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Portfolio investment management and risk analysis in electronic stock markets

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Abstract

In recent years, as liberalized and integrated financial markets and the quantity of countries and products to invest have increased, institutional and wealthy individual investors have started to look for alternative investment as well as high-yielding products with traditional products with high percentages. Investors prefer an investment with many advantages while managing financial assets, but assume that the risk is low. Traditional portfolio management, however, places emphasis on volatility to reduce portfolio risk, and modern investors use investors' historical knowledge of mathematical and statistical methods to create alternatives to investors instead of creating portfolios. Markowitz, one of the initiators of portfolio management, considered a standard deviation as a risk. If you have a huge number of stocks selected, it is hard to calculate standard deviations instead of standard one. So they proposed a linear program model as a portfolio proposal. Their models do not interfere with the number of shares and the distribution of industry branches. As a result, a portfolio can consist of theoretically the only shares.

The study consists of three sections. In the first part, basic definitions related to portfolio, two types of portfolio and Markowitz mean-variance model are given. In the second part, information was given about the distribution of portfolio management and investment analysis and in the third part, the risk's concept and the calculation of risk were provided.

Introduction

In the last 40 years, the concept of portfolio management has developed quite rapidly with the development of markets and the rise of innovative products and the introduction of more professional applications, it has moved away from simple theoretical approaches to meet the risk and return expectations of investors. In this period, the biggest improvement affecting portfolio management practices is the rapid change in the risk perception of both individual and institutional investors. As we develop new products in the upcoming period, risk analyses of these products will be important and new horizons will be opened in portfolio management.

In this period, the most important initiative in portfolio management has emerged through the researches of Markowitz. Markowitz, who is accepted as the creator of Modern Portfolio Theory, has set out to know that the investor who invests in a certain portion of its assets cannot know the return that will be obtained at the finish of the period and he attempted to make some estimates using previous period risk and yield analyzes of securities. Today, portfolio management has reached a more measurable level thanks to concepts such as Effective Portfolio Concept, Financial Asset Pricing Model (FAPM), Arbitrage Pricing Model (APT), Effective Markets Hypothesis. It will be easier for investors to reach their goals through the proper definition of portfolio management and the successful implementation of the Portfolio Management Process. The process of the portfolio management should be elaborated on a detailed basis, and a variety of analyzes should be performed for each investor. Portfolio Planning Process, Portfolio Implementation Process and Portfolio Feedback Process must be completed completely. In the Portfolio Planning Process, the investor's objectives and limitations should be determined accurately and an investment policy document appropriate to the investor should be organized and an appropriate management style should be determined for the investor. After analyzing market

expectations and establishing strategic asset distributions, it is ensured that the criteria determined in the planning process of the portfolio are applied in the Portfolio Implementation Process. A portfolio is created considering the investment strategy, investment styles and market expectations of the portfolio. At this point, it is significant to make the correct choice of the portfolio, to create asset distributions, to review the research reports and to make the trading decisions with the right timing in the market. Finally, within the Portfolio Feedback Process; Monitoring and Revision of Portfolio, Decisions of Tactical Asset Allocation and Performance Evaluation of Portfolio should be performed effectively.

The portfolio needs to be varied in order to reach a net real return in current interest levels. It is essential to consider different investment alternatives. The purpose of portfolio management is to decide which assets will be entered into the portfolio within the framework of the decision-making process against risk and return and what assets will be extracted from the portfolio depending on the changing economic conditions.

Portfolio management can be said to be a set of plans to achieve financial aims. The most critical point here is that the investor's financial objective is well defined. For example, wealth protection, providing absolute returns, creating a certain accumulation for the future.

Today, new investment instruments have different strategies and features, the correct classification of assets is important in analyzing the return and risk situations of portfolios and increasing the diversification opportunities. Generally accepted classes of assets; local equities, locally fixed income securities, international equities, international fixed income securities, real estate investments, cash also cash investments. In recent years, alternative investments have been used as a different asset classification instead of real estate. Alternative investments are generally real estate, private equity funds, natural resources,

commodities, exchange rates and hedge funds, and these investments are the right approach to identify non-homogeneous structures as different asset classes due to their different risk-return characteristics.

In the stock market, there is a near connection between risk and return. In financial terms, risk management is the procedure of finding and assessing risks and then developing approaches to maximize profits by managing and minimizing risks. All investments require certain risks, and investors must receive fair compensation to cover the risks. So the risk is the focus of the stock market, an investor cannot gain profit without any risk and successful investors use stock market risk management strategies to minimalize risk and maximize profits.

Recently, wealthy individual investors and institutional investors have begun to make significant changes in their investment habits. In addition to traditional stock and bond investments, investors have turned to more investment-oriented investments over time, thanks to the diversity of products offered by alternative investments. Similarly, alternative investments have been preferred more and more in many portfolios as they contribute a lot to risk diversification in portfolios.

Accurately measuring whether an investment is successful or not is of great importance in investment analysis. In order to calculate the performance of any investment, many different studies have been carried out in recent years and various performance measurement criteria or ratios have emerged.

1. The Portfolio Theory

1.1 The Definition of Portfolio

Portfolio, word meaning wallet. The meaning of the portfolio in the dictionary is defined as ”the total value of the assets that are owned by more than 1 asset with the same or different characteristics.” The financial meaning is the total value of an investor's investment by investing in more than 1 investment instrument (cash, gold, foreign currency, time deposits, bonds, stocks and treasury bills) with the same or different characteristics.

1.2 Traditional Portfolio Approach

According to the traditional portfolio approach, portfolio management is not a science but an art. This art has its own rules and principles. These are important for the investor and require careful work. However, the ability to utilize these theoretical tools effectively depends on knowledge and experience that vary from person to person. Therefore, it can be said that the traditional portfolio analysis involves subjective acquisitions such as intuition and introversion. (Christy and Clendeni, 1974)

The main aim of the traditional method is to increase the benefit of the investor. In other words, assuming that any consumer chooses goods and services that will provide the highest benefit, it is supposed that the investor also selects a portfolio that maximizes the benefit preferences for risk and returns. In other words, according to the risk level, the investor is trying to increase to maximum the determined benefit**.** (Bekçioğlu, 1984, p10)

In the traditional portfolio approach, the portfolio return is the dividend of the securities that create the portfolio and the value increase in a certain period. Therefore, investors are expected to estimate future securities returns. On the

other hand, the risks that may appear according to various portfolio returns should be calculated. The major aim of making a portfolio is to distribute the risk. As the securities' return that makes up the portfolio will not move in an identical direction, the portfolio's risk will be smaller than the single security's risk. The traditional portfolio theory is dependent on the principle of increasing the number of securities on the portfolio. (Fisher and Jordan, 1979, p.496)

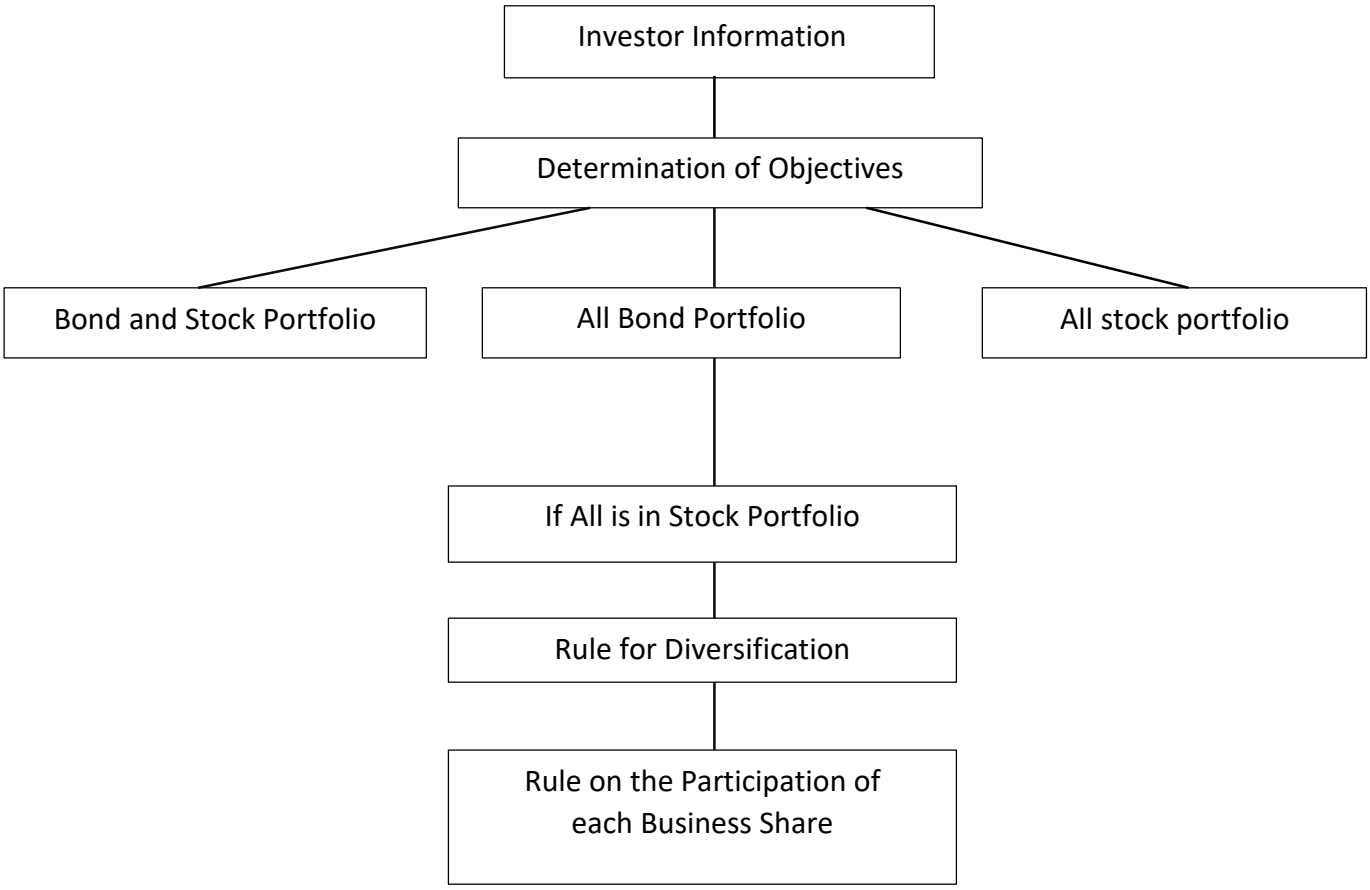

Figure 1. Stages in Traditional Portfolio Approach

The traditional approach in the management of securities portfolios; It includes the stages of determining the purpose of the investor, choosing the securities to be involved in the portfolio and managing the portfolio. In general, the objectives of the investors can be stated as obtaining a fixed and stable income, protecting

the capital or obtaining the capital gain. It is probably to show the stages of traditional portfolio theory as in **Figure 1.**

The start step in the traditional portfolio approach is to obtain information about the investor. This information helps the portfolio manager in determining the criteria on the portfolio. In this figure, the purpose of the most suitable portfolio can be revealed. To summarize, the steps on the traditional approach of the portfolio are as follows. (Jones and others, 1977, p.327)

1. Collecting information about the investor
2. Determining the purpose of the portfolio
3. Investment policies
4. Selection of securities to be involved in the portfolio

1.3 Modern Portfolio Approach

In countries where the capital market has developed, until the 1950s, investors thought that they could reduce the risk only by rising the amount of securities in the portfolio without considering the relationships between securities' returns in the portfolio. However, in the modern portfolio approach, the risk cannot be reduced by only diversifying the portfolio, because, in the portfolio, securities or securities groups are suggested to move in the equal or opposite direction. (Akmut, 1989, p.5)

Known as the inventor of modern portfolio theory, Harry Markowitz, in his article titled "portfolio selection" published in 1952, explored how securities on the portfolio could achieve the maximum possible rate of return at certain risk levels. Markowitz has contributed to traditional portfolio management in three key areas.

The first and most important of all, in portfolio management, is to prove that the sum of parts or parts is not equal to the whole. Markowitz has shown that the portfolio risk may be smaller than the risks of the assets that make up the portfolio,

and under certain circumstances, the non-systematic risk of portfolio can be made zero.

Secondly, although some portfolios of the investors provide the same return because they are riskier, some of the portfolios are at the same risk level, they do not prefer because they provide less return and therefore some portfolios are superior to others and this situation is the principle of superiority. According to Markowitz, there is an effective limit in the choice of securities.

The third important point is that the effective limit can be obtained by quadratic programming. The method developed by Markowitz requires a complex set of calculations. For this reason, William Sharpe, a student of Markowitz in 1963, developed this method in a simple way. This method known as single index model has been used as a package program in the 1970s and used in computer analysis. The single index model is mostly used for maximizing the returns of investments in alternative stocks, while the model developed by Markowitz is used in the analysis of investments in bonds, stocks, real estates and real estates.(Korkmaz, 2012, p.144)

In the case of a huge number of securities investment in portfolio theory, portfolio risk is especially investigated. Portfolio risk is measured in terms of changes in returns. Variation or deviation in returns is expressed with variance or standard deviation. Which securities will be taken into the portfolio is important. What is the effect on a portfolio return when security is added to or removed from a portfolio? Will portfolio risk increase or decrease next year? Will the portfolio be realized at the expected rate? The answers to these and similar questions are what investors want to know. In short, a group of investors, what kind of portfolio should be created, the portfolio returns are the most and the portfolio risk is minimal. These concerns about portfolio investors have been tried to be minimized with the help of modern portfolio theory.

1.3.1 Modern Portfolio Theory Basics

It is probable to summarize the views of Harry Markowitz on the modern portfolio approach, which differentiates it from the traditional portfolio approach. (Markowitz, 1959, p.3)

The portfolio's choice is broader and different than the concept of securities selection. A good portfolio should not be considered as a long list of good stocks and bonds. Because the securities taken with certain purposes and techniques to the portfolio should be considered one by one and their differences and features should be investigated. Additionally, portfolio analysis has two dimensions. The first is the investor who invests in securities. The other is the financial assets that make up the portfolio. When making a portfolio analysis, first of all, the investors' expectations should be considered.

Portfolio analysis begins with the collection of the essential information on securities. Establishes the basic inputs of portfolio analysis and various sources of information on securities. Most of these resources; the information about the entity to which the security belongs, each security's performance in previous years, the expectations for future performances of securities or assets. If, as portfolio entry input, the performance of the securities in the past years is used, the result will generally be an improved repetition of the past. On the other side, if the expectations for the future are input to the portfolio analysis, the result will differ depending on the direction of the expectations.

The modern portfolio theory's basics can be considered as the connection between the uncertainty of portfolio returns and the securities.

The equations used in modern portfolio theory can be expressed as follows.

The expected return is calculated as follows.

$$E(r_i) = \sum_{i=1}^{n} P_i \, r_i$$

The variance of a stock is calculated as follows.

$$\sigma_i^2=\sum_{i=1}^{n} P_i\,[r_i - E(r)]^2$$

The standard deviation calculates as the square root of the variance.

$$\sigma = \sqrt{\sum_{i=1}^{n} P_i\,[r_i - E(r)]^2}$$

In here;

σ_i^2 : the variance of the asset of i

σ_i : the standard deviation of the asset of i

$E(r_i)$ the excepted return of the asset of i

P_i : the realization possibility of the presence of the asset return of i

P_{ir_i} : the excepted return on the expected return of the asset of i

n : Number of assets (1,2,3…..n)

It is obvious that those with the highest expected return on securities with the same risk are preferred, or those by the equal expected yield will be preferred. It is possible to decide which of the 2 securities with different risks and expected returns to be selected with the help of the coefficient of variation.

Coefficient of Variation ;

$$CV = \frac{\sigma_i}{Er_i}$$

The usage of the coefficient of change in securities selection is revealed in Table1.

Financial Assets	Expected Return (%)	Risk(%)
X	20	15
Y	10	8

$$CVx = \frac{15}{20} = 0.75$$

$CV_Y = \frac{8}{10} = 0.8$

As shown in Table 1, the risks or expected returns of X and Y securities are not equal. In this case, the optimal of the coefficient of change should be decided. It is expected that the investor will choose the smaller X securities with the coefficient of variation.

1.3.2 The Uncertainty of Portfolio Returns

An investor who faces a problem of uncertainty does not have objective knowledge of the possibilities of possible outcomes.

Generally, uncertainty is a major component of securities investments. Aside from the fact that future estimation techniques in economic subjects are not sufficiently effective in the decision-making process, the changes caused by non-systematic events, capital gains or dividends affect a certain security aspect, emphasize the extent of uncertainty. For example, problems in international relations, the decrease or increase of military expenditures, a dry summer, a great discovery, are the uncertainties that portfolio managers cannot directly account for. The occurrence of these negative conditions will lead to deviations in the portfolio manager's expectation of the or investors. (Bolak, 1991, p.162)

1.3.3 Calculation of the expected Return of the Portfolio

The anticipated return in the portfolio is equivalent to the weighted average expected return of the securities. Weight is the proportion of the securities in the portfolio. Accordingly, the portfolio's expected percentage is formulated as follows.

$$E(R_P) = \Sigma_{i=1}^{n} W_i R_i$$

In here,

W_i : The weight of the i assets on the portfolio

R_i : Expected return of i

$E(R_P)$: Expected return on portfolio of n securities

1.3.4 Relationship Between Securities Returns

The second important element of securities investments is the relationship between returns. Markowitz has shown that by considering the relationships between financial assets return and the combination of assets that are not fully positive, the risk can be decreased without any sacrificing expected returns. As it is known, securities returns can rise and fall together at the same time. However, this relationship is not absolutely complete. The impact of alteration in economic conditions on securities may vary on a sectoral or business basis.

If there was no relationship between securities returns, diversification could not be further limited. Therefore, there is a relationship between the yields of securities. But this relationship is not complete. Therefore, the risk can be decreased by diversification but not eliminated. The relationship between securities returns is not the same for all securities. The linking between the securities yields of the two enterprises operating in the same industry is high than the linking between the returns of the securities operating in the different industries. In order to reduce the portfolio risk, securities with a high relationship between securities returns should not be involved in the portfolio. For example, a group of hundred securities, whose returns are moving in the same direction, may be more protective than just single security. In parallel, according to the modern portfolio theory, it is recommended that the amount of securities to be involved in the portfolio should generally be between 4-15.

1.3.5 Fundamentals of Portfolio Analysis

In order for the decision process to work in the portfolio analysis, the investor type needs to be well defined. First of all, the criteria such as the risk preference of the investor, the standard of living, the volume of savings, and the legal

situation should be laid down. Because, for each type of investor, the details of portfolio analysis have to be revealed separately.(Amling, 1978, p.619)

However, two main approaches apply to all investors: (Markowitz, 1959, p.6)

1. All investors prefer more returns than fewer returns at the same risk level.
2. All investors desire less risk than more risk at an equal level of return.

1.4 Assumptions of Modern Portfolio Theory

The assumptions of modern portfolio theory can be classified under five main headings: (Harrington, 1997, p.28)

1. The aim of the investor is to increase the utility function. All investors are rational thinkers. Investors aim to increase the expected benefit in each period and have a marginal benefit that is diminishing their well-being. That is to say, investors perceive each investment with their probability distribution that will contribute to their welfare at the final of a period of holding.

2. Investors only make investment selections based on expected returns and risks. As a measure of return, the mean of the expected returns of the assets constituting the portfolio and the variance of these portfolio returns as the measure of risk is used.

3. Investors' expectations about risk and return are homogeneous. In other words, all investors prefer more returns than less at the same risk level.

4. Investors have an identical time horizon

5. The capital market is highly effective, according to modern portfolio theory. In other words, information is rapidly and fully mirrored in the prices of securities. The market is always in balance. There is no limit for the flow of information and it is possible for investors to reach the information in question simultaneously.

1.5 Markowitz Mean-Variance Model

Many savings owners create portfolios without being aware of them throughout their life. These portfolios are perhaps not the most suitable portfolios. However, investors have created these portfolios with risk-return preferences. The real purpose for making a portfolio is the effort of the investor to reach the risk-return component as intended.

By creating a portfolio, it is possible for investors to make the best combination of risk returns through diversification. The method that can be used at this stage is the "Mean-Variance Model" proposed by Markowitz. (Harrington, 1997, p.9)

As is known, the traditional portfolio approach is broadly qualitative. The related variables are not tried to be converted into quantitative. However, in modern portfolio theory, the Mean-Variance model strives to quantify the relevant variables and to put the portfolio composition process into a standard optimization framework. This requires the calculation of the risk and expected a return on each security.

Markowitz, who made the first study on modern or scientific portfolio composition, states that effective portfolios should be formed by considering the expected return and the variance of these returns.

The Mean-Variance model is created on the following two assumptions:

1. Investors are individuals who are at risk.
2. The investments' probability distribution is approximately normal.

Therefore, an investor has the standard deviation from the two investment alternatives with the identical level of expected return, the lower risk; or standard deviations will choose the alternative which is the most expected return from equal investments. When the choice is made according to the average variance criterion, if the assumptions mentioned are correct, the investor increase to the maximum level the expected benefit. Furthermore, Markowitz argued that in order to form effective portfolios, it is essential to know the covariances between the

expected return, risk and securities in relation to each security. However, the mean-variance criterion cannot always be decided. Another criticism that can be brought to the average is the assumptions. The first validity assumption that individuals avoid risk is acceptable. However, the normal distribution of returns on investment may not be realistic. Alternatively, instead of normal distribution assumption, investors may be assumed to have a quadratic or quadratic utility function. In this case, the mean-variance criterion continues to be valid. (Aydoğan, 1989, p.7)

2. Portfolio Management

The stock, bonds and other securities that are owned by a real or legal person form, creating their portfolio. Time-varying economic conditions may require changes to the portfolio such as removing certain securities, adding some, or changing the amounts of securities. Deciding on such issues and making the essential arrangements is a knowledge that requires knowledge. This subject is called portfolio management. Portfolio Management is to bring the assets together with various strategies considering the developments in the market in line with the investment targets and limitations. In general, investors give the management of their portfolios in two ways:

1. The portfolio is entrusted to the manager but the decision is not given to the manager. In this situation, a manager is usually a soft person who fulfils all orders of the portfolio owner. The manager finalizes the trading transactions based on the orders given by the investor. The power to order and decide on all these works belongs to the portfolio owner. Routine works such as the collection of dividends and interest rates and timely collection of the amounts of the redeemed bonds are made without giving orders to the manager. This form of management may have some drawbacks. As it is

known, in the financial markets, big changes, ups and downs can be experienced in a short time period. For this reason, the timing error is made, especially because the evaluation of opportunities or reduction of losses depends on the order of the investor.

2. The second implementation in management of portfolio is the full authorization of the portfolio manager on securities. In this case, the portfolio has no real owner. However, the manager may act as the holder of the portfolio, even though it's not legal. Relations between the owner and the manager are regulated by a contract to be made between them. All types of authority can be given to the manager by agreement. In this case, if the managers desire, they can sell the securities of the portfolio and buy the securities to the portfolio which they want. The administrator uses or sells the rights of securities of the portfolio. Shortly, the manager as the actual owner of the portfolio can perform all transactions related to the portfolio with a contract. (Apak and Demirel, 2009, p.300)

The purpose of portfolio management is to take various securities into the portfolio according to the needs of investors and to manage the portfolio in according with the investment objectives. Investors' needs are expressed as a risk. The portfolio manager tries to increase the profitability of the investor in accordance with the risk.

As in all complex problems, decisions in portfolio management are difficult and require a long process. That is due to the hardship of selecting portfolios with the desired characteristics by using a big number of complex data in the creation of portfolios that conform to the investor's criteria.

2.1 Portfolio Management Process

The portfolio management system is a dynamic process consisting of 5 stages:

1. Portfolio Planning

2. Investment Analysis
3. Portfolio Selection
4. Portfolio Collection
5. Portfolio Revision (Smith, 1971, p.42)

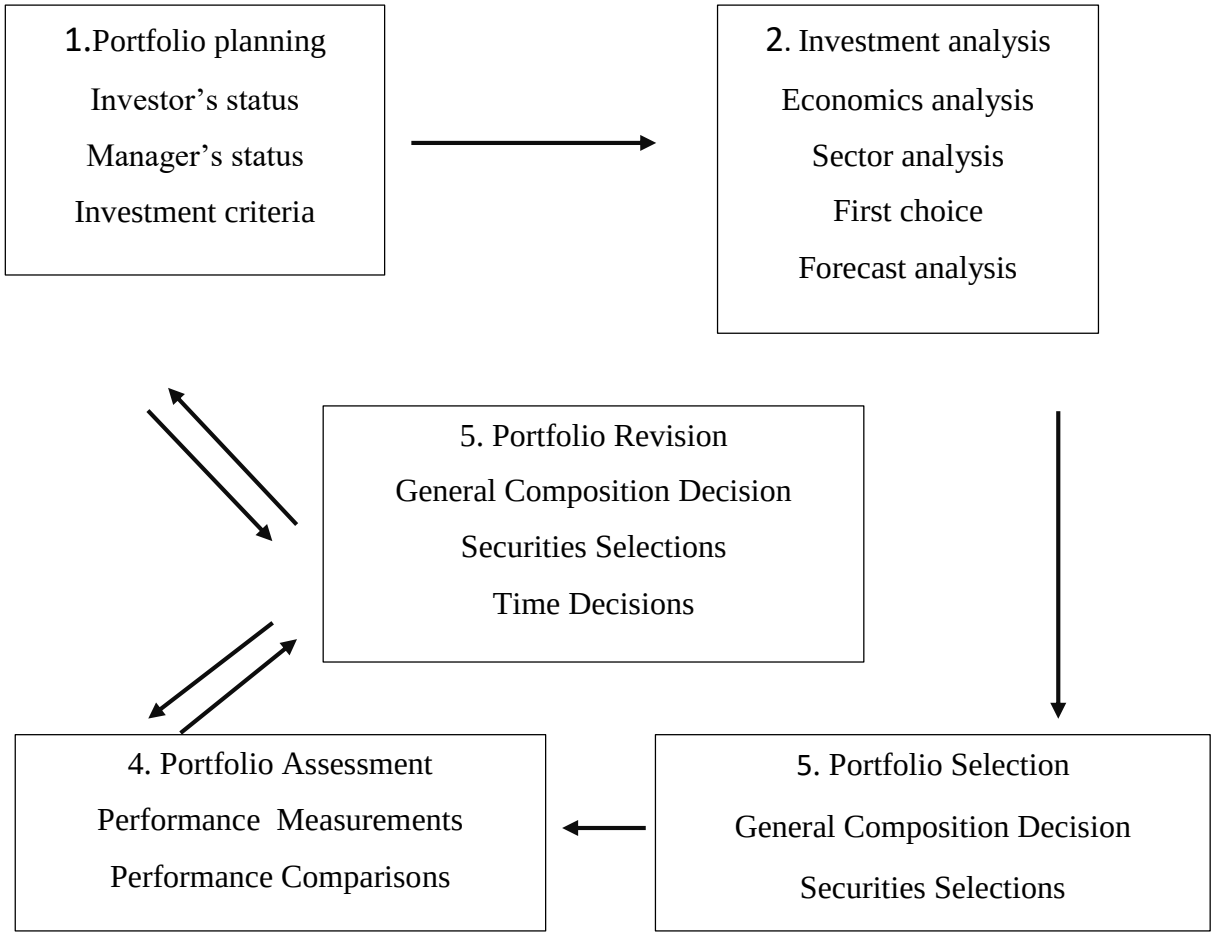

Figure 3. Portfolio Management Process

2.1.1 The Planning of Portfolio

Portfolio planning can be examined in 3 main articles.

- Investor's status
- Manager's status
- Investment Criteria

Investigating the situation of the investor; It is essential to explain the investment period, to specify the wishes and the investors' objectives and to estimate the fund movements in the investment process. All this information about the investor will help to create a healthy portfolio.

When evaluating the status of the portfolio manager; factors such as getting preferable results than the results obtained from the portfolio created by the investor or getting preferable results than the results that obtained with validated investment methods should be examined. Regarding the issue, especially for investors, the role and responsibility of the portfolio manager become clearer.

The ending stage of portfolio planning is the definition of the investment criterion that the portfolio manager wishes to achieve. The portfolio manager ought to determine the investment criterion to meet both the investor's goals and his / her own expectations. (Apak and Demirel, 2009, p.301)

2.1.2 Investment Analysis

The second stage of portfolio management is investment analysis. Investment analysis is an analysis of the qualifications of securities to be involved in the portfolio, and quantitatively estimating the performance of different securities within a certain time. In this analysis, it is not only the evaluation and analysis of past performances of financial assets which can be invested. In addition, prospective explicit and mathematical estimates should be made by using various information. With such calculations, it can be demonstrated whether international or national economic, social and political conditions are suitable for investment. Investment analysis consists of economic analysis, sector analysis, first selection and forecasting analysis among securities.(Baylan and Can, 2005, p.19)

The enterprises' profitability and thus the increase in the dividends are related to the progress of the economy which they are in. Economic fluctuations affect the movements in the securities market. It helps the profits of the growing

economy firms. In these periods, the profit share distributed by the companies is also high. Firms profitability falls in the stability and shrinking economic conditions. In these periods, the securities market is likely to be stagnant. Since the profitability of the firms is low, the stocks of the companies do not bring much profit. In general, a variety of data can be utilized to evaluate the situation of the economy. Some of these data include:

1. Gross National Product
2. Per Capita Income
3. Interest rates
4. Money and credit supply
5. Employment level
6. A general level of the prices
7. Balance of payments
8. Public and private sector expenditures
9. Industrial, agricultural and service production
10. Developments in the construction industry
11. Monetary and fiscal policies

Managers and economists can use an almost infinite amount of variables in future estimations. By interpreting the economic data mentioned above, the effects of the growth and reduction periods of the economy can be obtained and the impacts on the operating activities can be investigated.

Sector analysis is the main area of interest in securities analysis. According to the operations' results of the enterprise, which is planned to be invested, it may be possible to see the growth and growth in the sector and to make investments by comparing with the sector sizes. In order to decide rational decisions, the situation of the company in the sector and status within the sector should be scrupulously examined. Because, in economic fluctuations terms, the degree of influence of sectors is different. For example, some sectors, such as automotive,

construction, are high precision to economic fluctuations. Certain sectors, such as pharmaceuticals and food, are not responsive to cyclical fluctuations. In the periods when the economy has improved, more growth can be observed in the electricity-electronics sector.

When making the first selection of securities, the securities and the sector which can be nominated to enter the portfolio, are determined at the finish of the financial and sector analysis. Securities can be selected qualitatively by taking benefit of the personal information and experience of portfolio managers and by selecting a number of quantitative data.

In the fourth phase of investment analysis, the investment expert tries to make quantitative estimates of the performance of a security. The experts' estimates can be: (Friedman and others, 2005, p.39)

1- Profit, dividend, interest and market values at the finish of each year,
2- Possible deviations in these estimates,
3- Relations between securities.

The challenge at the final stage is to make these estimates clear and quantitative.

2.1.3 The Selection of Portfolio

Portfolio selection; primarily, determination of the quantity of investment to be creat in each investment category. Then, the investment amount to be made to different securities should be determined in this category. This stage constitutes the first step of the investment expert's initiative on behalf of the investor. In portfolio selection, it is determined which assets will be the portfolio first.

The most significant choice in portfolio management is the selection of the asset mix**.** The selection of the asset segment refers to dividing the portfolio investment in different asset forms such as equity, bonds, warrants, treasury bills, financial bonds, asset-backed securities, repo, gold and foreign currency. Then, it is determined how much investment to be made. This choice is an important stage.

Because, investment analysis, economic analysis, sector analysis, initial separation, forecasting analysis and general composition decisions are the preliminary studies for this election. All these studies can clarify the investment decisions of the portfolio manager and reduce potential risks. .(Ceylan and Korkmaz, 1998, p.230)

2.1.4 The Assessment of Portfolio

The portfolio has to be evaluated at certain time intervals due to its dynamic structure. At this stage, changes in the efficiency and price of the portfolio over time are examined. The results are evaluated according to the objectives and investment criteria of the investor determined at the start of the investment period. Since the portfolio's evaluation is an evaluation of the results caused by the portfolio selection, it is determined to what extent the decisions are expected. As it is known, the securities selection is made at the start of the investment period and the evaluations are made at the finish of a certain period. Thus, in addition to acquiring the effect of the portfolio, it is determined how consistent the initial estimates are.(Çağlar, 1977, p.95)

Portfolio Valuation can be implemented in two stages:

1. Calculation of performance measures
2. Performing performance comparisons

Measurement of performance may be in the forms of calculating the performance of individual assets, as well as evaluating the results of the portfolio. In both cases, the portfolio manager will calculate the deviations in the yield and value of the assets over time. As a result of those calculations, data on the current yield, growth and the portfolio's risk are obtained.

During the comparison phase, the achievement of the portfolio manager in the accounts and decision-making services is investigated. The comparison can be made with alternative portfolios, or according to some standards. For example; the criteria for portfolios can be compared with the market averages or the criteria

of random portfolios. In fact, the performance of a portfolio and high performance of the desired goals is the number of the success of the person who created and managed the portfolio.

2.1.5 Portfolio Revision

Portfolio revision is also called a review of the portfolio. This is a stage that enables portfolio management to be a dynamic process. If the portfolio composition is changed after the portfolio's performance is measured, the relevant changes are made at this stage. The purpose of the portfolio revision is to maximize the portfolio's return at a specific risk level.

The relationship between portfolio revision and portfolio planning; the results obtained at certain times can be explained as affecting the investor's objectives and investment profile.

The relationship between portfolio revision and portfolio evaluation; continuous evaluation of portfolio investments, making changes if necessary and evaluating the results of changes.(Corner and Mayes, 1983, p.11)

As the portfolio revision is a process that requires continuous analysis, economic, sectoral and securities analyze need to be continuously imprinted. As seen, the portfolio revision; It is a process shaped by planning, analysis and evaluation. With the portfolio revision, the opportunities in the market can be evaluated in a timely style. Therefore, while some assets of the portfolio are excluded, some assets can be involved in the portfolio and the efficiency of the portfolio can be increased.

2.2 Types of Portfolio

A variety of portfolio alternatives can be created by bringing together different securities. However, we can talk about 3 different portfolios in terms of traditional securities such as stocks and bonds.(Gallo and Lockwood, 1997, p.47)

1. Portfolio of only bonds
2. The portfolio based on only of stocks
3. Mixed portfolios

In addition to these, there are portfolios consisting of other investment instruments. During the investment period, which types of assets will be more efficient are estimated by using various statistical techniques. These assets are selected and included in the portfolio. We can list the investment instruments other than stocks and bonds as follows.

- Asset-Backed Securities
- Financing Bonds
- Treasury bond
- Revenue Sharing Certificates
- Bank Bonds and Bank Guaranteed Bonds
- Deposit and Deposit Certificates
- Repo
- Foreign Exchange and Foreign Currency Accounts
- Gold

As investors can have different degrees of expectations from their portfolios and portfolio diversification will differ according to investor characteristics.

2.2.1 Portfolio Types by Formation

Considering that portfolios are generally composed of stocks and bonds, four different portfolio types can be mentioned. These portfolio types,

- Portfolios consisting of sole shares,
- Portfolios consisting of solely bonds,
- Portfolios consisting of other investment instruments,

- Mixed portfolios.

The above-mentioned portfolio types are important for investors to make the most ideal combination of their preferences according to their liking or risk aversion.

2.2.1.1 Portfolios created from Totally Bonds

This type of portfolio is the kind of portfolio that is preferred by the savings owners who hold the trust of the principal, ie do not like to take risks, and who have difficulty in monitoring the market. A portfolio composed of treasury bills with different corporate and government bonds provides a limited income besides a low-risk ratio. Since such investments can be a robust type of investment, it is useful to create such portfolios in periods of recession. Moreover, the investor protects himself from some risks with his bond portfolio consisting of different maturities.

2.1.1.2 Portfolios created from Stocks and Bonds

It is the most used portfolio type. According to the situation of the economy, the principal is divided among stocks, bonds and derivative products in certain ratios. In this way, by combining the elements of safety and profitability, a balanced portfolio is tried to be created.

Developments in the economy vary over time. Since the capital market is the mirror of the economy, there is a revival in the bond market in the periods when the economy is sluggish, and a movement on the stock market is seen in the times of economic revival. Due to these characteristics, such portfolio owners try to avoid losing their portfolios easily by adapting them to the general economy with small operations.

Table 2. Equity and Bond Portfolios.(Brown and others, 2009)

Rate of Stocks	Rate of Bonds	Average Return (%)	Standard Deviation (%)
1.0	0.0	12.50	14,90
0.9	0.1	11.85	13.63
0.8	0.2	11.20	12.38
0.7	0.3	10.55	11.15
0.6	0.4	9.90	9.95
0.5	0.5	9.25	8.80
0.4	0.6	8.60	7.70
0.3	0.7	7.95	6.69
0.2	0.8	7.30	5.82
0.1	0.9	6.65	5.116
0.0	1.0	6.00	4.80

Table 2 shows the average returns and the standard deviation values of the securities by changing the amounts of the bonds and stocks in the portfolio. Accordingly, the portfolio reaches the highest yield (12.50%) with an investment fund consisting of only stocks. At the said return level, the risk level of the portfolio(14.90%) is at the highest level. With the beginning of giving more space to the bonds, which are fixed income investment instruments in the portfolio and related to this, we are expected a decline in the average return and the portfolio's risk.

2.1.1.3 Portfolios created from full stocks

The fact that stock portfolios are separated from other portfolio types is that they only include stocks rather than a few different investment instruments. It is probable to think that the person who tries to create a portfolio from the stocks has unlimited options. In such portfolios, it is probably to invest at any risk level. In the portfolios consisting of stocks, the investor type has a great impact on the portfolio creation decision. In order to form such a portfolio, the market must be carefully observed and would be able to trade at any time. There is a benefit in the portfolio of those whose prices fall or do not change. Portfolio of stocks can be applied successfully in economically stable periods. This portfolio type has its

own characteristics. Stocks to be involved in the portfolio may be examined in two groups:

I.Short-Term Stocks

These; may be shares of companies that cut their production due to reasons such as difficulties in supplying raw materials, lack of energy or working capital, hence stagnating or regressing in the market. The purchase should be made when obstacles are removed or problems are felt. Because, after the abolition of the negativity, the efficiency of such companies will increase and the prices of the stocks of these companies will increase.

II. Long-Term Stocks

These are the shares of companies that can make a bounty in the long term. During the investment periods of the enterprises, it is probable to buy such shares in the market cheaply. However, it would be ensured that the establishments in the forms of organization are selected very carefully, the management staff has proved their success and experienced managers. Generally, in such investments, high yields can be obtained in the long run.

2.2.1.4 Portfolios created from other Investment Instruments

A portfolio may be associated with other investment instruments other than equity securities such as stocks and bonds. The yield, risk, duration, rights and legal structure of each investment instrument are varied. The investor also selects to invest in risk according to the financial market and investment tools.(Marcus and others, 1993, p.29)

We can list the investment instruments other than stocks and bonds as follows;

- Asset-Backed Securities
- Financing Bonds
- Treasury Bond

- Revenue Share Certificates
- Bank Bonds and Bank Guaranteed Bonds
- Deposit and Deposit Certificates
- Repo
- Foreign Exchange and Foreign Currency Accounts
- Preferred Shares
- Warrants
- Profit-Loss Partnership Certificate
- Option Contracts
- Futures Contracts

In addition to the above-mentioned investment instruments, real estate investment funds and deed funds can also be involved in the portfolio. Diversification can be made by creating a portfolio of these financial assets. As is known, which assets to be acquired in the portfolios to be formed is directly related to the investor's attitude towards the risk. In addition, risk and yield comparisons of investment instruments should be made.

2.3 Portfolio Creation

Account owner generally wants to invest in good and quality securities. However, it is wrong to think that quality can only be achieved by investing in a conservative character. It is probable to find quality in all types of securities from the most inactive bond to the stock of the fastest increase in value. The quality of the portfolio depends on the management success of the enterprises.

On the other hand, it is wrong to think that a portfolio based on assets that provide rapid appreciation is always a speculative portfolio. The speculative character of security is a result of a risk of poor quality. It is probable to have security that will increase the value without too much risk. In addition, the aim of a good portfolio is to achieve the highest return with minimum risk. In the portfolio formation, the gender, age, occupation, psychological status and

financial power of the investor are effective. One of the issues to be considered in creating portfolios is to detect the minimum or maximum securities limits to be kept in the portfolio. Such an application is both cheap and easy. A second application is to act from a risk-return approach. This approach is complex and costly.

Some of the issues that the investor should consider in the selection of securities when creating a portfolio are: (Akgüç, 1989, p.688-691)

- Financial structure: Debts / Equity, Debts / Asset Total rates are lower, the higher the interest rate, the higher the profitability of partnerships.
- Cost of manufactured goods and services: The high share of fixed costs in costs causes excessive play in profits in periods when sales fluctuate.
- Liquidity situation: As the partnerships that are healthy in terms of liquidity, are able to meet their liabilities in the future periods, they are also capable of providing the essential funds.
- Developments in raw materials and sales prices: Tthe enterprises' risk which has stable raw material and sales prices is fewer than the price fluctuating corporations.
- Possibility to control raw material resources: This is a risk-reducing factor.
- Having rights to superiority: Having such rights is a risk-reducing factor.
- The high quality of the product: The high quality compared to the competitors has an increasing effect on profitability.
- Partner structure: The partner structure can have an effect on the profit distribution of the enterprise and its management. In addition, the distribution of shares to large masses can also lead to gaps in management.
- Profit distribution policy: It would be useful to examine the articles related to the distribution of profit in the company's articles of association. For

example; if it is foreseen to distribute an essential portion of the profit to the founders, usufruct holders, the board of employees and directors, this may have an unwanted effect on the share yield.

- Market share in the industry: A firm with a high market share means that its sales and profits are stable and that the risk is less. As in the selection of stocks, there are issues that should be considered by the investor in the selection of bonds.

The investor who intends to make a bond investment, while making the investment decision, to obtain periodic interest income for a certain period of time, while lending, and at the finish of the bond, the guaranteed value of the bond is to get back.

As is known, two types of the bond's yield can be mentioned. The first is the yield obtained if the bond purchased at a certain price within a period is sold after the interest is collected within that period. The second is the yield of the purchased bond in the portfolio until the maturity date and the yield obtained if the periodic interest income and the principal at the maturity date are collected. The first type of yield is called a quarterly yield and is calculated by separating the net profit or loss between the purchase price and the selling price by the amount of the interest income for the period. Thus, the found value helps the investor to decide whether to hold the portfolio or not.

For example, if the one-quarter yield of other bonds with the same risk is higher than the investor's yield, the investor may consider selling bonds and buying high-yield bonds. In addition, the future of the bond in the portfolio, expectations about the market interest rates, future changes in the bond's risk of etc. given according to factors.

2.4 Measurement of Portfolio Risk and Return

For an investor, making decisions through investment opportunities is not just a choice between individual securities. Because there are various combinations of individual securities. As the number of opportunities increases, the problem becomes complex and portfolio theory emerges. Investors can create a variety of portfolios by creating various securities combinations. However, what is important for the investor is the creation of an optimal portfolio. For this, the risk and the portfolio's return should be calculated.

Portfolio risk is calculated by the portfolio's standard deviation. Portfolio risk is not calculated as the amounted standard deviations' average of securities that create the portfolio. That is due to the probability that the portfolio risk is smaller than the amounted average securities' risk that makes up the portfolio due to in-portfolio interaction. Even theoretically, when the portfolio is formed with the equal expected yield and standard deviation, it is possible that the portfolio's standard deviation is zero.

The portfolio's standard deviation also based on the structure of the connection between the returns of the securities. The connection between the securities' expected returns creating the portfolio is measured by covariance. In order to calculate the return and the portfolio's risk, it is useful to focus on the basic concepts such as the importance of the Beta (β) coefficient in portfolio selection, the portfolio's expected return and the portfolio variance.

2.4.1 Importance of Beta (β) Coefficient in Portfolio Selection

One of the indicators concerning stock investors in the stock exchange is the beta (β) coefficients of the stocks.

Since systematic risk is determined in the economy, it is not probable to eliminate the portfolio by diversification. However, by gathering different securities in a portfolio, it is probably to reduce the non-systematic portfolio's risk to zero.(Bolak, 1990, p.11)

Some developments in the economy affect the return of all stocks in the market. For example, the decline in interest rates, the rise of the gross national product, the increase in emissions, the demand for stocks, and thus increase the price of all stocks. On the other side, the increase in foreign exchange prices and the rise in interest rates lead to a reduction in the demand for stocks and thus decrease the price of all stocks. As can be seen, stocks are affected to a particular extent from the trends in the economy. Here, any changes in the stock, the changes that will occur due to these reasons, the market conditions to create a dependent return. The return on the stock market's equity conditions may arise from the sector in which the entity is involved or directly from the conditions affecting the corporation concerned. In any sector, such as the price of imported inputs or the bankruptcy's risk of an enterprise, or a high rate of profit, may be counted.

Beta coefficient is a measurement of the sensitivity of any stock to market fluctuations. In other words, the additive of a security to the return and the portfolio's risk is calculated with the beta coefficient of that security. That is, the variation in the value of the securities of the portfolio as a result of a unit increase refers to the variation in the value of the portfolio's variance.

When making stock analysis, investors should also examine the market's dependence on market conditions, as well as they're unique in market-independent conditions. Beta (β) is a fine indicator of this dependence. The beta (β) coefficient of the portfolio can be described as the weighted average of the beta coefficients of individual securities. (Firth, 1977, p.99)

$$\beta j = Cov(j,m) / Var(m)$$

Here; j – is the ratio of covariance between the stock and market portfolio to the market portfolio variance. B is the coefficient or risk premium requested by the investor. The beta coefficient reveals whether a stock return is parallel to all return of the stock.

It can benefit from a beta coefficient in the selection of securities to be involved in the portfolio. When the stock market's general coefficient is taken as 1 and the β coefficients of other stocks are calculated based on this value, the sensitivity of that stock to the market changes is calculated.

If β> 1 is the return of the portfolio, there will be a variation in the identical direction and greater than that of the variation in the market. Such shares are called "attack" stocks. These stocks have a greater sensitivity to the market. If there is a 1% rise in the yield of the market portfolio, the growth in the yield of the attack will be more than 1%. In other words, when there are price rises in the stock market, the price increase of attack stocks is higher than the average increase.

If +1> β> -1, there will be a smaller variation on the yield of the portfolio than the variation in the return on the market.

If β <-1 is the return of the portfolio, the change in the return of the market is in the contrary direction and there will be a greater change. A 1% rise in the market portfolio's yield of the leads to lower growth in the holding stock's yield. In other words, while the prices in stock market are increasing, the price increase in these stocks will be lesser than the average increase.(Bolak, 1990, p.12)

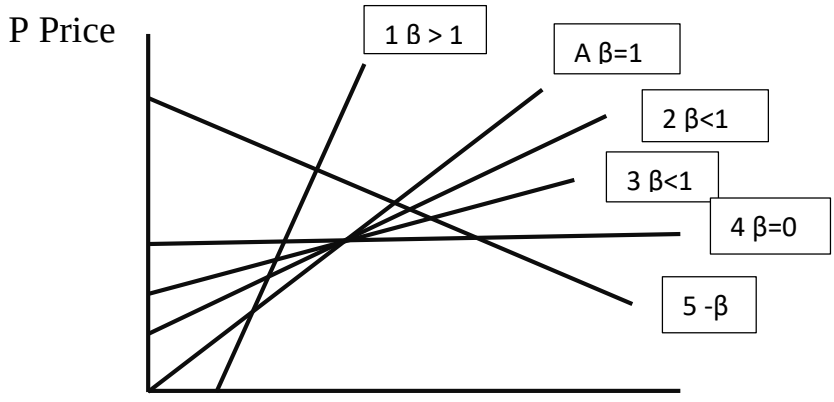

Figure 4: Values of the Beta Coefficient

In the figure, line A shows β = 1, 1 = β> 1, 2 and 3 illustrated β <1, 4 = β=0, and 5 demonstrated -β.

According to the expected variations in market prices, it is essential to select the securities or portfolio with the appropriate beta coefficient. It can be said that if the beta coefficients can be determined to stabilize in the past, they will continue to show the same stability in the future and therefore will be useful in guiding investors. (Firth, 1977, p.98)

Equivalent returns of stocks on the portfolio, which are independent of market conditions, affect each other in a compensatory way and cause a decrease in non-systematic risk. Even if the stocks' quantity in the portfolios sufficiently increases, it may be possible to eliminate this risk completely. Thus, sufficiently diversified portfolios only involve systematic risk. Since systematic risk is the effect of all shares moving in an identical direction, it is not probable to eliminate this risk. As a result, the beta coefficients that the investor can use in portfolio generation and risky stocks are extremely useful tools.(Bolak, 1990, p.16)

2.4.2 Expected Return of the Portfolio

The rate of return of the portfolio is equivalent to the weighted average of the yields of the securities in the portfolio. The weight applied to each return is the ratio of the security to which this income belongs.

The expected return of a portfolio of securities (N) is calculated as follows.

$$E(R_p) = \sum_{j=1}^{n} X_j E(R_{ij})$$

E (Rp) = The expected return of the portfolio
E (Rjj) = The expected return on a single security
Xj = j shows the ratio of securities in the portfolio.

2.4.3 The Portfolio Variance

As it is known, portfolio risk is various from the average risk of individual securities. If the yields of the two securities are in the opposite direction, the variance of a portfolio of these two securities will be lower than the variances of the two securities separately. If the yield of the securities is independent of each

other, the spread of the possible returns of the portfolio will be lesser than the spread of the yield on each of these securities. If the linking between the securities returns is the same, then created the portfolio's risk will not change in terms of the investor.(Apak and Demirel, 2009, p.311)

The variance of a P portfolio, which we have explained in this way, by Ơ²p, can be well-defined as the expected value of the potential returns of the portfolio from the average return of the portfolio.

$$\sigma_i^2 = \sum_{j=1}^{n} P_{ij}\left[R_{ij-} - E(R_i)\right]^2$$

3. Risk Concept and Calculation in Electronic Stock Market

3.1 Risk Concept

Risk; the possibility that future events, events or internal and external factors may affect the understanding of the objectives and objectives of the administrations. Financial risk is the possibility of a negative difference between realized return and expected return. The risk consists of an estimate. There are those who base the risk on mathematical and statistical data, as well as those who calculate risk through non-quantitative methods such as estimation and experience. The risk is also determined as the uncertainty in achieving the expected result. (Hagin, 1979, p.95)

The perception of risk as an economic definition is defined as the uncertainty of the occurrence of uncertainty or an unforeseen event which might result in the formation of an economic loss.(Jones and others, 1977, p134)

The investor's yield from the investment is likely the possibility of falling below or exceeding the expected yield. This possibility constitutes the risk of an investor's investment.

Uncertainty is inevitable and the individual is exposed to risks arising from different uncertainties. In this sense, the risk consists of uncertainty and economic risk can be determined as measurable uncertainty. Although the perceptions of risk and uncertainty seem to express close meanings to each other, there are differences to distinguish these two concepts.

The concepts of uncertainty and risk arising from the fact that there are factors which are not known exactly at the inputs of the function that will reach the desired result. Changes in entries result in at least 2 dissimilar results. One of these results is worse than the other. The main point that differentiates between risk and uncertainty is the probability of the case of different situations and the definition of the results that these situations can reveal.

The uncertainty‘s concept can be defined as the inability to know which of the possible outcomes will occur.

The concept of uncertainty arises when a definite view or judgment cannot be made about the future. The risk is to determine the level of uncertainty.

As is known, risk and return are two factors that determine the investment decision. For this reason, investors would also consider risk as much as expected returns on their investments. One of the assumptions that constitute the institutional basis of portfolio management is the linear connection between risk and return. In other words, as the return on portfolio increases, it is presumed that the risk will increase. The second basic assumption is that the risk will increase as the maturity of the investment extent.

With the concept of risk, it is supposed that the returns of the investments are not fully known, whereas the alternative returns related to these investments and the possible distribution of these returns are known. In short, investors are able to forecast the likelihood of results under the assumption of risk.

Formulas of the above-mentioned statistical values:

Expected value = $E(X) = \sum P_i X_1$

Variance = $Var(X) = S^2 = \sum P_i(X_1 - X)^2$

Standard deviation = Square root of the variance = S

n = Number of events

X_i = Results of events

P_i = Probability of events

X = Specifies the mean value calculated from the sample.

3.2 Investments Related Risks and Sources of Risks

The two most significant factors affecting the investor's decision are the expected return and risk of the investment**.** Investors generally do not have adequate knowledge of risk, although they have the necessary knowledge of the rate of return. The resource of risk may be multiple. Some of risks may be partially controlled by the investor, but some of them are fully developed outside the control of the investor. (Bekçioğlu, 1984, p.59)

In this way, the risks that the investor may face are divided into systematic and non-systemic risks. The total risk of investor can be expressed by the following formula.

$$\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma_c^2$$

In here ;

(σ_i^2) the total risk of securities invested, (β_i^2) sensitivity of securities to systematic risk, (σ_m^2) systematic risk, (σ_c^2) refers to non-systemic risk.

It was accepted that the risk would decrease with diversification in portfolio theory. With good diversification, it is supposed that it is probably to bring the non-systematic risk closer to zero. The systematic risk exists for each portfolio; however, the systematic risk may differ depending on the kind of portfolio. For

example, the rates of bonds, shares, and options contracts of the investment in the portfolio change the magnitude of systematic risk. The risk of a well-diversified portfolio can be reduced, but never systematic risk can be reset. The non-systematic risk can be approached to theoretically zero.

It is thought that investors will make the non-systematic the portfolio's risk ineffective with a good diversification.

The non-systematic risk arises from the specific characteristics of the stocks and the estimates of how these characteristics will affect stock prices. The non-systematic risk cannot be estimated and investors cannot obtain an additional return due to their non-systematic risk assumption.

The following table tries to clarify the effect of divergence on portfolio risk.

Table 3. Relationship Between Portfolio Diversification and Risk

Number of Stocks in Portfolio	Average Standard Deviation of Portfolio Returns	The ratio of Standard Deviation of the Portfolio to the Single Stocks
1	49.24	1.00
2	37.36	0.76
4	29.69	0.60
6	26.64	0.54
8	24.98	0.51
10	23.93	0.49
20	21.68	0.44
30	20.87	0.42
40	20.46	0.42
50	20.20	0.41
100	19.69	0.40
200	19.42	0.39
300	19.34	0.39
400	19.29	0.39
500	19.27	0.39
1000	19.21	0.39

As shown in Table 3, it is possible to reduce total risk to systematic risk level through diversification. It is seen that the rise in the quantity of shares has very little benefit in total risk reduction after 100.

Investment analysis focuses on various types of risk types and various risk groups depending on the reasons and effects of the emergency. In the portfolio theory, total risk can be separated into 2 main groups as systematic and non-systemic risk according to whether the investor has the ability to control or limit the risk. This is revealed in Figure 3 as sources of total risk.

3.2.1 The Sources of Systematic Risk

The unpredictable financial risk that cannot be controlled by the investor is called systematic risk. The systematic risk, also named market risk, is the risk that the financial asset cannot be decreased through diversification. Systematic risk can also be named as “risk arising from the factors affecting the prices of all traded securities at the same time”.(Liang and Bing, 1999, p.55)

In a review of 28 companies listed and traded on the BSE in 1987, the systematic risk ratio was calculated as 65.5. In the study carried out on the stocks of 63 companies traded in NYSE in the USA, it was determined that systematic risk constitutes approximately 33% of the total risk. BSE is affected by the systematic risk sources such as interest rate, fluctuations in foreign exchange prices and inflation.

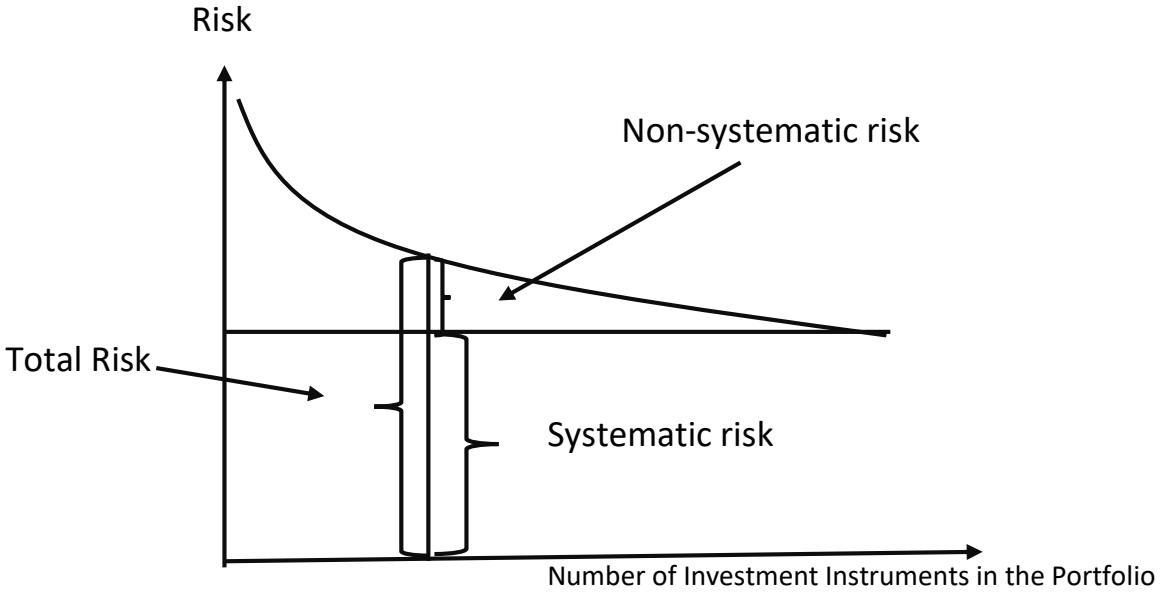

Figure 3. Systematic and Non-Systematic Risk Elements

As revealed in figure 3 the total risk can be decreased to a systematic risk level with a good diversification.

3.2.1.1 Purchasing Power (Inflation) Risk

The risk of purchasing power, also called inflation risk, is the sudden depreciation of money and the rapid increase in general level of prices. Especially in our country, which has been experiencing high inflation for years, investors need to consider the purchasing power risk. If the general grade of prices is constantly rising and this increase exceeds the return on investment, purchasing power decreases.

Inflation risk is a fact that the money allocated to the investment has the effect of decreasing the purchasing power with the effect of inflation.(Francis, 1986, p.205)

The effects of inflation risk on the enterprises can be listed as follows.

- Inflation periods lead to a more conservative strategy in enterprises' activities.
- During inflation periods, enterprises avoid investing or turn to short-term investments.
- Working capital needs of enterprises increase in inflation periods.
- The fact that they tend to hold more stocks than other times in order to protect against continuous price increases in inflation periods and increase the short-term borrowing.
- The monetary policy followed by the monetary authorities to cut the inflation rate for periods of inflation, the shortening of the maturity of bank loans, the rise in interest rates, the borrowing costs of the enterprises' increase.

Nominal earnings are not significant in countries with high inflation rates. Therefore, the real profit should be calculated. As can be seen from this point, inflation affects the expected values of investments and therefore the investment’s

value. Purchasing power risk affects securities at different levels. Therefore, the effects of inflation on bonds and stocks should be considered separately.

A good bond can be measured by protecting the investor against inflation. The investor investing in bonds must earn an income above the inflation rate. In order to reduce the effect of inflation risk, the inflation rate is paid over a certain amount, inflation based bonds are issued and investors are protected against inflation risk.

Equity securities are securities that less affected by inflation than bonds. There are even those who argue that stocks are resistant to inflation. The advocates of that view believe that together with the inflation, the profit from the sales and the dividends to be distributed will increase and thus the value of shares will increase against inflation.

In addition, it was argued that the stocks were not resistant to inflation. The advocates of that view suggest that the amount of sales from the enterprises will increase in the face of inflation; However, since the price of the business will increase, it will balance the increase of stocks and the shares will not gain value against inflation. The dividends distributed in the high inflation environment could not go further from being symbolic and did not contribute positively to the price of shares.

Nevertheless, it can be said that the shares were affected less than inflation by the unaffected bonds.

3.2.1.2 Interest Rate Risk

Interest rate risk is defined as changes in the market and interest rates in the future which may negatively affect the prices and returns of securities.

Interest rate risk refers to a decrease or decrease in the market interest rate. Changes in the market interest rate, change the efficiency of fixed income securities. The money invested in the bond loses its profitability when market

interest rate rises. Because it is probable to pay money at a better rate, money is invested at a lower rate. On the contrary, when the interest rate of market decreases, the real return of the current bond is increasing.(Ceylan and Korkmaz, 2012, p.494)

The interest rate of market does not only affect fixed-rate bonds and bonds but also directly affects stocks. There is a reverse linking between stock prices and the market interest rate. When the interest rate of market increases, stock prices decrease and stock prices increase when market interest rate decreases. This is because when interest rates of market are higher than the expected return of stocks, the investor chooses interest. Conversely, when interest rate of market is lower than the stocks' expected return, the investor will prefer stocks.

Treasury bonds and government bonds bear the interest rate risk. Because, in order to provide the demand and supply of these bonds in the open market, the state may be in the role of buyer and seller.

Inflation is the most significant factor triggering the increase in market interest rates. Inflation decreases the real value of money. The inflation rate should be at an acceptable level so that market interest rate does not vary much. Because, in inflationary environments, interest rates lose their meaning. The investor, at least through interest, aims to maintain the money's real value. If a reasonable inflation level stabilizes, the risk of excessive variation in interest rates in the market will be eliminated. In order to avoid the interest rate risk, the investor can invest in short-term bonds. Thus, when the interest rate of market rises, they may invest their bonds at the market rate.(Jones and others, 1977, p.135)

Alteration in interest rates changes the outcome of expected returns. When the interest rates decrease, prices of all securities change and they decrease when they increase. Securities may be affected at different rates from this inverse relationship.

3.2.1.3 Market Risk

In the capital market, there may be large reductions in the market prices of financial assets, which may sometimes be attributed to a specific cause or causes, and sometimes without any valid reason. The negative impact of such a price decline on the investor's yield is the market risk. Price changes due to market risk are not audited by the company. Factors like the beginning or end of an unforeseen war, the election year, the increase of political activities or the illness or death of the prime minister or president in the country, the increase of speculative activities in the market, the increase of gold and oil extraction, etc. are the psychological factors affecting the market. Many reasons that influence investors' expectations about the future are pessimistic or optimistic may play an significant role in increasing or reducing the effectiveness of market risk.(Amling, 1978, p.20-21)

Market risk is more felt on low-quality financial assets than on high-quality financial assets. In inactive markets, there is a higher market risk than in active markets. Market risk affects stocks more than bonds. Because the real values of bonds and debt securities like these can be estimated more accurately than the values of stocks. This will cause the bond market price to fluctuate less due to market risk than a stock price. It is quite unlikely for the investor to decrease or eliminate market risk by diversifying. Because, with the emergence of market risk, all securities move in an equal direction. However, the investor who wants to guard himself against the market risk should calculate the sensitivity of the price of the stock which he intends to buy to the variations in the market.

3.2.1.4 Political Risk

Political and economic crises and wars in the world are quite effective on the behaviour of investors. Another dimension of political risk is related to international trade's volume. Protection initiatives, quoteas, exchange rate fluctuations or foreign capital investments constitute the elements of this risk. Political risk is a relationship kind of risk that is used to describe the changes in

the political conditions that will result in the return of securities. Political risk can emerge as a reflection of national and international political developments. In many sources, the political risk is examined in the market risk.(Francis, 1972, p.210)

3.2.1.5 Currency Risk

In the literature, we may present as foreign exchange risk. The risk of foreign currency is a risk arising when the value of money fluctuations in foreign currency investments. There is a near connection between changes in the exchange rates and interest rates in different countries. In parallel with the volatility in exchange rates, the profitability of investments in foreign countries may also change.

The truth that the exchange rates change continuously does not mean that investors with international portfolios will always win or lose any time. It is possible that the investors, who form a portfolio in the international area, may gain value against the money of some of the countries in the portfolio and also depreciate against some of them.

In order to defend against the currency risk, the truth that the international portfolios that the investors will form also include securities of different countries can play a momentous role in reducing the exchange rate risk.(Timonhy and Daniel, 2005)

The following formula can be used when calculating the yield and risk of a diversified portfolio at the international level.

$$r_n = r_c + r_d$$

In here;

r_n : Total return on foreign securities

r_c : Rate of return of foreign securities

r_d : The rate of return from the return of foreign currency returns to the currency of the investor when entering the foreign country

It should be noted that these returns may be negative. The risk of investment can be stated as follows.

$$\sigma_n^2 = \sigma_c^2 + \sigma_d^2 + 2\sigma_{cd}$$

As can be seen from the above equation, exchange rate risk is based on exchange rate risk, correlation and the local market risk between the two. The exchange rate risk affects all entities with foreign currency inflow or outflow.

3.2.2 Non-Systematic Risks

Non-systematic risk, another part of total risk, is the risk that is specific to a company or sector. Worker strike, management errors, discoveries, advertising campaigns, changes in consumer preferences can lead to non-systematic changes in company income. Non-systematic factors are independent of factors affecting other industries and the securities market in general.

The non-systematic risk is a kind of risk that can be abolished in a very well-diversified portfolio. While it is impossible to control the systematic risk, it is probable to decrease or eliminate the non-systemic risk by the changes and orientations in the sources.

3.2.2.1 Financial Risk

Financial risk is the reduction of the enterprise's solvency. This risk arises from fact that the firm finances its activities with own resources or foreign sources. The shares of the enterprise are more at risk than the bonds they issue because the bonds are paid first.

In other words, within the capital structure of a business, financial risks, such as bank loans, bonds, fixed payment obligations, slow down the enterprise’s cash flow of. If we define the risk as a reduction in the profits per share, then the profits per share of the enterprises with a big share of foreign capital in the total capital

increase in the welfare periods or inflationary environment where the sales increase. (Ineichen and Alexander, 2003, p.77-82)

Financial risk is determined by the financial leverage's degree. The grade of financial leverage showing the effect of the variation in the profit before interest and tax to the profit before tax is calculated as follows.

$$Fix = FVDK \,/\, FVDK - F$$

FVDK: Profit before interest and taxes

F: Interest

Fix : Financial leverage

When the stock is compared with the stock, the financial risk of the stock will be higher. Because, regardless of the status of the enterprise, interest debt to bondholders is paid first. However, the interest payable's size may lead to big fluctuations in the amount of profit to be allocated to shareholders.

As for the investor, the financial risk rises depending on the following factors of the business invested in securities.

- Increasing the debts of the enterprise
- Fluctuation in sales
- The possibility of increase in raw material prices
- Strike
- The production of fashion pass
- Increase in income
- The inadequacy of working capital
- Management errors

Moreover, an investor's financial risk may be reduced depending on the following factors.

- Renewal of the technology of the enterprise
- The operation has monopolistic patents,

- The consumer prefers the goods and the services produced by the company
- Increased probability of controlling the raw material resources of the enterprise
- Realization of capital increases mainly through own resources
- The export potential of the business has an increasing tendency

Depending on all these factors, a very good portfolio to be created from the securities of different companies in the industry can be reduced or eliminated.

3.2.2.2 Business and Industry Risk

Sometimes, changes in profits of firms operating in one or several business lines cause significant fluctuations in the stock prices of these companies. Investors investing in the mentioned stocks are subject to loss of capital or income. The expected fluctuations in the industry only affect enterprises within the industry and do not affect enterprises outside the industry. The changes that are expected to occur in industry stem from changes in economic conditions, changes in laws and attitudes. Such changes affect the profit of the enterprise and hence the value of its securities. Considering the changes that may be formed in industrial conditions, it is essential to estimate the income and expenses of the enterprise. An enterprise that is open to negative changes, high productivity variability and therefore the risk is high. For example, companies in industries that produce basic commodities such as flour, coal and iron are less likely than companies in other industries. That is due to the less volatility of demand for such goods. However, the risk of an outsourcing industry of raw material sources is high than the risk of an industry using domestic raw materials.

It is also possible to control the risk of business and industry, which are not systematic types of risks, with a good diversification.(Jones and others, 1977, p.137)

3.2.2.3 Management Risk

Management risk is a kind of risk resulting from poor management of enterprises. Management of businesses by unsuccessful managers causes this risk. A poor management approach causes the firm not to make a profit, and this leads to the depreciation of stocks. In the result of management errors, the values of the stocks of the companies may decrease and the risk may increase. It is probable to eliminate the management risk with a very well-diversified portfolio.(Ceylan and Korkmaz, 1998, p.502)

3.3 Calculation of Portfolio Variance, Covariance and Correlation in Electronic Stock

The investor needs to know the return and the portfolio's risk at the decision-making stage. The portfolio isn't a simple sum of the securities that create it but has its own characteristics. It is essential to create an optimum portfolio for the investor. The portfolio's risk is not an average of the risks of the securities that form it individually. The portfolio's standard deviation depends on the linking between the securities, it contains. The portfolio's risk is smaller than the sum of the risks of the securities that make it.(Siegel, 1994, p.5)

In the portfolio method, the risk of the financial asset is calculated with the help of covariance between the returns of other securities that create the portfolio. Markowitz stated the portfolio risk as follows.

Variance,

$$\sigma_p^2 = \Sigma_{i=1}^{n} \Sigma_{i=1}^{n} w_i w_j \sigma_{ij}$$

In here,

σ_p^2 : Variance of portfolio

w_i : Weight of i asset in a portfolio

σ_{ij} : i and j covariance between financial assets

The σ_{ij} expression herein is more clearly described below.

$$\sigma_{ij} = P_{ij} \sigma_i \sigma_j$$

In here,

σ_i : Variance of the i asset

σ_j : Variance of the j asset

P_{ij} : Correlation coefficient between i and j assets

The following table shows the portfolio's variance consisting of two securities.

$$=E\{W_1R_1+W_2R_2-[W_1E(R_1)+W_2E(R_2)]\}^2$$

$$=E\{W_1[R_1-E(R_1)]+W_2[R_2-E(R_2)]\}^2$$

$$=E\{W_1^2[R_1-E(R_1)]^2+W_2^2[R_2-E(R_2)]^2+2W_1W_2[R_1-E(R_1)][R_2-E(R_2)]\}$$

$$=W_1^2E[R_1-E(R_1)]^2+W_2^2E[R_2-E(R_2)]^2+2W_1W_2E[R_1-E(R_1)][R_2-E(R_2)]$$

$$=W_1^2\sigma_1^2+W_2^2\sigma_2^2+2W_1W_2Cov(R_1,R_2)$$

Another concept in this calculation is the concept of covariance. Covariance refers to the alteration in the combination of securities pairs. The covariance value may be positive or negative. Positive results indicate that the values of the securities act together. The negative expression indicates that they are reversed. The covariance value does not yield the transaction's value.(O'Neil, 2009, p.57)

The covariance coefficient can be stated as follows.

$$Cov(i,j)=\frac{\sum_{j=1}^{n}(R_i-E(R_i)(R_j-E(R_j)}{n-1}$$

As mentioned above, covariance determines the direction of movement together but cannot determine the force of the movement together. The correlation coefficient determines the direction and strength of the movement. The coefficient of correlation takes between -1 and +1. If the coefficient is close to +1, the variables are moving in the same direction. If the coefficient is close to -1, the variables are moving in the opposite direction. The truth that the coefficient is close to 0 means that the movements of the variables are independent.

The correlation coefficient is acquired by dividing the covariance between two financial assets by the product of the standard deviations of the two financial assets.

$$P_{ij} = \frac{\mathrm{cov}(i,j)}{\sigma_i \sigma_j}$$

If the correlation coefficient between the stocks in the portfolio is close to -1, the portfolio's risk will be less.

The expected return, standard deviation, variance, covariance and correlation coefficient were calculated for a portfolio of 2 stocks.

Table 3. Monthly Return Rate of Nokia (X) and Huawei (Y)

Months	**Monthly Return Percentage (X)**	**Monthly Return Percentage (Y)**
10/09	2,56	-4,84
11/09	0,00	6,90
12/09	-7,14	24,06
01/10	5,00	28,08
02/10	-6,98	-9,32
03/10	6,17	8,05
04/10	-1,22	-1,97
05/10	3,80	-1,94
06/10	13,67	1,31
07/10	11,20	8,51
08/10	11,57	-1,40
09/10	10,68	16,03
10/10	-4,63	10,40
11/10	-2,70	5,93
12/10	7,77	-3,28

Table 4. Monthly Return Rate Chart for Nokia(X)

Months	**Monthly Return Percentage (X)**	$(\boldsymbol{R_x - E(R_x)})^2$
10/09	2,56	1,69
11/09	0,00	14,90
12/09	-7,14	121,00
01/10	5,00	1,30
02/10	-6,98	10,84
03/10	6,17	5,34

04/10	-1,22	25,81
05/10	3,80	0,00
06/10	13,67	96,24
07/10	11,20	53,88
08/10	11,57	59,44
09/10	10,68	46,51
10/10	-4,63	72,08
11/10	-2,70	43,03
12/10	7,77	15,29
	$\boldsymbol{E(R_x)}$ =3,86	$\boldsymbol{\Sigma} = 567{,}35$

Expected return;

$E(R_x) = \Sigma_{i=1}^{15} \frac{R_i}{15} = 3{,}86$

Variance;

$\sigma_2^x = \Sigma_{i=1}^{15} \frac{(R_i - ER_i)^2}{15} = 37{,}82$

Standard deviation;

$\sigma_x = \sqrt{37{,}82} = 6{,}15$

Coefficient of Variation;

$CV_x = \frac{\sigma_x}{E(R_x)} = 1{,}593$

When the distribution of the return values of Nokia(X) by months is revealed in the figure, changes in the monthly rate of return are more comprehensible.

Return **X Stock**

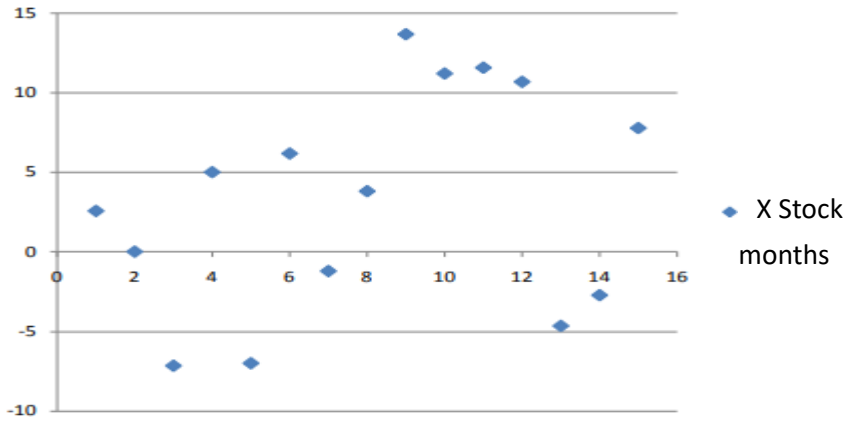

Figure 5. Distribution of X Shares.

Figure 5 shows that the return rates of X shares vary by month.

Table 5. Monthly Return Rate Chart for Huawei (Y)

Months	**Monthly Return Percentage (Y)**	$(\boldsymbol{R_y - E(R_y)})^2$
10/09	-4,84	100,40
11/09	6,90	2,96
12/09	24,06	356,45
01/10	28,08	524,41
02/10	-9,32	210,25
03/10	8,05	8,24
04/10	-1,97	51,12
05/10	-1,94	50,69
06/10	1,31	14,98
07/10	8,51	11,09
08/10	-1,40	43,30
09/10	16,03	117,72
10/10	10,40	27,25
11/10	5,93	0,56
12/10	-3,28	71,57
	$\boldsymbol{E(R_y)}$ =5,18	$\boldsymbol{\Sigma} =$ 1590,99

Expected return;

$E(R_y) = \Sigma_{i=1}^{15} \frac{R_i}{15} = 5{,}18$

Variance;

$\sigma_2^y = \Sigma_{i=1}^{15} \frac{(R_i - ER_i)^2}{15}$ = 106,07

Standard deviation;

$\sigma_y = \sqrt{106{,}7} = 10{,}3$

Coefficient of Variation;

$CV_y = \frac{\sigma_y}{E(R_y)}$ = 1,99

As can be seen from Table 3 and Table 4, Huawei's monthly average rate of return is more than Nokia that is why Huawei's standard deviation more than Nokia.

When the distribution of the return values of Huawei (Y) is determined by the figure, the changes in the monthly rate of return are more comprehensible.

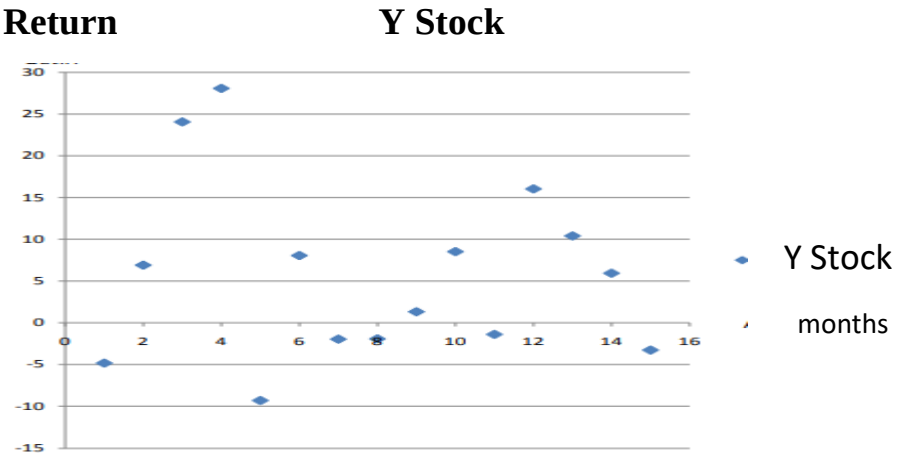

Figure 6. Y Equity Income Distribution

As can be realized from the distribution graphs, Y returns are fluctuating more than the returns of X shares. Another indicator of this is that the Y coefficient of variation is greater than the X's exchange coefficient.

When the rate of return of Y and X shares are evaluated together, the following graph is obtained:

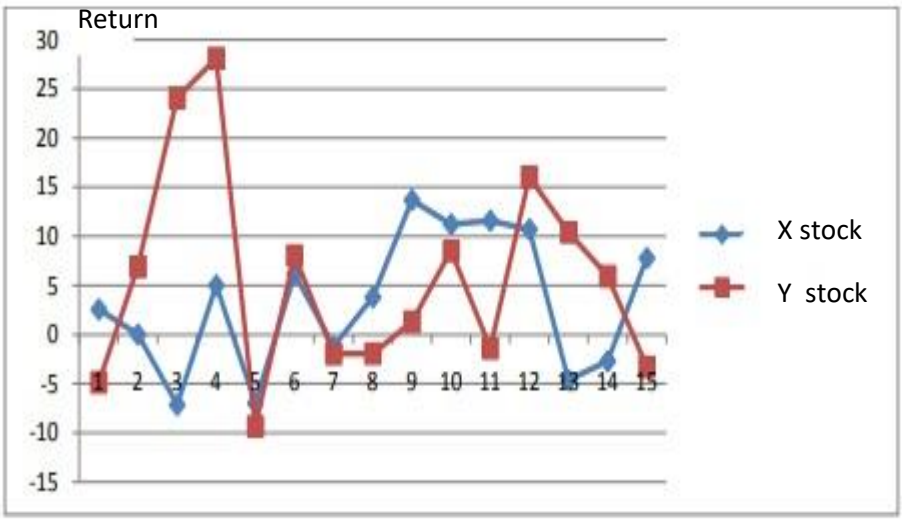

Figure 7. Distribution of Y and X Shares Monthly

Months	**X Return**	**Y Return**	$(R_x - E(R_x))$	$(R_y - E(R_y))$	$(R_x - E(R_x))$x $(R_y - E(R_y))$
10/09	2,56	-4,84	-1,30	-10,02	13,03
11/09	0,00	6,90	-3,86	1,72	-6,64

12/09	-7,14	24,06	-11,00	18,88	-207,68
01/10	5,00	28,08	1,14	22,90	26,11
02/10	-6,98	-9,32	-10,84	-14,50	157,18
03/10	6,17	8,05	2,31	2,87	6,63
04/10	-1,22	-1,97	-5,08	-7,15	36,32
05/10	3,80	-1,94	-0,06	-7,12	0,43
06/10	13,67	1,31	9,81	-3,87	-37,96
07/10	11,20	8,51	7,34	3,33	24,44
08/10	11,57	-1,40	7,71	-6,58	-50,73
09/10	10,68	16,03	6,82	10,85	74,00
10/10	-4,63	10,40	-8,49	5,22	-44,32
11/10	-2,70	5,93	-6,56	0,75	-4,92
12/10	7,77	-3,28	3,91	-8,46	-33,08

$\Sigma = -47{,}19$

$Cov(x,y) = \frac{15}{1} \Sigma_{j=1}^{15}(\boldsymbol{R_y} - \boldsymbol{E}(\boldsymbol{R_y}))(\boldsymbol{R_y} - \boldsymbol{E}(\boldsymbol{R_y}))$ = -3,15

$P_{x,y}\ \frac{\mathrm{cov}(x,y)}{\sigma_x \sigma_y}$= -0,05

The truth that the correlation coefficient (-0,05) takes the value shows that there is an inverse connection between the 2 stocks although not strong. The expected portfolio's return with the participation of 50% shares of Y and X shares; It is probable to make a comparison between investing in a single stock and investing in the portfolio by calculating the variance, standard deviation, and coefficient of variation. Accordingly, the expected return on the portfolio calculates below.

$$E(R_P) = \sum_j^n W_i R_{ij}$$

$E(R_P) =$ (0,5x3,86) + (0,5x5,18)

$E(R_P) =$ 4,52(%)

Variance of portfolio;

$\sigma_p^2 = \sigma_x^2 w_x^2 + \sigma_y^2 w_y^2 + 2\sigma_x \sigma_y w_x w_y P_{xy}$

σ_p^2 = 37,82x0,25+106,07x0,25+2x6,15x10,3x(-0,05)

σ_p^2 = 29,64

Standard deviation;

σ_p = 5,44

Coefficient of variation;

$CV_P = \frac{\sigma_p}{E(R_p)}$ = 1,2

Although the expected return on the portfolio was higher than the expected return of Nokia (X), the portfolio risk was lower than the Nokia (X) company. On the other side, the coefficient of variation of the portfolio was lower than the change factor of Huawei (Y) and Nokia (X). The result is that the portfolio's performance is well than the performance of single stocks.

$$w_x = \frac{\sigma_y^2 - \sigma_x \sigma_y P_{xy}}{\sigma_x^2 + \sigma_y^2 - 2\sigma_x \sigma_y P_{xy}}$$

$$w_x = \frac{106{,}7 - 6{,}15 \times 10{,}3x(-0{,}05)}{37{,}82 + 106{,}7 - 2x6{,}15x10{,}3x(-0{,}05)}$$

$w_x = 0{,}73$

$w_y = 0{,}27$

In this case, the portfolio's risk is minimum when investing 73% in shares X and 27% in shares Y. It cannot be said that this is the desired situation for all investors. As risk will decrease with the expected return, the behaviour of the investor towards the risk will be decisive.

Conclusion

Portfolio selection differs according to the investor's risk sensitivity and perception risk. Theoreticians of traditional portfolio management emphasized the significance of personal ability, expertise and diversification of the person in the portfolio creation process. In addition, theorists of modern portfolio management defined the portfolio selection process as a process that should be carried out with scientific methods by using quantitative data. Markowitz, the pioneer of modern portfolio theory, is the start of the theories produced in the portfolio management process and pioneered all models proposed after this theory. According to the preference of the investor, this model depends on the principle of making the portfolio risk the smallest or making the expected return on portfolio the largest. By defining the average variance model, Markowitz calculated the correlation between the stocks and argued that the portfolio could be protected from non-systematic risks in line with the negative correlation between the shares.

Variance is generally used as a measure of risk in portfolio optimization models. Although they are not used very frequently, there are alternative risk measures. In this thesis study, the mentioned risk measures were examined. The reasons for not frequently using the risk measures outside of the variance are that it is hard to decide which risk measure is the best, and there is no common risk measure definition. As long as a common risk definition is not made, the difficulties of comparing different risk measures will continue. In order to overcome this difficulty, the performances of the portfolios which were held in a certain period according to different risk measures were calculated. Thus, it can be understood that the distribution of assets made according to different risk measures is the same or different.

We have now more precisely defined the framework in which the analysis ends and the investor chooses and operates the investment.

First, I conclude that volatility (standard deviation), beta, VaR, and CVaR are not adequate risk measures and that the approach based on a normal distribution is not appropriate for the financial market. I think the market is absolutely dangerous. You have to take risks when entering the market or determining the asset class.

I then defined the various asset classes and the various risks associated with them - often the risks that can be managed or mitigated. I also proposed a classification based on risk, but not on the foundation of volatility.

I defined that the market is not perfectly efficient. Indeed it is dictated by many emotions and psychological biases. It is inappropriate to base investment decisions based solely on basic behavioural and technical analysis. This behavioural prejudice must also be considered.

From the perspective of asset valuation, various methods have been proposed based on principles, ratios, or specific analytical methods empirically verified in the context of, for example, money management.

In terms of portfolio building, it is advisable to perform a strategic allocation that provides considerable flexibility without being based on volatility criteria. The choice of different weights for strategic allocation depends on the attractiveness of each asset class at the period of analysis and should be done using a "multi-forces" investment approach.

Indeed, future portfolio management will focus on managing the various risks that make up the portfolio and determining whether or not to be exposed to specific asset classes.

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