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"Portfolio Performance Analysis"

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I would like to thank all my friends; I thank you all for having shared many experiences and thoughts with me throughout the last years. So I was lucky such a many good friends.

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ABSTRACT

It is an obvious fact that, there is a common belief about the investments made on Istanbul Stock Exchange (ISE). It is right to say that most of our people reckon making investment on Istanbul Stock Exchange as a kind of gambling and they believe that the result would be a loss. In order to eliminate these prejudices, investors must be informed about the investment opportunities and investment strategies in the stock exchange market.

This study is to form a portfolio among the 6 chosen stock certificates which have the highest and the lowest transaction volume in ISE national 30 indexes. These stock certificates' closing data of the years between 2001-2006 (for a three month period of each) were taken as a basis. The continuation of the portfolio performance is a topic, which has been being examined intensively for a long time. Most of the investors want to believe that the previous performance of a fund is the determiner of its next performance. If the performance does not have continuity then all of the studies made before will remain as the analysis of the past and will not be used to estimate.

In this study, 6 stock certificates that were transacted the least and another six that were transacted the most from Istanbul Stock Exchange were chosen. The prior analyses of these stock certificates were made and the portfolio was made with the results that were obtained from it. In addition to this performance analyses were also done. With the assessment of the performance results, the expected earnings of the portfolio and the realized earnings were compared and it was determined whether the continuation of the portfolio performance exists or no.

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CHAPTER 1: INTRODUCTION

1.1 AIM OF THIS STUDY

The aim of this study is to form a portfolio among the 6 chosen stock certificates which have the highest and the lowest transaction volume in ISE national 30 indexes. These stock certificates' closing data of the years between 2001-2006 (for a three month period of each) were taken as a basis. The aim is also to provide analyses of the formed portfolio within the framework of Modern Portfolio Theory. In addition, it is intended to reveal how the results can affect future oriented investment decision.

1.2 BROAD PROBLEM AREA

In finance literature, there are two main portfolio management approaches. One of them is called *Traditional Portfolio Management* and this theory is mostly based on simple diversion. The other one is Modern Portfolio Theory which was developed in 1950s and it is based on mathematical and statistical features. *Modern Portfolio Theory* began with an article of Harry Markowitz, which was called 'Portfolio Selection' and published on 'Journal France' in 1952. After 39 years, Merton Miller and William Sharpe developed a more comprehensive theory and won the Nobel Prize. (Markowitz 1990, 279) The first studies of Markowitz were related with the investors' are being focused on risk estimation and the earnings of the each stock document which makes up the portfolio. However, Markowitz indicated the importance of portfolio's risk-earning situation instead of the risk-earning situation of each financial medium in the portfolio. Moreover, he noted that it is important to choose the portfolio instead of choosing each investment vehicle. For example, it is necessary to find expected values, standard deviations and correlations for the analysis of a portfolio which was chosen randomly in a period of time and which consists of financial vehicles. Hence, the expected values and deviations of the portfolio can be calculated.

Generally people who want to invest, want to have good earnings in the market as a result of their investment. Also, the risks of the investment are also as important as its earnings according to them. Although having big risks mean good earnings, investors always hope to have great earnings by taking small risks. Here, at this point forming a portfolio and risk reducing problem occurs. In this study, by taking risk-earnings relation into consideration, risk –earnings relation of the chosen portfolios was examined.

1.3 METHODOLOGY

In this study, by using the finance functions of Excel, the earnings, mean, variance and standard deviation of the stock certificates were calculated. Again with the help of Excel, the covariance of the stock documents was calculated by forming 'covariance matrix'. The correlation numbers between the stock certificates were calculated by using Excel's correlation function.

Within the framework of the results the earnings, variance and standard deviations of the formed portfolios were calculated with 'MMULT' function. Active limit was calculated Excel's 'DATATABLE' FUNCTION.

By using index's closing data, its mean, variance and standard deviation were calculated.

The betas of the index and the stock certificates were calculated by the 'slope' function of Excel.

The relation of the stock certificates with the others and the index was examined by 'regression analysis' function.

1.4 Structure of the Study

The first chapter shows the aim of this study, broad problem statement, methodology and the structures of this study.

The second chapter starts with introduction to investment theory and explain the why investor need to investment. This chapter to talk about capital market history and definition rates of return.

In the third chapter, to mention "Modern Portfolio Theory". Chapter explain that portfolio return and it's how to calculation. How measure to portfolio risk this mean calculation of the mean and variance. And this chapter to touch on systematic and unsystematic risk what this mean. Have been result this chapter contain all of the portfolio analysis.

The fourth chapter explain that how to make a diversification and explain select of the efficient frontier. Besides explain that Capital Asset Pricing Model, Securities Market line and Capital Market Line.

The fifth chapter consists with applications, collected based on the closing prices of the stocks in three months period between the years of 2001-2006 and this datas used the calculation of the portfolio analysis. In first application, common stocks past data's calculated return, variance, standard deviation, covariance, correlation. And result of the calculation, construct a portfolio than calculate portfolio return, variance, standard deviation, efficient frontier. Than calculated index return and stocks betas ,compare of this data's.

In second and last application, form of the expected return with Capital Asset Pricing Model(CAPM) and compare realize the portfolio's return.

The sixth chapter consists with conclusion and gives some recommendation about investment strategies and how must be portfolio management

Chapter 2:AN INTRODUCTION to INVESTMENT THEORY

2.1 Finance from the Investor's Perspective

Most financial decisions you have addressed up to this point in the term have been from the perspective of the firm. Should the company undertake the construction of a new processing plant? Is it more profitable to replace an old boiler now, or wait? In this module, we will examine financial decisions from the perspective of the purchaser of corporate securities: shareholders and bondholders who are free to buy or sell financial assets. Investors, whether they are individuals or institutions such as pension funds, mutual funds, or college endowments, hold *portfolios*, that is, they hold a collection of different securities. Much of the innovation in investment research over the past 40 years has been the development of a theory of portfolio management, and this module is principally an introduction to these new methods. It will answer the basic question, *What rate of return will investors demand to hold a risky security in their portfolio?* To answer this question, we first must consider what investors want, how we define return, and what we mean by risk. (William N. Goetzmann)

2.2. Why Investors Invest?

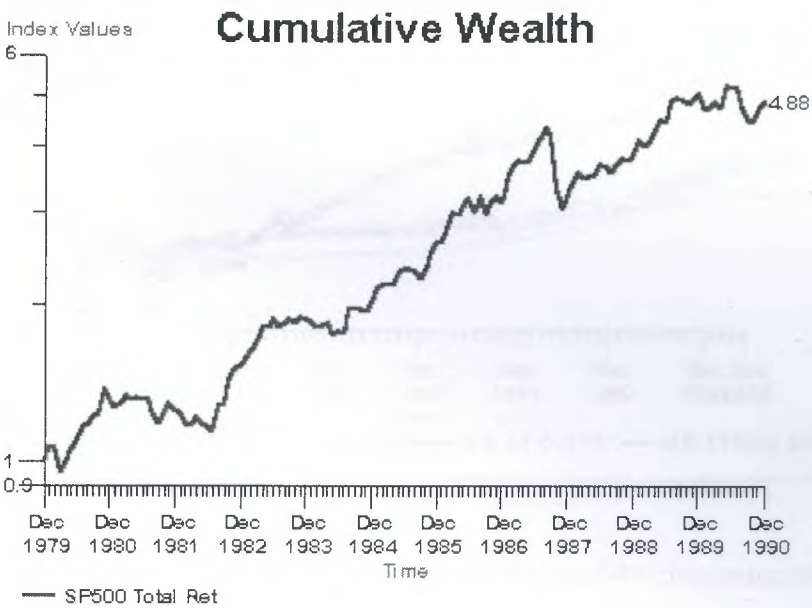
What motivates a person or an organization to buy securities, rather than spending their money immediately? The most common answer is savings -- the desire to pass money from the present into the future. People and organizations anticipate future cash needs, and expect that their earnings in the future will not meet those needs. Another motivation is the desire to increase wealth, i.e. make money grow. Sometimes, the desire to become wealthy in the future can make you willing to take big risks. The purchase of a lottery ticket, for instance only increases the *probability* of becoming very wealthy, but sometimes a small chance at a big payoff, even if it costs a dollar or two, is better than none at all. There are other motives for investment, of course. Charity, for instance. You may be willing to invest to make something happen that might not, otherwise -- you could invest to build a museum, to finance low-income housing, or to re-claim urban neighborhoods. The dividends from these kinds of investments may not be economic, and thus they are difficult to compare and evaluate. For most investors, charitable goals aside, the key measure of benefit derived from a security is the rate of return. (William N. Goetzmann)

2.3. Definition of Rates of Return

The investor return is a measure of the growth in wealth resulting from that investment. This growth measure is expressed in percentage terms to make it comparable across large and small investors. We often express the percent return over a specific time interval, say, one year. For instance, the purchase of a share of stock at time t, represented as P_t will yield P_{t+1} in one year's time, assuming no dividends are paid. This return is calculated as: $R_t = [P_{t+1} - P_t]/P_t$. Notice that this is algebraically the same as: $R_t = [P_{t+1}/P_t]-1$. When dividends are paid, we adjust the calculation to include the intermediate dividend payment: $R_t=[P_{t+1} - P_t+D_t]/P_t$. While this takes care of all the explicit payments, there are other benefits that may derive from holding a stock, including the right to vote on corporate governance, tax treatment, rights offerings, and many other things. These are typically reflected in the price fluctuation of the shares. (William N. Goetzmann)

2.4. Capital Market History

The 1980's was one of the greatest decades for stock investors in the history of the U.S. capital markets.



(Courtesy Ibbotson Associates)

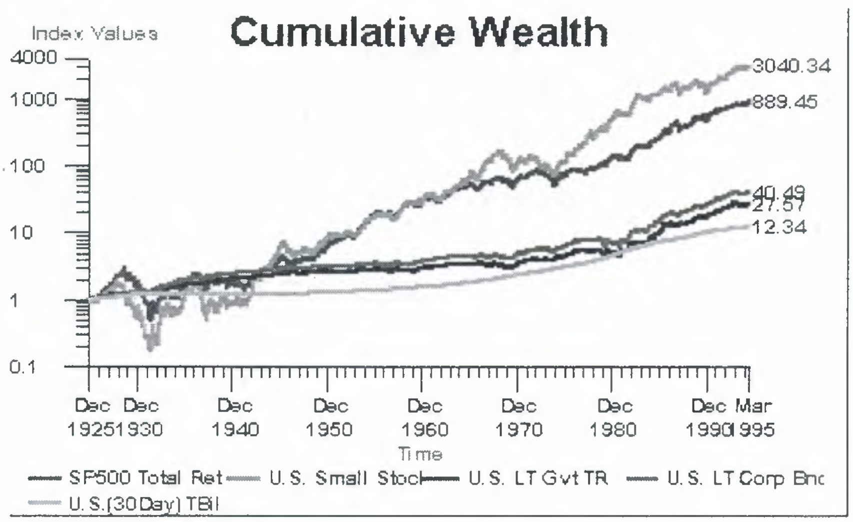
We measure stock market performance by the total return to investment in the S&P 500, which is a standard index of 500 stocks, weighted by the market value of the equity of thecompany. Dividends paid by S&P 500 companies are assumed to be re-invested in shares of stock. This provides a measure of total investor return, before individual taxes are paid.

The 1930's was one of the worst decades for U.S. stock investors.

(Courtesy Ibbotson Associates)

In the 1930's stock markets crashed all over the globe. U.S. stock investors experienced a zero percent return for the eleven-year period from 12/1929 to 12/1939.U.S. Capital Markets over the Long Term: 1926 - 1995

Over the past 68 years, A stock investment in the S&P increased from $1 to $800



(Courtesy Ibbotson Associates)

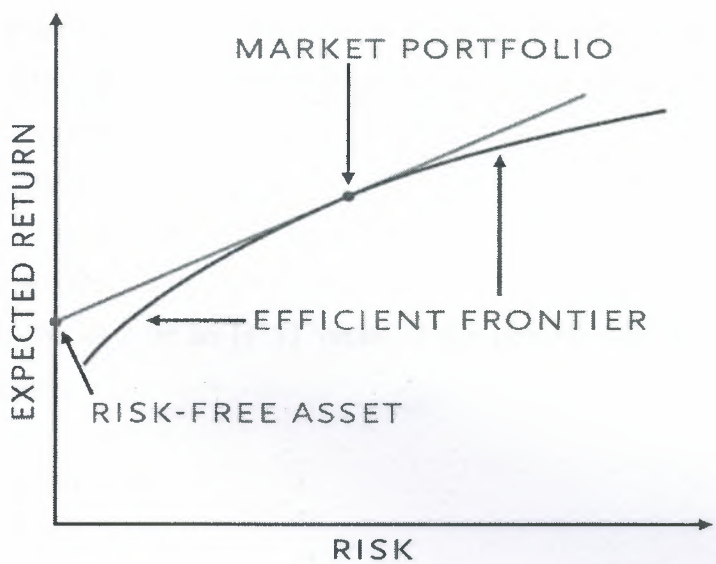
Source:http://viking.som.yale.edu/will/finman540/classnotes/notes.htm

Chapter 3:MODERN PORTFOLIO THEORY

3.1.Introduction

Modern portfolio theory (MPT) proposes how rational investors will use diversification to optimize their portfolios, and how a risky asset should be priced. The basic concepts of the theory are Markowitz diversification, the efficient frontier, capital asset pricing model, the alpha and beta coefficients, the Capital Market Line and the Securities Market Line.

MPT models an asset's return as a random variable, and models a portfolio as a weighted combination of assets; the return of a portfolio is thus the weighted combination of the assets' returns. Moreover, a portfolio's return is a random variable, and consequently has an expected value and a variance. Risk, in this model, is the standard deviation of the portfolio's return.



Source: http://en.wikipedia.org/wiki/Modern_portfolio_theory

3.2.Portfolio Expected Return

Thus far we have dealt with portfolios of at most two assets, with only one involving any risk. It is time to turn to the general relationship between the characteristics of a portfolio and the characteristics of its components.

Let there be *n* assets and *s* states of the world, with R an {n*s} matrix in which the element in row i and column j is the return (or value) of asset i in state of the world j. Here is an example with n=3 and s=4:

	Good	Fair	Poor	Bad
Asset1	5	5	5	5
Asset2	10	8	6	-5
Asset3	25	12	2	-20

Let x be an {n*1} vector of asset holdings in a portfolio. For example:

	x
Asset1	0.20
Asset2	0.30
Asset3	0.50

What will be the return of the portfolio in each of the states? This is easily computed. The {1*s} vector of portfolio returns in the states (rp) will be:

rp = x'*R

Here:

	Good	Fair	Poor	Bad
rp	16.50	9.40	3.80	-10.50

Now, let p be an {s*1} vector of the probabilities of the various states of the world. In this case:

	p
Good	0.40
Fair	0.30
Poor	0.20
Bad	0.10

The expected return (or value) of the portfolio will be:

ep = rp*p

In this case:

ep = 9.13

It is useful to write the expression for expected return in terms of its fundamental components:

ep = x'*R*p

The product of the three terms can be computed in either of two ways. Above, we computed x'*R, then multiplied the result by p. Alternatively, we could have multiplied x' by the result obtained by multiplying R times p:

ep = x'*(R*p)

The parenthesized expression is an {n*1} vector in which each element is the expected return (or value) of one of the n securities. Let *e* be this vector:

e = R*p

Here:

	e
Asset1	5.00
Asset2	7.10
Asset3	12.00

Using these results we may write:

ep = x'*e

That is, the expected return (or value) of a portfolio is equal to the product of the vector of its asset holdings and the vector of asset expected returns (or values). This is the case whether the returns are discrete, as in this derivation, or continuous (that is, drawn from continuous distributions).

The units utilized for the values in vectors x and e will depend on the application. In some cases, physical units (e.g. shares) may be appropriate for x; in others, values (e.g. dollars); and in yet others, proportions of total value. Whatever the units selected, to find the end-of-period value of a portfolio, the end-of-period values per unit of exposure should be placed in vector e and the number of units of each asset held placed in vector x. To find the expected return (or value-relative) for a portfolio, multiply the expected returns (or value-relatives) in vector e by the exposures to the assets in vector x.

Whatever the application, the relationship between the expected outcome of a portfolio and the expected outcomes for its components is relatively simple and intuitive. For example, the expected return on a portfolio is a weighted average of the expected returns on its components, with the proportionate values used as weights. Since the relationship is *linear*, the *marginal effect* on portfolio expected return of a small change in the exposure to a single component will equal its expected outcome:

d(ep)/d(x(j)) = e(j)

If the expected outcome were the only relevant characteristic of a portfolio, it would be easy to make investment decisions. But risk is also relevant. And, as we will see, its determination presents a more substantial challenge. (William F. Sharpe)

3.3. Mean and Variance

It is further assumed that investor's risk / reward preference can be described via a quadratic utility function. The effect of this assumption is that only the expected return and the volatility (i.e. mean return and standard deviation) matter to the investor. The investor is indifferent to other characteristics of the distribution of returns, such as its skew. Note that the theory uses a historical parameter, volatility, as a proxy for risk, while return is an expectation on the future.

Recent innovations in portfolio theory, particularly under the rubric of Post-Modern Portfolio Theory (PMPT), have exposed many flaws in this total reliance on standard deviation as the investor's risk proxy.

Under the model:Portfolio return is the proportion-weighted combination of the constituent assets' returns.

Portfolio volatility is a function of the correlation of the component assets. The change in volatility is non-linear as the weighting of the component assets changes.

Mathematically

In genera

Expected return:

$$\mathrm{E}(R_p) = \sum_i w_i \mathrm{E}(R_i)$$

Where R is return.

Portfolio variance:

$$\sigma_p^2 = \sum_i \sum_j w_i w_j \sigma_{ij} = \sum_i \sum_j w_i w_j \sigma_i \sigma_j \rho_{ij}$$

Portfolio volatility:

$$\sigma_p = \sqrt{\sigma_p^2}$$

For a two asset portfolio:

Portfolio return:

$$\mathrm{E}(R_p) = w_A \mathrm{E}(R_A) + (1 - w_A)\mathrm{E}(R_B) = w_A \mathrm{E}(R_A) + w_B \mathrm{E}(R_B)$$

Portfolio variance: $\sigma_p^2 = w_A^2\sigma_A^2 + w_B^2\sigma_B^2 + 2w_A w_B \rho_{AB} \sigma_A \sigma_B$

For a three asset portfolio, the variance

$$w_A^2\sigma_A^2+w_B^2\sigma_B^2+w_C^2\sigma_C^2+2w_Aw_B\rho_{AB}\sigma_A\sigma_B+2w_Aw_C\rho_{AC}\sigma_A\sigma_C+2w_Bw_C\rho_{BC}\sigma_B\sigma_C$$

As can be seen, as the number of assets (n) in the portfolio increases, the calculation becomes "computationally intensive" - the number of covariance terms = n (n-1) /2. For this reason, portfolio computations usually require specialized software. These values can also be modeled using matrices; for a manageable number of assets, these statistics can be calculated using a spreadsheet.

Source:(http://en.wikipedia.org/wiki/Modern_portfolio_theory)

3.4.Portfolio Risk

For present purposes we will use as a measure of portfolio risk the standard deviation of the distribution of its one-period return or the square of this value, the variance of returns. By definition, the variance of a portfolio's return is the expected value of the squared deviation of the actual return from the portfolio's expected return. It depends, in turn, on the possible asset returns (R), the probability distribution across states of the world (p) and the portfolio's composition (x). The relationship is, however, somewhat complex.

To begin it is useful to create a matrix of deviations of security returns from their expectations. This can be accomplished by subtracting from each security return the corresponding expectation:

```
d = R - e*ones(1,s)
```

The result (d) shows the deviation (surprise) associated with each security in each of the states of the world. Here:

	Good	Fair	Poor	Bad
Asset1	0.00	0.00	0.00	0.00
Asset2	2.90	0.90	-1.10	-12.10
Asset3	13.00	0.00	-10.00	-32.00

The deviation (surprise) associated with the portfolio in each of the states of the world can be obtained by multiplying the transpose of the composition vector times the asset deviation matrix:

```
dp = x'*d
```

In this case:

	Good	Fair	Poor	Bad
dp	7.37	0.27	-5.33	-19.63

To determine the variance of the portfolio, we wish to take a probability-weighted sum of the squared deviations. A simple way to do so uses the dot-product operation, in which elements are treated one by one:

```
vp = sum(p'.*(dp.^2))
```

However, there is a more elegant and (as will be seen) far more useful way to do the computation. First, we create a {s*s} matrix with the state probabilities on the main diagonal and zeros elsewhere. This can be done in one statement:

```
P = diag(p);
```

In this case, P will be:

	Good	Fair	Poor	Bad
Good	0.40	0.00	0.00	0.00
Fair	0.00	0.30	0.00	0.00
Poor	0.00	0.00	0.20	0.00
Bad	0.00	0.00	0.00	0.10

The variance of the portfolio is then given by a more conventional matrix expression:

```
vp = dp*P*dp'
```

For our portfolio:

```
vp = 65.9641
```

and

```
sdp = sqrt(vp)
    = 8.1218
```

To see why the latter procedure for computing variance is more useful, we substitute the vectors used to compute dp:

```
vp = (x'*d)*P*(x'*d)'
```

There is an easier way to write the last portion. Remember that the transpose operation turns a matrix on its side. From this it follows that:

```
(a*b)' = b'*a'
```

For example, let a be a {ra*c} matrix and b a {c*rb} matrix. Then (a*b) is {ra*rb} and (a*b)' is {rb*ra}. Now consider the expression to the right of the equal sign. The first term (b') is of dimension {rb*c}, while the second is of dimension {c*ra}. Their product will thus be of dimension {rb*ra}. Since each element will represent the sum of the same set of products as in the result produced by the expression on the left, the resulting matrices will in fact be the same.

We can use this result to note that:

```
(x'*d)' = d'*x''
```

But two transpose operations will simply turn a matrix on its side, then turn it back, giving the original matrix. Therefore:

(x'*d)' = d'*x

And the expression for portfolio variance can be written as:

vp = (x'*d)*P*(d'*x)

Of course the multiplications can be performed in any desired order. For example:

vp = x'*(d*P*d')*x

The parenthesized term is of great importance in portfolio analysis - - enough to warrant its own section in this exposition. (William F. Sharpe)

3.5.Systemetic and Unsystematic Risk

It is important to distinguish between expected and un expected returns because the unanticipated part of return,that portion resulting from suprises,is the significant risk of any investment.After all,if we always receive exactly what we expect,then the investment is perfectly predictable and,by definition,risk-free.In other words,the risk of owning an asset comes from suprises-unanticipated events.

Systematic and Unsystematic Risk

The first type of suprise,the one affects most assets,we label systematic risk.A systematic risk is one that influences a large number of assets,each to a greater or lesser extend.Because systematic risks have marketwide effects,they are sometimes called market risks.

The second type of suprise we call unsystematic risk.Ansytematic risk is one that affects a single asset, or possibly a small group of assets.Because these risks are unquie to individual companies or assets,they are sometimes unquie or asset specificsiks.

(Charles J. Corrado,Bradford D. Jordan pg. 540)

3.6.Covariance

The matrix described in the previous section is termed the *covariance matrix* for the assets in question. Each of its elements is said to measure the *covariance* between the corresponding assets. Using C to represent the covariance matrix:

C = d*P*d'

In this example:

	Asset1	Asset2	Asset3
Asset1	0.00	0.00	0.00
Asset2	0.00	18.49	56.00

Asset3   0.00   56.00 190.00

The variance of a portfolio depends on the portfolio's composition (x) and the covariance matrix for the assets in question:

```
vp = x'*C*x
```

which of course gives the same value found earlier (65.9641).

Well and good. But what do the covariance numbers mean? How are we to interpret the fact that the covariance of Asset2 with Asset3 is 56.00, while that of Asset3 with itself is 190.00, and so on?

Examination of the matrices involved in the computation of C provides the answer. Recall that C=d*P*d'. Consider the covariance of Asset2 and Asset3. It uses the information in row 2 of matrix d and that in column 3 of matrix d' (the latter is, of course, also in row 3 of matrix d). It also uses the vector of probabilities along the diagonal of matrix P. The net result, written in a slightly casual notation is that:

```
C(2,3) = sum(d(2,s)*p'(s)*d(3,s))
```

where the sum is taken over the states of the world.

As this expression shows, the covariance between two assets is a probability-weighted sum of the product of their deviations. To verify this we can adapt the expression above to make it legal in MATLAB:

```
c23 =  sum(d(2,:).*p'.*d(3,:))
```

The answer is 56.00, precisely equal to the value in the second row and third column of the covariance matrix.

Put in terms of prospective results: the covariance between two assets is the expected value of the product of their deviations from their respective expected values. It immediately follows that the covariance of asset i with asset j is the same as the covariance of asset j with asset i. Thus the matrix is symmetric around its main diagonal -- note that the value in row 2, column 3 is the same as that in row 3, column 2. It also follows from the expression for covariance that the covariance of an asset with itself is its variance. The asset variances thus lie on the main diagonal of the covariance matrix. In this case:

```
va = diag(C)
```

Here:

	va
Asset1	0.00
Asset2	18.49
Asset3	190.00

The asset standard deviations are of course the square roots of these numbers:

```
sda = sqrt(diag(C))
```

In this case:

	sda
Asset1	0.00
Asset2	4.30
Asset3	13.78

Note that the first asset's return is certain. Hence its variance and standard deviation are zero. The second asset is risky, with a standard deviation of 4.30. The third is considerably more risky, with a standard deviation of 13.78.

Since the covariance matrix includes asset variances along the main diagonal, the entire matrix is sometimes termed a *variance-covariance matrix*. For brevity we will use the simpler term *covariance matrix*, but it should be remembered that the diagonal elements are both covariances and variances.

For the special case in which the probability of each state is the same, it is possible to compute the covariance matrix more simply using the standard MATLAB function *cov*. However, the function assumes that the inputs represent a sample of observations drawn from a larger population and hence adjusts the values in the matrix upwards to offset the bias associated with measuring deviations from a fitted mean. In effect, each value produced by the MATLAB function cov will equal the one given by our formulas times (s/(s-1)), where is the number of states (observations).

To use the cov function, simply provide the matrix of observations, with each row representing a different observation (state) and each column a different asset class. For example, if the returns in our {n*s} matrix R were historic observations and we were willing to assume that they were equally probable we could compute:

```
C = cov(R')
```

which would give:

	Asset1	Asset2	Asset3
Asset1	0.00	0.00	0.00
Asset2	0.00	44.92	122.58
Asset3	0.00	122.58	360.92

These values are, of course, quite different from those found earlier, due to both the assumption of equal probabilities and the correction for bias.

With this aside completed, we return to our forward-looking example. (William F. Sharpe)

3.7.Correlation

It is relatively easy to find a meaning for the elements on the main diagonal of the covariance matrix. But what of the remaining ones? How can one interpret the fact that the covariance of Asset2 with Asset3 is 56.00?

The solution is to scale each covariance by the product of the standard deviations of the associated assets. The result is the *correlation coefficient* for the two assets, usually denoted by the Greek letter rho:

```
rho(i,j) = C(i,j)/(sda(i)*sda(j))
```

The matrix of correlation coefficients is termed (unimaginatively) the *correlation matrix*. We denote it Corr. To compute it, we compute a matrix containing the products of the asset standard deviations:

sda*sda':

	Asset1	Asset2	Asset3
Asset1	0.00	0.00	0.00
Asset2	0.00	18.49	59.27
Asset3	0.00	59.27	190.00

We need to divide each element in the covariance matrix by the corresponding element in this matrix. This can be done in one equation:

```
Corr = C./(sda*sda')
```

Giving:

	Asset1	Asset2	Asset3
Asset1	NaN	NaN	NaN
Asset2	NaN	1.00	0.94
Asset3	NaN	0.94	1.00

Notice that the elements associated with asset pairs in which one of the assets is riskless are *NaN* (not a number), since they involve an attempt to divide zero (the covariance) by zero(the product of two standard deviations, one of which is zero).

While the correlation of two assets, one of which is riskless, is not really a number, it sometimes proves helpful to set it to zero. This can be accomplished by adjusting the matrix of the cross-products of the standard deviations to have ones in the cells for which the true value is zero. A simple way to do this is to add to the original matrix a matrix with 1.0 in such positions. Since "true" is represented in MATLAB as 1.0, a single matrix expression does the job. Here is a set of statements that accomplishes the objective:

```
z = sda*sda';
z = z + (z==0);
CC = C./z;
```

where CC is the desired correlation matrix. In this case:

	Asset1	Asset2	Asset3
Asset1	0.00	0.00	0.00
Asset2	0.00	1.00	0.94
Asset3	0.00	0.94	1.00

In most cases, the covariance matrix is known, and the correlation matrix derived from it as an aid in interpretation. However, there are cases in which standard deviations and correlations are estimated first, and the covariance matrix derived from those estimates. To do this, we simply reverse the terms in the definition of correlation. For the element in row i, column j:

```
C(i,j) = rho(i,j)*sda(i)*sda(j)
```

And, for the entire matrix:

```
C =CC.*(sda*sda')
```

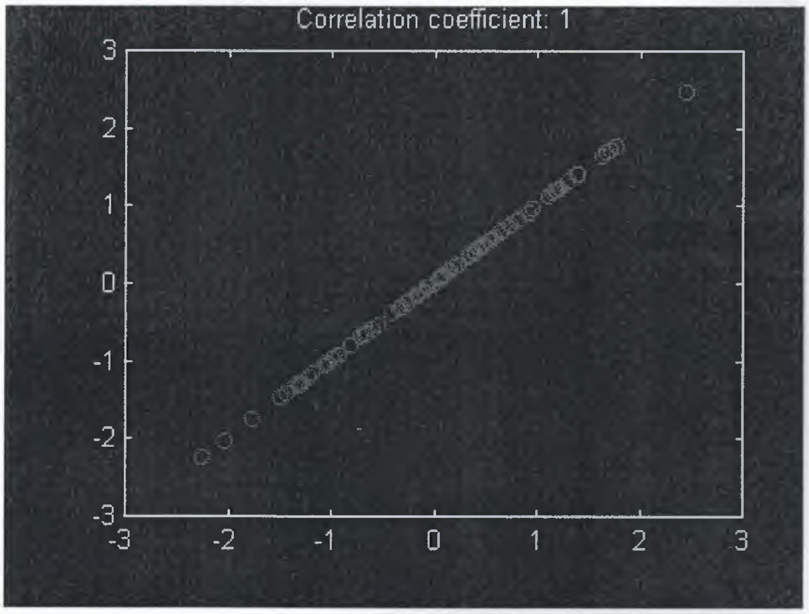
Note that the adjusted matrix CC was used in the latter computation to avoid NaN values in the cells associated with the riskless asset. (William F. Sharpe)

3.8.Interpreting Correlation Coefficients

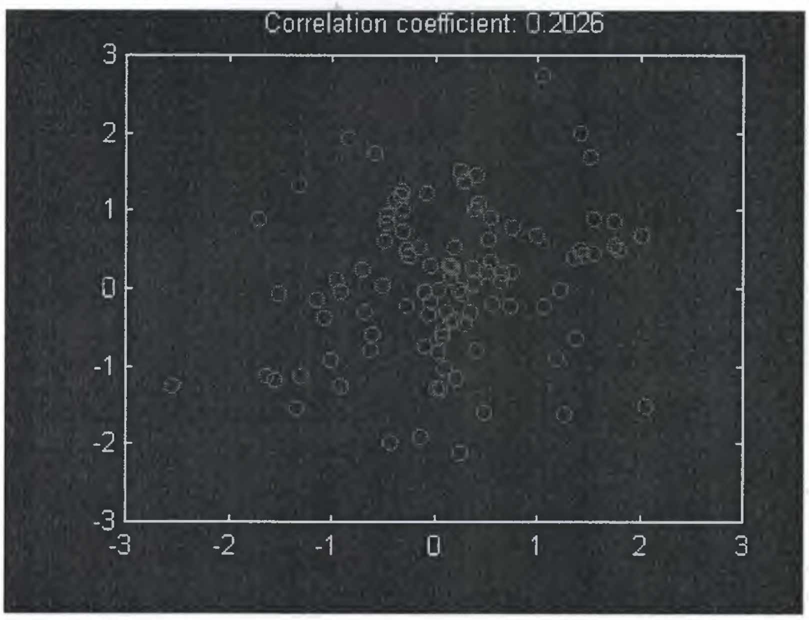
Asset covariances are the main ingredients for computing portfolio risks. But we have shown that standard deviations are much easier to interpret than are asset variances. Similarly, correlations often prove more useful for communicating relationships than do covariances. Correlation coefficients measure the extent of the association between two variables. Each such coefficient must lie between -1 and +1, inclusive. A positive coefficient indicates a positive association: a greater-than-expected outcome for one variable is likely to be associated with a greater- than-expected outcome for the other while a smaller-than-expected outcome for one is likely to be associated with a smaller-than-expected outcome for the other. A negative coefficient indicates a negative association: a greater-than-expected outcome for one variable is likely to be associated with a smaller-than-expected outcome for the other while a smaller-than- expected outcome for one is likely to be associated with a greater-than-expected outcome for the other.

The figures below provide examples. In each case the probabilities of the points shown are assumed to be equal.

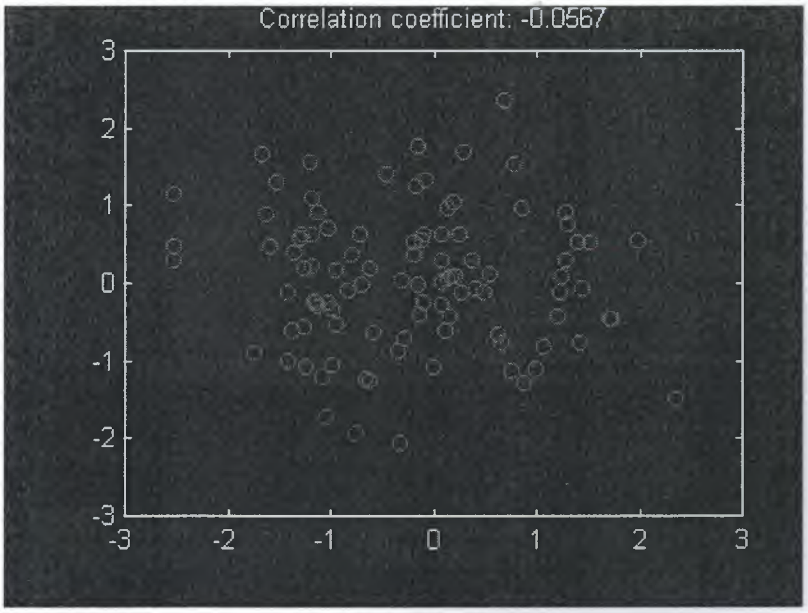
Correlation coefficent: 1



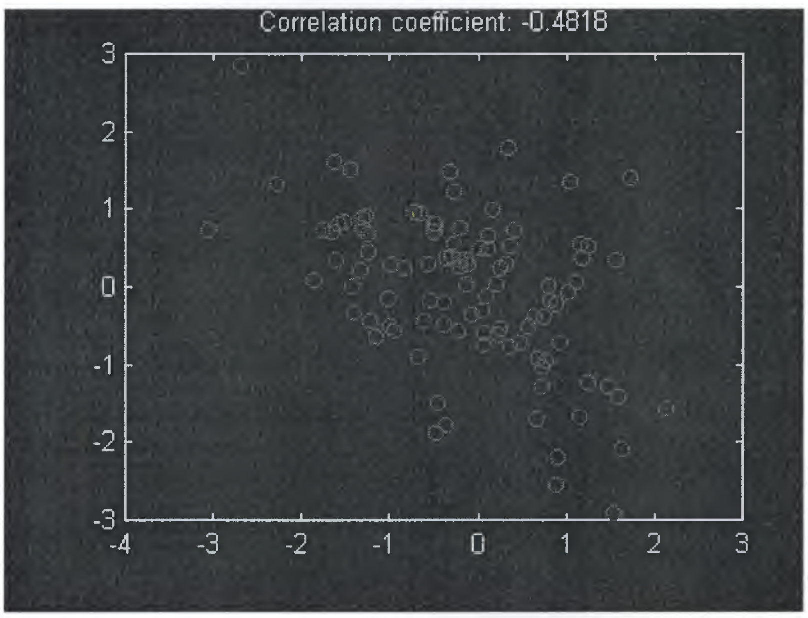
Correlation coefficent:0,2026



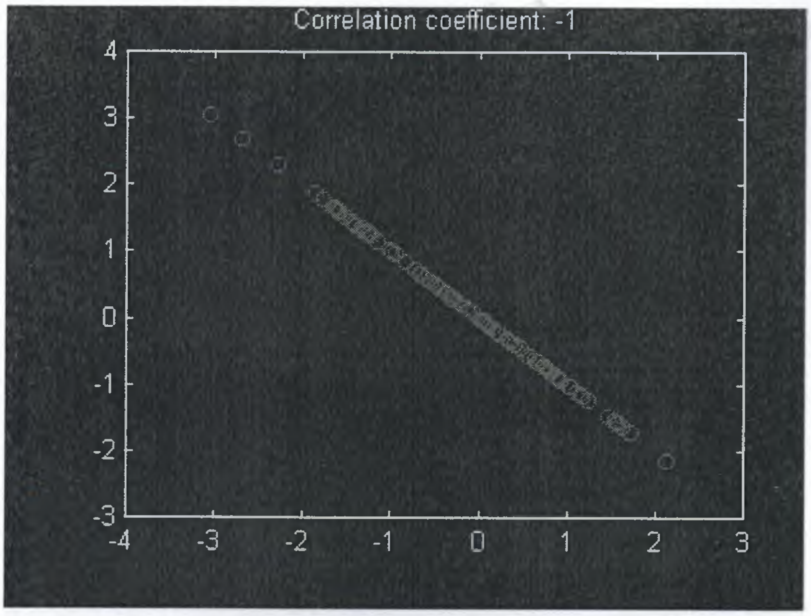
Correlation coefficent:-0,0567



Correlation coefficent:-0,4814



Correlation coefficent:-1



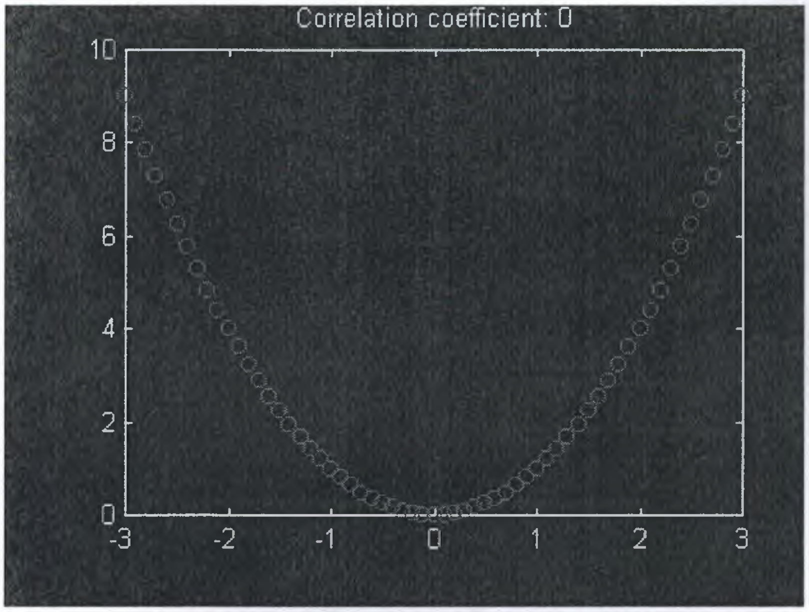
In the above examples the variables are roughly jointly normally distributed with means of zero and standard deviations of 1.0 -- roughly, because each of the 100 points is drawn from such a joint distribution so the (sample) distribution of the actual results departs somewhat from the underlying (population) distribution.

Note that in the case of perfect positive correlation (+1.0), the points fall precisely along an upward- sloping straight line. In this case it has a slope of approximately 45 degrees due tothe nature of the variables. In general, the line may have a greater or smaller slope. Nonetheless, a necessary and sufficient condition for perfect positive correlation is that all possible outcomes plot on an upward-sloping straight line.In the case of perfect negative correlation the plot has the opposite characteristic. All points will plot on a downward-sloping straight line. Here too, the slope will depend on the magnitudes of the variables, but the line will be downward-sloping in any event.

As the figures show, in the case of less-than-perfect positive correlation (between 0 and +1.0), the points will tend to follow an upward-sloping line, but will deviate from it. The closer the correlation coefficient is to zero, the greater will be such deviations and the more difficult it will be to see any positive relationship. In the case of less-than-perfect negative correlation (between 0 and -1), the points will tend to follow a downward-sloping line. Here too, the closer the correlation coefficient is to zero, the greater will be the deviations and the more obscure the relationship.

If the correlation coefficient is zero, the best linear approximation of the relationship will be a flat line. This does not preclude the possibility that there is a non-linear relationship between the variables. The figure below shows a case in which the correlation coefficient is zero, but knowledge of the value of the variable on the horizontal axis would help a great deal if one wished to predict the value of the variable on the vertical axis. In this case the variables are *uncorrelated*, but they are not *independent*.

Correlation coefficent:0



In the special case in which probabilities are equal, one can use the MATLAB function *corrcoef* to compute a correlation matrix directly from an {n*s} matrix of values of n assets in s different states of the world, with each row representing a different state (observation) and each column a different asset. For example:

corrcoef(R')

would give:

	Asset1	Asset2	Asset3
Asset1	NaN	NaN	NaN
Asset2	NaN	1.00	0.96
Asset3	NaN	0.96	1.00

In this case the only source of the differences from our forward- looking estimates is the use of equal probabilities rather than the predicted probabilities. Since the correlation coefficient is the ratio of estimated variance to the product of two estimated standard deviations, any adjustment of the covariance matrix for sample bias cancels out, leaving the correlation coefficients unaffected. (William F. Sharpe) Source:http://www.stanford.edu/~wfsharpe/mia/mia.h

3.9.The risk-free asset

The risk-free asset is the (hypothetical) asset which pays a risk-free rate - it is usually proxied by an investment in short-dated Government securities. The risk-free asset has zero variance in returns (hence is risk-free); it is also uncorrelated with any other asset (by definition: since its variance is zero). As a result, when it is combined with any other asset, or portfolio of assets, the change in return and *also in risk* is linear.

Because both risk and return change linearly as the risk-free asset is introduced into a portfolio, this combination will plot a straight line in risk-return space. The line starts at 100% in cash and weight of the risky portfolio = 0 (i.e. intercepting the return axis at the risk-free rate) and goes through the portfolio in question where cash holding
= 0 and portfolio weight = 1.

Mathematically:

Using the formulae for a two asset portfolio as above:

Return is the weighted average of the risk free asset, *f*, and the risky portfolio, p, and is therefore linear:

Return = $w_f \mathrm{E}(R_f) + w_p \mathrm{E}(R_p)$

Since the asset is risk free, portfolio standard deviation is simply a function of the weight of the risky portfolio in the position. This relationship is linear.

Standard deviation = $\sqrt{w_f^2\sigma_f^2 + w_p^2\sigma_p^2 + 2w_f w_p \sigma_{fp}}$

= $\sqrt{w_f^2 * 0 + w_p^2\sigma_p^2 + 2w_f w_p * 0}$

= $\sqrt{w_p^2\sigma_p^2}$

= $w_p\sigma_p$

Source:(http://en.wikipedia.org/wiki/Modern_portfolio_theory)

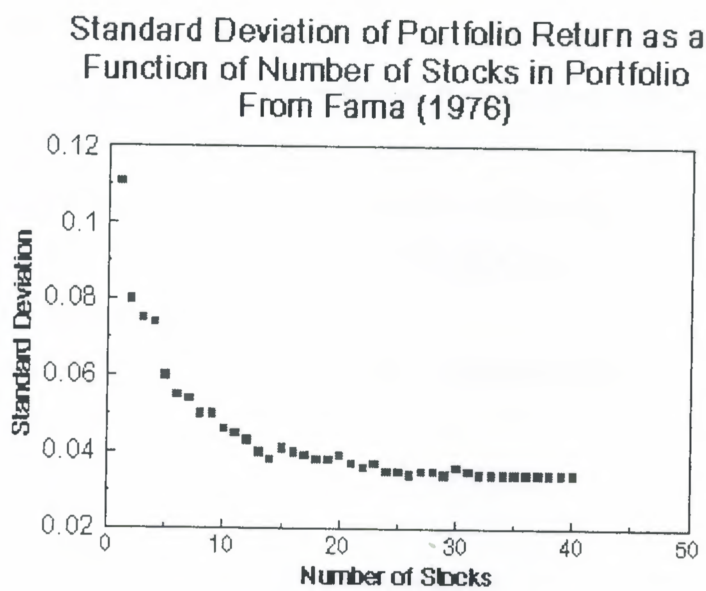
Chapter 4:DIVERSIFICATION

4.1Introduction

An investor can reduce portfolio risk simply by holding instruments which are not perfectly correlated. In other words, investors can reduce their exposure to individual asset risk by holding a diversified portfolio of assets. Diversification will allow for the same portfolio return with reduced risk. For diversification to work the component assets must not be perfectly correlated, i.e. correlation coefficient not equal to 1. Source:(http://en.wikipedia.org/wiki/Modern_portfolio_theory)

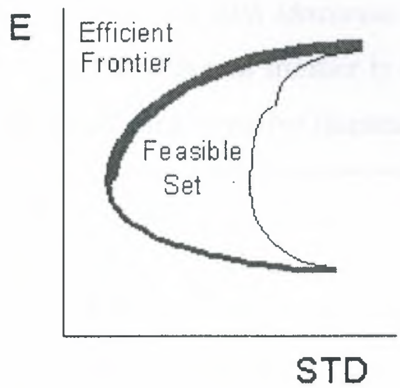
4.2.More Securities and More Diversification

Now consider what will happen as you put more assets into the portfolio. Take the special case in which the correlation between all assets is zero, and all of them have the same risk. You will find that you can reduce the standard deviation of the portfolio by mixing across several assets rather than just two. Each point represents an equally-weighted combination of assets; from a single stock to two, to three, to thirty, and more. Notice that, after 30 stocks, diversification is mostly achieved. There are enormous gains to diversification beyond one or two stocks.



(Courtesy Campbell Harvey)

If you allow yourself to vary the portfolio weights, rather than keeping them equal, the benefits are even greater, however the mathematics is more challenging. You not only have to calculate the STD of the mixture between A&B, but the STD of every conceivable mixture of the securities. None-the-less, If you did so, you would find that there is a set of portfolios which provide the lowest level of risk for each level of return, and the highest level of return for each level of risk. By considering all combinations of assets, a special set of portfolios stand out -- this set is called the efficient frontier.



The efficient frontier, shown in blue, is the set of dominant portfolios, at least from the perspective of a risk averse investor. For ANY level of risk, the efficient frontier identifies a point that is the highest returning portfolio in its risk class. By the same token, for any level of return, the frontier identifies the lowest risk portfolio in that return class. Notice that it extends from the maximum return portfolio (actually a single asset) to the minimum variance portfolio. The efficient frontier has a portfolio for everyone -- there are an infinite number of points in the set, corresponding to the infinite variation in investor preferences for risk. The area called the feasible set represents all feasible combinations of assets. There are no assets that fall outside of the feasible set. .

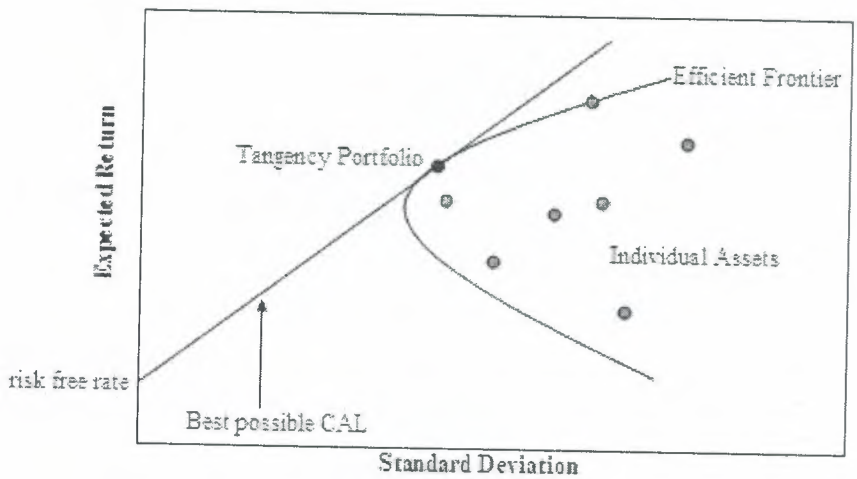
(William F. Sharpe)

Source:http://www.stanford.edu/~wfsharpe/mia/mia.h

4.3.The efficient frontier

Every possible asset combination can be plotted in risk-return space, and the collection of all such possible portfolios defines a region in this space. The line along the upper edge of this region is known as the *efficient frontier* (sometimes "the **Markowitz frontier**"). Combinations along this line represent portfolios for which there is lowest risk for a given level of return. Conversely, for a given amount of risk, the portfolio lying on the efficient frontier represents the combination offering the best possible return. Mathematically the Efficient Frontier is the intersection of the *Set of Portfolios with Minimum Variance* and the *Set of Portfolios with Maximum Return.*

The efficient frontier is illustrated above, with return μ_p on the y axis, and risk σ_p on the x axis; an alternative illustration from the **diagram** in the CAPM article is at right.



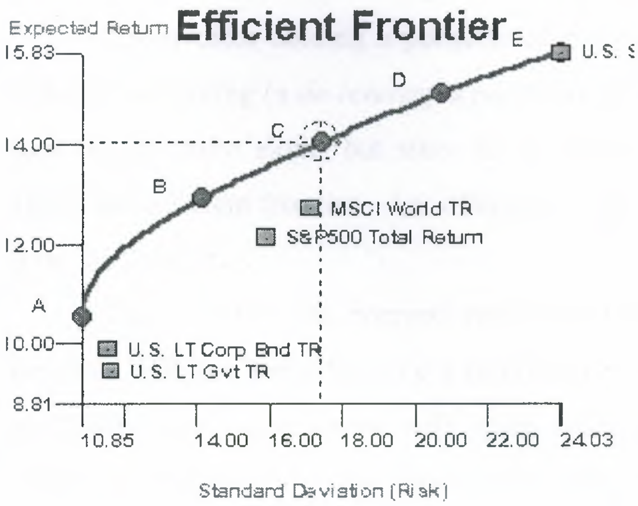
The efficient frontier will be convex – this is because the risk-return characteristics of a portfolio change in a non-linear fashion as its component weightings are changed. (As described above, portfolio risk is a function of the **correlation** of the component assets, and thus changes in a non-linear fashion as the weighting of component assets changes.)

The region above the frontier is unachievable by holding risky assets alone. No portfolios can be constructed corresponding to the points in this region. Points below the frontier are suboptimal. A rational investor will hold a portfolio only on the frontier.

Source:(http://en.wikipedia.org/wiki/Modern_portfolio_theory)

4.4. An Actual Efficient Frontier Today

This figure is an efficient frontier created from historical inputs for U.S. and international assets over the period 1970 through 3/1995, using the Ibbotson EnCorr Optimizer program.



(Courtesy Ibbotson Associates)

This is state-of-the-art portfolio selection technology, however it is still based upon Markowitz's original optimization program. There are some basic features to remember:

A minimum variance portfolio exists

A maximum return portfolio is composed of a single asset.

B,C,D & E are critical points at which one the set of assets used in the frontier changes, i.e. an asset drops out or comes in at these points.

There are no assets to the northwest of the frontier. That is why we call it a frontier. It is the edge of the feasible combinations of risk and returns.

(William F. Sharpe) Source:http://www.stanford.edu/~wfsharpe/mia/mia.h

4.5.Portfolio leverage

An investor can add leverage to the portfolio by borrowing the risk-free asset. The addition of the risk-free asset allows for a position in the region above the efficient frontier. Thus, by combining a risk-free asset with risky assets, it is possible to construct portfolios whose risk-return profiles are superior to those on the efficient frontier.

An investor holding a portfolio of risky assets, with a holding in cash, has a positive risk-free weighting (a *de-leveraged portfolio*). The return and standard deviation will be lower than the portfolio alone, but since the efficient frontier is convex, this combination will sit above the efficient frontier – i.e. offering a higher return for the same risk as the point below it on the frontier.

The investor who borrows money to fund his/her purchase of the risky assets has a negative risk-free weighting -i.e a *leveraged portfolio*. Here the return is geared to the risky portfolio. This combination will again offer a return superior to those on the frontier. (Source:(http://en.wikipedia.org/wiki/Modern_portfolio_theory))

4.6.The market portfolio

The efficient frontier is a collection of portfolios, each one optimal for a given amount of risk. A quantity known as the Sharpe ratio represents a measure of the amount of additional return (above the risk-free rate) a portfolio provides compared to the risk it carries. The portfolio on the efficient frontier with the highest Sharpe Ratio is known as the market portfolio, or sometimes the super-efficient portfolio; it is the tangency-portfolio in the above diagram.

This portfolio has the property that any combination of it and the risk-free asset will produce a return that is above the efficient frontier - offering a larger return for a given amount of risk than a portfolio of risky assets on the frontier would. (http://en.wikipedia.org/wiki/Modern_portfolio_theory)

4.7.Capital Market Line

When the market portfolio is combined with the risk-free asset, the result is the *Capital Market Line*. All points along the *CML* have superior risk-return profiles to any portfolio on the efficient frontier. (The market portfolio with zero cash weighting is on the efficient frontier; additions of cash or leverage with the risk-free asset in combination with the market portfolio are on the Capital Market Line. All of these portfolio represent the highest Sharpe ratios possible.)

The CML is illustrated above, with return μ_p on the y axis, and risk σ_p on the x axis. One can prove that the CML is the optimal CAL and that its equation is:

$$CML : E(r_C) = r_F + \sigma_C \frac{E(r_M) - r_F}{\sigma_M}$$

(http://en.wikipedia.org/wiki/Modern_portfolio_theory)

4.8.Capital Asset Pricing Model

Because the CAPM is a theory, we must assume for argument that ...;

All assets in the world are traded.

All assets are infinitely divisible.

All investors in the world collectively hold all assets.

For every borrower, there is a lender.

There is a riskless security in the world.

All investors borrow and lend at the riskless rate.

Everyone agrees on the inputs to the Mean-STD Picture.

Preferences are well-described by simple utility functions.

Security distributions are normal, or at least well described by two parameters.

There are only two periods of time in our world.

(William F. Sharpe) Source:http://www.stanford.edu/~wfsharpe/mia/mia.h

The asset return depends on the amount for the asset today. The price paid must ensure that the market portfolio's risk / return characteristics improve when the asset is added to it. The CAPM is a model which derives the theoretical required return (i.e. discount rate) for an asset in a market, given the risk-free rate available to investors and the risk of the market as a whole.

(http://en.wikipedia.org/wiki/Modern_portfolio_theory)

The CAPM is usually expressed:

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f)$$

β, Beta, is the measure of asset sensitivity to a movement in the overall market; Beta is usually found via regression on historical data. Betas exceeding one signify more than average "riskiness"; betas below one indicate lower than average.

$(E(R_m) - R_f)$ is the market premium, the historically observed excess return of the market over the risk-free rate.

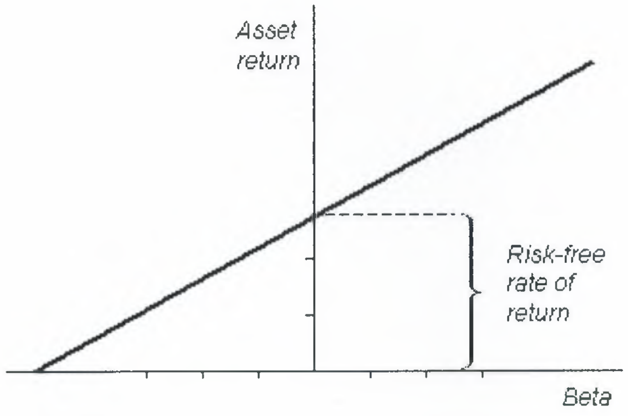
Once the expected return, $E(r_i)$, is calculated using CAPM, the future cash flows of the asset can be discounted to their present value using this rate to establish the correct price for the asset. (*Here again, the theory accepts in its assumptions that a parameter based on past data can be combined with a future expectation.*)

A more risky stock will have a higher beta and will be discounted at a higher rate; less sensitive stocks will have lower betas and be discounted at a lower rate. In theory, an asset is correctly priced when its observed price is the same as its value calculated using the CAPM derived discount rate. If the observed price is higher than the valuation, then the asset is overvalued; it is undervalued for a too low price.

4.9.Securities Market Line

The SML essentially graphs the results from the capital asset pricing model (CAPM) formula. The X-axis represents the risk (beta), and the Y-axis represents the expected return. The market risk premium is determined from the slope of the SML.

The Securitiy Market line



The relationship between Beta & required return is plotted on the *securities market line* (SML) which shows expected return as a function of **β**. The intercept is the risk-free rate available for the market, while the slope is $(\mathrm{E}(R_m) - R_f)$. The Securities market line can be regarded as representing a single-factor model of the asset price, where Beta is exposure to changes in value of the Market. The equation of the SML is thus:

$$\mathrm{SML}: E(R_i) - R_f = \beta_i(E(R_M) - R_f)$$

It is not a useful tool in determining if an asset being considered for a portfolio offers a reasonable expected return for risk. Individual securities are plotted on the SML graph. If the security's risk versus expected return is plotted above the SML, it is undervalued since the investor can expect a greater return for the inherent risk. And a security plotted below the SML is overvalued since the investor would be accepting less return for the amount of risk assumed.

CHAPTER 5: DATA ANALYSIS

5.1.Definitons of Data

This study used datas of ISE-30 between 2001 and 2006. I selected six stocks with the highest trading volume and six stocks with the lowest trading volume from ISE-30. I collected quarterly closing stock prices between 2001-2006 from Istanbul Stock Exchange's web page (www.imkb.gov.tr). Data analysis approach of Markowits "Modern Portfolio Theory" and the Excel's financial tools have been used.

The name of the highest trading volume stocks are: Doğan Holding(DOHOL), Garanti Banks(GARAN) , İş Banks C(ISCTR), Koç Holding(KCHOL), Turkcell(TCELL), Yapı Kredi Banks (YKBNK).

The name of the lowest trading volme stocks are: ABANA Elektromekanik(ABANA), Anadolu Cam(ANACM), Birlik Mensucat(BRMEN),Esem Spor Giyim (ESEMS),Is Bankası C (ISBTR),Transtürk Holding(TRNSK) .

5.2.Calculation Return of the Common Stocks

This the percentage return that would be earned by an investor who bought the stock at the end of a particular quarter t-1 and sold it at the end of the following quarter.For quarter t and stock's monthly return r_{At} is defined as $r_{At}= \ln (P_{At} / P_{A,t-1})$.

We ignore dividends for this study.We assume that the return data for the 24 quarter represent the distribution of the returns for the quarter.We thus assume that past gives us some information about the way returns will behave in the future.This assumption allows us to assume that the average of the historic data represent expected quarterly return from each stock. It also assumes that we can learn the variance of the future returns from historic data. Using the Average( ),Varp( ) and Stdevp( ) functions in Excel, I calculated the statistics for the return distribution.

A) High Trading Volume:

(Table 5.1)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													
2		DOHOL		GARAN		ISCTR		KCHOL		TCELL		YKBNK	
3	QUARTER	Price	Return	Price	Return	Price	Return	Price	Return	Price	Return	Price	Return
4	30.03.2001	0,41		0,37		1.82		1,99		1,53		0.78	=LN(M5/M4)
5	29.06.2001	0,67	49,11%	0,77	73,29%	2.52	32,54%	2,93	38.69%	1,77	14,57%	1.55	68.67%
6	28.09.2001	0.27	-90,89%	0,44	-55,96%	1,47	-53,90%	1,78	-49,84%	0.84	-74,53%	0.89	-55.48%
7	28.12.2001	0,62	83,13%	0,93	74,84%	2,3	44,76%	3,43	65.59%	2,64	114,51%	1,77	68.75%
8	29.03.2002	0,62	0,00%	0,95	2,13%	2.1	-9,10%	2.93	-15,76%	1.82	-37,19%	1,59	-10.72%
9	28.06.2002	0,53	-15,68%	0,7	-30,54%	1,16	-59,35%	2,8	-4.54%	1,48	-20,68%	0,63	-92.58%
10	30.09.2002	0,49	-7,85%	0,54	-25,95%	0,95	-19,97%	2,8	0,00%	1,63	9,65%	0,43	-38.19%
11	31.12.2002	0,47	-4,17%	0,8	39,30%	1,23	25,83%	3,11	10,50%	2.05	22,93%	0,55	24.61%
12	31.03.2003	0,38	-21,26%	0,6	-28,77%	1,12	-9.37%	2,48	-22,64%	1,84	-10,81%	0,57	3.57%
13	30.06.2003	0,41	7,60%	0,72	18,23%	1,28	13,35%	2,68	7,76%	2,01	8,84%	0,61	6,78%
14	30.09.2003	0.51	21,83%	0,99	31,85%	1,8	34,09%	3,53	27,55%	2,02	0,50%	0,64	4,80%
15	31.12.2003	1,01	68,33%	1,59	47,38%	2,84	45,60%	5,17	38,16%	2,96	38,21%	1,15	58,60%
16	31.03.2004	1,2	17,24%	1,83	14,06%	2,94	3.46%	4,82	-7,01%	3,95	28,85%	1,47	24,55%
17	30.06.2004	0,98	-20,25%	1,72	-6,20%	2,75	-6,68%	4,2	-13,77%	3,92	-0,76%	1,41	-4,17%
18	30.09.2004	1,28	26,71%	1,96	13,06%	3,22	15,78%	5,52	27,33%	4,24	7,85%	1,57	10,75%
19	29.12.2004	1,35	5,32%	2,41	20,67%	4,36	30,31%	5,52	0,00%	5,94	33,71%	1,68	6,77%
20	31.03.2005	1,67	21,27%	2,9	18,51%	4,56	4,49%	4,69	-16,29%	5,85	-1,53%	2,14	24,20%
21	30.06.2005	1,59	-4,91%	3,26	11,70%	4,64	1,74%	4,77	1,69%	5,35	-8,93%	2,03	-5,28%
22	30.09.2005	1,78	11,29%	3,98	19,96%	6,68	36,44%	5,55	15,15%	6	11,47%	2,22	8,95%
23	30.12.2005	2,08	15,58%	4,85	19,77%	8,36	22,43%	5,77	3,89%	6,65	10,29%	2,5	11,88%
24	31.03.2006	2,91	33,58%	4,95	2,04%	8	-4,40%	6,5	11,91%	6,98	4,84%	2,82	12,04%
25	30.06.2006	2,87	-1,38%	3,94	-22,82%	5,57	-36,20%	4,72	-32,00%	7,25	3,80%	2,39	-16,54%
26	29.09.2006	2,87	0,00%	4,48	12,84%	5,75	3,18%	4,86	2,92%	7,7	6,02%	2,62	9,19%
27	29.12.2006	2,23	-25,23%	4,68	4,37%	6,5	12,26%	5,5	12,37%	7,15	-7,41%	2,46	-6,30%

28	A	B	C	D	E	F	G	
29		DOHOL	GARAN	ISCTR	KCHOL	TCELL	YKBNK	
30	Querterly Mean	**7,36%**	**11,03%**	**5,53%**	**4,42%**	**6,70%**	**4,99%**	**<--=AVAREGE(M5:M27)**
31	Querterly Variance	**11,47%**	**9,43%**	**7,83%**	**6,01%**	**10,61%**	**12,34%**	**<--=VARP(M5:M27)**
32	Querterly Stand. Dev.	**33,86%**	**30,71%**	**27,98%**	**24,52%**	**32,58%**	**35,12%**	**<--=STDEVP(M5:M27)**
33								
34	Annual Mean	**29,45%**	**44,13%**	**22,14%**	**17,68%**	**26,81%**	**19,98%**	**<--=4*G30**
35	Annual Variance	**45,87%**	**37,72%**	**31,33%**	**24,05%**	**42,46%**	**49,34%**	**<--=4*G31**
36	Annual Stand. Dev.	**67,73%**	**61,42%**	**55,97%**	**49,04%**	**65,16%**	**70,24%**	**<--=SQRT(G35)**

According to result of my calculation(Table 5.1);GARAN has the highest return with 11,03%, KCHOL has the at least return with 4,42%.However,YKBNK has the most risk with a standard deviation of 35,12%,KCHOL has the lowest risk with a standard deviation of 24,52%.

Under normal conditions high risk must provide high return but although YKBNK has the highest standard deviation(35,12%) it does not provide the highest return,this shows that

YKBNK is not a good stocks.The result of the analyze is that,GARAN showed good performance during a period(mean=11,03 and standard deviation=30,71).

B)Low Trading Volume:

(Table 5.2)

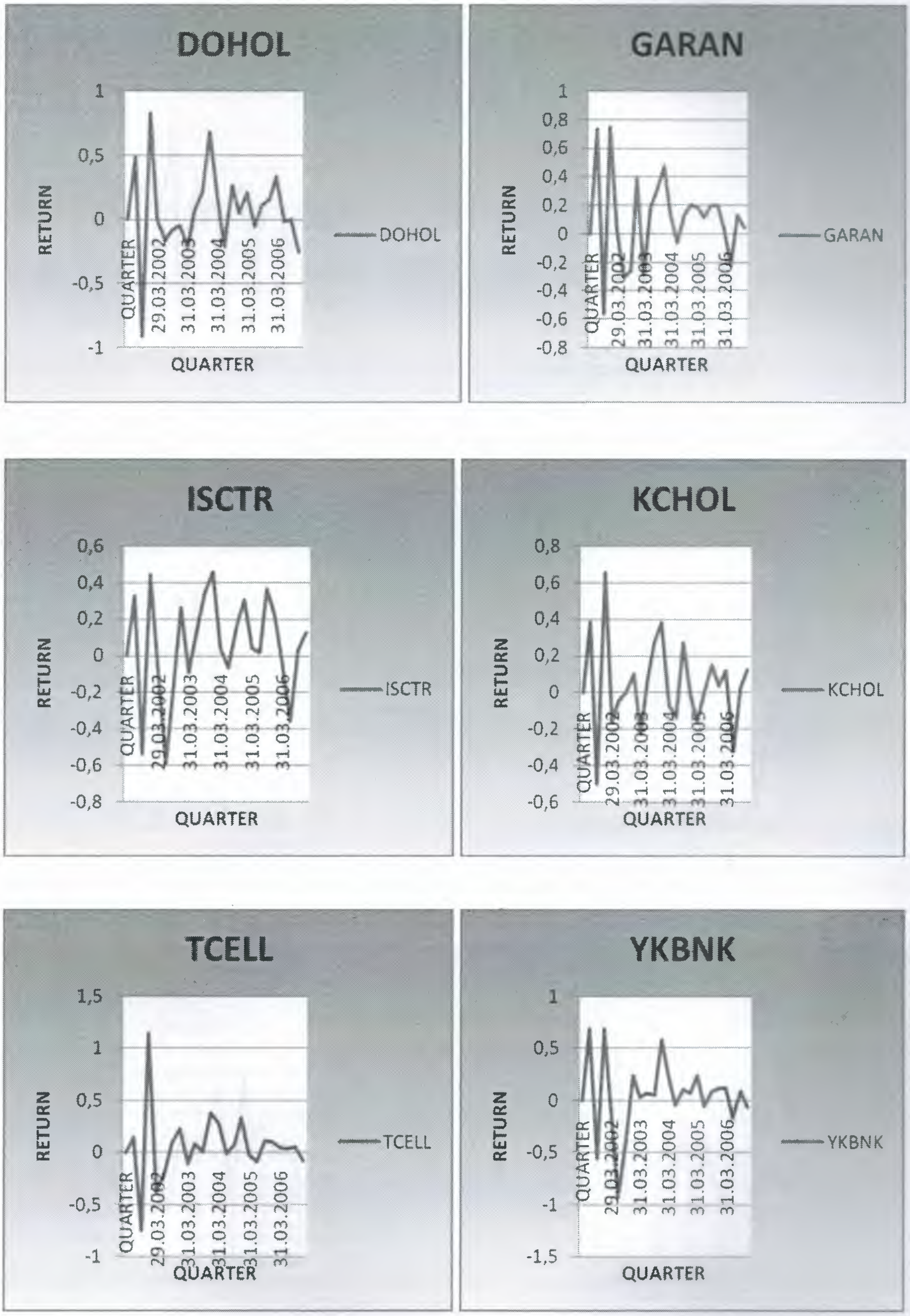
	A	B	C	D	E	F	G	H	I	J	K	L	M
1													
2		ABANA		ANACM		BRMEN		ESEMS		ISBTR		TRNSK	
3	QUARTER	Price	Return	Price	Return	Price	Return	Price	Return	Price	Return	Price	Return
4	30.03.2001	1,2		0,32		0,6		0,43		713,96		0,22	=LN(M5/M4)
5	29.06.2001	1,39	14,70%	0,32	0,00%	0,68	12,52%	0,63	38,19%	815,62	13,31%	0,2	-9,53%
6	28.09.2001	1,52	8,94%	0,23	-33,02%	0,6	-12,52%	0,53	-17,28%	543,8	-40,55%	0,15	-28,77%
7	28.12.2001	1,75	14,09%	0,53	83,48%	0,76	23,64%	0,82	43,64%	815,62	40,55%	0,53	126,22%
8	29.03.2002	1,7	-2,90%	0,47	-12,01%	0,78	2,60%	0,79	-3,73%	669,98	-19,67%	0,39	-30,67%
9	28.06.2002	1,98	15,25%	0,46	-2,15%	0,83	6,21%	0,55	-36,21%	504,91	-28,29%	0,52	28,77%
10	30.09.2002	3,1	44,83%	0,56	19,67%	0,82	-1,21%	0,5	-9,53%	514,62	1,90%	0,36	-36,77%
11	31.12.2002	1,4	-79,49%	0,67	17,93%	1,17	35,55%	0,45	-10,54%	572,88	10,72%	0,38	5,41%
12	31.03.2003	1,25	-11,33%	0,89	28,39%	1,1	-6,17%	0,4	-11,78%	553,46	-3,45%	0,34	-11,12%
13	30.06.2003	1,43	13,45%	1,15	25,63%	1,52	32,34%	1,14	104,73%	597,15	7,60%	0,51	40,55%
14	30.09.2003	1,3	-9,53%	1,25	8,34%	1,59	4,50%	0,81	-34,17%	699,11	15,76%	0,38	-29,42%
15	31.12.2003	1,35	3,77%	2,13	53,30%	1,61	1,25%	1	21,07%	960,91	31,81%	0,66	55,21%
16	31.03.2004	1,21	-10,95%	2,88	30,17%	1,92	17,61%	2,03	70,80%	921,49	-4,19%	0,51	-25,78%
17	30.06.2004	1,22	0,82%	3,12	8,00%	1,49	-25,35%	1,51	-29,59%	798,29	-14,35%	0,39	-26,83%
18	30.09.2004	1,29	5,58%	4,01	25,10%	1,75	16,08%	1,65	8,87%	1.186,56	39,63%	0,54	32,54%
19	29.12.2004	1,45	11,69%	4,13	2,95%	1,86	6,10%	1,57	-4,97%	1.270,61	6,84%	0,43	-22,78%
20	31.03.2005	1,04	-33,23%	4,11	-0,49%	1,95	4,73%	1,38	-12,90%	1.502,97	16,79%	0,31	-32,72%
21	30.06.2005	0,93	-11,18%	4,86	16,76%	1,86	-4,73%	1,17	-16,51%	1.582,24	5,14%	0,32	3,17%
22	30.09.2005	0,93	0,00%	4,91	1,02%	1,82	-2,17%	1,11	-5,26%	1.577,85	-0,28%	0,36	11,78%
23	30.12.2005	1,15	21,23%	5,71	15,09%	2,01	9,93%	1,36	20,31%	1.672,12	5,80%	0,42	15,42%
24	31.03.2006	1,08	-6,28%	5,67	-0,70%	1,78	-12,15%	1,48	8,46%	1.617,54	-3,32%	0,45	6,90%
25	30.06.2006	0,83	-26,33%	4,79	-16,87%	1,59	-11,29%	0,88	-51,99%	1.389,30	-15,21%	0,39	-14,31%
26	29.09.2006	0,82	-1,21%	4,92	2,68%	1,71	7,28%	0,77	-13,35%	1.280,14	-8,18%	0,36	-8,00%
27	29.12.2006	0,86	4,76%	5,46	10,41%	1,79	4,57%	0,86	11,05%	1.299,87	1,53%	0,31	-14,95%

28	A	B	C	D	E	F	G	H
29		ABANA	ANACM	BRMEN	ESEMS	ISBTR	TRNSK	
30	Querterly Mean	-1,45%	12,33%	4,75%	3,01%	2,61%	1,49%	<--=AVAREGE(M5:M27)
31	Querterly Variance	5,29%	5,35%	1,96%	12,02%	3,67%	13,30%	<--=VARP(M5:M27)
32	Querterly Stand. Dev.	22,99%	23,14%	14,01%	34,67%	19,16%	36,47%	<--=STDEVP(M5:M27)
33								
34	Annual Mean	-5,79%	49,34%	19,01%	12,05%	10,42%	5,96%	<--=4*G30
35	Annual Variance	21,14%	21,42%	7,85%	48,08%	14,68%	53,20%	<--=4*G31
36	Annual Stand. Dev.	45,98%	46,28%	28,02%	69,34%	38,31%	72,94%	<--=SQRT(G35)

According to result of calculation(Table 5.2);ANACM has the highest return with 12,33%, ABANA has the lowest return with -1,45%.However,TRNSK has the highest with a standard deviation 36,47%,BRMEN has the lowest risk with a standard deviation of 24,52%.Under normal condition,high risk must provide high return for all the stocks but all stocks do not provide a high return.

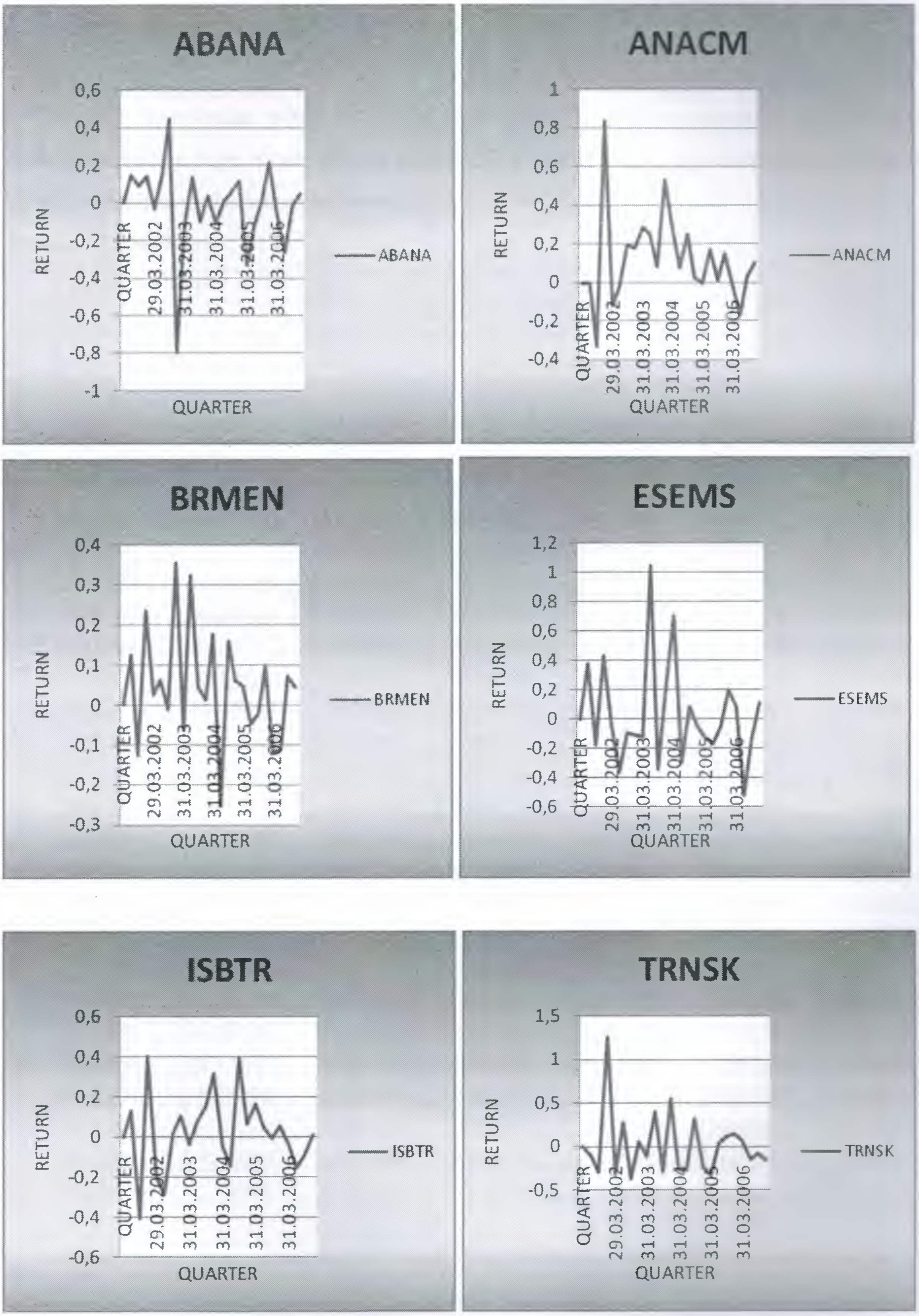
Returns Graph of High Trading Volume :

(Figure 5.1)



B) **Returns Graph of Low Trading Volume:**

(Figure 5.2)



5.3.Calculating Variance-Covariance Matrix

A) High Trading Volume :

In order to calculate efficient portfolios,we must be able to calculate the variance-covariance matrix from return data of stcocks. We first calculate the mean return for each asset(the last line of the following spreadsheet) :

Return (Table 5.3) :

	A	B	C	D	E	F	G
1							
2							
3		**Return**					
4	QUARTER	DOHOL	GARAN	ISCTR	KCHOL	TCELL	YKBNK
5	29.06.2001	0,491120553	0,732887509	0,3254224	0,386867784	0,14571181	0,68671629
6	28.09.2001	-0,90885575	-0,55961579	-0,5389965	-0,49838906	-0,7453329	-0,5547887
7	28.12.2001	0,831297519	0,748409859	0,44764672	0,655946897	1,1451323	0,68751336
8	29.03.2002	0	0,021277398	-0,09097178	-0,15755784	-0,3719424	-0,1072455
9	28.06.2002	-0,15684247	-0,30538165	-0,59351734	-0,04538301	-0,2067944	-0,9257695
10	30.09.2002	-0,07847162	-0,2595112	-0,1997133	0	0,09653793	-0,3819346
11	31.12.2002	-0,0416727	0,393042588	0,25830746	0,105003309	0,22925978	0,24613307
12	31.03.2003	-0,21256144	-0,28768207	-0,09368548	-0,22636417	-0,1080742	0,03571808
13	30.06.2003	0,075985907	0,182321557	0,13353139	0,077558234	0,08836915	0,0678226
14	30.09.2003	0,218253566	0,318453731	0,34092659	0,275481076	0,00496279	0,04800922
15	31.12.2003	0,683294884	0,473784352	0,45601739	0,381574818	0,38209176	0,58604905
16	31.03.2004	0,172371226	0,140581951	0,03460553	-0,07009876	0,28852631	0,24550046
17	30.06.2004	-0,20252426	-0,06199168	-0,06680867	-0,1376894	-0,0076239	-0,0416727
18	30.09.2004	0,267062785	0,130620182	0,15778045	0,273293335	0,07847162	0,10748591
19	29.12.2004	0,053244515	0,206682274	0,3030907	0	0,33714586	0,06771817
20	31.03.2005	0,212719034	0,185083989	0,04485057	-0,16294528	-0,0152675	0,24201204
21	30.06.2005	-0,04908961	0,117016458	0,01739174	0,016913722	-0,0893451	-0,05277
22	30.09.2005	0,112879348	0,199554624	0,36440362	0,151451623	0,11466291	0,0894714
23	30.12.2005	0,155754529	0,197696886	0,22434044	0,038874153	0,10285739	0,11878354
24	31.03.2006	0,335785187	0,020408872	-0,04401689	0,119130096	0,04843206	0,12044615
25	30.06.2006	-0,01384105	-0,22820685	-0,36204649	-0,31999338	0,03795255	-0,1654435
26	29.09.2006	0	0,128442323	0,0318048	0,029229638	0,06021886	0,09188095
27	29.12.2006	-0,25231044	0,043675064	0,12260232	0,123709654	-0,074108	-0,063013
28	MEAN	**7,36%**	**11%**	**5,53%**	**4,42%**	**6,7%**	**4,99%**

The means were calculated by using Excel function **Avarage( )** on each column of data.

Next, we calculate the excess return matrix by subtracting each asset's mean return from each of periodic returns:

The transpose of this matrix can be calculating using the array function.

EXCESS-RETURN MATRIX:

(Table 5.4)

32							G5-$B$28
33	QUARTER	DOHOL	GARAN	ISCTR	KCHOL	TCELL	YKBNK
34	29.06.2001	0,417485783	0,659252739	0,25178763	0,313233015	0,07207704	0.61308152
35	28.09.2001	-0,98249052	-0,63325056	-0,61263127	-0,57202383	-0,8189677	-0.6284235
36	28.12.2001	0,757662749	0,674775089	0,37401195	0,582312127	1,07149753	0.61387859
37	29.03.2002	-0,07363477	-0,05235737	-0,16460655	-0,23119261	-0,44557719	-0,1808803
38	28.06.2002	-0,23047724	-0,37901642	-0,66715211	-0,11901778	-0,28042918	-0,9994042
39	30.09.2002	-0,15210639	-0,33314597	-0,27334807	-0,07363477	0,02290316	-0,4555694
40	31.12.2002	-0,11530747.	0,319407818	0,18467269	0,031368539	0,15562501	0,1724983
41	31.03.2003	-0,28619621	-0,36131684	-0,16732025	-0,29999894	-0,18170899	-0,0379167
42	30.06.2003	0,002351137	0,108686787	0,05989662	0,003923465	0,01473438	-0,0058122
43	30.09.2003	0,144618796	0,244818961	0,26729182	0,201846307	-0,06867198	-0,0256256
44	31.12.2003	0,609660114	0,400149582	0,38238262	0,307940048	0,30845699	0,51241428
45	31.03.2004	0,098736456	0,066947181	-0,03902924	-0,14373353	0,21489154	0,17186569
46	30.06.2004	-0,27615903	-0,13562645	-0,14044344	-0,21132417	-0,08125869	-0,1153075
47	30.09.2004	0,193428015	0,056985413	0,08414568	0,199658565	0,00483685	0,03385115
48	29.12.2004	-0,02039026	0,133047504	0,22945593	-0,07363477	0,26351109	-0,0059166
49	31.03.2005	0,139084264	0,11144922	-0,0287842	-0,23658005	-0,08890224	0,16837727
50	30.06.2005	-0,12272438	0,043381689	-0,05624303	-0,05672105	-0,16297987	-0,1264048
51	30.09.2005	0,039244578	0,125919854	0,29076885	0,077816853	0,04102814	0,01583663
52	30.12.2005	0,08211976	0,124062116	0,15070567	-0,03476062	0,02922262	0,04514877
53	31.03.2006	0,262150418	-0,0532259	-0,11765166	0,045495327	-0,02520271	0,04681138
54	30.06.2006	-0,08747582	-0,30184162	-0,43568126	-0,39362815	-0,03568222	-0,2390783
55	29.09.2006	-0,07363477	0,054807553	-0,04182997	-0,04440513	-0,01341591	0,01824618
56	29.12.2006	-0,32594521	-0,02995971	0,04896755	0,050074885	-0,14774274	-0,1366477

Transpose( ):

(Table 5.5)

59	A	B	C	D	E	F	G	H	I	J	K	L
60		29.06.2001	28.09.2001	28.12.2001	29.03.2002	28.06.2002	30.09.2002	31.12.2002	31.03.2003	30.06.2003	30.09.2003	31.12.2003
61	DOHOL	0,417	-0,9825	0,7577	-0,0736	-0,23	-0,1521	-0,1153	-0,2862	0,0024	0,14462	0.60966
62	GARAN	0,659	-0,6333	0,6748	-0,0524	-0,379	-0,3331	0,3194	-0,3613	0,1087	0,24482	0,40015
63	ISCTR	0,252	-0,6126	0,374	-0,1646	-0,667	-0,2733	0,1847	-0,1673	0,0599	0,26729	0.38238
64	KCHOL	0,313	-0,572	0,5823	-0,2312	-0,119	-0,0736	0,0314	-0,3	0,0039	0,20185	0,30794
65	TCELL	0,072	-0,819	1,0715	-0,4456	-0,28	0,0229	0,1556	-0,1817	0,0147	-0,06867	0.30846
66	YKBNK	0,613	-0,6284	0,6139	-0,1809	-0,999	-0,4556	0,1725	-0,0379	-0,0058	-0,02563	0,51241

		M	N	O	P	R	S	T	U	V	W	Y	X
60		31.03.2004	30.06.2004	30.09.2004	29.12.2004	31.03.2005	30.06.2005	30.09.2005	30.12.2005	31.03.2006	30.06.2006	29.09.2006	29.12.2006
61	DOHOL	0,0987	-0,276	0,1934	-0,02	0,13908	-0,1227	0,03924	0,0821	0,2622	-0,087	-0,074	-0,3259
62	GARAN	0,0669	-0,136	0,057	0,133	0,11145	0,04338	0,12592	0,1241	-0,0532	-0,302	0,0548	-0,03
63	ISCTR	-0,039	-0,14	0,0841	0,2295	-0,0288	-0,0562	0,29077	0,1507	-0,1177	-0,436	-0,042	0,049
64	KCHOL	-0,144	-0,211	0,1997	-0,074	-0,2366	-0,0567	0,07782	-0,0348	0,0455	-0,394	-0,044	0,0501
65	TCELL	0,2149	-0,081	0,0048	0,2635	-0,0889	-0,163	0,04103	0,0292	-0,0252	-0,036	-0,013	-0,1477
66	YKBNK	0,1719	-0,115	0,0339	-0,006	0,16838	-0,1264	0,01584	0,0451	0,0468	-0,239	0,0182	-0,1366
67													

*{TRANSPOSE(B34:G56)}

We can now calculate our variance-covariance matrix by multiplying A^T times A. Again we use the array function **MMULT(A_Transpose,A)/N** so that can data calculate mean and standard deviation of our portfolio:

Product of transpose[excess return] times [excess return] /23 (Matrix) (Table 5.6)

68	A	B	C	D	E	F	G	H
69		**DOHOL**	**GARAN**	**ISCTR**	**KCHOL**	**TCELL**	**YKBNK**	
70	**DOHOL**	0,115	0,0866	0,068	0,0687	0,0891	0,09244	<--{=MMULT(B61:X66;B34:G56)/23}
71	**GARAN**	0,087	0,0957	0,0756	0,0628	0,074	0,09336	
72	**ISCTR**	0,068	0,0756	0,0786	0,0542	0,0625	0,08403	
73	**KCHOL**	0,069	0,0628	0,0542	0,061	0,0607	0,05805	
74	**TCELL**	0,089	0,074	0,0625	0,0607	0,1062	0,08001	
75	**YKBNK**	0,092	0,0934	0,084	0,058	0,08	0,12392	

B) Low Trading Volume :

Return (Table 5.7)

	A	B	C	D	E	F	G
1							
2							
3							
4	**QUARTER**	**ABANA**	**ANACM**	**BRMEN**	**ESEMS**	**ISBTR**	**TRNSK**
5	**29.06.2001**	0,147	0	0,1252	0,3819	0,1331	-0,0953
6	**28.09.2001**	0,0894	-0,3302	-0,1252	-0,1728	-0,4055	-0,2877
7	**28.12.2001**	0,1409	0,8348	0,2364	0,4364	0,4055	1,2622
8	**29.03.2002**	-0,029	-0,1201	0,026	-0,0373	-0,1967	-0,3067
9	**28.06.2002**	0,1525	-0,0215	0,0621	-0,3621	-0,2829	0,2877
10	**30.09.2002**	0,4483	0,1967	-0,0121	-0,0953	0,019	-0,3677
11	**31.12.2002**	-0,7949	0,1793	0,3555	-0,1054	0,1072	0,0541
12	**31.03.2003**	-0,1133	0,2839	-0,0617	-0,1178	-0,0345	-0,1112
13	**30.06.2003**	0,1345	0,2563	0,3234	1,0473	0,076	0,4055
14	**30.09.2003**	-0,0953	0,0834	0,045	-0,3417	0,1576	-0,2942
15	**31.12.2003**	0,0377	0,533	0,0125	0,2107	0,3181	0,5521
16	**31.03.2004**	-0,1095	0,3017	0,1761	0,708	-0,0419	-0,2578
17	**30.06.2004**	0,0082	0,08	-0,2535	-0,2959	-0,1435	-0,2683
18	**30.09.2004**	0,0558	0,251	0,1608	0,0887	0,3963	0,3254
19	**29.12.2004**	0,1169	0,0295	0,061	-0,0497	0,0684	-0,2278
20	**31.03.2005**	-0,3323	-0,0049	0,0473	-0,129	0,1679	-0,3272
21	**30.06.2005**	-0,1118	0,1676	-0,0473	-0,1651	0,0514	0,0317
22	**30.09.2005**	0	0,0102	-0,0217	-0,0526	-0,0028	0,1178
23	**30.12.2005**	0,2123	0,1509	0,0993	0,2031	0,058	0,1542
24	**31.03.2006**	-0,0628	-0,007	-0,1215	0,0846	-0,0332	0,069
25	**30.06.2006**	-0,2633	-0,1687	-0,1129	-0,5199	-0,1521	-0,1431
26	**29.09.2006**	-0,0121	0,0268	0,0728	-0,1335	-0,0818	-0,08
27	**29.12.2006**	0,0476	0,1041	0,0457	0,1105	0,0153	-0,1495
28	**MEAN**	**1,45%**	**12,33%**	**4,75%**	**3,01%**	**2,61%**	**1,49%**

Excess Return Matrix:

(Table 5.8)

32							G5-$B$28
33	QUARTER	ABANA	ANACM	BRMEN	ESEMS	ISBTR	TRNSK
34	29.06.2001	0,1615	0,0145	0,1396	0,3964	0,1476	-0.08083
35	28.09.2001	0.1039	-0,3158	-0,1107	-0,1584	-0,391	-0,2732
36	28.12.2001	0,1554	0,8493	0,2509	0,4509	0,4199	1,27673
37	29.03.2002	-0,0145	-0,1057	0,0405	-0,0228	-0,1822	-0,29225
38	28.06.2002	0,167	-0,007	0,0766	-0,3476	-0,2684	0,30217
39	30.09.2002	0.4628	0,2112	0,0024	-0,0808	0,0335	-0,35324
40	31.12.2002	-0,7804	0,1938	0,3699	-0,0909	0,1217	0,06855
41	31.03.2003	-0,0988	0,2984	-0,0472	-0,1033	-0,02	-0,09674
42	30.06.2003	0,149	0,2708	0,3379	1,0618	0,0905	0,41995
43	30.09.2003	-0,0808	0,0979	0,0595	-0,3273	0,1721	-0,27975
44	31.12.2003	0,0522	0,5475	0,027	0,2252	0,3326	0,56655
45	31.03.2004	-0,095	0,3162	0,1906	0,7225	-0,0274	-0,24334
46	30.06.2004	0,0227	0,0945	-0,2391	-0,2814	-0,129	-0,25378
47	30.09.2004	0,0703	0,2654	0,1753	0,1032	0,4108	0,33991
48	29.12.2004	0,1314	0,044	0,0754	-0,0352	0,0829	-0,2133
49	31.03.2005	-0,3179	0,0096	0,0617	-0,1145	0,1824	-0,31273
50	30.06.2005	-0,0973	0,1821	-0,0328	-0,1506	0,0659	0,04623
51	30.09.2005	0,0145	0,0247	-0,0073	-0,0382	0,0117	0,13227
52	30.12.2005	0,2268	0,1654	0,1138	0,2176	0,0725	0,16864
53	31.03.2006	-0,0483	0,0075	-0,107	0,099	-0,0187	0,08348
54	30.06.2006	-0,2488	-0,1542	-0,0984	-0,5054	-0,1376	-0,12862
55	29.09.2006	0,0024	0,0413	0,0872	-0,119	-0,0673	-0,06556
56	29.12.2006	0,0621	0,1186	0,0602	0,125	0,0298	-0,13505

Transpose( ):

(Table 5.9)

A	B	C	D	E	F	G	H	I	J	K	L
QUARTER	29.06.2001	28.09.2001	28.12.2001	29.03.2002	28.06.2002	30.09.2002	31.12.2002	31.03.2003	30.06.2003	30.09.2003	31.12.2003
ABANA	0,161	0,104	0,155	-0,015	0,167	0,463	-0,78	-0,099	0,149	-0,081	0,052
ANACM	0,014	-0,316	0,849	-0,106	-0,007	0,211	0,194	0,298	0,271	0,098	0,547
BRMEN	0,14	-0,111	0,251	0,04	0,077	0,002	0,37	-0,047	0,338	0,06	0,027
ESEMS	0,396	-0,158	0,451	-0,023	-0,348	-0,081	-0,091	-0,103	1,062	-0,327	0,225
ISBTR	0,148	-0,391	0,42	-0,182	-0,268	0,034	0,122	-0,02	0,09	0,172	0,333
TRNSK	-0,081	-0,273	1,277	-0,292	0,302	-0,353	0,069	-0,097	0,42	-0,28	0,567

	M	N	O	P	R	S	T	U	V	W	X	Y
QUARTER	31.03.2004	30.06.2004	30.09.2004	29.12.2004	31.03.2005	30.06.2005	30.09.2005	30.12.2005	31.03.2006	30.06.2006	29.09.2006	29.12.2006
ABANA	-0,095	0,023	0,07	0,131	-0,318	-0,097	0,014	0,227	-0,048	-0,249	0,002	0,062
ANACM	0,316	0,095	0,265	0,044	0,01	0,182	0,025	0,165	0,007	-0,154	0,041	0,119
BRMEN	0,191	-0,239	0,175	0,075	0,062	-0,033	-0,007	0,114	-0,107	-0,098	0,087	0,06
ESEMS	0,723	-0,281	0,103	-0,035	-0,115	-0,151	-0,038	0,218	0,099	-0,505	-0,119	0,125
ISBTR	-0,027	-0,129	0,411	0,083	0,182	0,066	0,012	0,073	-0,019	-0,138	-0,067	0,03
TRNSK	-0,243	-0,254	0,34	-0,213	-0,313	0,046	0,132	0,169	0,083	-0,129	-0,066	-0,135

*{TRANSPOSE(B34:G56)}

Product of transpose[excess return] times [excess return] /23 (Matrix) (Table 5.10)

68		ABANA	ANACM	BRMEN	ESEMS	ISBTR	TRNSK	
69	ABANA	0,053	0,006	-0,006	0,02	-0,001	0,012	<--{=MMULT(B61:X66:B34:G56)/23}
70	ANACM	0,006	0,073	0,024	0,047	0,039	0,066	
71	BRMEN	-0,006	0,024	0,023	0,033	0,016	0,025	
72	ESEMS	0,02	0,047	0,033	0,122	0,027	0,054	
73	ISBTR	-0,001	0,039	0,016	0,027	0,038	0,04	
74	TRNSK	0,012	0,066	0,025	0,054	0,04	0,134	

5.4.Correlation

We calculated correlation with the Excel Correlation function.

A) High Trading Volume :

(Table 5.11)

	DOHOL	GARAN	ISCTR	KCHOL	TCELL	YKBNK	
DOHOL	1	0,83305342	0,71752462	0,82769923	0,80757495	0,77722271	<--=DATA ANALYSIS CORELATION
GARAN	0,83305342	1	0,88745931	0,84854269	0,74253873	0,87363571	
ISCTR	0,71752462	0,88745931	1	0,78148728	0,68454551	0,8505786	
KCHOL	0,82769923	0,84854269	0,78148728	1	0,75778744	0,66599022	
TCELL	0,80757495	0,74253873	0,68454551	0,75778744	1	0,69790094	
YKBNK	0,77722271	0,87363571	0,8505786	0,66599022	0,69790094	1	

ISCTR and GARAN has highest correlation coefficient(0,8874) and YKBNK and GARAN has high correlation coefficient as well(0,873). This is because all these firms belong to the banking industry and thus are equally affected by the economic events.

A) Low Trading Volume:

(Table 5.12)

	ABANA	ANACM	BRMEN	ESEMS	ISBTR	TRNSK	
ABANA	1	0,11358896	-0,17846146	0,24872875	-0,0254459	0,1486814	<--=DATA ANALYSIS CORELATION
ANACM	0,11358896	1	0,46237361	0,50843576	0,74813377	0,73652198	
BRMEN	-0,17846146	0,46237361	1	0,61837259	0,50541216	0,44534374	
ESEMS	0,24872875	0,50843576	0,61837259	1	0,38525887	0,41903322	
ISBTR	-0,0254459	0,74813377	0,50541216	0,38525887	1	0,55399112	
TRNSK	0,1486814	0,73652198	0,44534374	0,41903322	0,55399112	1	

Notice that low trading volume stocks have lower correlation coefficient than the high trading volume,because these companies belong to different industries.

Another way to took correlation coefficent is to graph Stock A and B returns on the same axes and then use the Excel **Trendline** facility to regress the returns of stock B on those os stock a. For this look at the Appendix A.

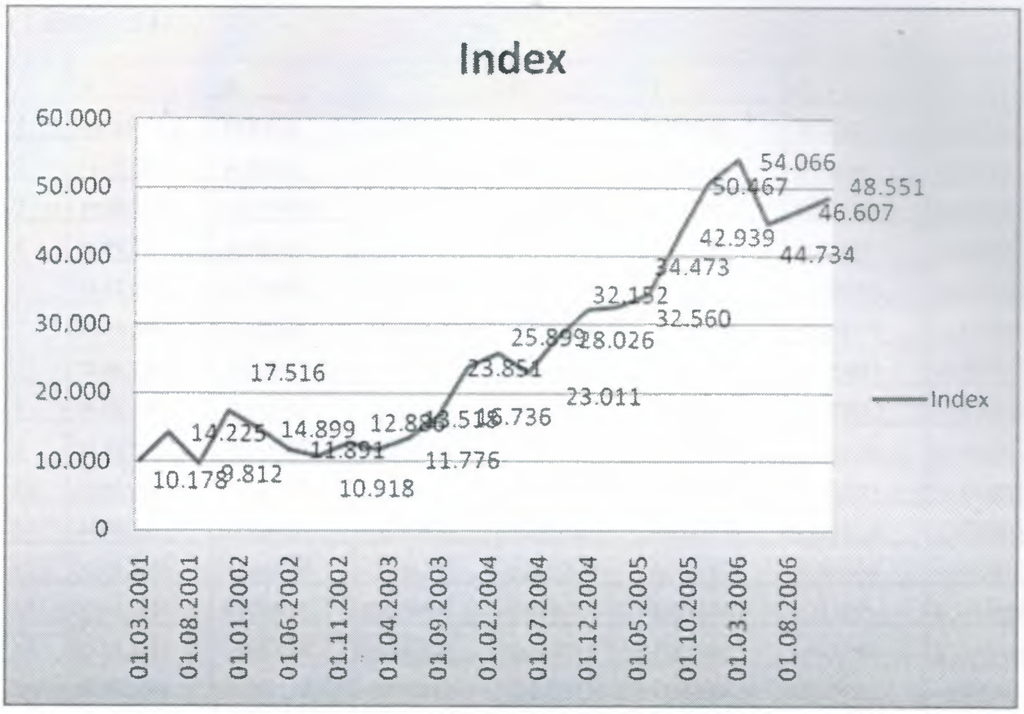
5.5 Calculating Index Return

(Table 5.13)

	A	B	C	D	E
1					
2					
3					
4					
5	QUARTER	Index	Return	R-Mean	
6	30.03.2001	10.178			
7	29.06.2001	14.225	33,48%	26,68%	RETURN=LN(B7/B6)
8	28.09.2001	9.812	-37,14%	-43,93%	R-MEAN=C7-$G$17
9	28.12.2001	17.516	57,95%	51,16%	
10	29.03.2002	14.899	-16,18%	-22,98%	
11	28.06.2002	11.891	-22,55%	-29,34%	
12	30.09.2002	10.918	-8,54%	-15,33%	
13	31.12.2002	12.886	16,57%	9,78%	
14	31.03.2003	11.776	-9,01%	-15,80%	
15	30.06.2003	13.518	13,80%	7,00%	
16	30.09.2003	16.736	21,35%	14,56%	
17	31.12.2003	23.851	35,43%	28,63%	
18	31.03.2004	25.899	8,24%	1,44%	
19	30.06.2004	23.011	-11,82%	-18,62%	
20	30.09.2004	28.026	19,72%	12,92%	
21	29.12.2004	32.152	13,73%	6,94%	
22	31.03.2005	32.560	1,26%	-5,53%	
23	30.06.2005	34.473	5,71%	-1,08%	
24	30.09.2005	42.939	21,96%	15,17%	
25	30.12.2005	50.467	16,15%	9,36%	
26	31.03.2006	54.066	6,89%	0,10%	
27	30.06.2006	44.734	-18,95%	-25,74%	
28	29.09.2006	46.607	4,10%	-2,69%	
29	29.12.2006	48.551	4,09%	-2,71%	

16	F	G		
17	Querterly Mean	**6,79%**	**<--=AVARAGE(C7:C29)**	
18	Querterly Variance	**4,30%**	**<--=VARP(C7:C29)**	
19	Querterly Stand. Dev.	**20,75%**	**<--=STDEVP(C7:C29)**	
20				
21	Annual Mean	**27,17%**	**<--4*G17**	
22	Annual Variance	**17,22%**	**<--4*G18**	
23	Annual Stand. Dev.	**41,49%**	**<--=SQRT(G22)**	

(Figure 5.3)



Compersion to Index(see figure 5.3)

High trading volume securities have higher return than index but higher risk.Low trading volume securities have lower return but higher risk.An investor should prefer high trading volume securities to both index(a very well diversified portfolio) and low trading volume securities.

5.6.Calculating Betas

Beta means that systematic risk of the stocks. Namely beta is show the market risk of our assets.Here,we calculate beta with Excel's **Slope** function. But we can calculate beta is different way.(see **Appendix B**). Beta is the slope of our regression line. If beta is lower than 1,stock provide a lower risk than market.If beta higher than 1,stock provide a higher risk than market.

A) High Tarding Volume :

(Table 5.14)

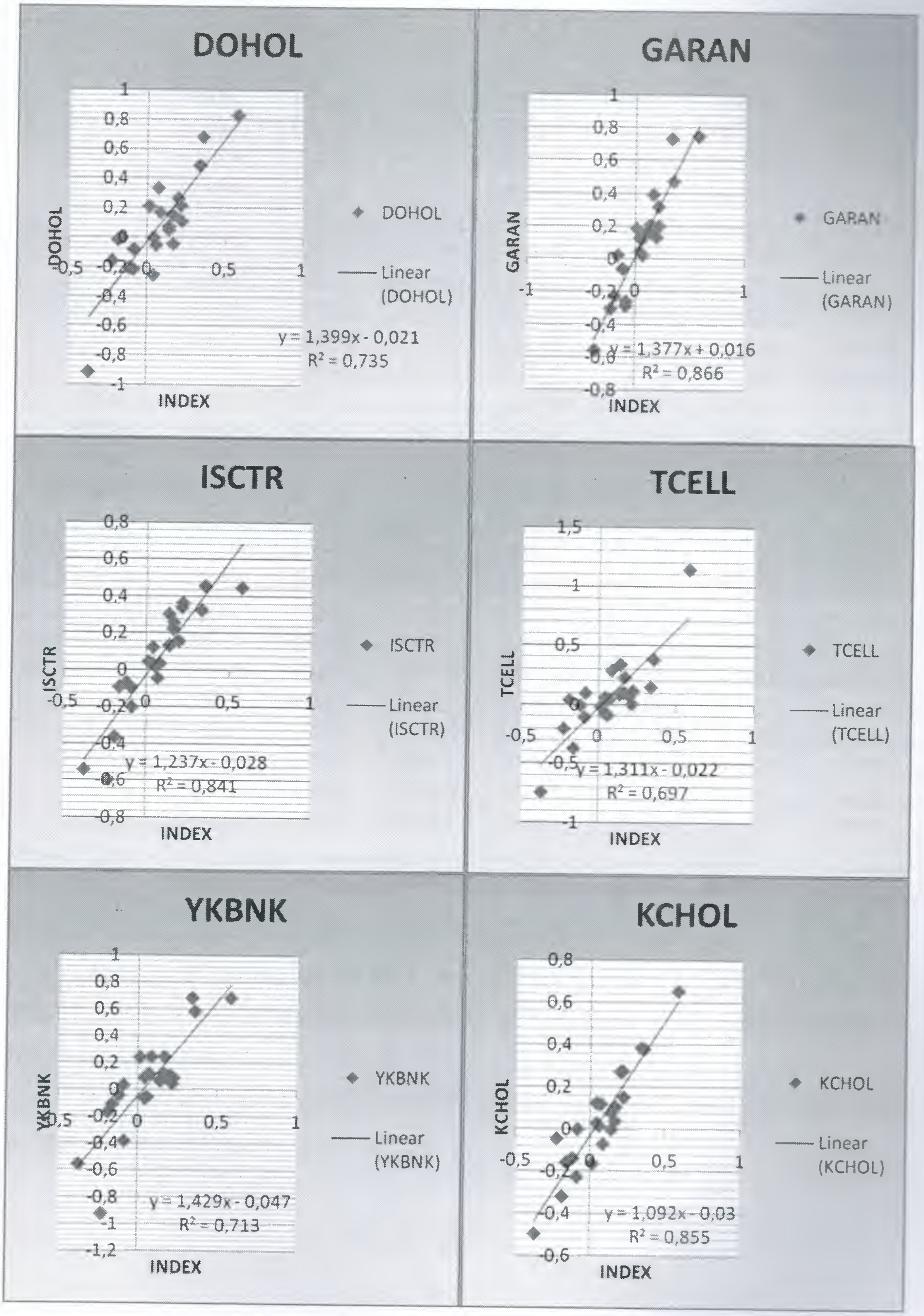
	A	B	C	E	F	G	H	I
1	QUARTER	DOHOL	GARAN	ISCTR	KCHOL	TCELL	YKBNK	INDEX
2	30.03.2001	R-Mean	R-Mean	R-Mean	R-Mean	R-Mean	R-Mean	R-Mean
3	29.06.2001	0,4174858	0,6225592	0,2700761	0,3426672	0,0786751	0,6367762	0,2668426
4	28.09.2001	-0,982491	-0,669944	-0,594343	-0,54259	-0,81237	-0,604729	-0,439325
5	28.12.2001	0,7576627	0,6380816	0,3923004	0,6117463	1,0780956	0,6375732	0,5115788
6	29.03.2002	-0,073635	-0,089051	-0,146318	-0,201758	-0,438979	-0,157186	-0,22975
7	28.06.2002	-0,230477	-0,41571	-0,648864	-0,089584	-0,273831	-0,97571	-0,293442
8	30.09.2002	-0,152106	-0,369839	-0,25506	-0,044201	0,0295012	-0,431875	-0,153299
9	31.12.2002	-0,115307	0,2827143	0,2029611	0,0608027	0,1622231	0,196193	0,0977988
10	31.03.2003	-0,286196	-0,39801	-0,149032	-0,270565	-0,175111	-0,014222	-0,158008
11	30.06.2003	0,0023511	0,0719933	0,0781851	0,0333576	0,0213324	0,0178825	0,0700287
12	30.09.2003	0,1446188	0,2081255	0,2855803	0,2312805	-0,062074	-0,001931	0,1456101
13	31.12.2003	0,6096601	0,3634561	0,4006711	0,3373742	0,315055	0,5361089	0,2863342
14	31.03.2004	0,0987365	0,0302537	-0,020741	-0,114299	0,2214896	0,1955603	0,0144484
15	30.06.2004	-0,276159	-0,17232	-0,122155	-0,18189	-0,074661	-0,091613	-0,186162
16	30.09.2004	0,193428	0,0202919	0,1024341	0,2290928	0,0114349	0,0575458	0,1292305
17	29.12.2004	-0,02039	0,096354	0,2477444	-0,044201	0,2701091	0,0177781	0,0694122
18	31.03.2005	0,1390843	0,0747557	-0,010496	-0,207146	-0,082304	0,1920719	-0,05532
19	30.06.2005	-0,122724	0,0066882	-0,037955	-0,027287	-0,156382	-0,10271	-0,010838
20	30.09.2005	0,0392446	0,0892263	0,3090573	0,107251	0,0476262	0,0395313	0,1516743
21	30.12.2005	0,0821198	0,0873686	0,1689941	-0,005326	0,0358207	0,0688434	0,0936093
22	31.03.2006	0,2621504	-0,089919	-0,099363	0,0749295	-0,018605	0,070506	0,000956
23	30.06.2006	-0,087476	-0,338535	-0,417393	-0,364194	-0,029084	-0,215384	-0,257402
24	29.09.2006	-0,073635	0,018114	-0,023542	-0,014971	-0,006818	0,0419408	-0,026913
25	29.12.2006	-0,325945	-0,066653	0,067256	0,0795091	-0,141145	-0,112953	-0,027066
26								
27	**BETA**	**1,3995205**	**1,3774701**	**1,2372821**	**1,0927791**	**1,3110586**	**1,4295375**	**1**

<--=SLOPE(H3:H57;H3:H25)

YKBNK has the highest beta of 1.429.This means that YKBNK is 1.429 times riskier than the market.KCHOL has the lowest beta of 1,09.This means that KCHOL is acting just like the index.

Firm spesific risk is diversifiable risk and is measured by the residuals from the line.YKBNK and DOHOL have the highest firm spesific risks component other stocks.

(Figure 5.4)


DOHOL
DOHOL
Linear (DOHOL)
y = 1,399x - 0,021
R² = 0,735
INDEX
GARAN
GARAN
Linear (GARAN)
y = 1,377x + 0,016
R² = 0,866
INDEX
ISCTR
ISCTR
Linear (ISCTR)
y = 1,237x - 0,028
R² = 0,841
INDEX
TCELL
TCELL
Linear (TCELL)
y = 1,311x - 0,022
R² = 0,697
INDEX
YKBNK
YKBNK
Linear (YKBNK)
y = 1,429x - 0,047
R² = 0,713
INDEX
KCHOL
KCHOL
Linear (KCHOL)
y = 1,092x - 0,03
R² = 0,855
INDEX

B) Low Trading Volume:

(Table 5.15)

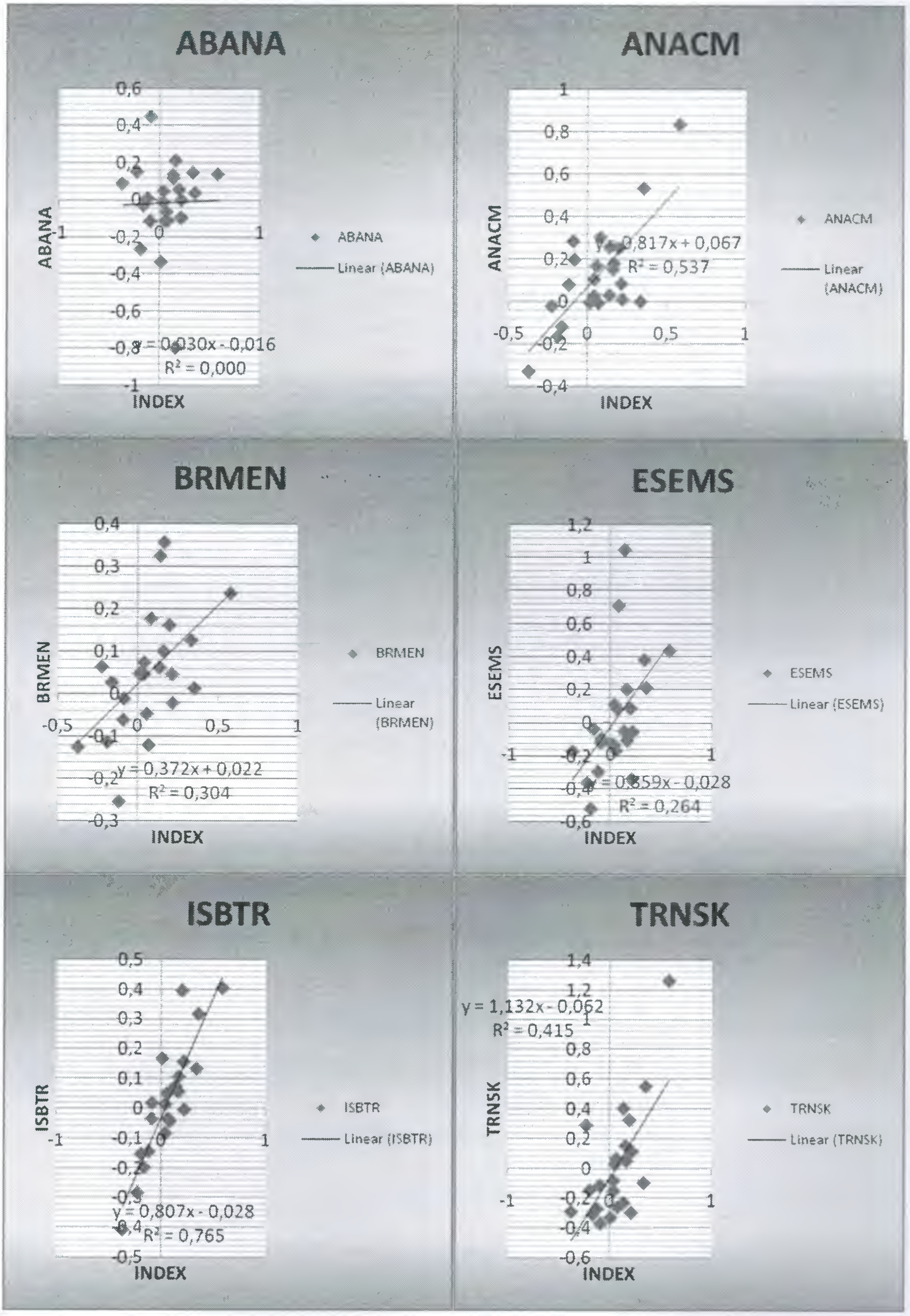
	A	B	C	D	E	F	G	I
1	QUARTER	ABANA	ANACM	BRMEN	ESEMS	ISBTR	TRNSK	INDEX
2		R-Mean	R-Mean	R-Mean	R-Mean	R-Mean	R-Mean	R-Mean
3	29.06.2001	0,1614667	-0,123343	0,0776396	0,3517978	0,1070698	-0,110221	0,2668426
4	28.09.2001	0,1038911	-0,453584	-0,172687	-0,20298	-0,431511	-0,302593	-0,439325
5	28.12.2001	0,15539	0,711455	0,1888652	0,4062905	0,3794071	1,2473311	0,5115788
6	29.03.2002	-0,014503	-0,243487	-0,021548	-0,067408	-0,222753	-0,321641	-0,22975
7	28.06.2002	0,1669531	-0,144849	0,0146082	-0,392252	-0,30892	0,2727714	-0,293442
8	30.09.2002	0,4627898	0,0733676	-0,059645	-0,125447	-0,007003	-0,382635	-0,153299
9	31.12.2002	-0,780445	0,0559982	0,3079312	-0,135497	0,0811957	0,0391566	0,0977988
10	31.03.2003	-0,098844	0,160601	-0,109217	-0,14792	-0,060539	-0,126136	-0,158008
11	30.06.2003	0,1490154	0,132953	0,2758766	1,0171822	0,049927	0,3905545	0,0700287
12	30.09.2003	-0,080826	-0,039961	-0,0025	-0,371886	0,1315879	-0,30915	0,1456101
13	31.12.2003	0,0522249	0,4096357	-0,035023	0,1805842	0,2920208	0,5371579	0,2863342
14	31.03.2004	-0,095	0,1783256	0,1285675	0,677899	-0,067941	-0,27274	0,0144484
15	30.06.2004	0,022715	-0,0433	-0,301073	-0,326063	-0,169572	-0,283175	-0,186162
16	30.09.2004	0,0702759	0,1276155	0,1133161	0,0585288	0,3702899	0,3105118	0,1292305
17	29.12.2004	0,1314059	-0,093857	0,0134372	-0,079837	0,0423869	-0,242695	0,0694122
18	31.03.2005	-0,317858	-0,128197	-0,000271	-0,159129	0,1418942	-0,342124	-0,05532
19	30.06.2005	-0,097307	0,0442727	-0,094776	-0,195217	0,0253466	0,0168381	-0,010838
20	30.09.2005	0,0144845	-0,113107	-0,069264	-0,082781	-0,02883	0,1028724	0,1516743
21	30.12.2005	0,2268172	0,0276023	0,0517747	0,1729879	0,0319773	0,13924	0,0936093
22	31.03.2006	-0,048316	-0,130373	-0,169045	0,0544206	-0,059238	0,0540822	0,000956
23	30.06.2006	-0,248806	-0,292001	-0,160403	-0,550012	-0,178158	-0,158011	-0,257402
24	29.09.2006	0,0023632	-0,096565	0,0252358	-0,163668	-0,107882	-0,094953	-0,026913
25	29.12.2006	0,0621126	-0,019202	-0,001801	0,080405	-0,010757	-0,164442	-0,027066
26								
27	BETA	**0,0304726**	**0,8174032**	**0,3724005**	**0,8591617**	**0,807885**	**1,1325574**	**1**

<--=SLOPE(H3:H57;H3:H25)

Apart from TRNSK all the stocks have betas lower than 1. This means that only TRNSK is riskier than the market.ABANA has a beta of almost 0.This means that ABANA has no systematic risk.

In genera low trading volume stocks have higher firm spesific risks than high trading volume stocks.

(Figure 5.5)


ABANA
ABANA
Linear (ABANA)
y = 0,030x - 0,016
R² = 0,000
INDEX
ANACM
ANACM
Linear (ANACM)
y = 0,817x + 0,067
R² = 0,537
INDEX
BRMEN
BRMEN
Linear (BRMEN)
y = 0,372x + 0,022
R² = 0,304
INDEX
ESEMS
ESEMS
Linear (ESEMS)
y = 0,859x - 0,028
R² = 0,264
INDEX
ISBTR
ISBTR
Linear (ISBTR)
y = 0,807x - 0,028
R² = 0,765
INDEX
TRNSK
TRNSK
Linear (TRNSK)
y = 1,132x - 0,062
R² = 0,415
INDEX

5.7.Calculating Portfolio Mean and Variance

We now construct a new portfolio as a result of the above the analysis.

A) High Trading Volume:

Assume that are six risky asset that have the following expected returns and The variance-covariance matrix (Table 5.6).

	A	B	C	D	E	F	G
1		DOHOL	GARAN	ISCTR	KCHOL	TCELL	YKBNK
2	DOHOL	11,47%	8,66%	6,80%	6,87%	8,91%	9,24%
3	GARAN	8,66%	9,57%	7,56%	6,28%	7,40%	9,34%
4	ISCTR	6,80%	7,56%	7,86%	5,42%	6,25%	8,40%
5	KCHOL	6,87%	6,28%	5,42%	6,10%	6,07%	5,80%
6	TCELL	8,91%	7,40%	6,25%	6,07%	10,62%	8,00%
7	YKBNK	9,24%	9,34%	8,40%	5,80%	8,00%	12,39%

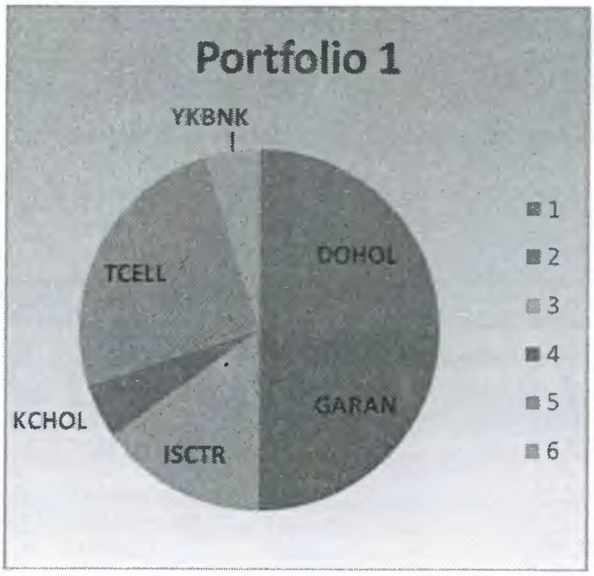
	I	J	K
1	Mean Returns		Standart Deviation
2	7,36%		33,15%
3	11,03%		30,71%
4	5,53%		27,98%
5	4,42%		24,52%
6	6,70%		32,58%
7	4,99%		35,12%

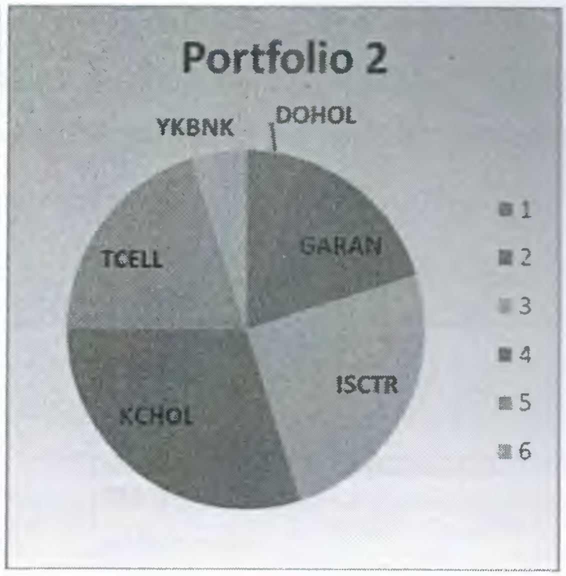
In order to form the efficient frontier,we are forming two portfolios with the following.According to mean and standart deviation form of the portfolios.

We wish to consider two portfolios of risky assets:

(Table 5.16)

		DOHOL	GARAN	ISCTR	KCHOL	TCELL	YKBNK
9	Portfolio 1	0,25	0,25	0,15	0,05	0,25	0,05
10	Portfolio 2	0,05	0,15	0,25	0,3	0,2	0,05





For clarity of exposition, we first allocate space on the spreadsheet for the transposes of the two portfolios.We use array function **Transpose** to insert cells.

L	M	N
13	Portfolio 1	Portfolio 2
14	0,25	0,05
15	0,25	0,15
16	0,15	0,25
17	0,05	0,3
18	0,25	0,2
19	0,05	0,05

We next calculate the means,variances, and covariance of the two portfolios. We use the Excel function **Mmult** for all the calculations.

11	A	B	C	D	E	F	G
12	Portfolio 1				Portfolio 2		
13	Mean	**7,58%**			Mean	**6,32%**	**<--=MMULT(B10:G10;I2:I7)**
14	Variance	**8,25%**			Variance	**6,90%**	**<-- =MMULT(B10:G10;MMULT(B2.G7:N14:N19))**

16	A	B	C
17	Covariance	**0,07438675**	**<--=MMULT(B9:G9;MMULT(B2:G7;N14:N19))**
18	Correlation	**0,98602344**	**<--=C16*/SQRT(B14*F14)**

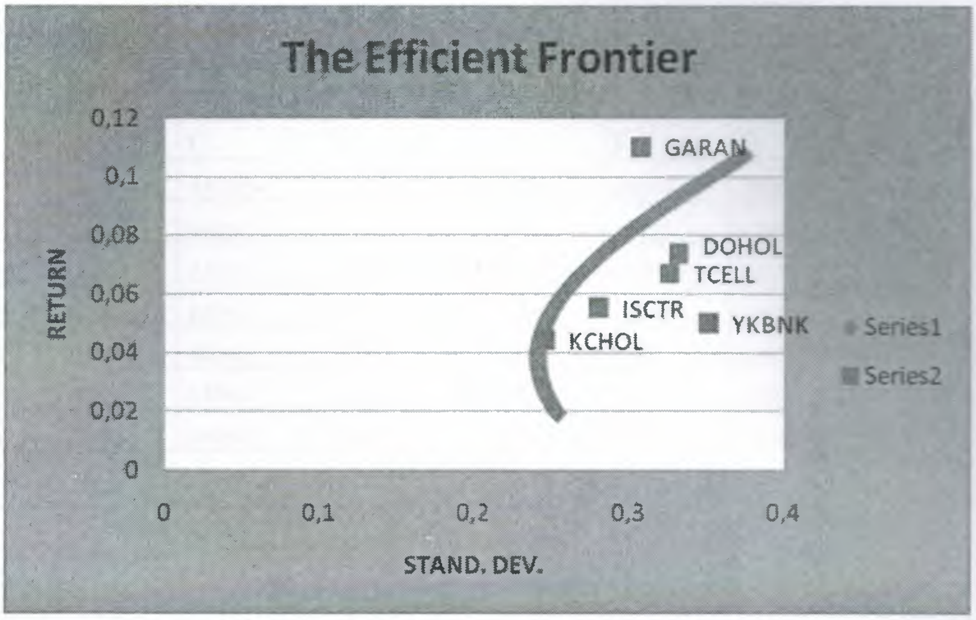
We can now calculate the standart deviation and return of combinations of portfolios 1 and 2. Note that once we have calculated the means,variances,and the covariance of returns of the two portfolios, the calculation of the mean and the variance of any portfolio is the same as for the two-asset case.

21	A	B	C	D	E
22	Calculating returns of combinations of portfolio 1 and 2				
23	Proportion of portfolio 1			0,3	
24	Mean return			6,70%	<--=D23*B13+(1-D23)*F13
25	Variance of return			7,25%	<--=D23^2*B14+(1-D23)^2*F14+2*D23*(1-D23)*B17
26	Stand. Dev. Of return			26,92%	<--=SQRT(D25)

I have randomly assigned a weight of 0.3 for portfolio 1 and weight of 0.7 for portfolio 2.

Table of returns (uses this example and DataTable)

30	Proportion	Stand Dev	Mean	
31		26,92%	6,70%	
32	-3,5	25,37%	1,94%	
33	-3,4	25,21%	2,06%	
34	-3,3	25,07%	2,19%	
35	-3,2	24,93%	2,31%	
36	-3,1	24,80%	2,44%	
37	-3	24,69%	2,57%	
38	-2,9	24,58%	2,69%	
39	-2,8	24,49%	2,82%	
40	-2,7	24,40%	2,94%	
41	-2,6	24,33%	3,07%	
42	-2,5	24,27%	3,19%	
43	-2,4	24,22%	3,32%	
44	-2,3	24,18%	3,44%	
45	-2,2	24,15%	3,57%	
46	-2,1	24,13%	3,69%	
47	-2	24,12%	3,82%	
48	-1,9	24,13%	3,94%	
49	-1,8	24,15%	4,07%	
50	-1,7	24,17%	4,19%	
51	-1,6	24,21%	4,32%	
52	-1,5	24,26%	4,44%	
53	-1,4	24,32%	4,57%	
54	-1,3	24,39%	4,69%	
55	-1,2	24,48%	4,82%	
56	-1,1	24,57%	4,95%	
57	-1	24,67%	5,07%	
58	-0,9	24,79%	5,20%	
59	-0,8	24,91%	5,32%	
60	-0,7	25,05%	5,45%	
61	-0,6	25,19%	5,57%	
62	-0,5	25,35%	5,70%	
63	-0,4	25,51%	5,82%	
64	-0,3	25,69%	5,95%	
65	-0,2	25,87%	6,07%	
66	-0,1	26,06%	6,20%	
67	0	26,26%	6,32%	
68	0,1	26,47%	6,45%	
69	0,2	26,69%	6,57%	
70	0,3	26,92%	6,70%	
71	0,4	27,15%	6,82%	
72	0,5	27,40%	6,95%	
73	0,6	27,65%	7,07%	
74	0,7	27,91%	7,20%	
75	0,8	28,17%	7,33%	
76	0,9	28,45%	7,45%	
77	1	28,72%	7,58%	
78	1,1	29,01%	7,70%	
79	1,2	29,30%	7,83%	
80	1,3	29,60%	7,95%	
81	1,4	29,91%	8,08%	
82	1,5	30,22%	8,20%	
83	1,6	30,53%	8,33%	
84	1,7	30,86%	8,45%	
85	1,8	31,18%	8,58%	
86	1,9	31,52%	8,70%	
87	2	31,85%	8,83%	
88	2,1	32,20%	8,95%	
89	2,2	32,54%	9,08%	
90	2,3	32,90%	9,20%	
91	2,4	33,25%	9,33%	
92	2,5	33,61%	9,45%	
93	2,6	33,98%	9,58%	
94	2,7	34,35%	9,71%	
95	2,8	34,72%	9,83%	
96	2,9	35,10%	9,96%	
97	3	35,48%	10,08%	
98	3,1	35,86%	10,21%	
99	3,2	36,25%	10,33%	
100	3,3	36,64%	10,46%	
101	3,4	37,03%	10,58%	
102	3,5	37,43%	10,71%	
103	DOHOL	33,15%		7,36%
104	GARAN	30,71%		11,03%
105	ISCTR	27,98%		5,53%
106	KCHOL	24,52%		4,42%
107	TCELL	32,58%		6,70%
108	YKBNK	35,12%		4,99%



An efficient portfolio is the portfolio of risky assets that gives the lowest variance of return of all portfolio having the same expected return. Alternatively ,we may say that an efficient portfolio has highest expected return of all portfolios having the same variance.

A feasible portfolio is any portfolio whose proportions sum to one. The feasible set is the set of portfolio means and standard deviations generated by feasible portfolios; this feasible set is the area inside and to the right of the curved line. A feasible portfolio is on the envelope of the feasible set if for a given mean return it has minimum variance. Finaly, a portfolio x is an efficient portfolio if it maximizes the return given the portfolio variance (or standard deviation).

KCHOL is envelope, ISCTR-TCELL-DOHOL-YKBNK are feasible but not efficent, GARAN is efficent but not on the envelope.

B) Low Trading Volume:

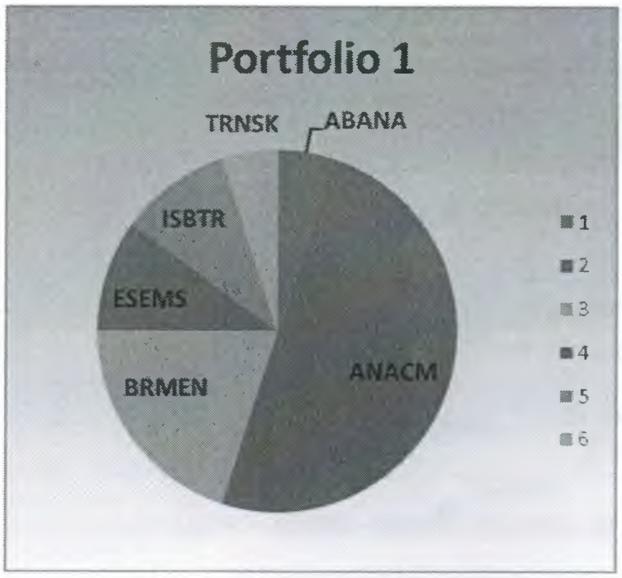
(Table 5.12)

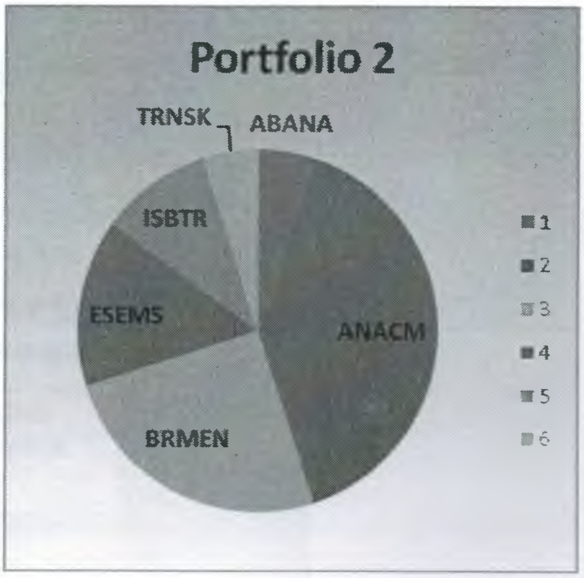
	A	B	C	D	E	F	G
1		ABANA	ANACM	BRMEN	ESEMS	ISBTR	TRNSK
2	ABANA	5,29%	0,60%	-0,57%	1,98%	-0,11%	1,25%
3	ANACM	0,60%	7,25%	2,35%	4,69%	3,87%	6,62%
4	BRMEN	-0,57%	2,35%	2,35%	3.28%	1,61%	2,46%
5	ESEMS	1,98%	4,69%	3,28%	12,22%	2,74%	5,43%
6	ISBTR	-0,11%	3,87%	1,61%	2,74%	3,83%	3,99%
7	TRNSK	1,25%	6,62%	2,46%	5,43%	3,99%	13,39%

1	M-Returns		standart deviation
2	-1,45%		22,99%
3	12,33%		23,14%
4	4,75%		14,01%
5	3,01%		34,67%
6	2,61%		19,16%
7	1,49%		36,47%

(Table 5.17)

8		ABANA	ANACM	BRMEN	ESEMS	ISBTR	TRNSK
9	Portfolio 1	0,05	0,5	0,2	0,1	0,1	0,05
10	Portfolio 2	0,05	0,4	0,25	0,15	0,1	0,05



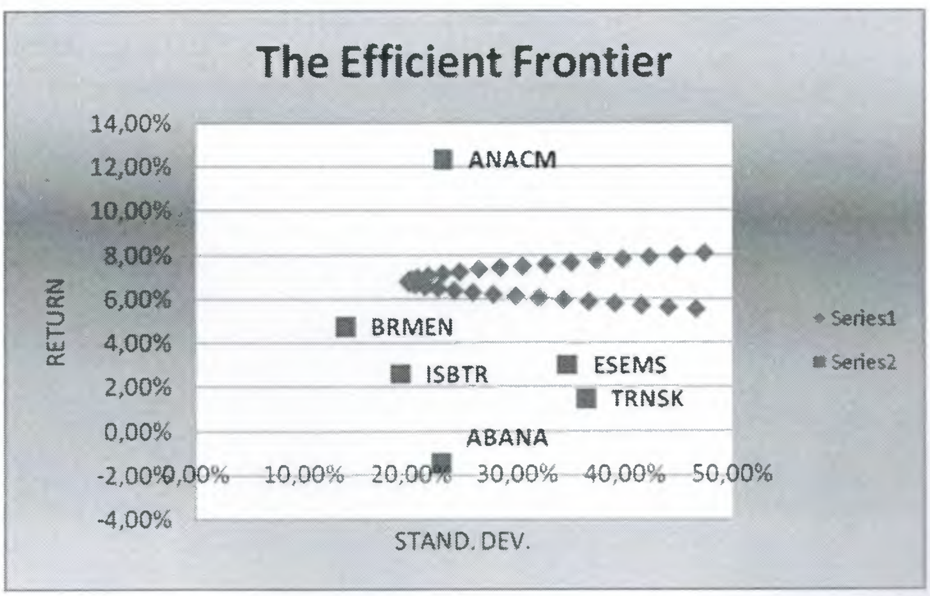


11	M	N
12	Portfolio 1	Portfolio 2
13	0,05	0,05
14	0,5	0,4
15	0,2	0,25
16	0,1	0,15
17	0,1	0,1
18	0,05	0,05

11	A	B	C	D	E	F	G
12	Portfolio 1				Portfolio 2		
13	Mean	**7,68%**			Mean	**6,84%**	**<--=MMULT(B10:G10;I2:I7)**
14	Variance	**4,21%**			Variance	**3,91%**	**<-- =MMULT(B10:G10;MMULT(B2.G7:N14:N19))**

16	A	B	C
17	Covariance	**0,0403379**	**<--=MMULT(B9:G9;MMULT(B2:G7;N14:N19))**
18	Correlation	**0,9939142**	**<--=C16*/SQRT(B14*F14)**

21	A	B	C	D	E
22	Calculating returns of combinations of portfolio 1 and 2				
23	Proportion of portfolio 1			**0,3**	
24	Mean return			**7,09%**	**<--=D23*B13+(1-D23)*F13**
25	Variance of return			**4,72%**	**<--=D23^2*B14+(1-D23)^2*F14+2*D23*(1-D23)*B17**
26	Stand. Dev. Of return			**21,72%**	**<--=SQRT(D25)**



ANACM is efficent but all the other stocks are not efficient.

Table of returns (uses this example and DataTable)

Proportion	Stand. Dev.	Mean	
	21,72%	7,09%	
-1,5	46,71%	5,57%	
-1,4	44,15%	5,65%	
-1,3	41,62%	5,74%	
-1,2	39,14%	5,82%	
-1,1	36,70%	5,91%	
-1	34,34%	5,99%	
-0,9	32,05%	6,08%	
-0,8	29,86%	6,16%	
-0,7	27,79%	6,24%	
-0,6	25,87%	6,33%	
-0,5	24,13%	6,41%	
-0,4	22,61%	6,50%	
-0,3	21,38%	6,58%	
-0,2	20,47%	6,67%	
-0,1	19,92%	6,75%	
0	19,78%	6,84%	
0,1	20,04%	6,92%	
0,2	20,70%	7,01%	
0,3	21,72%	7,09%	
0,4	23,04%	7,17%	
0,5	24,63%	7,26%	
0,6	26,42%	7,34%	
0,7	28,39%	7,43%	
0,8	30,50%	7,51%	
0,9	32,73%	7,60%	
1	35,04%	7,68%	
1,1	37,43%	7,77%	
1,2	39,88%	7,85%	
1,3	42,37%	7,94%	
1,4	44,91%	8,02%	
1,5	47,49%	8,10%	
ABANA	22,99%		-1,45%
ANACM	23,14%		12,33%
BRMEN	14,01%		4,75%
ESEMS	34,67%		3,01%
ISBTR	19,16%		2,61%
TRNSK	36,47%		1,49%

5.8.Is the ISE-30 not Efficient?

We start by asking if the ISE-30 indeed is efficient with respect to the six assets we have chosen. In part 5.3(Table 5.6) we calculated the variance-covariance matrix for this data set.We can create the following spreadsheet to find two efficient portfolios:

(Table 5.6)

	A	B	C	D	E	F	G
1		DOHOL	GARAN	ISCTR	KCHOL	TCELL	YKBNK
2	DOHOL	0,1146823	0,086634	0,0679989	0,0687244	0,089098	0,0924436
3	GARAN	0,086634	0,0956514	0,0755952	0,0628097	0,0740467	0,0933588
4	ISCTR	0,0679989	0,0755952	0,0786474	0,0541586	0,0625309	0,0840349
5	KCHOL	0,0687244	0,0628097	0,0541586	0,0609811	0,0607248	0,0580485
6	TCELL	0,089098	0,0740467	0,0625309	0,0607248	0,1061823	0,0800135
7	YKBNK	0,0924436	0,0933588	0,0840349	0,0580485	0,0800135	0,1239192

	I	J
1	M-Returns	M-Constant
2	0,0736348	0,0286348
3	0,1103283	0,0653283
4	0,0553463	0,0103463
5	0,0442006	-0,0007994
6	0,0670367	0,0220367
7	0,0499401	0,0049401
	Constant	0,045

Calculating Two Efficient Portfolios
(Table 5.18)

12	A	B	C	D	E	F	G
13							
14		z	x			z	y
15	MMULT(MINVERSE	**0,1448635**	**0,3110253**	C15/SUM($C$15:$C$20)		**0,347327654**	**-1,0367252**
16	RSE(B2:G7),	4,1906826	8,9974904			4,388873782	-13,100184
17	I2:I7	-0,1638126	- 0,3517093			-0,409838228	1,2233107
18		-2,0686091	- 4,4413506			-2,888422797	8,6215444
19		0,4086511	0,8773831			0,343787289	-1.0261577
20		-2,0460142	- 4,3928389			-2,116751527	6,3182119

22	Mean	**0,6392418**	**<--MMULT(TRANSPOSE(D15:D20);I2,I7)**	Mean	**-0.8261347**
23	Variance	**1,3724665**	**<-- MMULT(MMULT(TRANSPOSE(D15:D20);B3:G7);D15:D20)**	Variance	**2.6002171**
24	Sigma	**1,1715232**	**<--SQRT(C23)**	Sigma	**1.6125189**
25	Cavariance	**-1,7737299**	**<--MMULT (MMULT(TRANSPOSE(D15:D20);B3:G7);J2:J7)**		

We intend to create a **DataTable** with which to calculate the efficient frontier;however,before doing so we calculate the mean and standart deviation of IMKB-30 portfolio:

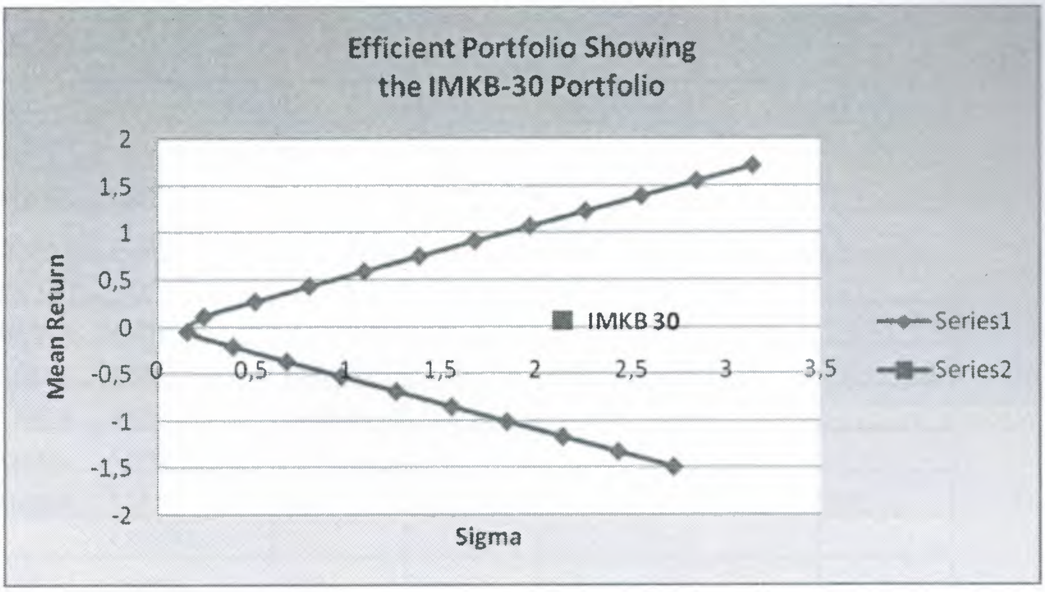
	L	M	N
1	QUARTER	Return	
2	29.06.2001	33,48%	
3	28.09.2001	-37,14%	
4	28.12.2001	57,95%	
5	29.03.2002	-16,18%	
6	28.06.2002	-22,55%	
7	30.09.2002	-8,54%	
8	31.12.2002	16,57%	
9	31.03.2003	-9,01%	
10	30.06.2003	13,80%	
11	30.09.2003	21,35%	
12	31.12.2003	35,43%	
13	31.03.2004	8,24%	
14	30.06.2004	-11,82%	
15	30.09.2004	19,72%	
16	29.12.2004	13,73%	
17	31.03.2005	1,26%	
18	30.06.2005	5,71%	
19	30.09.2005	21,96%	
20	30.12.2005	16,15%	
21	31.03.2006	6,89%	
22	30.06.2006	-18,95%	
23	29.09.2006	4,10%	
24	29.12.2006	4.09%	
25			
26	Mean(IMKB-30)	6,79%	<--AVERAGE (M3:M26)
27	Sigma	20,75%	<--STDEVP(M3:M26)

The data table that we create shows calculation for a single portfolio as well as the data for the IMKB-30:

28	A	B	C	D	E	F
29		Calculation for a single portfolio				
30		Prop.x	0,75			
31		Prop.y	0,25			
32						
33		Mean	0,272897655			
34		Variance	0,269377296			
35		Sigma	0,519015699			
36						
37			Data Table			
38			Portfolio			
39			prop.	Sigma	Mean	
40	0,25			0,5190157	0,2728977	
41			-2	2,7250889	-1,4850172	
42			-1,75	2,4326336	-1,3252068	
43			-1,5	2,1402945	-1,1653963	0,067929838
44			-1,25	1,8481271	-1,0055859	
45			-1	1,5562278	-0,8457754	
46			-0,75	1,2647825	-0,685965	
47			-0,5	0,9741985	-0,5261546	
48			-0,25	0,685572	-0,3663441	
49			0	0,4031297	-0,2065337	
50			0,25	0,163023	-0,0467232	
51			0,5	0,2493947	0,1130872	
52			0,75	0,5190157	0,2728977	
53			1	0,805056	0,4327081	
54			1,25	1,0947198	0,5925185	
55			1,5	1,3857366	0,752329	
56			1,75	1,6774024	0,9121394	
57			2	1,9694288	1,0719499	
58			2,25	2,2616762	1,2317603	
59			2,5	2,5540687	1,3915708	
60			2,75	2,8465616	1,5513812	
61			3	3,1391269	1,7111916	

We have then added the IMKB-30 mean return of 0,0679 in a seperate column. All this work goes to produce graph of the efficient frontier and the IMKB-30.

(Figure 5.6)



ISE-30 not efficient because the return is not on the line.

5.9.To Form of the Expected Return with CAPM

We now calculate the expected return with CAPM formula. CAPM formula is $E(R)=R_f+beta(R(m)-R_f)$. E(R)=Expected Return,R_f=Risk Free Rate,R_m=Market Return. Pleasure note that we have chosen the risk free rate of interest as 4,5% from yearly Turkish treasury bill on 25.05.2007.

A) High Trading Volume:

(Table 5.19)

	A	B	C	D	E	F	G
1		Mean Returns	BETAS				
2	DOHOL	7,36%	1,3995205				
3	GARAN	11,03%	1,3774701		Risk Free Rate	4,50%	
4	ISCTR	5,53%	1,2372821				
5	KCHOL	4,42%	1,0927791				
6	TCELL	6,70%	1,3110586				
7	YKBNK	4,99%	1,4295375				
8	INDEX	6,79%	1				
9	Portfolio	0,25	0,25	0,15	0,05	0,25	0,05
10		CAPM					
11		DOHOL	7,71%				
12		GARAN	7,66%		Mean	7,56%	
13		ISCTR	7,34%				
14		KCHOL	7,01%				
15		TCELL	7,51%				
16		YKBNK	7,78%				

10			CAPM	Mean Returns	
11		DOHOL	7,71%	7,36%	Underprice
12		GARAN	7,66%	11,03%	Overprice
13		ISCTR	7,34%	5,53%	Underprice
14		KCHOL	7,01%	4,42%	Underprice
15		TCELL	7,51%	6,70%	Underprice
16		YKBNK	7,78%	4,99%	Underprice

B) Low Trading Volume:

(Table 5.20)

	A	B	C	D	E	F	G
1		M-Returns	BETAS				
2	ABANA	-1,45%	0,0304726				
3	ANACM	12,33%	0,8174032		Risk Free Rate	4.50%	
4	BRMEN	4,75%	0,3724005				
5	ESEMS	3,01%	0,8591617				
6	ISBTR	2,61%	0,807885				
7	TRNSK	1,49%	1,1325574				
8	INDEX	6,79%	1				
9	Portfolio	0,05	0,5	0,2	0,1	0.1	0.05
10		CAPM					
11		ABANA	4,57%				
12		ANACM	6,37%				
13		BRMEN	5,35%		MEAN	6,12%	
14		ESEMS	6,47%				
15		ISBTR	6,35%				
16		TRNSK	7,10%				

10			CAPM	Mean Returns	
11		ABANA	4,57%	-1,45%	Underprice
12		ANACM	6,37%	12,33%	Overprice
13		BRMEN	5,35%	4,75%	Underprice
14		ESEMS	6,47%	3,01%	Underprice
15		ISBTR	6,35%	2,61%	Underprice
16		TRNSK	7,10%	1,49%	Underprice

5.10.To Realize the Returns

According to result of analysis;if we had invested money in the above portfolios on 08.03.2007, gain or loss money like this;

A) High Trading Volume:

(Table 5.21)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1		DOHOL		GARAN		ISCTR		KCHOL		TCELL		YKBNK	
2	**QUARTER**	Price	Return	Price	Return	Price	Return	Price	Return	Price	Return	Price	Return
3	08.03.2007	2,23		5,41		6,31		4,44		7,1		2.89	
4	08.06.2007	2,7	**0,1913**	6,55	**0,1912**	5,85	**-0,076**	5,25	**0,1676**	8,2	**0.144**	2.92	**0.0103**
5													
6		Portfolio	0,25	0,25	0,15	0,05	0,25	0,05					
7													
8		Return											
9		19,13%											
10		19,12%		Mean	**12,92%**								
11		-7,57%											
12		16,76%											
13		14,40%											
14		1,03%											

B) Low Trading Volume:

(Table 5.22)

16		ABANA		ANACM		BRMEN		ESEMS		ISBTR		TRNSK	
17	**QUARTER**	Price	Return	Price	Return	Price	Return	Price	Return	Price	Return	Price	Return
18	08.03.2007	0,77		5,85		1,75		0,36		1.274,87		0,28	
19	08.06.2007	0,94	**0,1995**	5,15	**-0,127**	1,77	**0,0114**	0,55	**0,4238**	1.150,00	**-0,103**	0,28	**0**
20													
21		Portfolio	0,05	0,5	0,2	0,1	0,1	0,05					
22													
23		Return											
24		19,95%											
25		-12,74%		Mean	**-0,019**								
26		1,14%											
27		42,38%											
28		-10,31%											
29		0,00%											

(Table 5.23)

46	**Index Return**		
47		**Index**	
48	**QUARTER**	**Price**	**Return**
49	08.03.2007	52073	
50	08.06.2007	55654	**6,65%**

Again with high trading volume stocks,we would gain more than index,however with low trading volume stocks would lose.

5.11.What Happen When We Add ANACM and Take out YKBNK from Our Portfolio?

We construct a new portfolio as aresult of the above analysis before the realize the return,We use ANACM instead of YKBNK. Because of YKBNK provides a low return high risk but ANACM high return low risk.The result is not what have expected low trading volume.This show that we cannot trust low trading volume stocks because they are very volatile.(Between 08.03.2007 and 08.06.2007 ANACM provided a return of -12,74%. However between 2001 and 2006,ANACM provided a positive return of 12,33%)

(Table 5.24)

33							
34							
35		DOHOL	GARAN	ISCTR	KCHOL	TCELL	ANACM
36	Portfolio I	0,25	0,25	0,15	0,05	0,15	0,15
37							
38	Return						
39	19,13%						
40	19,12%		Mean	**0,0951**			
41	-7,57%						
42	16,76%						
43	14,40%						
44	-12,74%						

CHAPTER 6: CONCLUSION and RECOMENDATION

We can say that, the application of Markowitz's Modern Portfolio Theory on Istanbul Stock Exchange-30 is partly successful when we look at the results of our calculations and analyses.

At the beginning of the chapter 5, we calculated the annual and a three month period of earnings and the risks of the stock documents. We made the analysis of the portfolios which were obtained within the framework of the results. These results showed us that the stock exchanges that have the highest transaction volume in the index provide more earnings than the index provides. At the same time, it was also seen that the stock certificates that have low transaction volume provide low earnings when it is compared to the market. The risks of the documents according to the market were a bit more than the earnings. The main reason for this is that Istanbul Stock Exchange is not a deep market and it has a structure which is open to speculations.

One of the stock certificates called ANACM which has a low transaction volume provided a quite more earnings than the other stock certificates. However, the performance of ANACM was not good enough at the end of the period when we were considering about investment.

One of the other results of our calculations is that previous data can give us hints about our future oriented investments or in other words they can help us to choose the path to carry on. However, these hints are not completely right. For example, as a consequence of the results, the expected earning of the portfolio, which was composed of stock certificates that have high transaction volume, is %7.56. We provided earnings of % 12.92 by expecting %7.56. Similarly, the expected earnings of the portfolio, which was composed of stock certificates that have low transaction volume, is %6.12. If we had invested by taking this fore mentioned percentage into account, we would have lost money. The expectation that we had formed with CAPM formula gave positive results in stock documents that are transacted the most whereas it gave negative results in the ones that are transacted the least.

In light of my analysis, I have the following recommendations. This study which we had done before we took the decision of investment showed us that the stock certificates which have high transaction volume in the market are more reliable than the ones which have low transaction volume.

With the help of this study, it is seen that if there is not any unexpected effects (war, economic crises etc.) Both of the groups of the stock certificates stay stable. I would recommend to the investors, who have plans to invest, to make investment on the stock certificates which have high transaction volumes in the market. I would also recommend them to make a long term portfolio.

Diversified portfolios are useful to reduce the investment risk to the least level and try to bring high earnings. Here the aim is to make diversification while providing portfolio. Good diversification can be done with the theory of Markowitz (Modern Portfolio Theory) and choice of optional portfolio in the active limit.

In conclusion, Markowitz's Modern Portfolio Theory and Optimization is the best method to provide portfolio for the stock certificates in Istanbul Stock Exchange.

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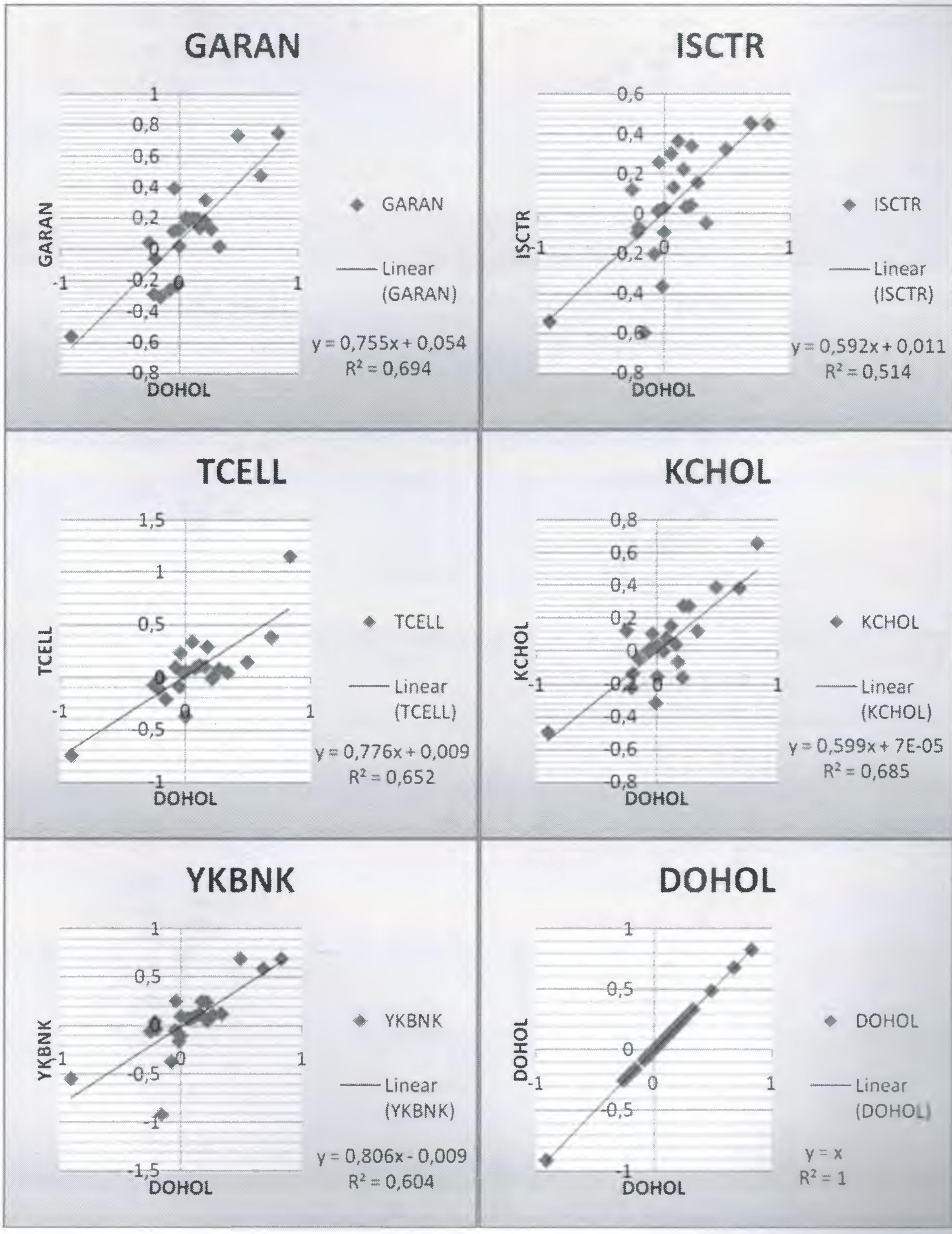
http://www.investopedia.com/

APPENDIX A

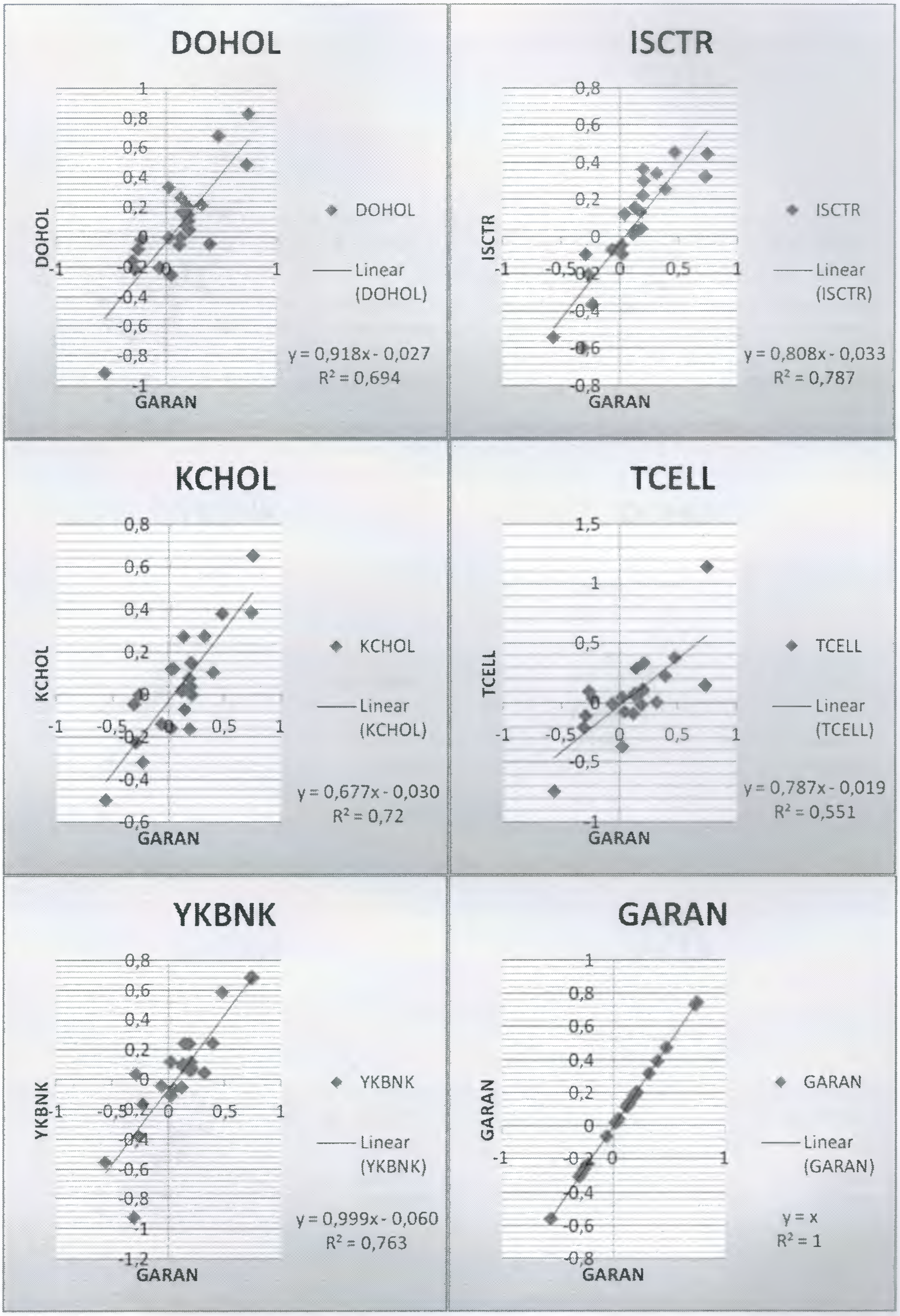
Another way to took at the correlation coefficent is to graph Stock A and B returns on the same axes and use Excel **Trendline** facilities to regress the returns of stock B on those of stock A.

A)High Trading Volume

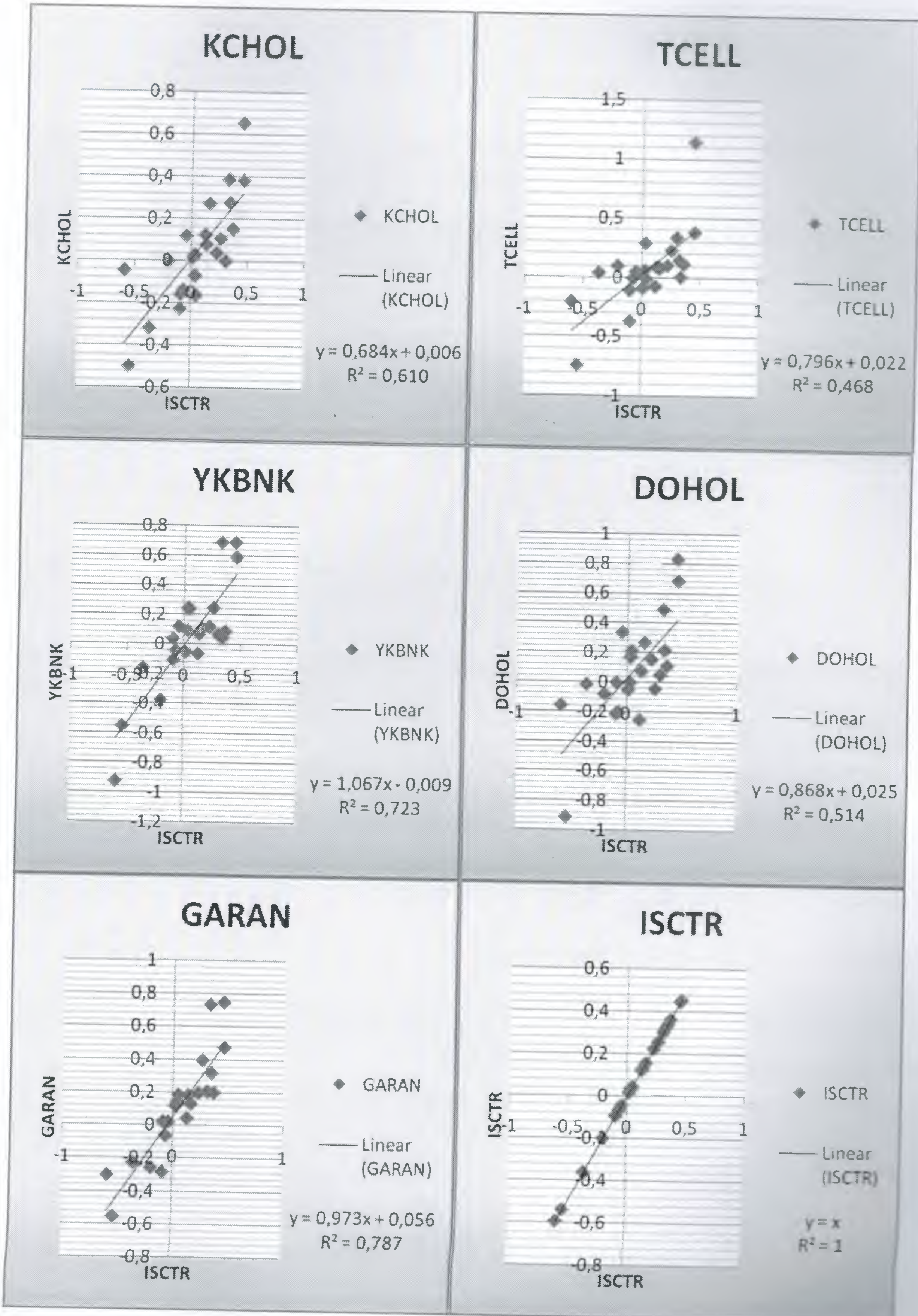
DOHOL



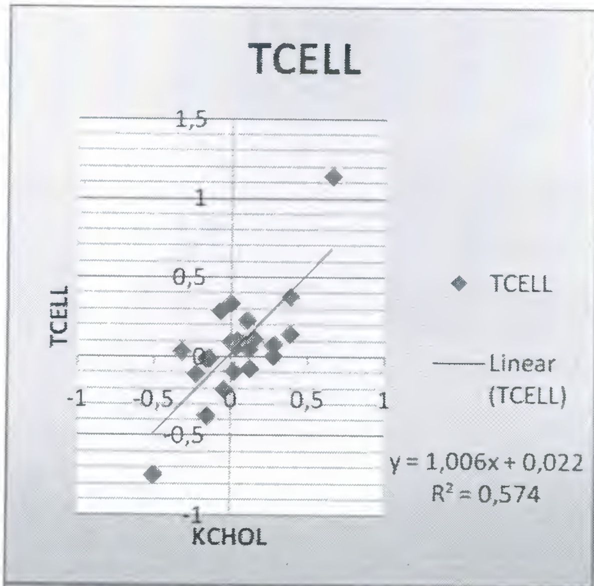
GARAN

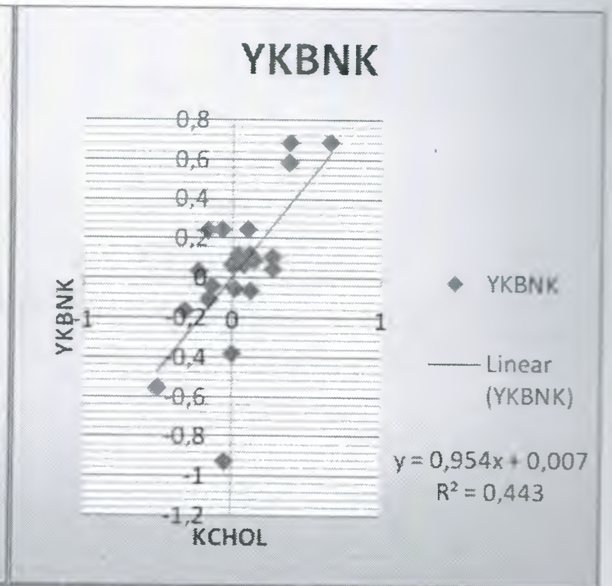

DOHOL
DOHOL
GARAN
Linear (DOHOL)
y = 0,918x - 0,027
R² = 0,694
ISCTR
ISCTR
GARAN
Linear (ISCTR)
y = 0,808x - 0,033
R² = 0,787
KCHOL
KCHOL
GARAN
Linear (KCHOL)
y = 0,677x - 0,030
R² = 0,72
TCELL
TCELL
GARAN
Linear (TCELL)
y = 0,787x - 0,019
R² = 0,551
YKBNK
YKBNK
GARAN
Linear (YKBNK)
y = 0,999x - 0,060
R² = 0,763
GARAN
GARAN
GARAN
Linear (GARAN)
y = x
R² = 1

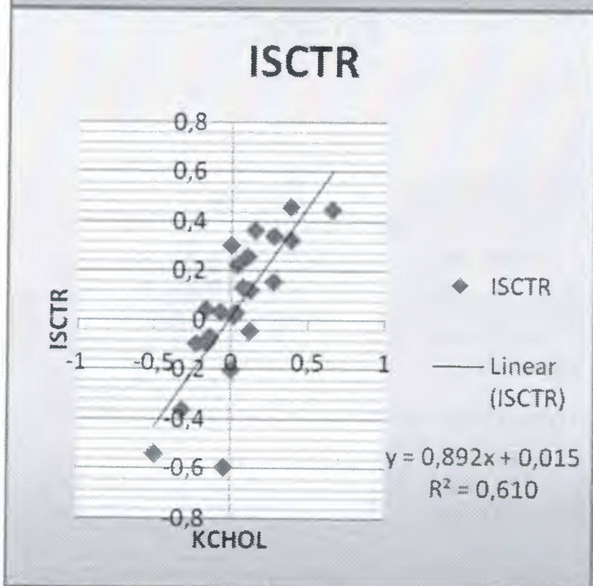
ISCTR

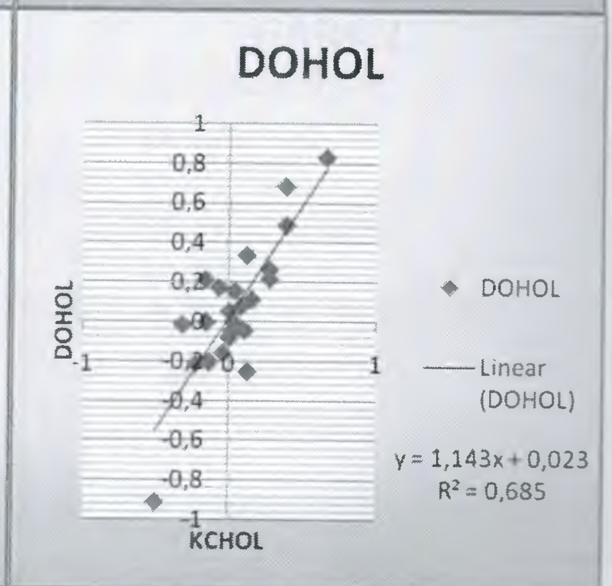

KCHOL
KCHOL
Linear (KCHOL)
y = 0,684x + 0,006
R² = 0,610
ISCTR
TCELL
TCELL
Linear (TCELL)
y = 0,796x + 0,022
R² = 0,468
ISCTR
YKBNK
YKBNK
Linear (YKBNK)
y = 1,067x - 0,009
R² = 0,723
ISCTR
DOHOL
DOHOL
Linear (DOHOL)
y = 0,868x + 0,025
R² = 0,514
ISCTR
GARAN
GARAN
Linear (GARAN)
y = 0,973x + 0,056
R² = 0,787
ISCTR
ISCTR
ISCTR
Linear (ISCTR)
y = x
R² = 1
ISCTR

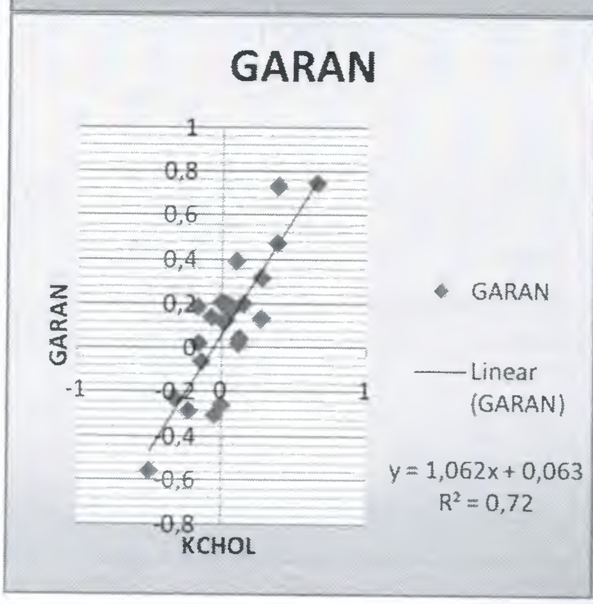
KCHOL

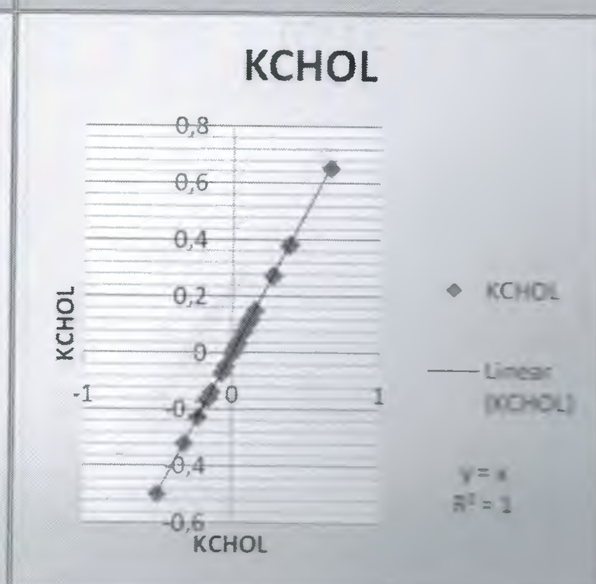

TCELL
TCELL
KCHOL
TCELL
Linear (TCELL)
y = 1,006x + 0,022
R^2 = 0,574


YKBNK
YKBNK
KCHOL
YKBNK
Linear (YKBNK)
y = 0,954x + 0,007
R^2 = 0,443

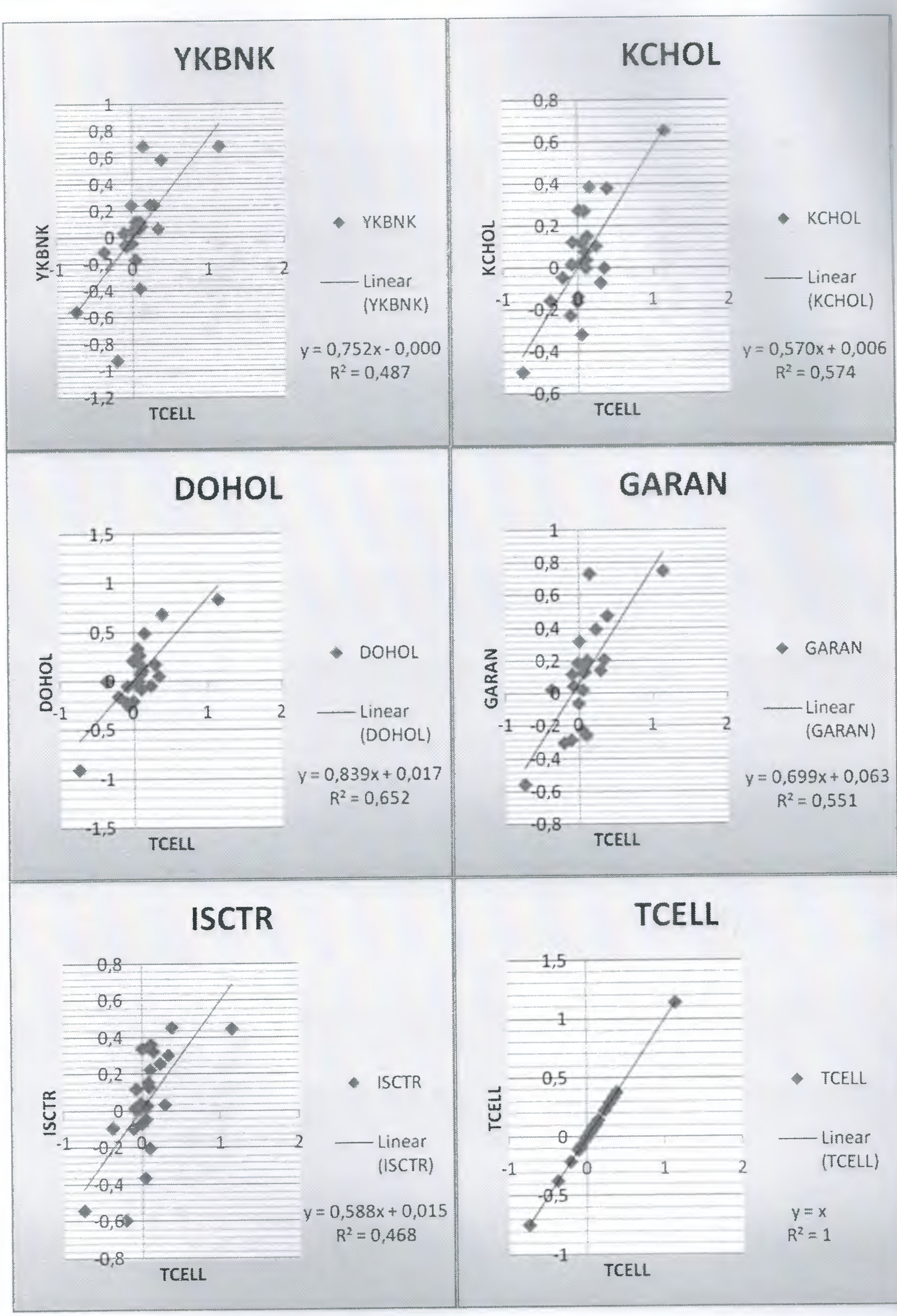

ISCTR
ISCTR
KCHOL
ISCTR
Linear (ISCTR)
y = 0,892x + 0,015
R^2 = 0,610


DOHOL
DOHOL
KCHOL
DOHOL
Linear (DOHOL)
y = 1,143x + 0,023
R^2 = 0,685

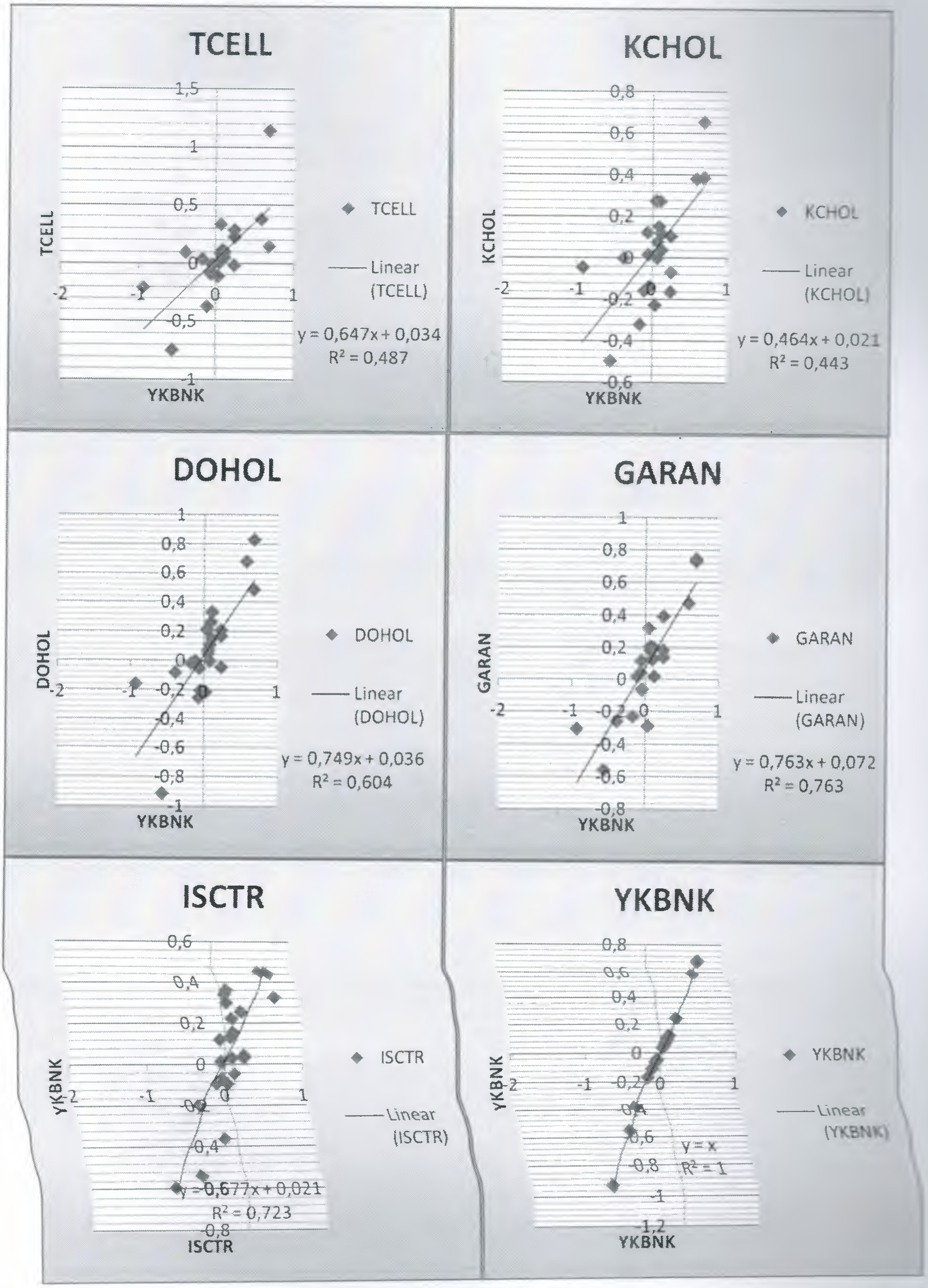

GARAN
GARAN
KCHOL
GARAN
Linear (GARAN)
y = 1,062x + 0,063
R^2 = 0,72


KCHOL
KCHOL
KCHOL
KCHOL
Linear (KCHOL)
y = x
R^2 = 1

TCELL


YKBNK
YKBNK
Linear (YKBNK)
y = 0,752x - 0,000
R² = 0,487
TCELL
KCHOL
KCHOL
Linear (KCHOL)
y = 0,570x + 0,006
R² = 0,574
TCELL
DOHOL
DOHOL
Linear (DOHOL)
y = 0,839x + 0,017
R² = 0,652
TCELL
GARAN
GARAN
Linear (GARAN)
y = 0,699x + 0,063
R² = 0,551
TCELL
ISCTR
ISCTR
Linear (ISCTR)
y = 0,588x + 0,015
R² = 0,468
TCELL
TCELL
TCELL
Linear (TCELL)
y = x
R² = 1
TCELL

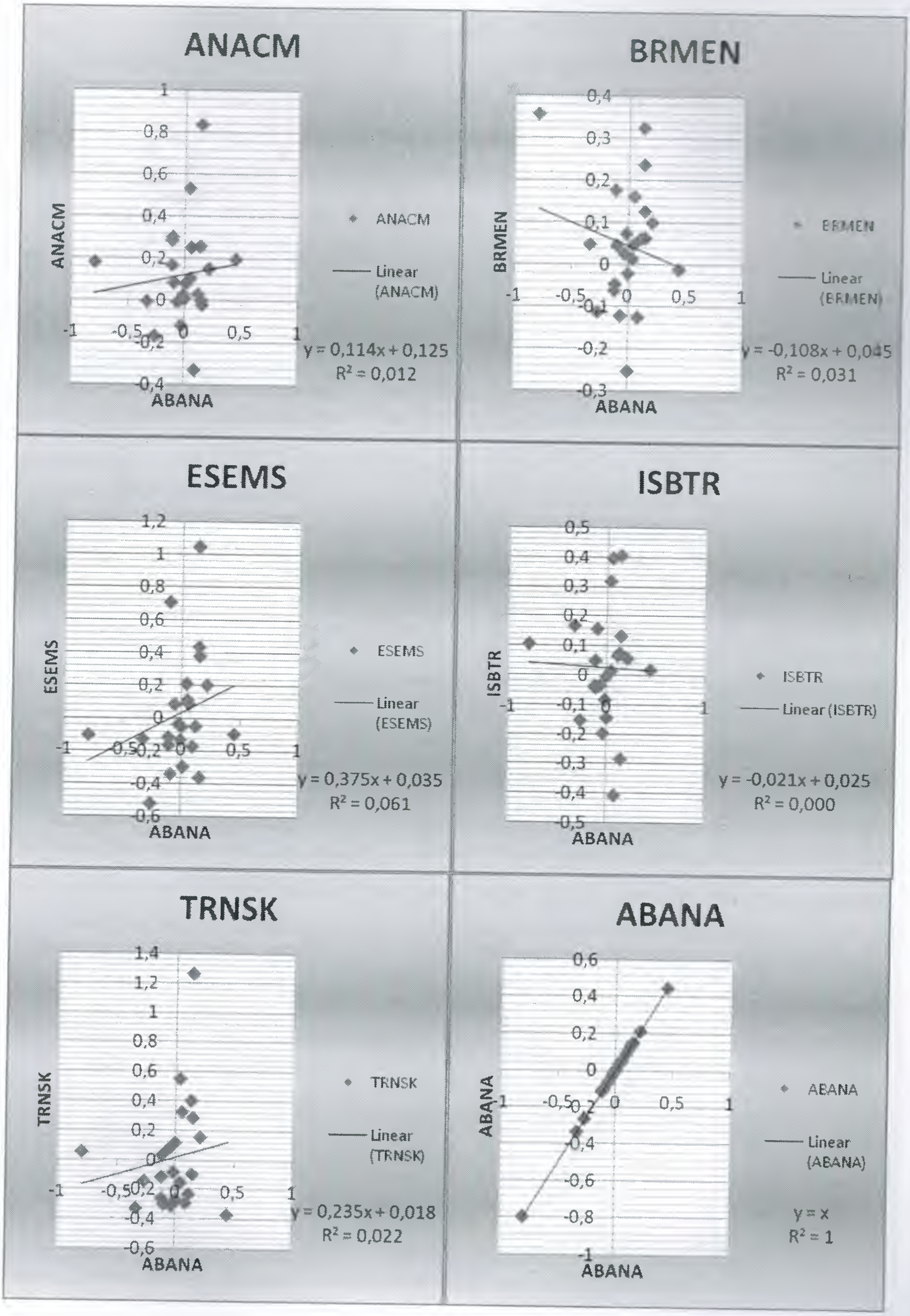
YKBNK



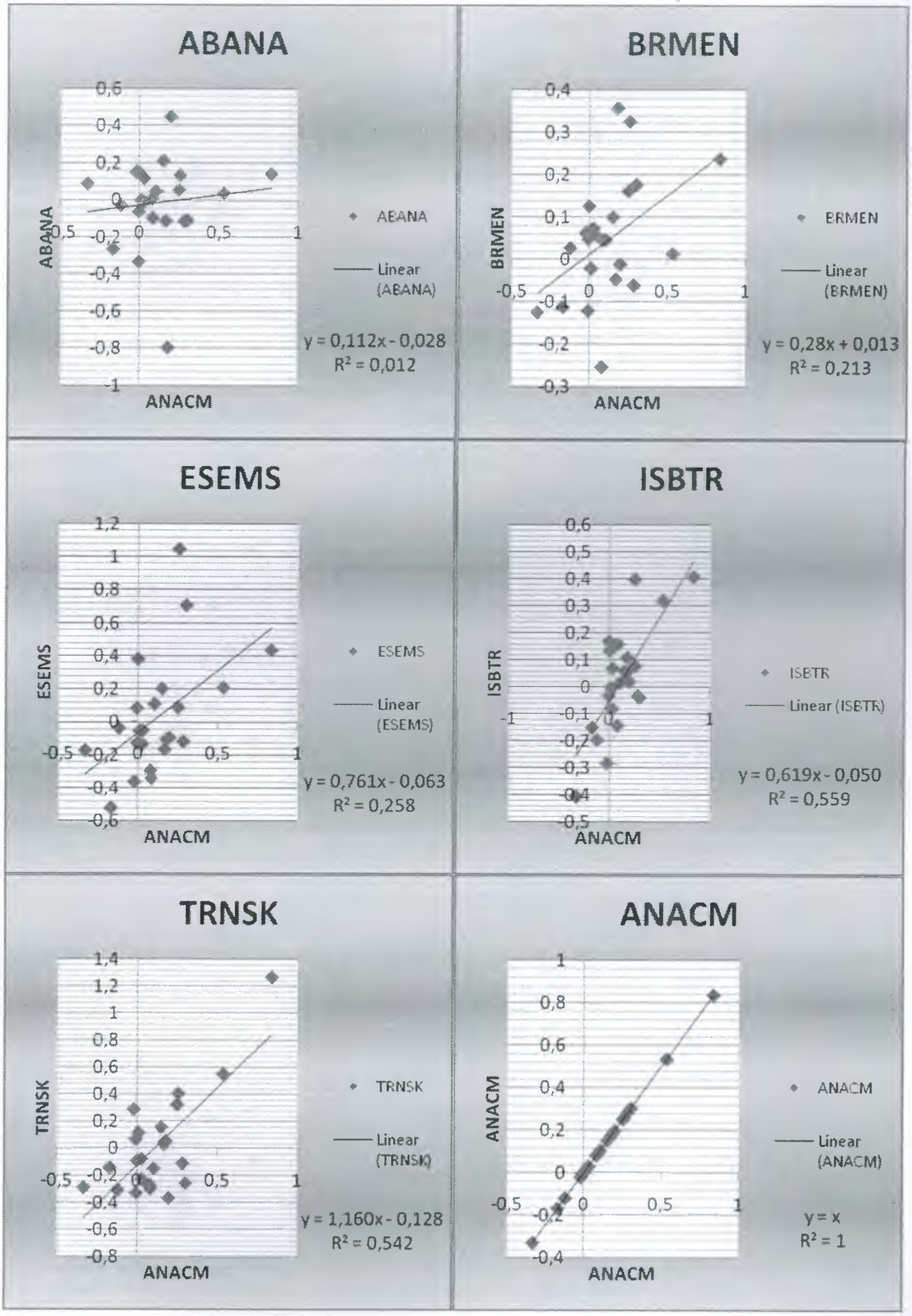
TCELL
TCELL
Linear (TCELL)
y = 0,647x + 0,034
R² = 0,487
YKBNK
KCHOL
KCHOL
Linear (KCHOL)
y = 0,464x + 0,021
R² = 0,443
YKBNK
DOHOL
DOHOL
Linear (DOHOL)
y = 0,749x + 0,036
R² = 0,604
YKBNK
GARAN
GARAN
Linear (GARAN)
y = 0,763x + 0,072
R² = 0,763
YKBNK
ISCTR
ISCTR
Linear (ISCTR)
y = 0,677x + 0,021
R² = 0,723
ISCTR
YKBNK
YKBNK
Linear (YKBNK)
y = x
R² = 1
YKBNK

B)Low Trading Volume

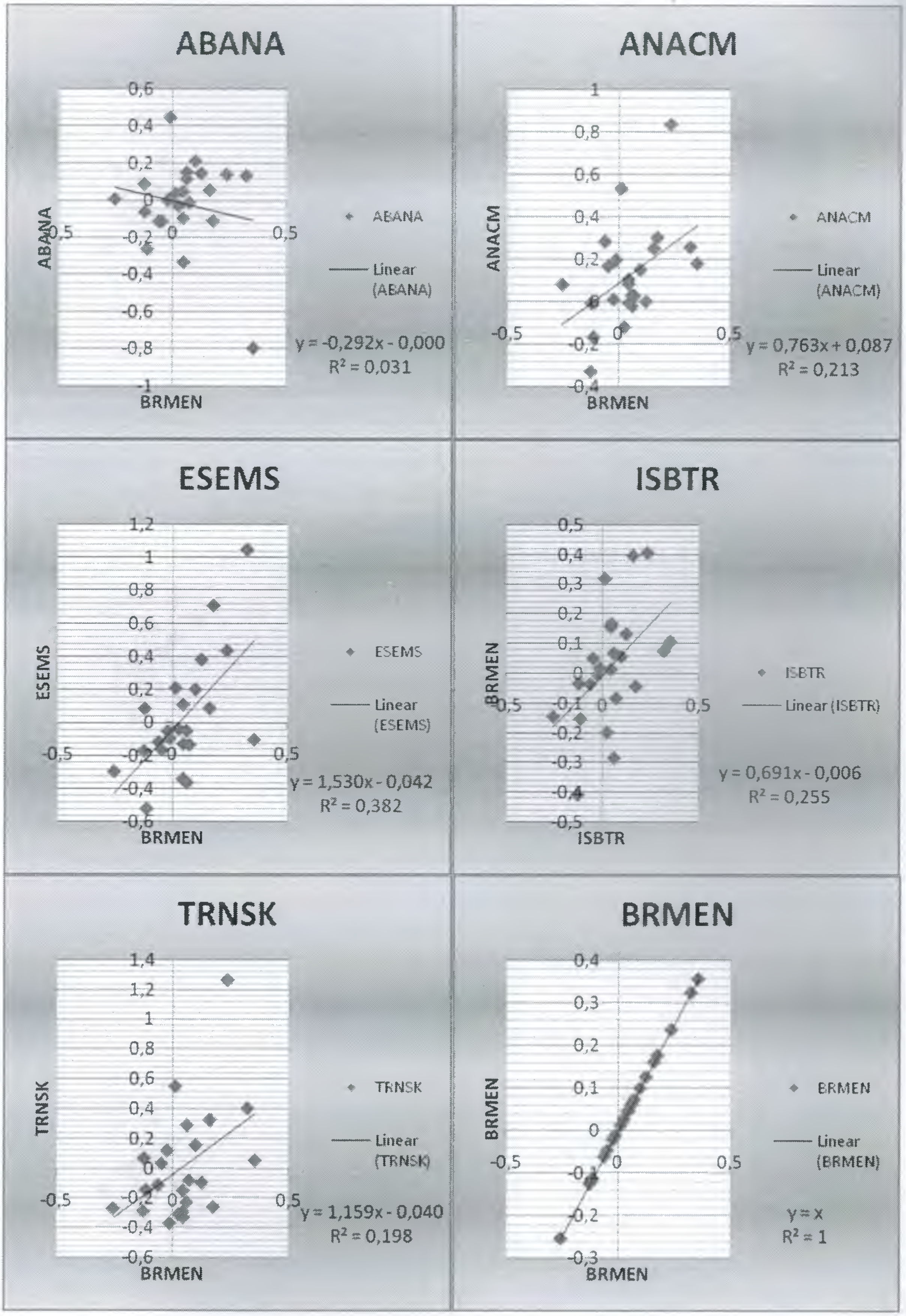
ABANA



ANACM

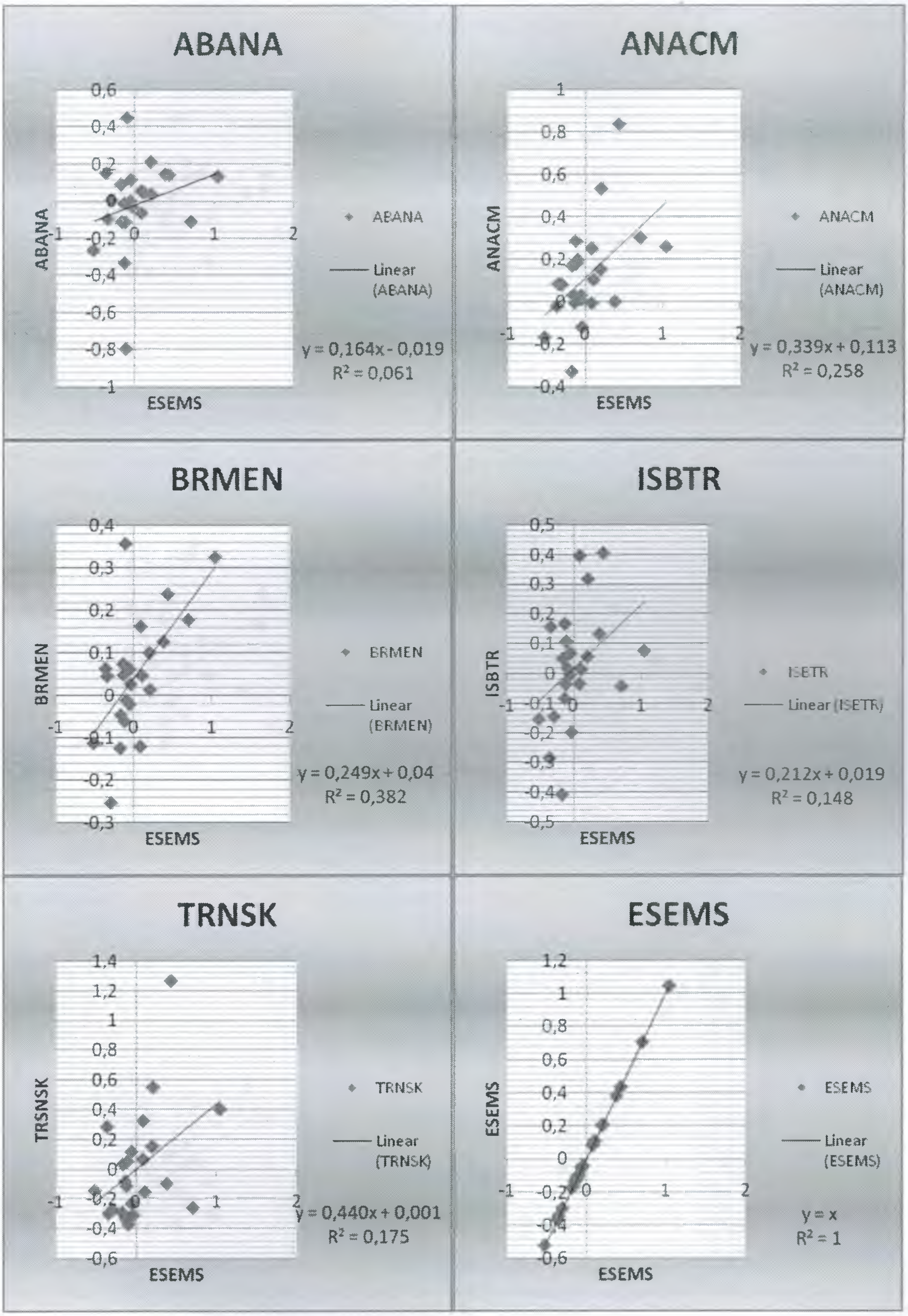

ABANA
ABANA
Linear (ABANA)
y = 0,112x - 0,028
R² = 0,012
ANACM
BRMEN
BRMEN
Linear (BRMEN)
y = 0,28x + 0,013
R² = 0,213
ANACM
ESEMS
ESEMS
Linear (ESEMS)
y = 0,761x - 0,063
R² = 0,258
ANACM
ISBTR
ISBTR
Linear (ISBTR)
y = 0,619x - 0,050
R² = 0,559
ANACM
TRNSK
TRNSK
Linear (TRNSK)
y = 1,160x - 0,128
R² = 0,542
ANACM
ANACM
ANACM
Linear (ANACM)
y = x
R² = 1
ANACM

BRMEN

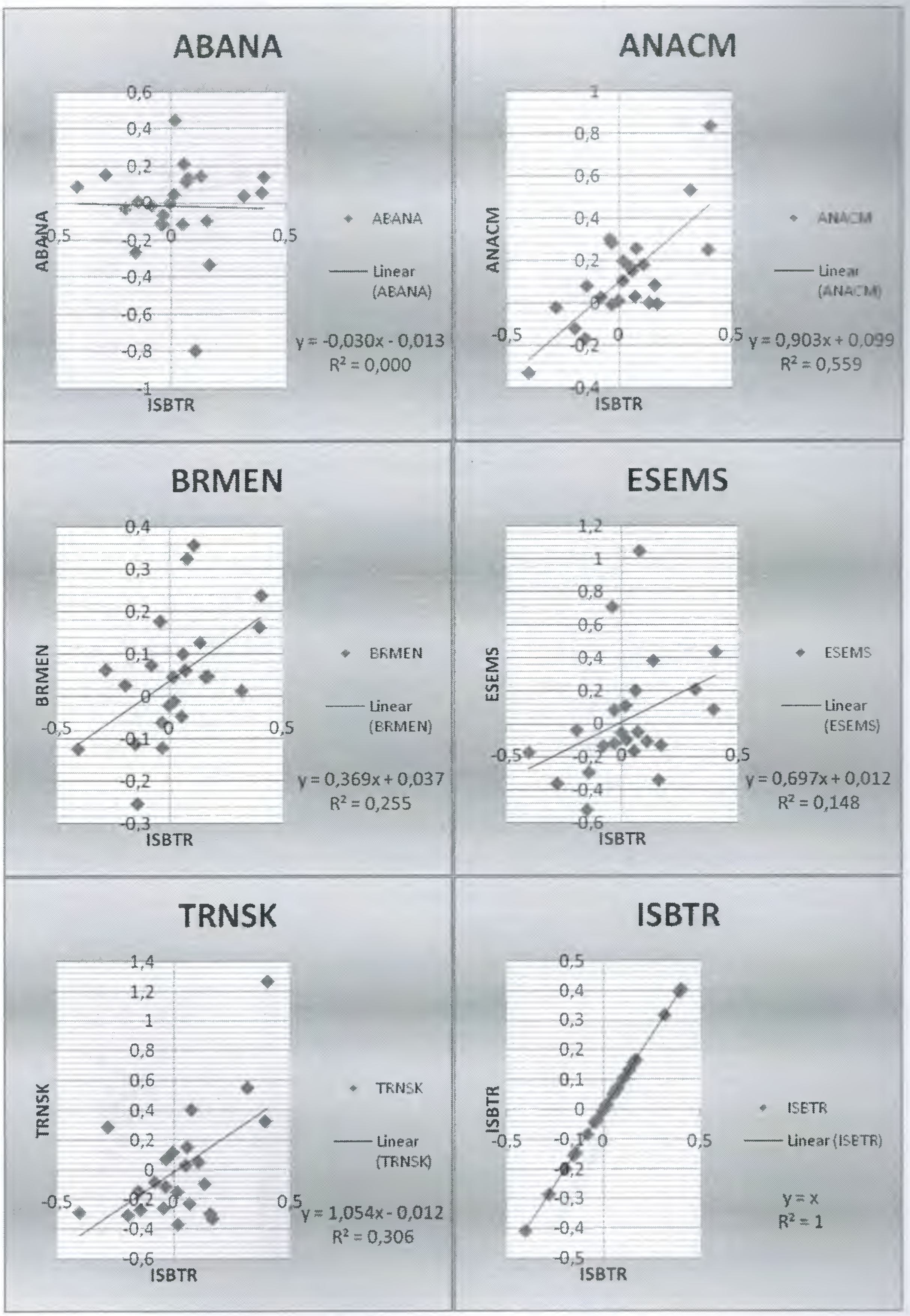


ABANA
ABANA
Linear (ABANA)
y = -0,292x - 0,000
R² = 0,031
BRMEN
ANACM
ANACM
Linear (ANACM)
y = 0,763x + 0,087
R² = 0,213
BRMEN
ESEMS
ESEMS
Linear (ESEMS)
y = 1,530x - 0,042
R² = 0,382
BRMEN
ISBTR
BRMEN
ISBTR
Linear (ISBTR)
y = 0,691x - 0,006
R² = 0,255
ISBTR
TRNSK
TRNSK
Linear (TRNSK)
y = 1,159x - 0,040
R² = 0,198
BRMEN
BRMEN
BRMEN
Linear (BRMEN)
y = x
R² = 1
BRMEN

ESEMS

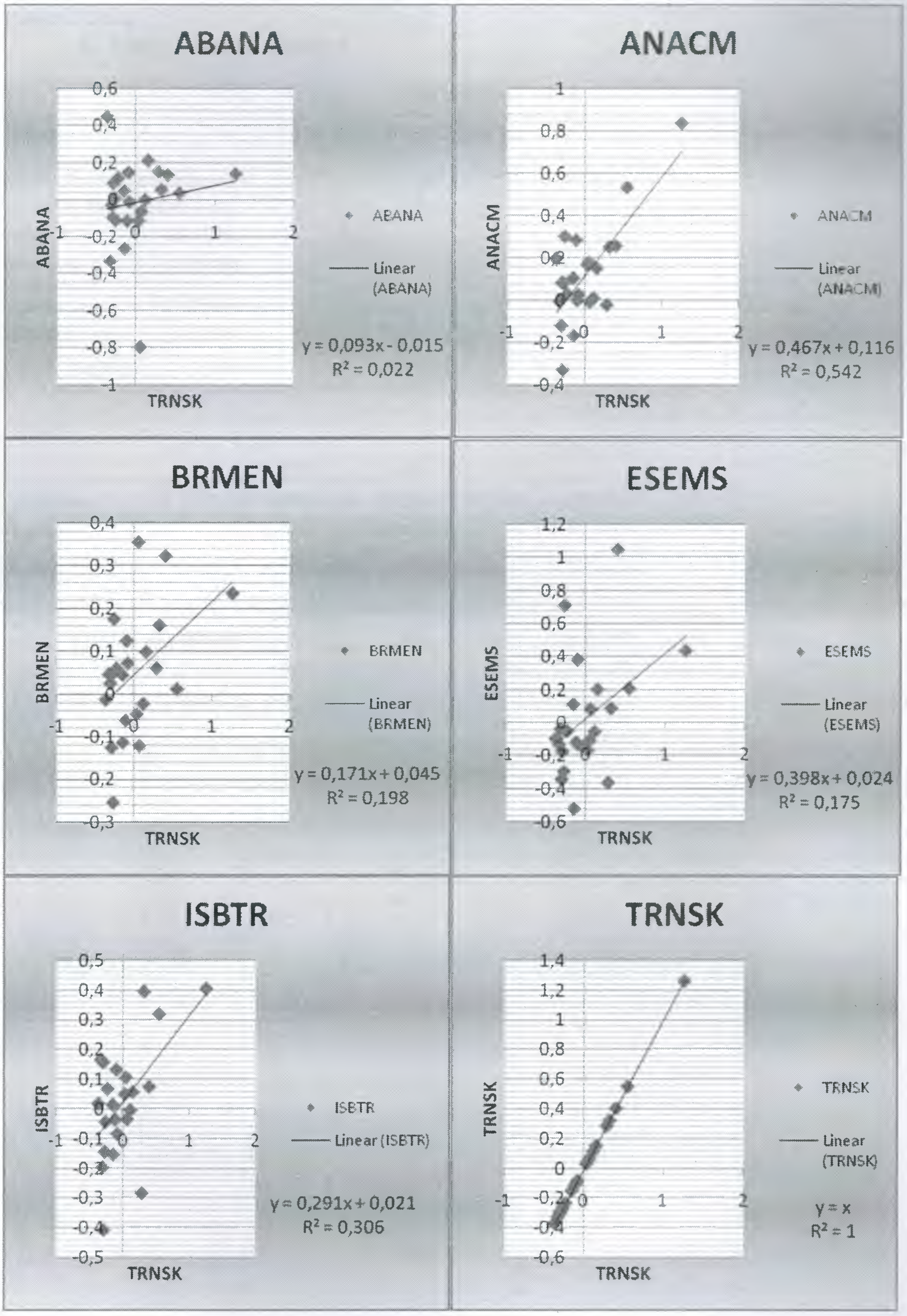

ABANA
ABANA
ESEMS
ABANA
Linear (ABANA)
y = 0,164x - 0,019
R² = 0,061
ANACM
ANACM
ESEMS
ANACM
Linear (ANACM)
y = 0,339x + 0,113
R² = 0,258
BRMEN
BRMEN
ESEMS
BRMEN
Linear (BRMEN)
y = 0,249x + 0,04
R² = 0,382
ISBTR
ISBTR
ESEMS
ISBTR
Linear (ISBTR)
y = 0,212x + 0,019
R² = 0,148
TRNSK
TRSNSK
ESEMS
TRNSK
Linear (TRNSK)
y = 0,440x + 0,001
R² = 0,175
ESEMS
ESEMS
ESEMS
ESEMS
Linear (ESEMS)
y = x
R² = 1

ISBTR



ABANA
ABANA
ISBTR
ABANA
Linear (ABANA)
y = -0,030x - 0,013
R² = 0,000
ANACM
ANACM
ISBTR
ANACM
Linear (ANACM)
y = 0,903x + 0,099
R² = 0,559
BRMEN
BRMEN
ISBTR
BRMEN
Linear (BRMEN)
y = 0,369x + 0,037
R² = 0,255
ESEMS
ESEMS
ISBTR
ESEMS
Linear (ESEMS)
y = 0,697x + 0,012
R² = 0,148
TRNSK
TRNSK
ISBTR
TRNSK
Linear (TRNSK)
y = 1,054x - 0,012
R² = 0,306
ISBTR
ISBTR
ISBTR
ISBTR
Linear (ISBTR)
y = x
R² = 1

TRNSK



APPENDIX B

Another Way of Calculating the Beta

We can use **ToolsData Analaysis/Regression** calculating beta.X variable 1 means beta.

A) High Trading Volume

DOHOL

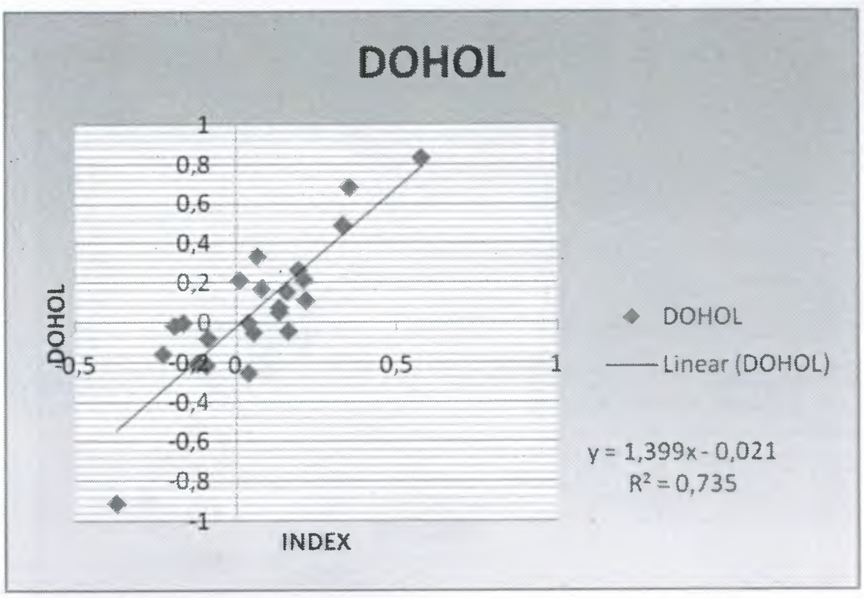
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,8573962
R Square	0,7351283
Adjusted R Square	0,7225153
Standard Error	0,1823981
Observations	23

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1,939042166	1,9390422	58,28366	1,72893E-07
Residual	21	0,698650116	0,0332691		
Total	22	2,637692282			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	-0,021434	0,0400194	-0,535601	0,597862	-0,10465933	0,06179	-0,104659	0,0617905
X Variable 1	1,3995205	0,183318321	7,6343736	1,73E-07	1,018289225	1,780752	1,0182892	1,7807519



GARAN

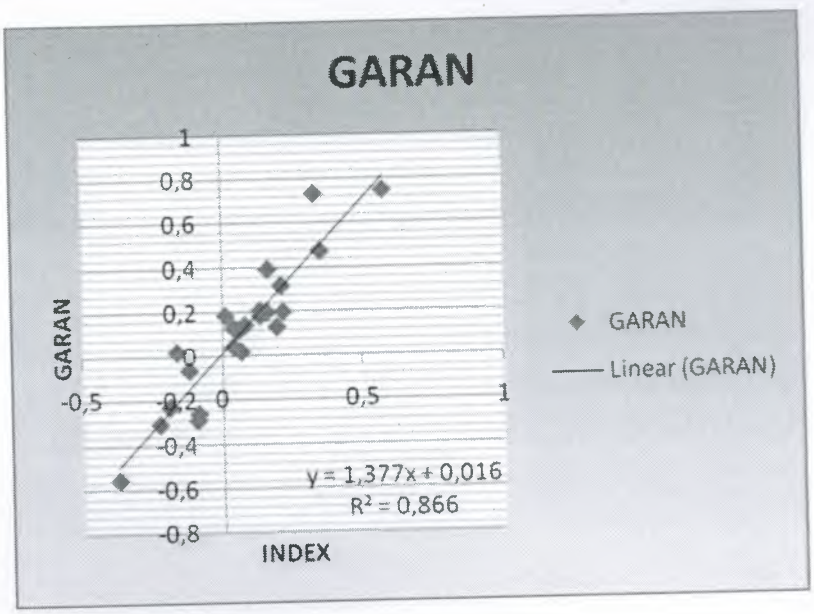
SUMMARY
OUTPUT

Regression Statistics	
Multiple R	0,930605
R Square	0,8660256
Adjusted R Square	0,8596459
Standard Error	0,1176339
Observations	23

ANOVA

	df	SS	MS	F	Significance F
Regression	1	1,878421413	1,8784214	135,7464	1,25241E-10
Residual	21	0,290592325	0,0138377		
Total	22	2,169013738			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	0,016757	0,025809689	0,6492508	0,523215	-0,03691723	0,070431	-0,036917	0,0704311
X Variable 1	1,3774701	0,118227382	11,651024	1,25E-10	1,131602754	1,623337	1,1316028	1,6233374



ISCTR

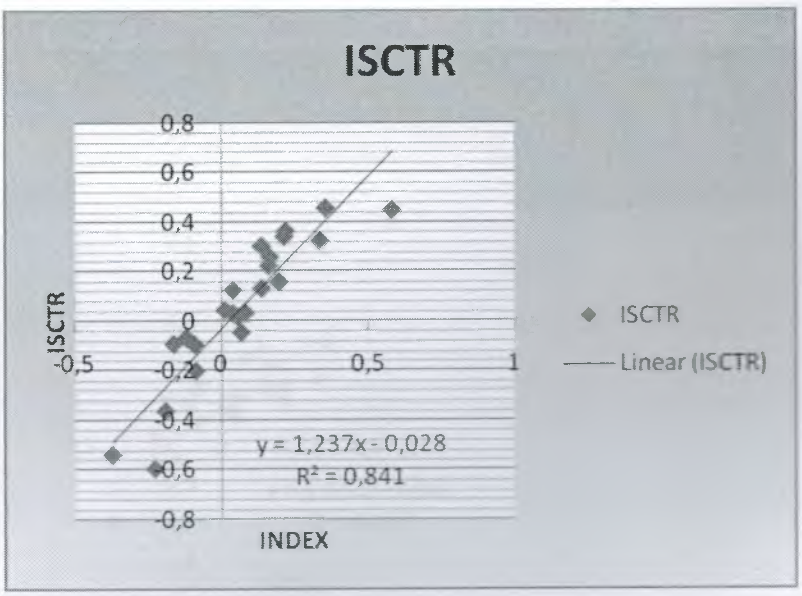
SUMMARY
OUTPUT

Regression Statistics	
Multiple R	0,9172809
R Square	0,8414042
Adjusted R Square	0,833852
Standard Error	0,1166318
Observations	23

ANOVA

	df	SS	MS	F	Significance F
Regression	1	1,515535653	1,5155357	111,4121	7,4598E-10
Residual	21	0,28566244	0,013603		
Total	22	1,801198094			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	-0,028702	0,025589823	-1,121619	0,274686	-0,08191899	0,024515	-0,081919	0,0245149
X Variable 1	1,2372821	0,117220231	10,555192	7,46E-10	0,993509284	1,481055	0,9935093	1,4810549



TCELL

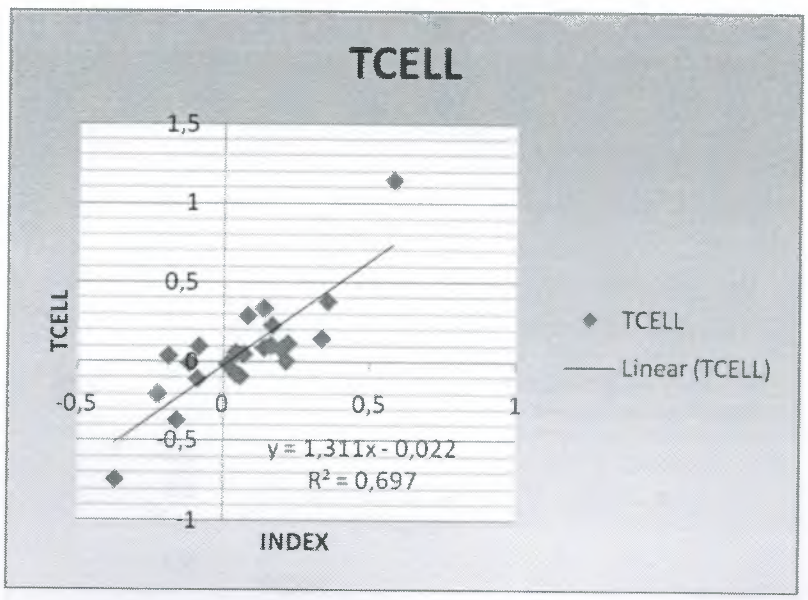
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,8349021
R Square	0,6970615
Adjusted R Square	0,6826358
Standard Error	0,1876586
Observations	23

ANOVA

	df	SS	MS	F	Significance F
Regression	1	1,701660468	1,7016605	48,32099	7,25051E-07
Residual	21	0,739530937	0,0352158		
Total	22	2,441191404			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	-0,022023	0,041173604	-0,534888	0,598346	-0,10764847	0,063602	-0,107648	0,0636019
X Variable 1	1,3110586	0,188605423	6,9513304	7,25E-07	0,918832158	1,703285	0,9188322	1,7032851



YKBNK

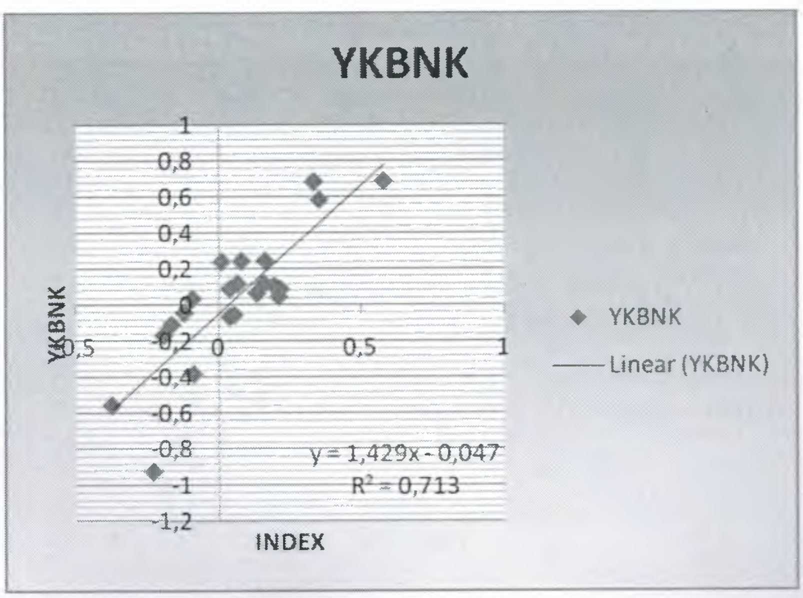
SUMMARY
OUTPUT

Regression Statistics	
Multiple R	0,8444281
R Square	0,7130589
Adjusted R Square	0,699395
Standard Error	0,1968947
Observations	23

ANOVA

	df	SS	MS	F	Significance F
Regression	1	2,023111516	2,0231115	52,18575	4,06075E-07
Residual	21	0,814117688	0,0387675		
Total	22	2,837229205			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	-0,047168	0,043200055	-1,091854	0,287266	-0,13700757	0,042671	-0,137008	0,0426713
X Variable 1	1,4295375	0,197888064	7,2239705	4,06E-07	1,018006777	1,841068	1,0180068	1,8410683



KCHOL

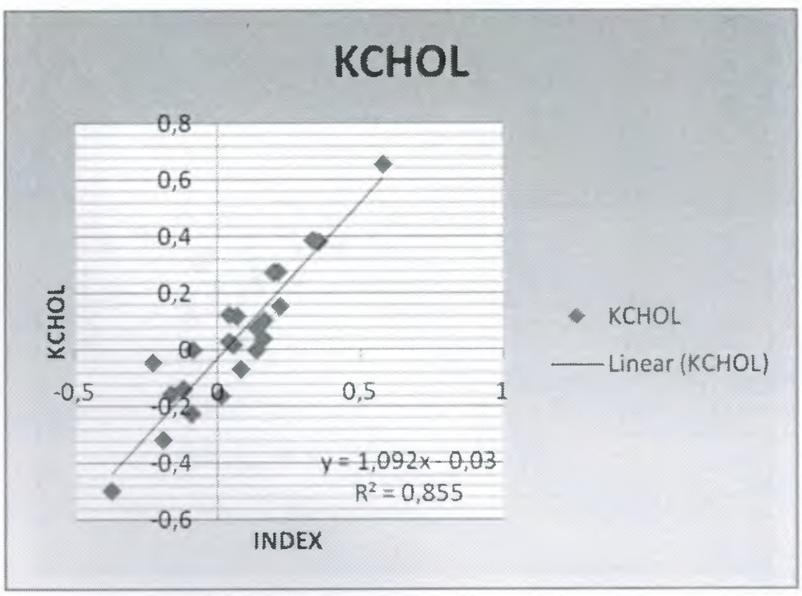
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,924682
R Square	0,8550369
Adjusted R Square	0,8481339
Standard Error	0,0976952
Observations	23

ANOVA

	df	SS	MS	F	Significance F
Regression	1	1,182206806	1,1822068	123,8644	2,8822E-10
Residual	21	0,200431595	0,0095444		
Total	22	1,382638401			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	-0,030032	0,021435015	-1,401059	0,175802	-0,07460828	0,014545	-0,074608	0,0145448
X Variable 1	1,0927791	0,098188154	11,129439	2,88E-10	0,888585652	1,296973	0,8885857	1,2969725



B) Low Trading Volume

ABANA

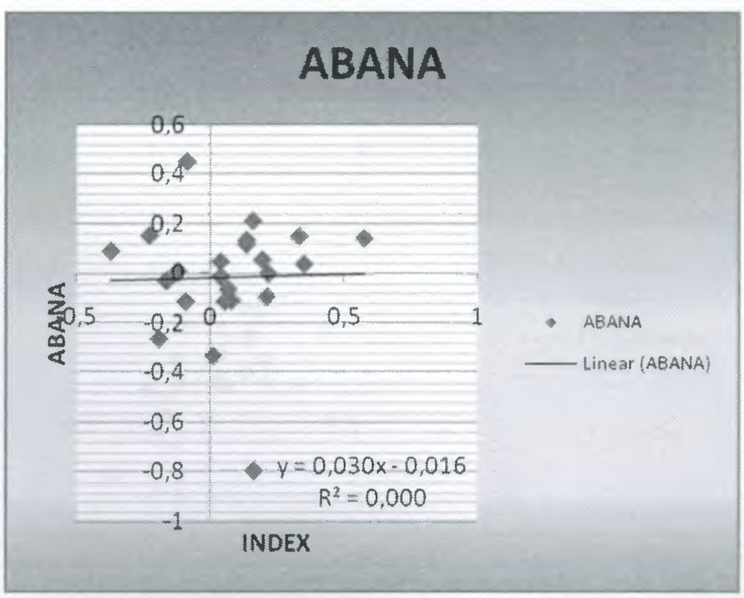
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,0275
R Square	0,000756
Adjusted R Square	-0,046827
Standard Error	0,240504
Observations	23

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0,00091928	0,0009193	0,015893	0,900878144
Residual	21	1,214688614	0,0578423		
Total	22	1,215607894			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	-0,016555	0,05276831	-0,313721	0,756828	-0,12629225	0,093183	-0,126292	0,0931832
X Variable 1	0,030473	0,241717717	0,1260669	0,900878	-0,4722069	0,533152	-0,472207	0,5331521



ANACM

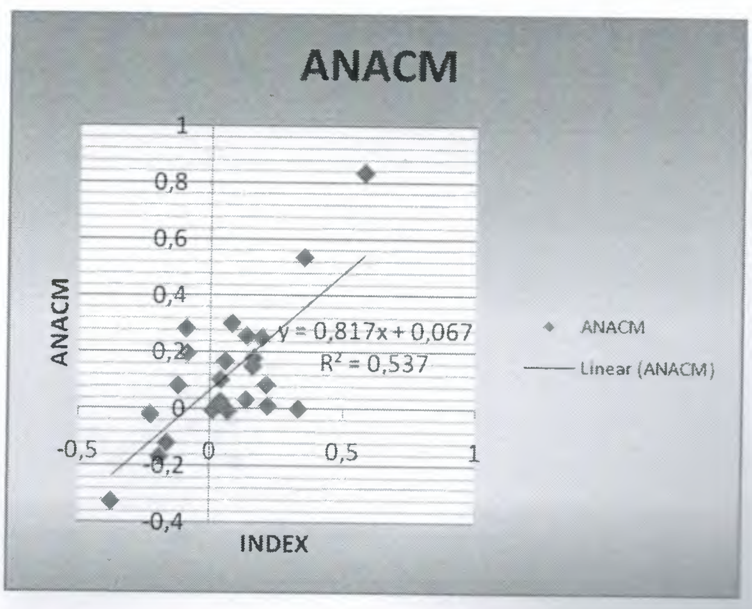
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,732896
R Square	0,537137
Adjusted R Square	0,515096
Standard Error	0,16475
Observations	23

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0,661456603	0,6614566	24,36981	6,96304E-05
Residual	21	0,569991768	0,0271425		
Total	22	1,231448371			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	0,067817	0,036147228	1,8761238	0,074607	-0,0073556	0,142989	-0,007356	0,142989
X Variable 1	0,817403	0,165580922	4,9365783	6,96E-05	0,473058815	1,161748	0,4730588	1,1617476



BRMEN

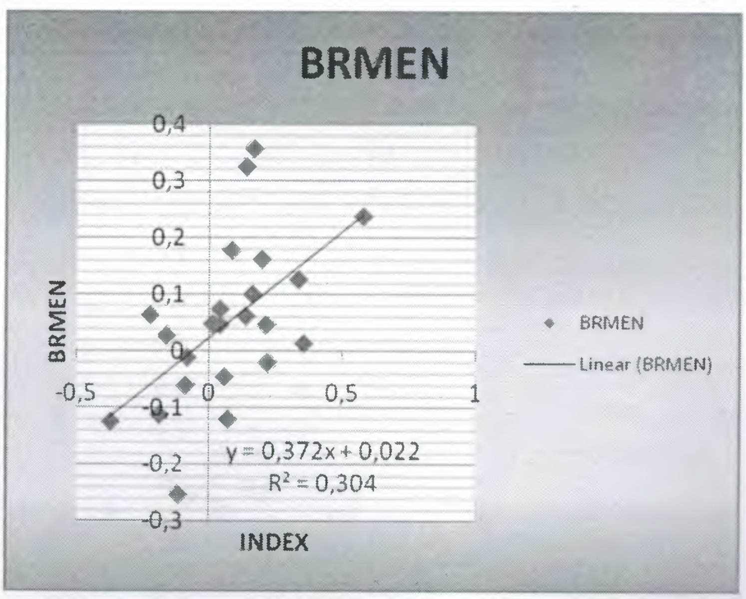
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,55147
R Square	0,304119
Adjusted R Square	0,270982
Standard Error	0,12231
Observations	23

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,137293238	0,1372932	9,177563	0,006377282
Residual	21	0,314152896	0,0149597		
Total	22	0,451446134			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0,022226	0,026835596	0,8282443	0,416846	-0,03358125	0,078034	-0,033581	0,0780341
X Variable 1	0,3724	0,122926789	3,0294493	0,006377	0,116760223	0,628041	0,1167602	0,6280407



ESEMS

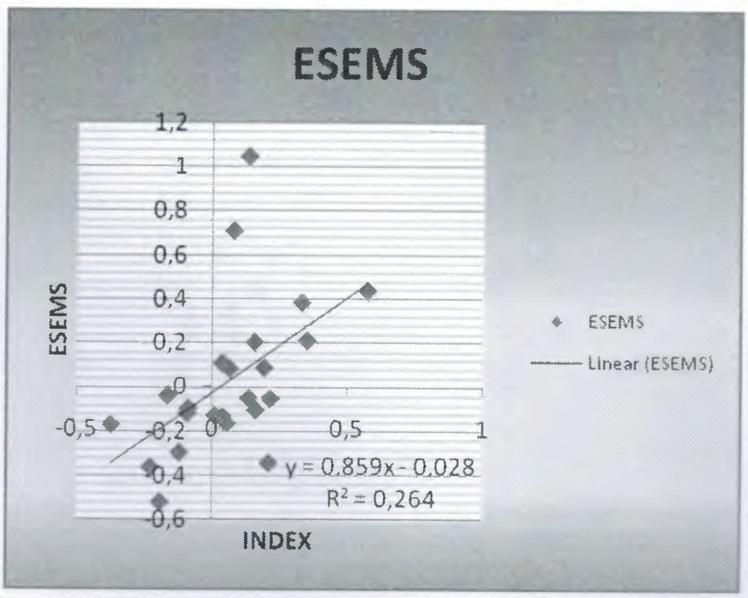
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,514132
R Square	0,264331
Adjusted R Square	0,229299
Standard Error	0,311205
Observations	23

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0,730766296	0,7307663	7,545455	0,012082119
Residual	21	2,033819348	0,0968485		
Total	22	2,764585644			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	-0,028226	0,068280532	-0,413381	0,683518	-0,17022302	0,113771	-0,170223	0,1137713
X Variable 1	0,859162	0,312775114	2,7468991	0,012082	0,208710238	1,509613	0,2087102	1,5096131



ISBTR

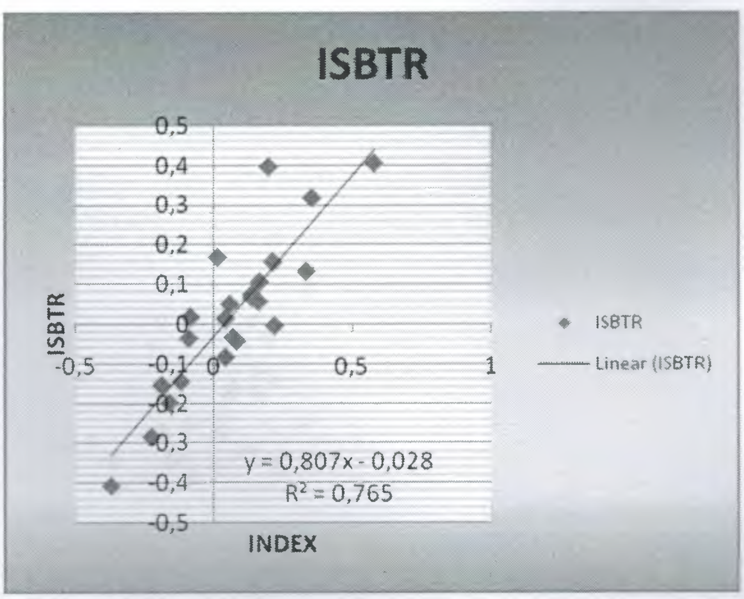
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,874984
R Square	0,765596
Adjusted R Square	0,754434
Standard Error	0,097059
Observations	23

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0,646141746	0,6461417	68,58901	4,70624E-08
Residual	21	0,197830182	0,0094205		
Total	22	0,843971927			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	-0,028828	0,021295458	-1,353699	0,190224	-0,07311397	0,015459	-0,073114	0,0154587
X Variable 1	0,807885	0,097548878	8,2818483	4,71E-08	0,605021016	1,010749	0,605021	1,010749



TRNSK

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,64429
R Square	0,41511
Adjusted R Square	0,387258
Standard Error	0,291891
Observations	23

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1,269840317	1,2698403	14,90417	0,000906227
Residual	21	1,789206857	0,0852003		
Total	22	3,059047174			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	-0,062024	0,064042899	-0,968473	0,343831	-0,1952083	0,071161	-0,195208	0,0711607
X Variable 1	1,132557	0,293363637	3,8605922	0,000906	0,522474282	1,74264	0,5224743	1,7426404