does not specify how many common risk factors are, respectively, which are the factors.

Asset prices are generally considered to be sensitive to recent economic developments. Everyday experience seems to support the view that individual asset prices are influenced by a wide range of contingencies and that some events have a greater effect on asset prices than others (Chen et al., 1986). Thus, different models can be used to determine the assets' return.

The APT assumes that the return of each asset depends on the influence of macroeconomic variables (Brealey et al., 2006). The APT has been discussed extensively in literature by Chen (1983), Connor & Korajczyk (1986), Berry et al. (1988), Groenewold & Fraser (1997), Sharpe (1982) and studied in several markets, such as by Antoniou et al. (1998) on the London Stock Exchange, Dhankar & Esq (2005) on the Stock Exchange of India, Berry et al. (1988) on the S & P 500 and Chen et al. (1986) on the New York Stock Exchange, Azeez & Yonezawa (2003) on the Japan Exchange and finally by Anatolyev (2005) on the Russian Stock Exchange.

The relationship between the capital market and the macroeconomic variables has been the subject of numerous studies, analyzing the influence of variables on the price of the listed titles. Also the anomalies that may appear on the capital market have been studied and it has been observed that the small capitalization companies and those that register a low PER value gain higher returns.

In this paper we analyzed the capital market in Romania, testing the influence that the macroeconomic variables have on the titles' price, but also the existence of the stock anomalies were tested.

The first chapter of the thesis presents general information about the capital market in Romania. The first aspect refers to the legislative changes that have occurred in terms of process of Romania's EU

accession. The second aspect of the organization and performance aims the Romanian capital market. Thus, given ongoing changes in law on the performance offered by Bucharest Stock Exchange (BVB) in the current context. In this regard, we analyzed the institutional activity and existing results, focusing on overall market performance, investors' yields and diversification of financial instruments operating in the domestic capital market. Internal capital market performance was also considered in terms of comparison with those obtained in mature capital markets.

In conclusion, the stock market has grown rapidly in terms of legal and institutional framework, but in terms of results, they needed a long process.

Chapter two provides solutions for the selection of financial assets, the group and their performance evaluation. It also presents basic concepts of operating portfolio theory, the construction and portfolio optimization and management techniques, while providing an overview of key performance measurement models.

The third chapter analyzes the literature devoted to the stock exchange anomalies and testing will then be done on the Romanian capital market. The observed anomalies are the size effect, the PER effect and the January effect. The observation period was divided into two sub-periods, namely January 2003 - December 2007 and January 2008 - December 2010, in order to be able to analyze the market before the crisis and during crisis.

Chapter four covers in addition to reviewing the literature, testing the APT model on the Romanian market, by taking into account the 30 titles listed in category I and category II. In addition to checking the accuracy of the model on the Bucharest Stock Exchange, I also tried to identify the macroeconomic variables that influence the profitability of the Romanian capital market, and the following were selected: inflation, interest rate, unemployment rate, gold price, price index of industrial production, average net wage rate parts and BET-C. The analyzed period was January 2002 - June 2010.

The chapter is structured as follows: in the first part will be presented the theoretical advantages of the model associated with the use of APT, then in the second sample is analyzed among the data analysis (the 30 titles listed at the 1st and 2nd tier of the BVB) the research methodology (linear regression will be used in quantitative analysis), and finally the empirical results are presented.

The last part is reserved for synthesizing and analyzing research results and future research tracing the main Romanian capital market.

The summary of PhD thesis's chapters

The summary of chapter 1

ROMANIAN CAPITAL MARKET IN THE CONTEXT OF ACCESSION TO THE EUROPEAN UNION

1.1. EU legal provisions on capital markets

1.2. The role of capital markets in the European Union

1.3. Construction of capital market

1.4. The Romanian capital market

1.5. The performance of Bucharest Stock Exchange

This chapter is for the Romanian capital market and particularly the Bucharest Stock Exchange (BVB). The first part presents general information about the stock market and about its construction as a result of EU accession. Next, the second part refers to the organization of the Romanian capital market, and the last part presents the BVB performances.

The European regulatory framework for financial investment intermediaries, regulated markets and alternative trading systems is the main European standard applicable to that area, namely Directive 2004/39/EC on markets in financial instruments or *MIFID*[1], as is known. This Directive was adopted by the Parliament and the Council in April 200, and is a directive that includes the general principles applicable to investment services, regulated markets and multilateral trading systems (alternative trading systems in our legislation).

The capital market is important for the functioning of the financial mechanism and the market economy. Thereby creating a global market that will support the creation of a global financial system efficiency, facilitating the reduction of capital costs and allocation of resources.

The whole capital market mediates the action of financial institutions such as mutual funds, investment funds and, in general, other financial intermediaries acting and different activity spectrum of national economies, as these markets are regulated.

Capital market economy country is manifested in specific mechanisms operating in a legal framework and organizational structure.

In Romania the capital market institutions and mechanisms began to crystallize in the 90s. The first capital market law, Law 52, appeared in 1994, when it was established the Romanian National Securities Commission (CNVM) as the regulatory authority and supervision of capital market.

The occurrence and development of the Romanian capital market has its beginning in the first steps regarding the creation of a domestic capital market, by stimulating private initiative.

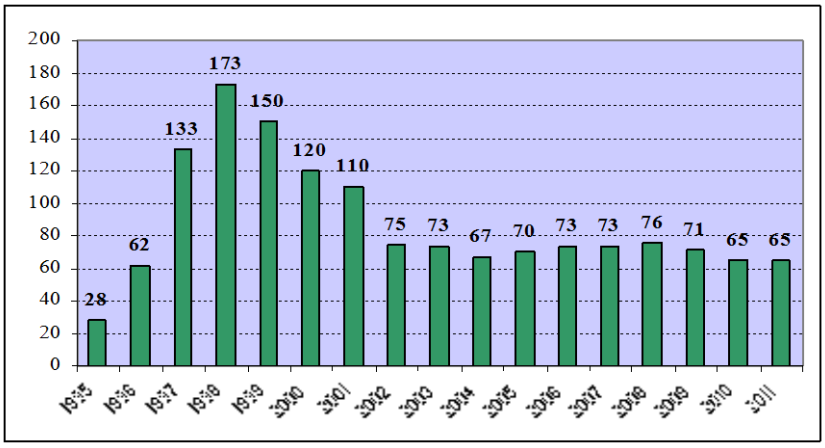
[1] Markets in Financial Investments Directive

Setting up the capital market and the stock market in Romania is regulated by Law 52/1994 on securities and stock exchanges. The occurrence of Law 297/2004 on the capital market was intended mainly to achieve a specific objective and absolutely necessary, given the integration of Romania into the European Union, namely the alignment of legislation with EU standards. In this respect, we have taken, on the one hand, a number of European Directives in the field, and on the other hand, the model over European legislation, namely the global regulation of the market.

Thus, on the Romanian market there were three stock markets that were functioning, namely the Bucharest Stock Exchange, RASDAQ and Monetary Financial and Commodities (BMFMS). In late 2006, the merger between BVB and BER was completed and the merger with BMFMS failed due to conflicts, which led to the development of derivative products on BVB.

Purchases and sales of shares and other capital market instruments are done by specialized companies called Financial Investment Services (also called SSIF or brokerage companies). SSIF are financial institutions whose main objective is brokering the sale and purchase transactions of financial instruments on the capital market.

Chart 1. *The evolution of the SSIF*



Source: Annual reports of the CNVM

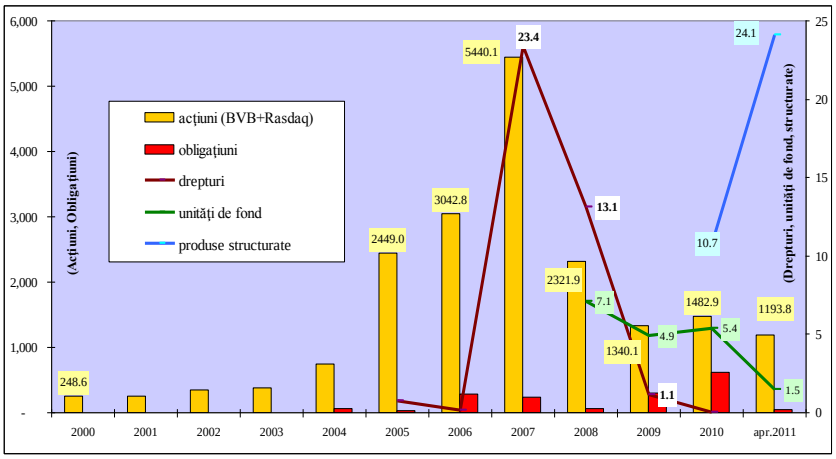
Exchange activity in our country dates from 1839, by the foundation of the trade exchanges, and on December 1, 1882 took place the official opening of the Bucharest Stock Exchange, which after a break of five decades was reestablished in 1995, when the first trading day was November 20, 1995. Bucharest Stock Exchange is divided into the following sectors: securities issued by Romanian legal entities, the bonds and other securities issued by the state, the central public administration authorities and local and other authorities, and the international sector. The securities issued by Romanian legal entities include two categories: shares and bonds. The shares sector is divided into three categories: category I, category II (basic) and category III.

On Rasdaq can be found only financial instruments issued by entities in Romania, namely shares and rights, both categories being assigned to one of the categories I-R, II-R, III-R.

Another novelty in the operational structure of the capital market is given by establishing the alternative trading system (ATS).

The Romanian capital market keeps being a share market. By comparison, the values of the bond issues that were traded remain at a low level of representation, while the units of fund are traded only since 2007, and structured products were launched only in 2010.

Chart 2. *Value traded (million euro)*



Source: www.bvb.ro

In addition to the above instruments (shares and bonds), on BVB can also be observed derivatives and indexes.

Capital market investments are made through specific institutions. The generic term that is used for this kind of investor capital management institution is an investment fund. Investment funds can be classified into two categories: open-end investment funds (UCITS" - Undertakings for Collective Investment in transferable Securities) and closed-end investment funds (Non UCITS).

Regarding the evolution of the Romanian market, but the amounts traded on Romanian capital market can be observed very low level compared to transactions on the capital markets mature.

Table 1. Comparative analysis of international stock market capitalization (billion Euros)

	Germany	Romania	United States	Japan
2006	1241.96	18.86	14644.02	3503.47
2007	1439.96	21.52	13358.12	2942.00
2008	797.06	6.47	8338.92	2238.85
2009	900.77	8.40	10465.98	2294.93
2010	1065.71	9.78	12934.78	2864.67

Source: http://epp.eurostat.ec.europa.eu/

The values traded on the BVB are due to the non-resident investors which are investing and trading in this market, especially to the buyers/ sellers from Cyprus who had the highest participation, and as for the most attractive area of interest this remained the banking and financial intermediation sector.

The summary of chapter 2

PORTFOLIO MANAGEMENT STRATEGIES

2.1. Informational efficiency of capital markets

2.2. Risk diversification and efficient portfolio construction

2.3. Portfolio management organization and management strategies

2.4. Portfolio performance measurement

2.5. Alternative strategies

Over time capital markets investors have sought to find a method to identify the real value of a financial asset that will allow them to earn profits. Most models were based on the method of discounted cash flows or corrected net asset method. These models are often full of bias, because of the variables taken into account or because they present measurement errors or lack of completeness, so that the values obtained differ often substantially from market prices.

Efficient market hypothesis has a significant impact on the investment process and portfolio managers, because it assumes that the investor cannot get a higher return than the market and the best strategy is that of "buy and hold ". Most of the valuation models used by financial theory presume the existence of an efficient market. An efficient capital market is a market on which the price of the financial assets will adjust immediately to new information about the issuer of the financial asset or the environment in which it operates, so that the current price reflects all available information about that issuer.

Markowitz showed that choosing a portfolio can reduce the analysis of two factors: the expected rate of return and the portfolio variance or standard deviation, as a measure of risk. If the number of securities in the portfolio increases, the standard deviation of the portfolio will approach zero, and the risk can be eliminated only if there exists a perfect negative correlation, which is quite rare in practice.

So, diversification can reduce risk, but never allow its complete elimination. Market risk refers to macroeconomic factors such as GDP, inflation, the average interest rate, exchange rates, recession and interest rate variations. These factors affect all firms simultaneously. Since all firms are affected in the same direction by these factors, this risk can be eliminated through

diversification. This risk is called systematic risk. The unexplained market risk is known as diversified, specific or unsystematic risk.

Markowitz (1959) developed a model for determining efficient portfolios, which will provide the best return possible for a given level of risk or the lowest possible risk to a certain rate of return. Any rational investor will choose a portfolio area located on the curve bounding feasible portfolios between vertical and horizontal tangent. The upper portion of the curve was called the Markowitz efficient frontier. With the introduction of the asset without risk, the efficient frontier is transformed from a curve into a right, and the best portfolios are given by the combination of the risk-free asset with the portfolio of risky assets.

Sharpe diagonal model was developed for the selection of portfolios, in trying to find a simplified model of portfolio selection. According to the diagonal model, but also to the indexes model have been constructed the CAPM model (Capital Asset Pricing Model of) and the multifactor model (Arbitrage Pricing Theory).

Regarding the portfolio building principles there are two large opposing currents: top-down and bottom-up. The first phase refers to the allocation of assets (there are strategic allocation and tactical allocation) and the second focuses on the problem of selecting individual securities. Each investor will try to make an optimal selection and for this most of the investors appeal to managers who are specialized in management styles. These management styles are divided into two broad categories: passive management techniques and active management techniques.

The active management techniques have two main forms, namely selectivity (assumes the selection / purchase of undervalued securities and selling the overvalued) and market-timing (involves predicting general market movements).

In addition to management techniques, the performance measurement must be mentioned. There are three methods that can be used to measure the performance of portfolios of financial instruments and they were submitted successively to Treynor (1965), Sharpe (1966) and Jensen (1968).

Another type of management is the alternative one, that in recent years have witnessed a great development. Investment alternatives include: investment funds, hedge funds, closed companies traded on regulated markets (private equity), venture capital funds and investment funds index.

The summary of chapter 3

STOCK MANAGEMENT STYLES AND ANOMALIES

3.1. Stock market anomalies. Overview

3.2. Research methodology and empirical results

Efficient market theory has become controversial, especially after detecting certain anomalies of the capital market. Some of the major faults that have been identified are: the size effect, the PER effect and the January effect.

The size effect is one of the oldest and most important anomalies, since Banz (1981) reported that small firms have higher returns than large companies. The effect was studied and observed in various markets, such as the U.S. market (Reinganum, 1981, Brown et al., 1983, Ibbotson, 1984, Lamoureux and Sanger, 1989), the German capital market (Stehle, 1997), respectively the UK market (Grossman and Shore, 2003).

Sanjoy Basu (1977) has shown that companies with a low P.E.R. value returns have been higher. The P.E.R. effect was observed in capital markets around the world: 13 countries around the world (Fama and French, 1998), UK (Levis, 1989, Gregory, Harris and Michou - 2001, Levis and Liodakis, 2001), Great Britain and some European countries (Brouwer, van der Put and Veld - 1997, Bird and Whitaker, 2003), Netherlands (Doeswijk, 1997), Finland (Booth, Martikainen, Perttunen and Yli-Olli - 1994), Japan (Aggarwal, Rao and Hirakita - 1990, Chan, Hamao and Lakonishok - 1991, Cai, 1997, Park and Lee, 2003), Taiwan (Chou and Johnson, 1990) and New Zealand (Chin, Prevost and Gottesman - 2002).

The January effect has been studied first by Wachtel (1942). Rozeff and Kinney (1976) demonstrated that the titles listed on the U.S. market obtain returns much higher in the first month of the year compared with other months. Keim (1983) uses dummy variables to test the January effect and shows the relationship between January effect and effect size. Subsequent studies have shown that it is an international phenomenon (Gultekin and Gultekin, 1983, Nassir and Mohammad, 1987; Ho, 1999), although less prominent in emerging markets (Claessens et al. In 1995, Fountas and Segedakis, 2002, Ho 1990). Mustafa and Gultekin (1983) tested 17 countries including Denmark, Germany, Netherlands, Spain, the United States and England, and Tinica, Barone - Anderson and West (1987) tested the Toronto Stock Exchange index. Mehdian and Perry (2002) analyzed the Dow Jones, NYSE and SP500 (1964-1998).

The main explanations about the January effect are: tax-loss-selling hypothesis (Branch, 1977 Dyl, 1977, Schultz, 1985), window-dressing hypothesis (Haugen and Lakonishok - 1988, Ritter and Chopra - 1989) turn -of the-year 'liquidity' hypothesis (Ogden, 1990), accounting information hypothesis (Rozeff and Kinney, 1976) and bid-ask difference (Keim, 1989).

After a review of the literature, the porpoise of this chapter is to test the presence of the anomalies on the Romanian capital market and to exploit the achieved outcomes. The testing was done on 30 randomly selected titles, listed on BVB at both tier I and tier II. Subsequently, these titles have been divided into three portfolios according to the recorded values. The first portfolio will contain the securities that registered the highest values and portfolio 3 the ones with the lowest values. The observation period is divided into two

sub-periods, namely January 2003 - December 2007 and January 2008 - December 2010, in order to observe the situation before the crisis and during the crisis.

A. The size effect

- **The first observation period (January 2003 - December 2007)**

Table 2. *Descriptive values of portfolios studied for effect size (January 2003 - December 2007)*

	P1	P2	P3
Mean	0.041905	0.043931	0.044944
Standard Deviation	0.615452	0.165122	0.185245
Skewness	0.648594	2.279694	2.471000
Kurtosis	17.159540	12.361870	14.358530

Source: author processing

Because small capitalization companies (P3) did not achieve higher returns, as can be seen in the table above, we can say that there is no size effect on the Romanian market in the period under review (January 2003 - December 2007) and the standard deviation analysis shows that the first portfolio (P1) is the most risky. Skewness registered positive values, so the distribution is tilted to the left, which means that it has more extreme values to the right, and most of the values are small. Kurtosis is influenced by the thickness distribution and the tail tips. The recorded values are well above 3 which means that differ significantly from the normal distribution, especially for P1.

Then by using T- test in order to test the null hypothesis that the portfolio means if taken two by two are equal and by using F-test for observing the variances equality.

Table 3. *Testing equality of portfolio analysis for effect size (January 2003 - December 2007)*

Portofolio	T-test		F-test	
	Vaue	probability	Value	probabiliy
P1 – P2	0.022927	0.9818	13.89246	0
P1 – P3	0.034092	0.9729	11.03812	0
P2 – P3	0.029427	0.9766	1.25859	0.4143

Source: author processing

So, we can see that whatever portfolio one invests in, the returns will be very close, but in terms of risk the investor will have a higher risk most likely when choosing P1 compared with the other two portfolios.

• The second observation period (January 2008 - December 2010)

Further on, we have also tested whether the size effect is present on the Romanian capital market and it can be seen that the recorded values are negative, due to lower share values during the crisis.

Table 4. *Descriptive values of portfolios studied for effect size (January 2008 - December 2010)*

	P1	P2	P3
Mean	-0.010061	-0.028306	-0.028175
Standard Deviation	0.156634	0.137267	0.261277
Skewness	-1.219665	-0.830798	-0.418105
Kurtosis	5.710904	4.947385	13.646630

Source: author processing

From the table above it can be seen that riskiest portfolio is P3, which can be observed when using the F-test. The skewness record which represents that the tail is longer to the left. Kurtosis has registered values greater than 3, which means that they differ significantly from normal distribution, especially for P3.

B. The P.E.R. effect

• The first observation period (January 2003 - December 2007)

Table 5. *Descriptive values of portfolios studied for PER effect (January 2003 - December 2007)*

	P1	P2	P3
Mean	0.035571	-0.012659	0.021675
Standard Deviation	0.772686	0.440303	0.418080
Skewness	-1.446021	-1.363860	-1.085097
Kurtosis	10.895240	6.261953	12.513220

Source: author processing

Because companies with a small P.E.R. value (P3) did not achieve higher returns, as can be seen in the table above, we can say that there is no P.E.R. effect on the Romanian market in the period under review (January 2003 - December 2007), and the standard deviation analysis shows that the first portfolio (P1) is the most risky. Skewness register negative values and the distribution will have long left tail and most of the values are higher. Kurtosis register, like as the size effect, values higher than 3, which means that it differs significantly from the normal distribution, especially in P3.

The following table shows the fact that the investor will achieve similar returns regardless of the portfolio in which will invest, but in terms of risk assumed is observed that the greatest risk occurs when investment in P1, and very similar risks if they invest in P2 and P3.

Table 6. Testing the average return for portfolios analyzed PER effect

(January 2003 - December 2007)

Portofolios	**T-test**		**F-test**	
	Value	probability	Value	probability
P1 – P2	0.391073	0.6966	3.079664	0.0001
P1 – P3	0.114064	0.9094	3.415759	0.0000
P2 – P3	0.407766	0.6843	1.109133	0.7129

Source: author processing

- **The second observation period (January 2008 - December 2010)**

Further it has been tested if the P.E.R. effect meets the Romanian capital market and it can be seen that negative values are recorded as well as for the capitalization for the same observation period, due to lower share value during the crisis. The standard deviation analysis shows that the first portfolio (P1) is the most risky.

Table 7. *Descriptive values of portfolios studied for PER effect*

(January 2008 - December 2010)

	P1	**P2**	**P3**
Mean	-0.007676	-0.018698	-0.056669
Standard deviation	0.928700	0.732878	0.630681
Skewness	0.431706	0.695758	-1.261557
Kurtosis	8.154376	4.626260	6.794321

Source: author processing

C. January effect

The model used is the following:

$$R_t = \mu + \sum_{i=1}^{11} a_i D_i + \sum_{i=1}^{p} \emptyset_i R_{t-i} + \varepsilon_t$$

where R_t represents the return of the title, and μ, a_i and $\emptyset_i$ are parameters, ε_t is the error term and D_i the monthly dummy variables, where $D_i = 1$ for i months and 0 otherwise. Dummy variables indicate the months and $i = Februarie\ (1) - \ Decembrie\ (11)$. In the regression was also added an autoregressive

term, to deal with any serial correlation that may occur due to asynchronous transactions. January effect test is a test based on μ coefficient estimates.

In the case of the testing made on the Romanian capital market, it was used the model that described the best the behavior of returns during the observed period, namely GARCH (p, q). Previous studies have shown that a GARCH (1,1) model captures the conditional return volatility quite well. It will be used an ARCH (1) model, to remove any correlation that may occur.

$$R_t = \mu + \sum_{i=1}^{11} a_i D_i + \emptyset R_{t-1} + \varepsilon_t$$

$$\tau_{\varepsilon_t}^2 = h_t = b_0 + b_{1a}\varepsilon_{t-1}^2 + b_{1b}h_{t-1}$$

It was also investigated the seasonal volatility component, the equation becoming the following:

$$\tau_{\varepsilon_t}^2 = h_t = b_0 + b_{1a}\varepsilon_{t-1}^2 + c_1 febr + \cdots + c_{11} dec$$

- **The first observation period (January 2003 - December 2007)**

Table 8. *Testing the January effect (January 2003 - December 2007)*

	P1 (high values)	P2	P3 low values)	BET-C
μ	0.167	0.199	0.333	0.010
a_1	-0.184	-0.157	-0.379	-0.060
a_2	-0.106	-0.339	-0.363	0.037
a_3	-0.244	-0.225	-0.310	-0.021
a_4	-0.173	-0.269	-0.285	0.016
a_5	-0.199	-0.189	-0.333	0.069
a_6	-0.087	-0.109	-0.301	-0.014
a_7	-0.159	-0.166	-0.203	0.049
a_8	-0.139	-0.161	-0.326	0.054
a_9	-0.048	-0.204	-0.139	-0.010
a_{10}	-0.279	-0.151	-0.428	-0.048
a_{11}	0.034	-0.213	-0.168	0.175
R_{t-1}	-0.005	-0.120	0.573	-0.029
variance equation				
b_0	0.002	0.001	0.003	0.000
b_{1a}	2.644	-0.091	1.892	2.253
b_{1b}	-0.015	1.139	-0.071	-0.003

Source: author processing

In the table above it can be seen that the values recorded in January are positive and the values recorded for the other months have negative coefficients. For the BET-C index, the January effect is present, but the recorded value is not significant, unlike for the three analyzed portfolios. Moreover, the January effect is stronger for P3 (which contains small cap companies) than for the other two.

Regarding the variance estimation, even if the values are low, the estimated coefficients of the constant are positive, but the b_{1a} and b_{1b} coefficients are both negative and positive, which is not as the variance

equation specifies. Moreover, $b_{1a} + b_{1b}$ is less than 1 for the analyzed period. So, the estimates that were made do not satisfy the requirements.

After investigating the existence of the seasonal volatility component has been observed that from March to October, the coefficients are negative for all three portfolios. The highest values are recorded for January, except for P1 which in December is the highest value observed, and in November for P3. Thus, we can say that in terms of volatility the January effect is present.

• The second observation period (January 2008 - December 2010)

Notice that the values recorded in January are negative, except for P3. For the BET-C index the recorded value is still negative. Thus we can say that in this period only for the P3 portfolio could be observed the January effect.

For the variance equation, the values are reduced and the estimated coefficients of the constant are positive. The b_{1a} and b_{1b}coefficients and are both negative and positive, which is not as the variance specifies. Except for portfolio P2 and BET-C, where both $b_{1a}$and b_{1b} are positive, and $b_{1a} + b_{1b}$ is less than 1. Therefore estimates only meet requirements for portfolio P2 and BET-C.

In terms of volatility, it can be observed that the January effect occurs.

Table 9. *Testing the effect of January (January 2008 - December 2010)*

	P1 (high values)	P2	P3 (low values)	BET-C
μ	-0.044	-0.068	0.138	-0.013
a_1	-0.018	0.037	-0.164	0.008
a_2	0.154	0.262	-0.109	0.138
a_3	0.111	0.115	0.057	-0.067
a_4	-0.046	-0.246	-0.295	-0.124
a_5	-0.052	-0.035	-0.286	0.026
a_6	0.360	0.087	-0.123	0.089
a_7	-0.078	0.038	-0.135	-0.008
a_8	-0.010	0.136	-0.118	0.054
a_9	-0.101	0.055	-0.178	-0.010
a_{10}	-0.038	0.021	-0.201	-0.018
a_{11}	0.010	0.128	-0.140	0.065
R_{t-1}	0.126	-0.305	-0.328	0.427
Variance equation				
b_0	0.014	0.000	0.000	0.000
b_{1a}	-0.114	0.341	-0.006	0.512
b_{1b}	0.679	0.592	0.838	0.469

Source: author processing

Thus, after testing the three anomalies it could have been seen that during January 2003 - December 2007 (before the crisis) on Romanian capital market is present only the January effect for all tested

portfolios, regardless of the registered capitalization of the companies from each portfolio. So, investors can get higher returns when they make transactions in this time of year.

During the crisis (January 2008 - December 2010) recorded values were negative due to a decrease of the tested titles' price. However, in terms of the January effect in January 2008 - December 2010, we can see that this anomaly is present for portfolio containing small capitalization companies. As a result, investors can earn money during the crisis when investing in companies that register low levels of capitalization.

The summary of chapter 4

MODELS OF PORTFOLIO ANALYSIS AND THEIR USE IN BUILDING STRATEGIES

4.1. The Arbitrage Pricing Theory (APT)

4.2. Research methodology and empirical results

4.3. Using APT model on the Romanian market of capital

A fundamental principle in finance is related to the risk-return relationship. Currently, the two models used to provide information on the risk-return relationship are CAPM and APT models. In this part, these models will be presented, but the focus will be on the APT model and especially on the factors that influence the titles' profitability.

Arbitrage Pricing Theory (APT) is a multifactorial model in which asset returns are explained by several factors starting from judgments based on the concept of arbitrage.

A regression model including several independent variables is known as a multiple regression. The relationship between the independent variable Y and the various independent variables (Xis), is given by:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n + \varepsilon$$

When replacing Xis with macroeconomic variables, the regression equation will be:

$$R_{it} = \beta_{1i} INF_t + \beta_{2i} DOB_t + \beta_{3i} SOM_t + \beta_{4i} AU_t + \beta_{5i} IPP_t + \beta_{6i} SAL_t + \beta_{7i} CS_t + \beta_{8i} Rbet - c_t + \varepsilon_t$$

where: R_{it} is the return calculated for the title i during the month t; INF_trepresents the inflation return; DOB_t represents the interest rate return; SOM_t represents the unemployment rate return; AU_t is the gold price return; IPP_t represents the price index of industrial production return; SAL_t represents the net salary average earnings return; CS_t is the exchange rate RON / EURO return and $Rbet - c_t$ is the

BET-C index return. The estimation will be done for β_{1i}, β_{2i}, ..., β_{8i}. This is repeated for i = 1, 2,...,30 titles, so we will have 30 values for each beta.

Following the regression based on representative samples will be used. This regression equation is:

$$\bar{R}_i = \lambda_0 + \lambda_1\beta_{1i} + \lambda_2\beta_{2i} + \lambda_3\beta_{3i} + \cdots + \lambda_8\beta_{8i} + \varepsilon_i$$

where $\bar{R}_i$ is the logarithmic average return for title i and β_{1i} to β_{8i} represent the sensitivity of the factor j and measures the inherent risk of the studied titles; λ is the reward for this risk (price risk). Therefore, β_{ij} represent the different the variables for each of the 30 titles, while λ_{ij} are the same for each title.

The research conducted in this chapter is to identify the macroeconomic variables that affect the prices of the tested variables and to observe their positive effects on the Romanian capital market, and finally, the APT model was tested, according to the values previously obtained, by performing a future simulation and proposing an arbitration.

The variables tested are represented by the 30 companies listed on BVBV at the 1st and 2nd tier. The selected macroeconomic variables are the following: inflation, interest rate, unemployment rate, gold price, price index of industrial production, average net wage, exchange rate and BET-C index. The observation period is January 2002- June 2010. Subsequently, this period was divided in two sub-periods, namely January 2002 - October 2008 and November 2008 - June 2010, in order to observe the situation before the crisis and during the crisis.

- **The total period of observation (2002 - 2010)**

The following table provides a distribution of results for each of the 30 titles.

Table 10. *Distribution of results according to the first regression on period 2002 - 2010*

	(-9.5,-1]	(-1,0]	(0,1]	(1,7.5]
β1	1	3	16	10
β2	1	10	15	4
β3	0	17	13	0
β4	0	7	22	1
β5	11	2	4	13
β6	10	4	4	12
β7	1	21	7	1
β8	10	4	8	8

Source: author processing

As shown the variables are significant for the selected titles. As for the adjusted R^2, its value varies from one title to another, even registering negative values. However in some cases the values are close to 74%, and most of them are within the range 15-74%, which is quite promising.

The correlation between the macroeconomic variables was also studied and it could have been observed that most of the correlations are relatively weak and insignificant. As for the correlations between the 30 titles and the macroeconomic variables, the data again shows relatively weak and insignificant correlations and the main correlation is with market factor, namely the BET-C index.

When the previous data has been replaced into the equation the following results will be obtained:

$$\hat{\bar{R}}_i = \underset{(-0.587675)}{-0.002718} + \underset{(1.696837)}{0.008828}\beta_{BET\text{-}C} + \underset{(-2.322294)}{(-0.006012)}\beta_{DOB} + \underset{(-0.124787)}{(-0.000665)}\beta_{SOM} + \underset{(4.099288)}{0.025519}\beta_{AU}$$

$$+ \underset{(0.336933)}{0.000170}\beta_{INF} + \underset{(4.340652)}{0.006678}\beta_{IPP} + \underset{(3.066665)}{0.013371}\beta_{SAL} + \underset{(2.808488)}{0.007225}\beta_{RS}$$

with the adjusted $R^2 = 0.695270$. The results show that two variables do not influence the selected titles' price, namely β_{SOM} (unemployment rate) and β_{INF} (inflation). Other variables provide a good description of the behavior of the average returns and the projected ones obtained by the APT model, explaining over 69% of average returns across the transversal sample. This suggests that the APT model is able to explain the transversal variation in returns of the Romanian capital market and specifically from the Romanian shares' market.

The risk premiums are positive for the market factor BET-C, the gold price, inflation, industrial production price index, average earnings and net salary exchange rate RON /EURO and negative for the interest rate and the unemployment rate, although the values are very low . Under the null hypothesis, the constant should be zero, but in this case, it is negative and relatively significant.

However, these results provide information on how the expected returns should be determined for the titles. For example, for the Rompetrol Well Services titles (PTR), the β value for the exchange rate is equal to 1.547502. If an investor believes that the rate would increase, that investor may buy more PTR shares, in order to increase his portfolio. This increase in the exchange rate would lead to a contribution of 1.547502 * 0.007225 =0.011180% of the expected yield of the PTR title, which might be enough to reward an investor for the additional assumed risk.

- **Analysis of the observed sub-periods**

The total period of observation (January 2002 - June 2010) will be divided into two sub-periods, so that the data can be calculated and compared before the financial crisis, that during it.

A). The first sub-period (January 2002 - October 2008)

For this period were taken into consideration only six macroeconomic variables, namely: the market factor (BET-C), the interest rate, the gold price, the price index of industrial production, the average net wage and the exchange rate between RON and EUR. The other two variables analyzed during the period 2002-2010 (the unemployment rate and the inflation) have not been taken into consideration any more as they did not influenced the 30 titles that were chosen.

Table 11. *Distribution according to the first regression results for the period January 2002 - October 2008*

	(-6,-1]	(-1,0]	(0,1]	(1,5.5]
β1	2	2	12	14
β2	2	9	14	5
β3	0	8	21	1
β4	11	6	7	6
β5	1	16	12	1
β6	7	7	9	7

Source: author processing

Like for the period 2002-2010, for the first sub-period (January 2002 - October 2008), it can be observed that the macroeconomic variables are significant for the selected titles. Most of the adjusted R^2 values are between 20-78%.

When replacing the data obtained previously we have the following results:

$$\hat{\bar{R}}_i = 0.002156 + 0.011584\beta_{BET\text{-}C} + (-0.010826)\beta_{DOB} + 0.027548\beta_{AU} + 0.009982\beta_{IPP} +$$
$$(0.323454) \quad (2.103587) \qquad (-2.106410) \qquad (4.971110) \qquad (5.022997)$$

$$+ 0.018002\beta_{SAL} + 0.007431\beta_{RS}$$
$$(3.341029) \qquad (2.356920)$$

with the adjusted $R^2 = 0.645119$. The variables provide a good description of the behavior of average returns and of the projected ones obtained by the APT model , explaining over 65% of average returns of the transversal sample. This suggests that the APT model is able to explain the transversal variation in returns of the Romanian capital market and specifically from the Romanian shares' market.

The risk premiums are positive for the market factor BET-C, the gold price, the price index of the industrial production, the average net salary and the exchange rate RON /EURO and negative for the interest rate. In terms of the constant value, this is very close to zero, positive and relatively significant.

If we take again the example of the Rompetrol Well Services title (PTR), its β value for the exchange rate is equal to 0.993598. When the exchange rate would register an increase, this would lead to a

contribution of 0.993568 * 0.007431 = 0.007383% of the expected yield of the PTR title, with 0.003797% less than the analysis made for the entire period.

B). The second sub-period (November 2008 - June 2010)

Table 12. *Distribution according to the first regression results for the period November 2008 - June 2010*

	(-9,-1]	(-1,0]	(0,1]	(1,29.5]
β1	1	3	17	9
β2	4	6	10	10
β3	9	12	5	4
β4	7	1	1	21
β5	1	11	8	10
β6	9	3	3	15

Source: author processing

From the table above, it can be seen that the macroeconomic variables are more significant than for the whole period or for the first sub-period. Most of the adjusted R^2 values are in the range 20-85%.

After replacing the date obtained previously into the equation, the following results were obtained:

$$\hat{\hat{R}}_i = \underset{(-0.391695)}{-0.002341} + \underset{(-0.035544)}{(-0.000279)\beta_{BET\text{-}C}} + \underset{(-4.675947)}{(-0.019725)\beta_{DOB}} + \underset{(9.203761)}{0.043825\beta_{AU}} + \underset{(3.693716)}{0.002835\beta_{IPP}}$$

$$+ \underset{(-1.986643)}{(-0.007738)\beta_{SAL}} + \underset{(8.565241)}{0.012336\beta_{RS}}$$

with adjusted R^2 = 0.822965. The results show that the BET-C market factor does not affect the titles' prices, while the other variables provide a good description of the relationship between the average returns and the projected ones, obtained by the APT model, explaining over 82% of average transversal returns of the sample.

The risk premiums are positive for the gold price, the index price of the industrial production and the exchange rate RON / EURO and negative the market factor BET-C, the interest rate and the average wage salary, but the values are very low. The constant is negative and relatively significant.

As for the exchange rate, if this will increase, its contribution to the expected yield of the title PTR would be equal to 0.842008 * 0.012336 = 0.010387%, with 0.000793% less than for the whole period.

In order to determine the equilibrium return, we will randomly pick seven titles out of the 30 studied previously. The seven titles selected are: Antibiotice (ATB), BRD - Groupe Societe Generale (BRD), Oil Terminal (OIL), Banca Transilvania (TLV), Azomureş (AZO), Alro (ALR) şi Omv Petrom (SNP).

For these titles six risk factors with common action have been identified. The expected returns and the expected sensitivities are given below:

Table 13. *Expected returns of securities and estimated sensitivities*

Title	Profitability expected	a_{i1}	a_{i2}	a_{i3}	a_{i4}	a_{i5}	a_{i6}
ATB	11.3474	0.150695	-0.321218	-0.788396	7.797775	0.653775	1.180737
BRD	7.2103	1.499838	-0.240044	-0.171804	-5.349606	-0.432876	2.089640
OIL	11.8390	-0.020094	-2.326571	-0.703646	0.998876	-0.680680	-1.201255
TLV	4.9480	0.640459	1.334397	-3.280207	16.880030	1.197927	15.600580
AZO	17.0200	0.956963	0.558884	-1.963989	15.701990	0.299082	7.657105
ALR	6.7139	1.429831	0.947343	-0.120648	10.051730	-0.847803	-1.550132
SNP	2.9270	1.392625	1.043759	-0.074641	-0.854919	-0.143375	3.312683

Source: author processing

The free-risk rate is -0.234100%, and the risk premiums associated with six risk factors are the following: -0.0279%, 1.9725%, 4.3825%, 0.2835%, 0.7738%, respectively 1.2336%. The factors that affect the returns of the titles' prices are: 5.559163, 0, -6.833516, 0.142426,-4.826288, respectively 0.505842.

The equilibrium return of each title will be calculated by using the equation:

$$E(R_i) = \lambda_0 + \sum_{k=1}^{K} a_{ik}\lambda_k + \sum_{k=1}^{K} a_{ik}\tilde{F}_{k,t} + e_{i,t}$$

Thus, in table 14 the equilibrium returns that were obtained can be seen.

Table 14. *Returns the balance of the seven titles*

	ATB	BRD	OIL	TLV	AZO	ALR	SNP
Steady returns $E(R_i)$	4.735139%	9.290159%	8.231837%	19.49348%	18.25715%	12.43445%	11.79400%

Source: author processing

The awaited return of the seven titles is different from that of equilibrium one. The following titles are overstated: BRD, TLV, AZO, ALR and SNP and the ATB and OIL titles are undervalued. The investors, in this case, will acquire ATB and OIL titles and will sell the other five titles, until, after the changes of the title prices, the equilibrium level will reached.

Next we will propose two arbitration portfolios. In the every case it will be taken into consideration six factors and a number of securities equal to seven, respectively eight.

A. Portfolio 1 to 7 titles and six risk factors

The titles used in this case are: ATB, BRD, OIL, TLV, AZO, ALR and SNP.

The arbitrage portfolio is the one that does not require funds from the investor, but it lead to a gain, with a zero risk.

By resolving the system of equations, for all titles it was obtained the same solution, namely 0. Therefore, the arbitrage portfolio return will be 0, if proposed.

B. Portfolio 2 to 8 degrees and six risk factors

The new title that was added is Siretul Pascani (SRT), whose expected return is equal to 3.8715%, and $E(R_{SRT})$ = 4.7521%, which represents an overstatement of the title.

Such a system with seven equations and eight unknowns has infinite solutions. In order to solve it, an arbitrary percentage for one of eight titles will be set, so the system will have a number of equations equal to the number of unknowns. As the title ATB is undervalued by the market we will set a positive weight to it. This weight will be established as following: a = 0.3. the system solutions will be then equal to b = 0.051601, c = -0.101035, d = 0.022195, e = -0.049884, f = 0.066715, g = -0.029652 and h = -0.259940.

The weights obtained from the system verified the conditions of arbitrage. Next it has been checked if the portfolio generates a positive return, so the arbitrage portfolio return is equal to:

$R_{pf(arbitrage)}$ = 0.3 x 11.3474% + (0.051601) x 7.2103% + (-0.101035) x 11.8390% + (0.022195) x 4.9480% + (-0.049884) x 17.0200% + 0.066715 x 6.7139% + (-0.029652) x 2.9270% + (-0.259940) x 3.8715% = **1.195695**% >0 (monthly), which represents a 14.348338% annual return, return which is more profitable than for the other financial instruments and and for an assumed risk equal to zero.

As a conclusion of this chapter, we can see that investors can follow the evolution of macroeconomic variables when deciding to invest in the capital market, due to the fact that they will influence the equity prices listed on BVB. These results provide information regarding the manner in which the expected returns for securities should be determined. Thus, if an investor believes that the exchange rate would increase, it might buy more shares to hold them in portfolio. This increase in the exchange rate would result in a contribution to the expected return of that title acquired, which could be enough to reward an investor for the additional risk assumed. Also, investors would be able to form some portfolios, such that when investing in them, to get more favorable return than for other financial instruments, for an assumed risk equal to zero.

Conclusions

The topics addressed in this study were structured in four chapters, in which were presented both theoretical and practical aspects, the latter making part from research.

I think that the theme is a topical one after the accession to the European Union, but also because of its high interest to the capital market in Romania, and especially on the Bucharest Stock Exchange.

The first chapter considers the basic issues that led to legislative and institutional architecture shaping the current capital markets. Here was shown the picture of the current capital market and the regulated market developments.

In **Chapter 2** were passed out basic concepts with which the portfolio theory operates, but also the management techniques, offering a synthesis of main performance measurement models.

The last two chapters represent the research, namely testing the stock anomalies that may appear on the Romanian stock market, but also testing the APT model on the Romanian capital market, seeking also to identify relevant factors that influence the price of titles listed on the Bucharest Stock Exchange (BVB).

Chapter 3 focused on the existing stock anomalies and the following anomalies were analyzed: the size effect, the P.E.R. effect and the seasonal effect (the January effect). Testing was done in light of the 30 titles listed on the 1st and 2nd tier, taking into account two observation periods, namely January 2003 - December 2007 and January 2008 - December 2010 (before crisis and during crisis).

After conducting following tests, it was observed that before the crisis there was no P.E.R. effect or size effect, but the January effect is present, and during the crisis, due to lower share values, the data that was obtained was negative for both the size effect and the P.E.R. one. Regarding the January effect it has been observed during the crisis only for the third portfolio (which includes companies - 10 of them - that register the smallest capitalization), for the rest of the portfolio negative values were obtained.

In the **last chapter** of the thesis was presented the APT model, what researchers think about it and the determining factors. In the research were taken into account eight macroeconomic variables: inflation, interest rate, unemployment rate, gold price, price index of industrial production, average net wage, exchange rate and BET-C index.

The purpose of this chapter was to examine the model accuracy on the 30 titles, to identify the variables that influence the prices of these securities, but also the creation of an arbitrage portfolio.

It was observed that the macroeconomic variables that were chosen influenced the titles' prices.

For the entire period of observation (January 2002 - June 2010), most variables provide a good description of the behavior of average returns and of the projected ones that were obtained by the APT model, except for two variables which do not influence, namely β_{SOM} (unemployment rate) and β_{INF} (inflation). As the first sub-period for which testing was done separately (January 2002 - October 2008), it were taken into account only the six variables that influenced the titles for the entire period of analysis, and it could have been seen that they influence the 30 titles. The analysis made during the on the financial crisis period (November 2008 - June 2010), shows an important influence of the tested variables, except one of the six variables analyzed, namely the BET-C market factor.

Further, the model was tested on the Romanian market, determining the equilibrium return, and for this seven titles of the 30 studied previously were chosen. After calculations, it was notice a difference between the expected return of the seven titles and equilibrium one. Thus, titles like BRD, TLV, AZO, ALR and SNP are overvalued and those like OIL and ATB undervalued, thing that will lead to the purchase of the titles ATB and OIL, and to the sale of those other five titles, until, after changes in stock prices, equilibrium will be reached.

In the end, two arbitrage portfolios were proposed. For each were taken into account six factors and a number of securities equal to seven, respectively eight. As for the first proposed portfolio, the profitability is equal to 0, and for the second one (which contains eight titles), its monthly return is equal to 1.195695%, which represents an annual return of 14.348338%.

Therefore, the results show that the APT model operates on the Romanian capital market. Regarding the macroeconomic variables considered, except for unemployment and inflation, they affect the analyzed titles' prices throughout the study period and the observed the two sub-periods.

Finally, conclude by stating that the results obtained in this thesis are particularly useful for investors who can take into account when deciding to invest both the stock anomalies and the macroeconomic variables influence on the stock prices listed on Bucharest Stock Exchange.

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