EFFICIENT MANAGEMENT OF A SECURITIES PORTFOLIO DURING A CRISIS PERIOD

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Abstract: *It is widely acknowledged that financial crises tend to make portfolio construction and management very difficult. So I considered in my Master Thesis the construction of an investment strategy on the Romanian capital markets, which would bring superior performance, not only in a booming economy, but also during a financial turmoil. First of all, we can notice a strong concentration of the entire market on the Bucharest Stock Exchange and investors are mostly interested in stock transactions. Even though the Romanian capital markets is not totally mature yet, if we try to make a comparison between the Modern Portfolio Management Theory (MPM) and the Post-Modern one (PMPM), I conclude that managers should use more the PMPT. The reason is that the latter lead to a more efficient securities portfolio, with lower risk for the same return. By considering and penalizing only the downside risk, it is more practical and offers a better risk-return tradeoff.*

1. Introduction

The economic reality nowadays is confronted with an unprecedented volatility. The socio-economic landscape is constantly changing, while security is a less and less common circumstance. Taking into account the new normal, portfolio management, and investment in general, both private and institutional, has to adapt and rise to another level. It is largely clear that any return earned on usual bank deposits is offset by the macroeconomic factors, like inflation or the exchange rate risk, in case of foreign currency deposits. But there is a solution to this dilemma: investment in securities, which, for a specified risk level would remunerate their owner with a positive return.

The topic of efficient portfolio management in periods of financial instability is one of a great relevance regarding the role an investment decision plays in the process of financing the economy of a society or even the entire world. We saw the great influence the recent financial turmoil had and the resulting shape of the financial world. This power and influence of the crisis and the complexity coming from the interconnection of the financial world determined me to choose this topic. My intention is to research the equity market element of capital markets; however, in order to get a grasp of the capital markets in Romania, we have to start by mentioning the economic theories which describe the portfolio investment decision.

With the objective of creating a picture of the Romanian stock exchanges, I tried to present here the most important modern financial theories which shape the investment decision. I not only explain them, but also analyze the critics brought to each of them.

The First Part of my Master Thesis presents the theoretical aspects of securities portfolio selection: the Markowitz model, the PMPT which evolved from the limitations the Markowitz theory exhibited and explains the indicators which assess portfolio performance in both theories. I present the most important financial crises and their cause (Chapter I); describe portfolio administration (Chapter II) and come with an analysis of the role capital markets should play in the economy: the evolution of number of listed firms on the stock exchange and their

capitalization as a percentage of GDP, the evolution of the Bucharest Stock Exchange and the main indices (Chapter III).

The Second part contains an applied study of the theories presented before, calculating the indices of performance evaluation mentioned. Here I will start with a description of the data and methodology of calculation the return of financial securities as well as the methodology of portfolio selection (Chapter IV). Later I will calculate the returns and risks for specific portfolios in conformity with the Markowitz theory and the methodology proposed by Soritino. In continuation I will calculate the indices measuring portfolio performance, comparing the returns of different portfolios and ordering them according to their performance (Chapter V).

In the end I will conclude by mentioning the main result of this study with the advantages and disadvantages of the models and theories used, as well as their importance.

2. Literature review

Since portfolio management is a very hot topic in general, and in special in the framework of the recent events, there have been more studies on this theme. M-F. Tsai and C-J. Wang (Post-modern Portfolio Theory for Informational Retrieval, 2012) propose a mean-semivariance framework to handle the uncertainty. Using this framework, they are able not only to deal with the uncertainty but are able to distinguish downside and upside uncertainty when trying to optimize a ranking list, improving at the same time the Information Retrieval performance much over the Probability Ranking Principle's one.

B.M. Rom and K.W. Ferguson (2001), argue that PMPT, even though used initially for asset allocation is increasingly being applied to measuring the investment performance of portfolios, investment managers, and mutual fund. Besides using only tools easy to incorporate into the existing performance, PMPT also widens the areas of use to implement asymmetric distributions such as futures, options, hedge funds and other derivative strategies.

James Brown (Managing the Retail Format Portfolio: an application of modern portfolio theory, 2010) proves that portfolios, following the example of hotel firms, can improve their returns and reduce risk by reallocating the assets in them (or the number of hotel rooms) across their different retail formats, to accommodate different customer needs.

K. Mirza and L. Huelin (Portfolio Optimization in a Downside Risk Environment, 2010) manage to be the first to include several acknowledged downside risk measures in a thorough analysis where their different properties are compared with those of variance. They show, thus, that that downside risk can be a better tool in investment management than variance. And at the same time, Cristiana Tudor (Active Portfolio Management on the Romanian Stock Market, 2012) tries to challenge the Efficient Market Hypothesis by doing an analysis of a series of Romanian portfolios in comparison to the evolution of the national and international stock markets. She reveals that the overall value of an active portfolio management strategy on the Romanian equity market is inferior to the value of a passive strategy tracking the market index over the analyzed period.

A theoretical framework of efficient portfolio selection

Capital markets, in spite of all the benefits it brings, are very complex and every investment decision required a sound analysis of the risk appetite and the return expected for the

risk assumed. The economist laying the foundation of decision theory and gave a definition to risk and uncertainty is Frank Knight (1921).

Whenever any dysfunction in any domain of the society appears, people try to analyze and to come up with a solution for it, because dysfunctions have an impact of the good functioning of the society, and on its productivity. Economic and financial crises are a good example of such dysfunction, and my topic is closely related to the crises topic, because I am analyzing the administration of a securities portfolio during such a financial turmoil. There is a wide spectrum of bubble crises registered along the history, some examples would be: the tulip bubble in Holland in 1636, the equity prices bubble in the '20s leading to the Great Depression, the increase of sovereign debt in many developed counties in the '70s of the bubble which appeared on the Japanese capital markets between 1985 and 1989.

Out of all these examples I would briefly go through the Great Depression, since this is one of the most important international crises. Sparked by the collapse of the New York Stock Exchange, economists could never agree on any circumstance which would have been the determining cause. Some support the idea that is a failure of the free market, while other advocate for the totally opposite view, that it is a fiasco of the government in their ambition to steer the economy. The impact of the depression was, however, striking: the trading volume collapsed, stock exchanges froze and remained down for long periods afterwards, the GDP fell, and so did profits and earnings.

The recent crisis, which started in 2008, presents many similarities with that one. It started with a housing bubble, which appeared as a result of the increased popularity of subprime loans and naturally affected the real estate market in the first place. Characterized by a very deep interconnection between banks and financial institutions, the panic spread with the lightning speed, affecting the banking sector and the financial sector in the entire world. We have to mention here, that the subprime credits weren't the only determinant of the turmoil, a very important factor was financial engineering, by creating products, which couldn't be understood by investors and their risks were very difficult, or even impossible to calculate.

As soon as the markets became violent, there securities lost their value, affecting all their possessors, meaning mostly every bank or financial institution. Measures were taken, from interest rates accommodation to direct subventions from the government of US, but the propagation was unavoidable, taking in account the degree of the netting in the financial world. Bankruptcies and nationalizations followed all over, especially in Europe. The turmoil led to a wave of distrust, not only in capital markets, but everywhere, most affected were the sovereign debt markets. Those countries which had an excessive level of debt have registered increasing spreads on their government bonds, making it harder to issue then and to finance their expenses.

Now that we mentioned and described the "Crisis" component of my thesis, I'll get to the second one, and the main I would say – portfolio management. Since portfolio administration is what I want to analyze, let's start by explaining what it actually is: portfolio management is the activity determined by the desire to maximize the risk-return relationship, according to the risk appetite characteristic to each specific investor, be it private or institutional. This activity is a very complex and must be continuous, because of the constantly changing economic and financial environment.

In this thesis I compare two methods of portfolio selection: the modern portfolio theory (MPT) – Markowitz model, and the post-modern portfolio theory (PMPT).

I will first introduce the Markowitz model of portfolio selection - the **Modern portfolio theory**. At its base are the risk and return of a diversified portfolio of securities. Markowitz uses

a security's variance to measure its risk, and the combination of variance and covariance determine the risk of a portfolio. This model proves mathematically the advantage of diversification in minimizing or even removing specific risk altogether. Harry Markowitz made the following assumptions while developing his model:

- Risk of a portfolio is based on the variability of returns from the said portfolio.
- An investor is risk averse.
- An investor prefers to increase consumption.
- The investor's utility function is concave and increasing, due to his risk aversion and consumption preference.
- Analysis is based on single period model of investment.
- An investor either maximizes his portfolio return for a *given* level of risk or maximizes his return for the minimum risk.
- An investor is rational in nature.

To choose the best portfolio from a number of possible portfolios, each with different return and risk, two separate decisions are to be made:
1) The first step is to analyze the respective securities existent in the capital markets and to determine of a set of efficient portfolios.
2) Next, the selection of the best portfolio out of the efficient set should take place.

Post-modern portfolio theory (or **PMPT**) is an extension of the traditional modern portfolio theory. Since there are important limitations to the original MPT formulation when measuring risk and return, the PMPT overcomes them by providing a framework that recognizes investors' preferences for upside over downside volatility. By coming with a new approach and a new Sharpe ratio – Sortino ratio - now semi-variance instead of variance is used to measure the possibility of a lower return than the average expected one to realize; since it was observed that investors are more interested in limiting the downside risk rather than penalizing the upside one. The average expected return now becomes the minimum expected return, considering every superior return as normal, and every inferior a failure. Risk in PMPT is calculated as relative to the minimum expected return and not the average one.

We mentioned capital markets as an important component of my study, let's now analyze them in a national framework. In Romania the capital market as a whole is represented by the Bucharest Stock Exchange and the Sibiu Stock Exchange.

Starting to grow rapidly since 2002, after a massive diversification of products available, the total capitalization of the stock exchange is over 22% of GDP, more than 10 times surpassing the 2002 value. Even though a heavy downward trend registered in 2008, with a high decline in transactions volume, securities prices, brought this capitalization to only 8% of GDP, in the past years, it recovered phenomenally.

In 2001 the Bucharest Stock Exchange was considered an equities trading one, however starting with 2003 bond trading intensified significantly, especially the municipal ones and those with a perspective of diversification with other fixed income securities. This comes as a result of the desire of investors to direction their money in more safe investments. Another reason of this high transaction volume is the choice of municipal authorities to finance their projects by issuing bonds.

Nowadays the Bucharest Stock Exchanges is trading equities of the most important Romanian companies, and their number is expecting to increase. However the main picture drawn from this analysis is that the capital market in Romania is trying its best to evolve in a

very difficult economy, and is going to extreme lengths to keep its balance, rather than being an actual financier of private investments – new investments which would contribute to the evolution of the economy.

3. Case study

Part II of the Master Thesis is based on the practical study of the evaluation of performance for a portfolio of securities of the Bucharest Stock Exchange. Here I put into practice the theoretical landmarks mentioned in the first part of the work on data released by Bucharest Stock Exchange for the period between **2009** and **2014**.

This part of the paper is structured in two chapters segmented into several sub-chapters which comprise the description of the sources of the information, data, research methodology and determining returns of financial securities on capital market development and the choice of optimal portfolio using elements of TMP and TPMP

I conducted research on assessment, modeling and forecasting portfolio risk and return, with indicators measuring the performance of a portfolio.

Data used and sources of information

The data used for analysis in this part of the Master Thesis have as source of origin:

- The National Bank of Romania – data series of rates of return on government securities;
- The Bucharest Stock Exchange - adjusted closing price of the shares: monthly data.

Research Methodology

The analysis excluded companies that were delisted from the stock exchange (because of insolvency or by their own decision) during the period, as well as new companies entered the Stock Exchange (done either by IPO - initial public offering or by transfer from another market) in this time being kept only companies whose trading was continuing . We included in this study **23** common shares at Bucharest Stock Exchange, with a monthly data frequency of share price.

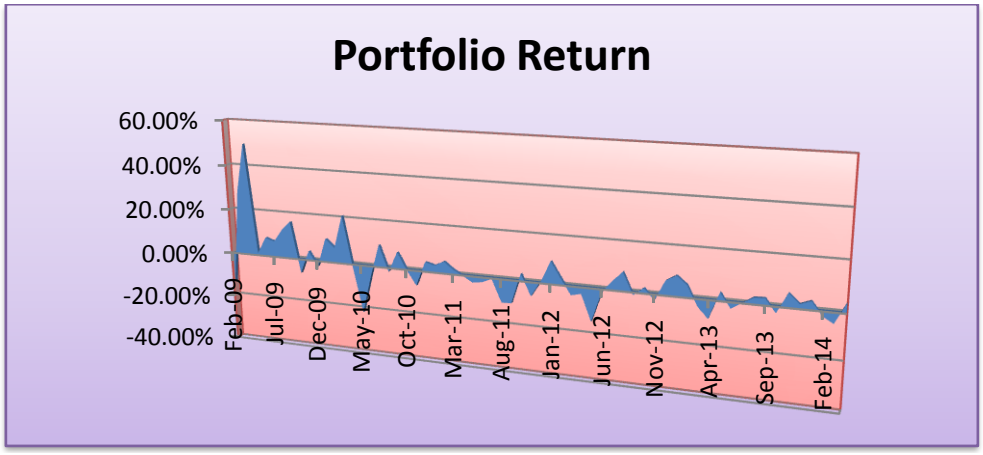
Selection is undertaken based on the following set of criteria:

- Shares listed in Category I and II on The Bucharest Stock Exchange;
- Satisfying the conditions of financial performance and liquidity of shares
- Price series are long enough to support the cointegration relationship;
- Trading volume is large enough to consider the relevant closing prices;
- Complete price series (very short periods of suspension)

The analysis and results related to modern and post-modern theory of portfolio

I will begin by conducting a review under binomial expected return - risk assumed as described in Markowitz model, in the situation when investors do not want their capital to be invested in the risk-free assets, forming thus the portfolios only of risky assets.

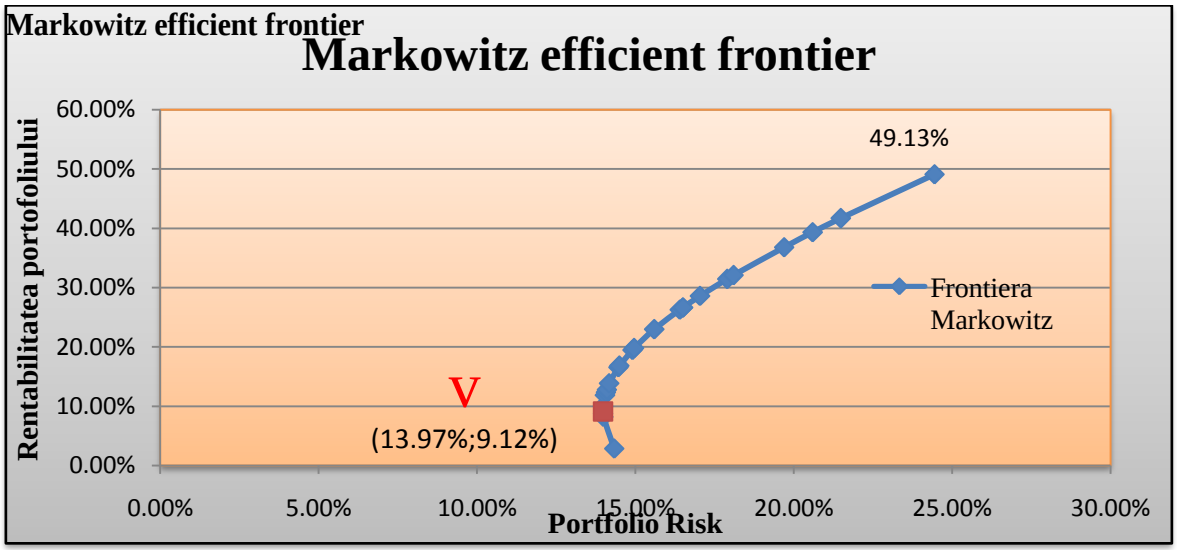
Based on primary data I calculated the monthly returns of the shares that formed an investor's portfolio and the monthly return of the portfolio. Monthly returns of each share taken in the analysis are found in Appendix One.



Graph 1: Portfolio yield evolution during the period 01.02.2009-01.02.2014

As can be seen in the chart above, the portfolio return is fairly volatile in the period analyzed. More specifically, lower volatility periods alternate with periods of high volatility.

The graph below presents the **Markowitz efficient frontier** (upper arm or dominant portfolios):



Graph 2: Markowitz efficient frontier when short selling are allowed on the market

Markowitz's frontier highlights performance of efficient portfolios. To emphasize this I will do a comparative analysis of the risk of two capital investment.

- 100% investment in a portfolio basis (ie Dafora), which has EDAFR = 19.79% annually, and σDAFR = 20.18%., And

- Investment in Markowitz portfolio (with the DAFR 22.87, -17.87% in ALT ... -8.89% in VNC) portfolio with the same hope of return expected as reference title but with σDAFR = 14, 96%.

Markowitz efficient portfolio risk reduction is evident, from 20.18% to 14.96%. This performance resulted from the diversification of the investment portfolio of the 23 individual risks, but also the covariance (between them) that led to a considerable reduction of the specific risk of each title.

TPMP argues that the target of each investor must be correlated with the risk of investment and the emergence of a higher return than the target does not demonstrate economic or financial risk.

In this theory, I have examined the downside risk (name given by the Sortino), and calculated it by using the downside semi-variance. Risk measure is shown only by lower volatility, but higher volatility target rate is uncertainty.

To calculate this indicator, we need to set the minimum acceptable rate of return. This target rate I set as risk free rate based on bond yields and records an average of 5.51 %. This rate can be considered as a benchmark for assessing the financial instruments PMPT. This rate is the minimum rate accepted by the investor to base their investment decision upon.

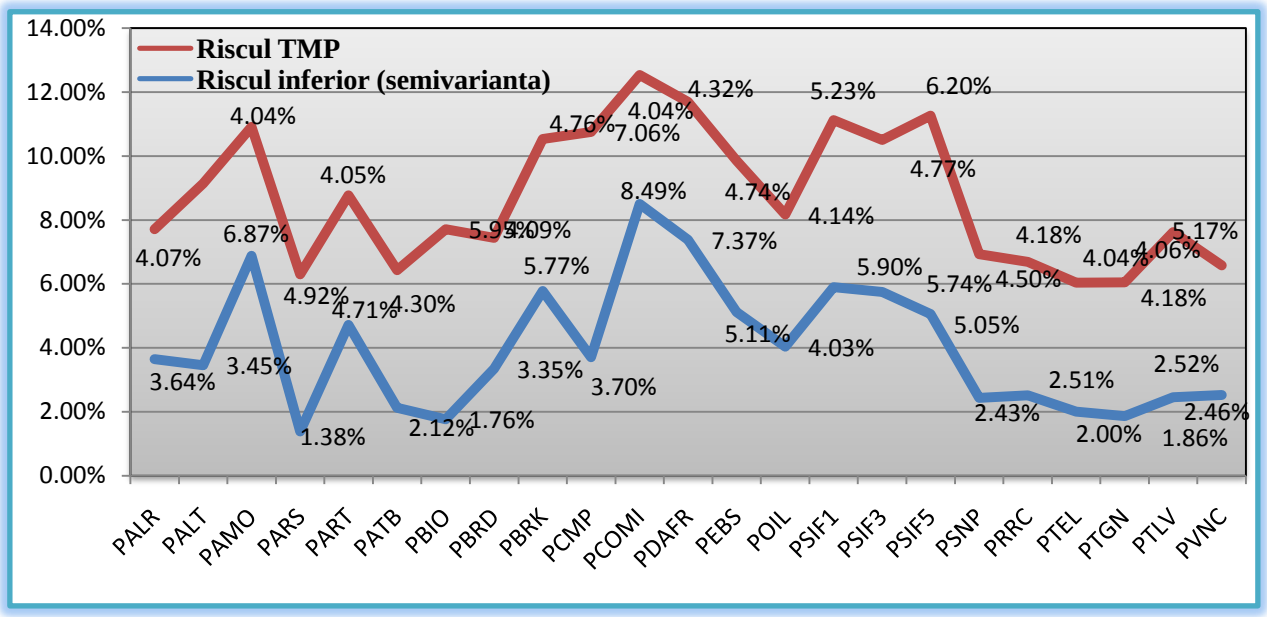
Stock	Potential rate superior to the targeted one	Upside Potential Ratio
ALR	11.66%	67.72%
ALT	10.91%	87.23%
AMO	12.37%	60.49%
ARS	7.98%	93.24%
ART	8.85%	54.68%
ATB	8.43%	74.94%
BIO	9.39%	107.07%
BRD	8.70%	61.75%
BRK	13.14%	72.60%
CMP	14.41%	103.12%
COMI	15.28%	61.01%
DAFR	18.27%	75.87%
EBS	11.12%	73.14%
OIL	10.18%	57.94%
SIF1	12.99%	77.85%
SIF3	10.94%	65.91%
SIF5	11.74%	80.08%
SNP	8.74%	68.17%
RRC	9.66%	71.97%
TEL	8.12%	62.17%
TGN	6.98%	67.38%
TLV	9.52%	87.05%
VNC	8.29%	65.39%^^

Graph 3: Rate of superior potential vs. Superior MAR potential rate return

The portfolio I have created out of the 23 shares listed on Bucharest Stock Exchange, I calculated the lower risk based on the lower semi-variance, and also upper and lower volatility. The results are presented in the table above (Graph 3).

Another indicator is the rate proposed by Sortino - Upside Potential Ratio which is used for portfolio selection. The benefit of the UPR indicator is to rank portfolios or financial securities studied in order to distinguish the best in terms of higher potential relative to the risk of failure. The strategy of the investors which have established their profitability objective is to achieve a higher profit as the minimum acceptable return, thus minimizing the risk of failure.

According to UPR, the shares with highest performance are BIO (107.07%), CMP (103.12%), ARS (93.24%), ALT (87.23%), with risk of failure of 16.87%, 20.38%, 8.62%, 18.83% and a potential to exceed target rate with 9.39% -BIO, 14.41% - CMP, 7.98% - ARS, ie 10.91% - ALT.



The analysis performed on the calculated risk of each asset, resulting from the two methods found that the PMPT estimated risk is lower than the risk calculated by MPT. Not risk has changed, but the method risk is calculated, i.e. the risk that measures any deviation from the average (positive or negative) in determining risk of not achieving the anticipated level of profitability required by investor. The risk calculated by the semi - variance shows that lower risk is a measure of the relative risk , which depends on the investor's investment objective , is specified as the target rate of return and the risk calculated by the standard deviation can distort investment performance and leads to erroneous conclusions.

Using the postmodern theory for portfolio analysis, we have lower risk and asymmetrical distributions of rates of return, allowing for adaptability and accuracy in forming efficient portfolios. Characteristics which could not be provided by the Markowitz mean - variance method.

I have calculated the indicators stipulated by the modern and postmodern theory (results can be found in annex) and got the same portfolios as the most efficient, just in different order: **TMP**: CMP SIF5, BIO, ALT, and **TPMP**: BIO, CMP and ARS.

4. Conclusions:

In this Master Thesis I aimed at building an investment strategy for the Romanian capital market which would manage to achieve superior performance both in normal market conditions and in crisis situations.

So I started from the fact that the existence of financial crisis significantly complicates the construction of portfolios given that these periods are characterized by generalized price decreases adversely affecting any portfolio correlated with the market return. Therefore, given the purpose of the work, the construction of portfolios with good results also in times of crisis, it was important that the methodology used ensured the neutrality of the portfolio compared to the market.

The analysis performed on the risk I calculated for every asset, by using the two methods mentioned above, determined that the estimated risk calculated by using the MPM method is lower than the risk calculated by PMPT. Not risk has changed, but how risk was calculated, i.e. the risk that measures any deviation from the average (positive or negative) in determining risk of not achieving the anticipated level of profitability required by investor.

The PMPT ensures a more accurate ROA development, leading to more accurate results. The portfolio managers should rely mainly on the use of postmodern theories, because these support the construction of efficient portfolios with lower risk at the same level of return. The Post Modern Portfolio Theory method is a more practical alternative to Modern Portfolio Theory in today's global capital markets, as the technical construction of efficient portfolios.

Annexis

Annex nr. 1: Monthly Returns on shares

Return on shares																					
ALR	***ALT***	***AMO***	***ARS***	***ART***	***ATB***	***BIO***	***BRD***	***BRK***	***CMP***	***COMI***	***DAFR***	***EBS***	***OIL***	***SIF1***	***SIF3***	***SIF5***	***SNP***	***RRC***	***TEL***	***TGN***	***TLV***	***VNC***
-0.1165	0.0400	0.0309	-0.0204	-0.3202	0.1302	-0.1462	-0.3077	-0.2450	-0.1500	-0.3910	-0.2066	-0.3083	-0.0816	-0.1400	-0.1026	-0.1977	-0.2857	0.0331	-0.0918	0.0078	-0.1772	-0.1486
0.4945	0.2308	0.0000	0.0000	0.0331	-0.0294	0.4432	0.5432	0.9374	0.1635	0.4837	0.5729	0.5663	-0.0370	0.2429	0.3762	0.4145	0.2750	0.1640	0.1124	0.1294	0.2153	0.1534
0.3971	1.1094	0.5000	0.1042	0.5120	0.4393	0.9850	0.1680	0.6748	0.9616	0.4327	0.6126	0.2712	0.1846	1.1206	0.5744	0.8648	0.2222	0.1375	0.2828	0.2868	0.3925	0.1950
-0.1105	-0.0864	0.1333	-0.0377	-0.2169	-0.1226	0.0000	0.0548	-0.2094	0.2938	0.2206	-0.1006	0.1165	0.0260	-0.2255	-0.0879	-0.0604	0.2727	0.2598	-0.0551	0.0315	0.0455	0.0307
-0.0533	0.0541	0.4765	-0.0196	-0.0473	0.4399	0.1509	0.0584	0.1938	-0.0717	0.0496	-0.0183	0.0840	0.0823	0.0570	0.0169	0.0058	-0.0042	0.0839	0.0500	-0.0467	-0.0087	0.3259
0.0187	-0.0308	0.0279	0.0300	0.0071	-0.0417	0.1148	0.2393	-0.0161	0.0215	0.0728	0.0372	0.2625	-0.0468	0.1257	0.1209	0.1221	0.0675	0.0686	0.0397	0.0899	0.2632	-0.0632
0.1656	0.1058	0.0116	0.0874	0.2394	0.0942	0.1127	0.2376	0.1807	0.0000	0.3559	0.1816	0.2356	0.1043	0.0745	0.3002	0.1710	0.0000	0.0435	0.0076	-0.0069	0.0833	0.0525
0.2632	0.0072	-0.1762	0.0625	0.0682	-0.0397	-0.0352	0.0000	0.1675	0.5882	0.6001	0.9051	0.0497	0.5722	0.2376	0.1870	0.1327	0.0474	0.1250	-0.0152	0.0101	0.0257	-0.0299
0.0625	-0.0499	-0.1628	0.0084	0.0638	-0.0827	-0.0868	-0.0080	-0.0996	-0.2143	-0.0702	-0.1185	-0.0687	-0.1272	-0.1760	-0.1233	-0.1719	-0.0189	0.1481	-0.0846	-0.0660	0.1062	-0.1630
-0.0078	-0.0200	0.0944	0.0167	-0.1200	-0.0226	0.0400	0.0887	-0.0132	-0.0067	0.1343	-0.0384	-0.0434	0.0243	0.0777	0.0625	0.1981	-0.0192	0.0108	0.0336	0.0600	0.2768	0.0386
-0.0514	-0.2347	-0.0558	-0.0246	0.0227	-0.0307	-0.0337	-0.0370	-0.0895	-0.0169	0.0075	0.0200	-0.0591	-0.0514	0.0180	0.0000	0.0000	-0.0235	-0.0380	0.0976	-0.0126	-0.0575	0.0068
0.1875	0.1633	0.0430	0.0252	0.0000	0.0078	0.0448	0.1308	0.1626	0.0793	0.1469	0.1071	0.0519	0.0667	0.1770	0.1544	0.2126	0.1165	-0.0205	0.1926	0.1745	-0.0094	0.0956
-0.0246	0.0029	0.0773	0.1475	0.0889	-0.0235	-0.0095	0.0068	0.0209	0.0831	0.1026	0.2393	-0.0407	0.0938	0.0677	0.0637	0.0325	-0.0108	0.2065	0.0683	0.1226	0.0048	0.1179
0.2914	0.3714	0.2967	0.4429	0.2500	0.0727	0.1490	0.0541	0.4772	0.6224	0.1860	0.2284	0.1291	-0.0071	0.1408	0.0299	0.1384	0.2509	-0.0414	0.1279	0.1932	0.0896	0.3534
0.0390	0.1208	0.0775	0.0990	0.0612	0.0676	-0.1088	-0.0705	0.0335	-0.1036	-0.0980	-0.0875	0.1111	-0.0504	-0.0926	-0.1105	0.0000	-0.0552	-0.0195	0.0052	0.0081	-0.0389	-0.1093
-0.1689	-0.2565	-0.3562	-0.2162	-0.3077	-0.1972	-0.1925	-0.1517	-0.2923	-0.2799	-0.1958	-0.2861	-0.1079	-0.2765	-0.3197	-0.3268	-0.3646	-0.0985	0.0000	-0.0923	-0.1406	-0.1444	-0.1705

-0.0710	-0.0875	-0.0851	-0.0805	0.0222	-0.1385	0.0058	-0.1301	0.0154	-0.0704	0.0406	-0.0357	-0.0879	-0.0419	-0.0100	-0.0835	0.0261	0.0341	-0.0569	-0.0904	0.0061	-0.0800	-0.1082
0.0694	0.0630	0.0233	0.1500	-0.0217	0.1202	0.0809	0.0748	0.1518	0.2455	0.0586	0.1382	0.1653	0.1257	0.1515	0.1970	0.1271	0.0297	-0.0468	0.1180	0.0780	0.0507	0.0522
-0.0779	0.0387	0.0057	-0.0761	-0.0778	-0.0183	-0.0428	0.0087	-0.0196	0.0462	-0.1105	0.0249	-0.0744	-0.0291	-0.0789	-0.0354	-0.0075	0.0449	0.0269	0.0000	0.0297	-0.0483	0.0307
0.0000	0.0298	0.0056	0.2706	0.0301	0.1669	0.0782	0.0603	0.0403	-0.0302	0.0000	0.0550	0.0361	0.3450	0.0857	0.0734	0.1439	0.0429	-0.0801	0.0556	0.0837	0.0290	0.1076
0.0563	0.0410	-0.0899	-0.0648	0.0117	-0.0556	0.0000	0.0081	0.0066	0.0528	0.0070	0.0380	0.0878	-0.0595	0.0088	0.0000	-0.0265	-0.0206	0.0050	-0.0526	0.0154	-0.0352	-0.0473
-0.0667	-0.0741	-0.1111	-0.0297	-0.0520	-0.0426	0.0000	-0.0323	-0.1511	-0.0661	-0.0876	-0.1303	-0.0669	-0.0395	-0.1478	-0.1282	-0.1497	-0.0150	-0.0900	0.0167	-0.0065	-0.0949	-0.0134
0.0679	0.0125	-0.0139	0.0306	-0.0122	0.1173	0.0622	0.0292	0.0985	0.0415	0.0291	0.0323	0.1855	-0.0905	0.0347	0.0657	0.0080	0.0213	0.0531	0.0574	0.0716	-0.0097	0.0068
0.0452	0.0247	0.0845	0.0248	0.0679	-0.1162	0.0434	0.1660	-0.0138	0.0820	-0.0632	0.0019	0.0210	0.0407	-0.0187	-0.0294	0.0698	0.0746	-0.0191	0.0233	0.0018	0.1393	-0.0014
0.0912	0.0361	0.0260	-0.0048	-0.0173	0.0409	0.0379	-0.0222	0.0347	0.1212	0.0914	0.1439	0.0373	0.0913	0.0754	0.0389	0.0823	0.1056	0.0106	0.1020	-0.0339	0.0272	0.0230
0.1085	0.1977	-0.0570	0.0583	0.0176	0.0518	-0.0617	0.0582	-0.0778	-0.0174	-0.1472	-0.0811	-0.0900	0.0159	0.1944	0.1350	0.1364	0.0754	-0.0263	-0.0930	-0.0004	0.0326	-0.0198
0.0767	0.0097	0.0201	-0.0505	0.0607	-0.0276	-0.0038	0.0067	-0.0305	0.0550	-0.0505	-0.0036	-0.0450	-0.1000	-0.0164	-0.0659	-0.0531	0.0280	-0.0198	0.0712	0.0022	0.0324	-0.0202
-0.0246	-0.0250	0.0724	-0.0338	-0.0300	0.0055	-0.0024	-0.0533	-0.0172	0.1024	-0.1579	-0.1329	0.0164	0.1224	-0.1718	-0.0456	-0.0949	-0.0955	-0.0607	0.0896	-0.0681	-0.0810	-0.0014
-0.0504	-0.0828	-0.0982	-0.0100	-0.0674	0.0142	-0.0435	-0.0141	-0.0382	0.0701	-0.1263	-0.0772	0.0372	-0.0295	-0.0144	-0.0748	-0.0359	-0.0402	0.2857	-0.0476	-0.0905	0.0766	-0.0966
-0.0398	-0.0538	0.3197	0.0303	0.0241	0.0000	0.0556	-0.0186	-0.0675	-0.0292	0.0054	-0.0102	-0.0501	-0.0380	-0.0351	-0.0526	-0.0292	-0.0152	-0.0411	-0.0682	-0.0239	-0.0544	0.0534
0.0442	-0.0909	-0.1856	-0.0784	-0.0065	-0.1162	-0.0789	-0.1266	-0.2088	-0.1301	-0.2707	-0.0400	-0.2404	-0.1272	-0.1010	-0.0126	-0.2060	-0.1098	-0.0492	-0.0390	-0.0939	-0.0694	-0.0594
-0.0132	-0.0775	-0.0823	-0.0106	-0.0764	-0.1032	-0.0130	-0.0833	-0.1397	-0.1925	-0.0200	-0.1867	-0.2042	-0.1424	-0.0904	-0.0873	-0.1193	-0.1550	-0.1870	-0.1269	-0.0467	-0.1491	-0.0586
-0.0268	-0.0108	0.1931	0.0194	-0.0404	0.0303	0.0853	0.0182	0.0201	-0.0162	0.0642	0.1111	-0.1646	0.0278	-0.0550	0.0274	-0.0129	0.0852	0.0246	0.0465	0.1402	0.0684	0.0344
-0.0909	-0.0740	-0.1676	0.0549	-0.1182	-0.0233	-0.0795	-0.0821	-0.2261	-0.0706	-0.1169	-0.1316	-0.1949	-0.0405	0.1634	0.1533	0.1340	-0.0557	-0.1844	-0.0722	-0.0698	-0.1195	-0.0506
-0.0152	0.0059	-0.0556	-0.0100	0.0197	-0.0201	0.0163	0.0418	-0.0273	-0.0152	-0.1388	-0.0758	0.0175	0.0141	0.0146	0.0925	0.0154	0.0000	-0.0590	0.0419	0.0855	0.0040	0.1167
0.0092	-0.0147	0.0294	0.0303	0.0253	0.0226	0.0264	0.0458	0.0599	0.1568	0.3223	0.1885	0.2862	0.0806	0.1024	0.0935	0.1722	0.1655	0.0679	0.0632	0.0754	0.1539	0.0000
-0.0747	-0.0448	0.0000	0.0294	0.1159	0.0559	0.0126	-0.0366	0.0282	0.0222	-0.2093	-0.1421	0.1059	-0.0231	0.2436	0.1395	0.1542	0.2278	-0.0122	-0.0600	0.0325	0.0029	0.0119
-0.0287	-0.0156	-0.1286	0.0000	-0.0584	-0.0226	-0.0030	-0.0130	-0.0515	-0.1043	-0.0412	-0.0772	-0.0673	-0.1179	-0.1381	0.0092	-0.0210	-0.0002	-0.0347	-0.0863	-0.0123	0.1154	-0.0531
-0.0197	0.0032	-0.1230	-0.0286	-0.0559	-0.0639	-0.0445	-0.0188	-0.0842	-0.0291	-0.1098	-0.0958	-0.0305	-0.0334	0.0037	0.0512	0.0036	-0.0335	-0.0641	-0.0503	0.0012	0.0858	0.0125

-0.2145	-0.0823	-0.2056	-0.0686	-0.0504	-0.0138	-0.0838	-0.1263	-0.0405	0.0125	-0.2212	-0.0829	-0.1542	-0.1673	-0.2063	-0.4091	-0.2605	-0.1319	-0.1781	-0.1703	-0.2114	-0.1649	-0.1123
-0.0308	-0.0759	-0.1059	0.0832	0.1923	-0.1053	-0.0343	-0.0285	0.0082	-0.0123	-0.1150	-0.1429	0.0222	-0.0437	0.0588	0.0108	0.0780	0.0773	-0.0667	-0.0272	-0.0072	-0.0021	-0.0815
-0.0227	0.0560	0.0526	0.1030	-0.1290	0.0271	0.1213	-0.0428	-0.0276	0.0875	0.0170	-0.0637	0.0233	0.0543	0.1111	0.0639	0.1071	0.0341	0.0893	0.0673	-0.0260	0.0549	0.0566
0.1279	0.1661	-0.0375	0.2070	0.0222	0.0727	-0.0290	-0.0283	0.1450	0.1103	0.0029	-0.0366	0.0652	0.3250	0.1190	0.1274	0.1000	-0.0072	0.0623	-0.0038	0.0762	0.0900	0.1250
-0.0763	-0.1061	-0.0260	-0.0883	0.0065	0.0144	0.0060	-0.1261	0.0257	0.1863	-0.0441	-0.0870	0.1223	-0.1393	0.0170	0.0400	0.0205	0.0210	-0.0031	-0.0656	-0.0559	0.0275	-0.0159
-0.1741	-0.0169	-0.0400	0.0408	0.0072	0.0416	0.0805	0.0860	0.0304	0.0332	-0.0256	0.0268	0.1065	0.0316	0.0395	0.0994	0.0201	0.0412	0.0186	-0.0347	-0.0105	0.0625	-0.0097
-0.0270	0.0069	-0.0278	-0.0231	-0.0172	-0.0364	-0.0350	-0.0677	-0.0330	-0.0541	-0.1284	-0.1014	0.1340	-0.0769	-0.0347	0.0415	-0.0423	-0.0281	-0.0578	-0.0599	0.0904	-0.0252	-0.0179
0.1111	0.0103	-0.0571	0.1315	-0.0291	-0.0131	0.0803	0.1110	0.0224	-0.0179	0.0507	0.0742	0.0636	0.0833	0.0622	0.1126	0.0316	0.0762	0.0161	0.1557	0.0634	0.0948	0.1111
0.0750	0.1186	0.2121	0.0731	0.0861	0.1557	0.0072	0.0857	0.0878	0.0000	0.2069	0.2853	0.0313	0.1000	0.0453	0.0302	0.0620	0.0262	0.0889	0.0583	-0.0321	0.0961	0.0239
0.0442	0.0303	0.0125	0.0233	0.0207	0.0230	0.1429	0.0568	0.0896	0.0455	0.0838	-0.0491	-0.0203	-0.0909	0.0568	0.0020	-0.0302	0.0198	0.4431	0.0499	-0.0100	0.0489	0.1341
-0.1849	0.1618	-0.0741	-0.0070	-0.0642	0.0297	-0.0208	-0.0543	0.0200	-0.1000	-0.0325	-0.0983	-0.0836	-0.0625	-0.0410	-0.0429	-0.0035	0.0058	-0.0990	-0.0284	0.0292	-0.0130	-0.0360
-0.0710	-0.2127	-0.1067	-0.0434	-0.1004	0.0039	-0.0200	-0.1170	-0.1924	-0.0763	-0.1017	-0.1226	0.0626	-0.1227	-0.2140	-0.0725	-0.0590	0.0275	0.0045	-0.0927	-0.0953	-0.1353	0.0000
-0.0124	0.1415	0.0299	0.0467	-0.0369	0.0087	0.0595	0.0296	0.1466	0.0523	0.1223	0.0404	0.0521	0.0030	0.2277	-0.1411	0.0598	-0.1058	0.0469	0.0821	0.0519	-0.0506	-0.0973
-0.0887	0.0338	0.0145	0.0166	-0.0125	0.0345	0.0082	-0.0644	-0.0220	0.0577	-0.0991	-0.1582	-0.1440	0.0076	-0.0806	-0.0402	-0.0028	0.0193	-0.0746	-0.0260	-0.1202	0.0406	0.0251
-0.0157	0.0082	-0.0571	0.0401	0.0549	-0.0233	0.0244	0.0488	0.0024	-0.0207	-0.0500	-0.0567	0.0718	-0.0301	-0.0965	0.0037	0.0007	0.0000	-0.0092	-0.0214	0.0306	0.0073	0.0447
0.0299	0.0270	0.0303	-0.0356	-0.0152	-0.0273	0.0516	0.0828	0.0304	0.0250	-0.0358	-0.0226	0.0920	-0.0310	0.0194	0.0732	0.0677	0.0000	0.0535	0.0000	0.0065	0.1613	-0.0152
-0.0329	0.0658	-0.0441	-0.0344	0.1779	0.0285	0.0132	0.0588	0.0551	-0.0449	0.0076	0.1538	-0.0385	0.0400	0.0333	0.0389	0.0523	0.0000	0.0221	0.0000	0.0011	-0.0035	0.0574
-0.0400	0.0000	-0.2769	-0.0019	0.0690	0.0299	0.0093	0.0172	-0.0287	-0.0196	-0.1463	-0.1400	0.1048	-0.0769	-0.0230	-0.0025	0.0441	0.0000	-0.0583	0.0000	-0.0238	-0.0174	-0.0993
0.0069	0.0494	0.1064	0.0396	0.1271	0.1698	0.0830	-0.0169	0.0894	0.0750	-0.0076	0.0814	-0.0052	-0.0633	0.1604	0.1050	0.1243	0.0000	-0.0161	0.0000	0.0414	0.0674	0.0574
-0.0021	0.0047	-0.0192	-0.0025	0.2593	-0.0124	0.0290	0.0000	-0.0264	-0.0400	-0.0269	0.0753	-0.0104	0.0098	0.0504	0.0128	0.0497	0.0000	-0.0023	0.0000	-0.0250	0.0963	-0.0389
0.0657	0.0585	0.6471	0.0006	-0.0909	0.0842	-0.1056	-0.0222	-0.0486	0.0426	0.0184	0.0633	0.0657	0.0476	-0.0255	-0.0581	-0.0524	0.0000	0.0864	0.0000	-0.0202	0.0048	0.0043
-0.0791	-0.0708	-0.0357	-0.0313	-0.0150	-0.0050	0.0222	-0.0057	-0.0240	-0.0316	-0.0606	-0.2006	-0.0472	-0.0589	0.0000	-0.0047	0.0383	0.0000	-0.0538	0.0000	0.0526	0.0555	0.0317
-0.1549	0.1071	-0.1235	0.0645	0.0660	-0.0183	0.0685	-0.0629	-0.1154	0.0086	-0.2033	-0.2745	-0.0513	-0.0483	-0.0961	-0.1700	0.0072	0.0000	-0.0727	0.0000	0.0207	-0.0143	-0.0503

0.0833	0.1140	0.0563	0.0418	0.0000	0.0152	0.0271	0.0207	0.0174	0.0657	0.2121	0.3135	-0.0118	0.0329	-0.0844	-0.0163	-0.0387	0.0000	0.0270	0.0000	0.0385	0.0261	-0.0515

Annex nr.2. Covariance Matrix (Ω) of shares returns

	ALR	AMO	ARS	ART	ATB	BIO	BRD	BRK	CMP	COMI	DAFR	EBS	OIL	SIF1	SIF3	SIF5	SNP	RRC	TEL	TGN	TLV	VNC
ALR	**0.01** 54	0.00 6807	0.0048 89854	0.0078 87285	0.0035 98029	0.0111 17874	0.0091 6042	0.0182 95424	0.0138 89006	0.0150 62368	0.0187 57331	0.0098 44081	0.0067 09787	0.0143 16406	0.0121 43323	0.0130 54491	0.0059 25103	0.0040 91059	0.0059 30416	0.0056 5078	0.0070 64297	0.0056 58336
ALT	0.01 351	0.01 4624	0.0070 30118	0.0127 25388	0.0112 55199	0.0205 66925	0.0077 1134	0.0226 29087	0.0221 65157	0.0133 55538	0.0178 61848	0.0087 19709	0.0074 89567	0.0252 39568	0.0145 12801	0.0209 02183	0.0064 08101	0.0031 42707	0.0079 78724	0.0087 83231	0.0096 0615	0.0077 38527
AMO	0.00 681	**0.02** **7774**	0.0048 35358	0.0053 09995	0.0110 70767	0.0114 3004	0.0048 8054	0.0125 01835	0.0131 70987	0.0104 25282	0.0108 26736	0.0061 02926	0.0058 7809	0.0124 48653	0.0072 07697	0.0107 65407	0.0049 80984	0.0048 20444	0.0061 30249	0.0055 08119	0.0061 83398	0.0093 80914
ARS	0.00 489	0.00 4835	**0.0081** **9095**	0.0048 78639	0.0035 5065	0.0038 63453	0.0027 8436	0.0072 52518	0.0075 44256	0.0051 21836	0.0060 12587	0.0032 22925	0.0059 43628	0.0067 8228	0.0049 83043	0.0063 84633	0.0030 04106	0.0004 4955	0.0031 66848	0.0037 98496	0.0030 12051	0.0047 64339
ART	0.00 789	0.00 531	0.0048 78639	**0.0149** **90837**	0.0046 64359	0.0108 39662	0.0055 3272	0.0132 31264	0.0118 6035	0.0083 42895	0.0119 84417	0.0065 30191	0.0045 43539	0.0144 63256	0.0092 08912	0.0124 21683	0.0049 69843	0.0006 40506	0.0041 82795	0.0041 86801	0.0060 82046	0.0043 53978
ATB	0.00 36	0.01 1071	0.0035 5065	0.0046 64359	**0.0110** **06799**	0.0087 04427	0.0020 0558	0.0091 95145	0.0077 25468	0.0044 03377	0.0066 40305	0.0039 08979	0.0048 2278	0.0111 21209	0.0067 51303	0.0085 74775	0.0014 22671	0.0017 35052	0.0037 65998	0.0027 57239	0.0030 88676	0.0055 76708
BIO	0.01 112	0.01 143	0.0038 63453	0.0108 39662	0.0087 04427	**0.0221** **99418**	0.0098 9791	0.0215 22558	0.0187 15094	0.0146 06813	0.0161 47823	0.0112 25218	0.0047 81348	0.0221 8257	0.0145 16492	0.0196 26476	0.0075 77564	0.0042 58574	0.0076 63052	0.0071 98178	0.0099 28841	0.0078 99077
BRD	0.00 916	0.00 4881	0.0027 84361	0.0055 32717	0.0020 05582	0.0098 97909	**0.0126** **3307**	0.0150 09422	0.0070 52812	0.0128 10028	0.0123 91254	0.0113 49946	0.0040 20492	0.0094 21875	0.0099 67217	0.0111 43096	0.0065 61665	0.0040 32941	0.0048 89226	0.0045 11051	0.0080 48318	0.0051 45512
BRK	0.01 83	0.01 2502	0.0072 52518	0.0132 31264	0.0091 95145	0.0215 22558	0.0150 0942	**0.0348** **97169**	0.0222 66374	0.0223 32809	0.0263 81827	0.0181 61938	0.0082 88623	0.0237 19281	0.0173 90262	0.0224 22445	0.0103 04648	0.0055 6053	0.0092 37311	0.0090 49618	0.0109 98614	0.0109 79557
CMP	0.01 389	0.01 3171	0.0075 44256	0.0118 6035	0.0077 25468	0.0187 15094	0.0070 5281	0.0222 66374	**0.0342** **47825**	0.0205 39288	0.0256 00672	0.0120 55866	0.0122 63055	0.0242 58574	0.0145 52679	0.0203 04042	0.0104 0077	0.0058 07254	0.0082 18236	0.0080 82948	0.0096 75066	0.0089 15861
COMI	0.01 506	0.01 0425	0.0051 21836	0.0083 42895	0.0044 03377	0.0146 06813	0.0128 1003	0.0223 32809	0.0205 39288	**0.0303** **81395**	0.0298 58815	0.0145 13027	0.0123 49914	0.0172 8816	0.0145 11672	0.0173 20645	0.0094 29665	0.0079 99436	0.0072 86726	0.0070 19451	0.0099 96852	0.0073 87048
DAFR	0.01 876	0.01 0827	0.0060 12587	0.0119 84417	0.0066 40305	0.0161 47823	0.0123 9125	0.0263 81827	0.0256 00672	0.0298 58815	**0.0400** **92464**	0.0134 07145	0.0159 60366	0.0224 46256	0.0175 01084	0.0193 4863	0.0085 72231	0.0073 90245	0.0082 90304	0.0077 49284	0.0097 32172	0.0075 19357
EBS	0.00 984	0.00 6103	0.0032 22925	0.0065 30191	0.0039 08979	0.0112 25218	0.0113 4995	0.0181 61938	0.0120 55866	0.0145 13027	0.0134 07145	**0.0187** **04303**	0.0044 72367	0.0114 67593	0.0111 80626	0.0131 07227	0.0083 43504	0.0051 71283	0.0052 39822	0.0051 36771	0.0080 61197	0.0050 78887
OIL	0.00 671	0.00 5878	0.0059 43628	0.0045 43539	0.0048 2278	0.0047 81348	0.0040 2049	0.0082 88623	0.0122 63055	0.0123 49914	0.0159 60366	0.0044 72367	**0.0155** **94231**	0.0105 5935	0.0089 08255	0.0094 87084	0.0033 14575	0.0026 17962	0.0042 58382	0.0037 35395	0.0041 50659	0.0048 30615
SIF1	0.01 432	0.01 2449	0.0067 8228	0.0144 63256	0.0111 21209	0.0221 8257	0.0094 2187	0.0237 19281	0.0242 58574	0.0172 8816	0.0224 46256	0.0114 67593	0.0105 5935	**0.0340** **36364**	0.0209 11347	0.0268 80745	0.0082 02383	0.0038 51049	0.0090 4342	0.0093 43381	0.0113 67693	0.0080 60168
SIF3	0.01 214	0.00 7208	0.0049 83043	0.0092 08912	0.0067 51303	0.0145 16492	0.0099 6722	0.0173 90262	0.0145 52679	0.0145 11672	0.0175 01084	0.0111 80626	0.0089 08255	0.0209 11347	**0.0196** **72714**	0.0193 96274	0.0071 8199	0.0032 78846	0.0063 59532	0.0072 41459	0.0094 04743	0.0071 27901
SIF5	0.01 305	0.01 0765	0.0063 84633	0.0124 21683	0.0085 74775	0.0196 26476	0.0111 431	0.0224 22445	0.0203 04042	0.0173 20645	0.0193 4863	0.0131 07227	0.0094 87084	0.0268 80745	0.0193 96274	**0.0252** **84728**	0.0094 8518	0.0030 6395	0.0080 86879	0.0087 80487	0.0116 69427	0.0077 92277
SNP	0.00 593	0.00 4981	0.0030 04106	0.0049 69843	0.0014 22671	0.0075 77564	0.0065 6166	0.0103 04648	0.0104 0077	0.0094 29665	0.0085 72231	0.0083 43504	0.0033 14575	0.0082 02383	0.0071 8199	0.0094 8518	**0.0090** **50266**	0.0030 08523	0.0034 97713	0.0041 44459	0.0056 61122	0.0048 30948
RRC	0.00 409	0.00 482	0.0004 4955	0.0006 40506	0.0017 35052	0.0042 58574	0.0040 3294	0.0055 6053	0.0058 07254	0.0079 99436	0.0073 90245	0.0051 71283	0.0026 17962	0.0038 51049	0.0032 78846	0.0030 6395	0.0030 08523	**0.0110** **34536**	0.0021 85523	0.0016 03914	0.0044 41866	0.0023 15645

TEL	0.00593	0.00613	0.0031 66848	0.0041 82795	0.0037 65998	0.0076 63052	0.0048 8923	0.0092 37311	0.0082 18236	0.0072 86726	0.0082 90304	0.0052 39822	0.0042 58382	0.0090 4342	0.0063 59532	0.0080 86879	0.0034 97713	0.0021 85523	**0.0062 8336**	0.0042 94571	0.0042 19913	0.0046 35288
TGN	0.00565	0.00 5508	0.0037 98496	0.0041 86801	0.0027 57239	0.0071 98178	0.0045 1105	0.0090 49618	0.0080 82948	0.0070 19451	0.0077 49284	0.0051 36771	0.0037 35395	0.0093 43381	0.0072 41459	0.0087 80487	0.0041 44459	0.0016 03914	0.0042 94571	**0.0062 92648**	0.0044 72446	0.0041 45886
TLV	0.00706	0.00 6183	0.0030 12051	0.0060 82046	0.0030 88676	0.0099 28841	0.0080 4832	0.0109 98614	0.0096 75066	0.0099 96852	0.0097 32172	0.0080 61197	0.0041 50659	0.0113 67693	0.0094 04743	0.0116 69427	0.0056 61122	0.0044 41866	0.0042 19913	0.0044 72446	**0.0106 48497**	0.0037 7702
VNC	0.00566	0.00 9381	0.0047 64339	0.0043 53978	0.0055 76708	0.0078 99077	0.0051 4551	0.0109 79557	0.0089 15861	0.0073 87048	0.0075 19357	0.0050 78887	0.0048 30615	0.0080 60168	0.0071 27901	0.0077 92277	0.0048 30948	0.0023 15645	0.0046 35288	0.0041 45886	0.0037 7702	**0.0093 11355**

Annex nr. 3 Correlation Matrix of shares returns

	ALR	***ALT***	***AMO***	***ARS***	***ART***	***ATB***	***BIO***	***BRD***	***BRK***	***CMP***	***COMI***	***DAFR***	***EBS***	***OIL***	***SIF1***	***SIF3***	***SIF5***	***SNP***	***RRC***	***TEL***	***TGN***	***TLV***	***VNC***
ALR	1.0000	0.6354	0.3291	0.4353	0.5191	0.2763	0.6012	0.6567	0.7891	0.6047	0.6963	0.7548	0.5800	0.4329	0.6253	0.6976	0.6615	0.5018	0.3138	0.6028	0.5740	0.5516	0.4725
ALT	0.6354	1.0000	0.5121	0.4533	0.6065	0.6261	0.8055	0.4004	0.7069	0.6989	0.4471	0.5206	0.3721	0.3500	0.7984	0.6038	0.7671	0.3931	0.1746	0.5874	0.6461	0.5432	0.4680
AMO	0.3291	0.5121	1.0000	0.3206	0.2602	0.6332	0.4603	0.2606	0.4016	0.4271	0.3589	0.3244	0.2678	0.2824	0.4049	0.3083	0.4062	0.3142	0.2754	0.4640	0.4166	0.3596	0.5833
ARS	0.4353	0.4533	0.3206	1.0000	0.4403	0.3739	0.2865	0.2737	0.4290	0.4504	0.3247	0.3318	0.2604	0.5259	0.4062	0.3926	0.4436	0.3489	0.0473	0.4414	0.5291	0.3225	0.5455
ART	0.5191	0.6065	0.2602	0.4403	1.0000	0.3631	0.5942	0.4020	0.5785	0.5234	0.3909	0.4888	0.3900	0.2972	0.6403	0.5362	0.6380	0.4267	0.0498	0.4310	0.4311	0.4814	0.3685
ATB	0.2763	0.6261	0.6332	0.3739	0.3631	1.0000	0.5569	0.1701	0.4692	0.3979	0.2408	0.3161	0.2724	0.3681	0.5746	0.4588	0.5140	0.1425	0.1574	0.4528	0.3313	0.2853	0.5509
BIO	0.6012	0.8055	0.4603	0.2865	0.5942	0.5569	1.0000	0.5910	0.7733	0.6787	0.5624	0.5413	0.5509	0.2570	0.8070	0.6946	0.8284	0.5346	0.2721	0.6488	0.6090	0.6458	0.5494
BRD	0.6567	0.4004	0.2606	0.2737	0.4020	0.1701	0.5910	1.0000	0.7148	0.3391	0.6539	0.5506	0.7384	0.2864	0.4544	0.6322	0.6235	0.6137	0.3416	0.5488	0.5059	0.6939	0.4744
BRK	0.7891	0.7069	0.4016	0.4290	0.5785	0.4692	0.7733	0.7148	1.0000	0.6441	0.6859	0.7053	0.7109	0.3553	0.6882	0.6637	0.7548	0.5798	0.2834	0.6238	0.6107	0.5706	0.6091
CMP	0.6047	0.6989	0.4271	0.4504	0.5234	0.3979	0.6787	0.3391	0.6441	1.0000	0.6367	0.6909	0.4763	0.5306	0.7105	0.5607	0.6900	0.5908	0.2987	0.5602	0.5506	0.5066	0.4993
COMI	0.6963	0.4471	0.3589	0.3247	0.3909	0.2408	0.5624	0.6539	0.6859	0.6367	1.0000	0.8555	0.6088	0.5674	0.5376	0.5936	0.6249	0.5687	0.4369	0.5274	0.5077	0.5558	0.4392
DAFR	0.7548	0.5206	0.3244	0.3318	0.4888	0.3161	0.5413	0.5506	0.7053	0.6909	0.8555	1.0000	0.4896	0.6383	0.6076	0.6232	0.6077	0.4500	0.3514	0.5223	0.4879	0.4710	0.3892
EBS	0.5800	0.3721	0.2678	0.2604	0.3900	0.2724	0.5509	0.7384	0.7109	0.4763	0.6088	0.4896	1.0000	0.2619	0.4545	0.5829	0.6027	0.6413	0.3600	0.4833	0.4735	0.5712	0.3848
OIL	0.4329	0.3500	0.2824	0.5259	0.2972	0.3681	0.2570	0.2864	0.3553	0.5306	0.5674	0.6383	0.2619	1.0000	0.4583	0.5086	0.4778	0.2790	0.1996	0.4302	0.3771	0.3221	0.4009
SIF1	0.6253	0.7984	0.4049	0.4062	0.6403	0.5746	0.8070	0.4544	0.6882	0.7105	0.5376	0.6076	0.4545	0.4583	1.0000	0.8081	0.9163	0.4673	0.1987	0.6184	0.6384	0.5971	0.4528
SIF3	0.6976	0.6038	0.3083	0.3926	0.5362	0.4588	0.6946	0.6322	0.6637	0.5607	0.5936	0.6232	0.5829	0.5086	0.8081	1.0000	0.8697	0.5382	0.2225	0.5720	0.6508	0.6498	0.5267
SIF5	0.6615	0.7671	0.4062	0.4436	0.6380	0.5140	0.8284	0.6235	0.7548	0.6900	0.6249	0.6077	0.6027	0.4778	0.9163	0.8697	1.0000	0.6270	0.1834	0.6416	0.6961	0.7112	0.5078

SNP	0.5018	0.3931	0.3142	0.3489	0.4267	0.1425	0.5346	0.6137	0.5798	0.5908	0.5687	0.4500	0.6413	0.2790	0.4673	0.5382	0.6270	1.0000	0.3011	0.4638	0.5492	0.5767	0.5263
RRC	0.3138	0.1746	0.2754	0.0473	0.0498	0.1574	0.2721	0.3416	0.2834	0.2987	0.4369	0.3514	0.3600	0.1996	0.1987	0.2225	0.1834	0.3011	1.0000	0.2625	0.1925	0.4098	0.2284
TEL	0.6028	0.5874	0.4640	0.4414	0.4310	0.4528	0.6488	0.5488	0.6238	0.5602	0.5274	0.5223	0.4833	0.4302	0.6184	0.5720	0.6416	0.4638	0.2625	1.0000	0.6830	0.5159	0.6060
TGN	0.5740	0.6461	0.4166	0.5291	0.4311	0.3313	0.6090	0.5059	0.6107	0.5506	0.5077	0.4879	0.4735	0.3771	0.6384	0.6508	0.6961	0.5492	0.1925	0.6830	1.0000	0.5464	0.5416
TLV	0.5516	0.5432	0.3596	0.3225	0.4814	0.2853	0.6458	0.6939	0.5706	0.5066	0.5558	0.4710	0.5712	0.3221	0.5971	0.6498	0.7112	0.5767	0.4098	0.5159	0.5464	1.0000	0.3793
VNC	0.4725	0.4680	0.5833	0.5455	0.3685	0.5509	0.5494	0.4744	0.6091	0.4993	0.4392	0.3892	0.3848	0.4009	0.4528	0.5267	0.5078	0.5263	0.2284	0.6060	0.5416	0.3793	1.0000