MACROECONOMIC FACTORS AND THE ARBITRAGE PRICING MODEL FOR THE TURKISH STOCK MARKET

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MACROECONOMIC FACTORS AND THE ARBITRAGE PRICING MODEL FOR THE TURKISH STOCK MARKET
MAKROEKONOMİK FAKTÖRLERİN TÜRK HİSSE SENEDİ PİYASASINDA ARBİTRAJ FİYATLAMA MODELİ İLE ANALİZİ

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Anahtar Kelimeler (Türkçe)
1) Hisse Senedi Getirileri
2) Risk
3) Arbitraj Fiyatlama Modeli
4) Makro Ekonomik Faktörler
5) Finansal Valık Fiyatlama Modeli

Anahtar Kelimeler (İngilizce)
1) Stock Returns
2) Risk
3) Arbitrage Pricing Model
4) Macroeconomic Factors
5) Capital Asset Pricing Model

ABSTRACT

This study aims to provide evidence on macroeconomic factors which are believed to affect stock returns of the companies listed in the ISE-30, using the Arbitrage Pricing Model. The sensitivity of stock returns to macroeconomic variables and explanatory power of these variables on stock returns were investigated employing the monthly stock returns of thirteen companies which were continuously traded within the ISE-30 index between January 1999 and December 2009.

Factors expected to affect stock returns are assumed to be namely; the foreign exchange rates, capacity utilization ratios, Treasury bill yields, ISE-100 index return, money supply, industrial production, gross domestic product, gold prices and current account deficit.

Findings suggest that the ISE-100 index return is the only variable that is effective on the stock returns of companies. So it would be claimed that as the model constructed in this study does not work for the sample of thirteen companies' returns, it probably would not be valid for the stock returns of ISE-100 listed companies as a whole. Thus, this study is reduced and bounded by the CAPM; it is no longer an Arbitrage Pricing Model. For further research studies, a different set of macroeconomic variables and longer time horizon on stock returns may be instructive in identifying a better relationship.

ÖZET

Bu çalışma IMKB-30'da işlem gören hisse senedi getirilerini etkilediği düşünülen makroekonomik faktörlerin etkisini Arbitraj Fiyatlama Modelini kullanarak açıklamaya çalışmaktadır.

Hisse senedi getirilerinin makroekonomik faktörlere karşı duyarlılığı ve getirilerdeki değişimi açıklama gücü, Ocak 1999- Aralık 2009 döneminde sürekli olarak IMKB-30'da işlem gören 13 firmanın aylık hisse senedi getirileri kullanılarak açıklanmaya çalışılmıştır.

Hisse senedi getirilerini etkilediği düşünülen makroekonomik değişkenler olarak döviz kuru, kapasite kullanım oranı, hazine bonosu faiz oranı, IMKB-100 endeks getirisi, para arzı, sanayi üretim endeksi, GSYİH, altın fiyatları ve cari işlemler açığı kullanılmıştır.

Bulgular sonucunda, IMKB-100 endeksindeki değişimin bu firmaların hisse senedi getirilerinde etkili tek faktör olduğu tespit edilmiştir. Bu çalışmada oluşturulan model söz konusu 13 firmada çalışmıyor ise, muhtemelen IMKB–100 de yer alan firmalar içinde çalışmayacaktır.

Bu nedenle çalışmada bir Arbitraj Fiyatlama Modeli oluşturulamamış, çalışma CAPM ile sınırlı kalmıştır. Böylece ileri araştırma çalışmaları için farklı bir makroekonomik değişkenler kümesi ve daha fazla hisse senedi getirisinin, daha uzun bir zaman periyodunda incelenmesi hisse senedi getirileri ve makroekonomik değişkenler arasındaki ilişkiyi daha net açıklayabilecektir.

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LIST OF ABBREVIATIONS

MPT	: Modern Portfolio Theory
CAPM	: Capital Asset Pricing Model
APM	: Arbitrage Pricing Model
RFR	: Risk Free Interest Rate
I-CAPM	: International Capital Asset Pricing Model
ISE	: Istanbul Stock Exchange
GNP	: Gross National Product
FA	: Factor Analysis
PCA	: Principal Component Analysis
AKBNK	: Akbank
ARCLK	: Arçelik
DOHOL	: Doğan Holding
DYHOL	: Doğan Yayin Holding
EREGL	: Ereğli Demir Çelik
GARAN	: Garanti Bankası
HURGZ	: Hürriyet Gazetecilik
ISCTR	: İş Bankası C
KCHOL	: Koç Holding
SAHOL	: Sabancı Holding

SISE	: Şişecam
TUPRS	: Tüpraş
YKBNK	: Yapi Kredi Bankasi
FX	: Foreign Exchange Rate
CUR	: Capacity Utilization Ratio
TBR	: Treasury Bill Rate
ISE 100	: Ise 100 Index
M2	: Money Supply
IPI	: Industrial Production Index
GDP	: Gross Domestic Product
GLD	: Gold Prices

1. INTRODUCTION

Finance theory plays significant role on how financial decisions are taken in risky stock markets. In this context, the risk – return relationship has gained prominence. The subjects of minimizing risk and maximizing return have been investigated. The portfolio management involves decisions on the type of assets in a portfolio, given the goals of the portfolio owner and changes in economic conditions. Selection has some constraints, most typically the expected return on the portfolio and the risk related with this return.

In literature, two main theories are instructive for investors. The traditional theory, assumed that risk could be reduced by raising the number of financial assets in a portfolio, without taking into consideration the relationship between the returns of the financial assets.

The second was modern portfolio theory. Modern Portfolio Theory was widely recognized in 1952 with publication of Harry Markowitz's article "Portfolio Selection" in the Journal of Finance. In this paper, Markowitz provided a definition of risk and return as the mean and variation of the outcome of an investment (Markowitz, 1952).

The variation of return between financial assets can be explained by the Capital Asset Pricing Model and the Arbitrage Pricing Model.

The Capital Asset Pricing Model describes the relationship between risk and expected return, which is used in pricing risky securities.

The model measures the sensitivity of an asset to systematic risk, as represented by its beta, as well as expected return of the market and the

expected return of a theoretical risk-free asset. The shortcomings of the capital asset pricing model directed researchers towards new model findings.

In this sense, a new model after CAPM is the Arbitrage Pricing Model, which was developed by Stephen Ross in 1976. The model implies that the expected return of a financial asset can be explained by various macroeconomic factors, where the sensitivity to each factor is specified by the specific beta coefficient. Chen, Roll and Ross (1986) sought to identify a number of macroeconomic factors (surprises in inflation, surprises in GNP through an industrial production index, changes in default premium corporate bonds, surprise shifts in the yield curve) as significant in explaining the returns of securities.

As such, the main objective of this research is to investigate the relationship between macroeconomic factors and the Arbitrage Pricing Model in the Turkish Stock Market.

2. LITERATURE REVIEW

"Portfolio Selection", was published by Harry Markowitz in the Journal of Finance, can be considered as first paper in the history of Modern Portfolio Theory (MPT).

The work of Markowitz (1952) proposes how rational investors would use diversification to optimize their portfolios. The model treats asset returns as a random variable and assumes the portfolio as a weighted combination of assets. Moreover, the portfolio return is a random variable and has an expected value and a variance. According to MPT, risk is the standard deviation of the return.

Markowitz's study on portfolio selection can be accepted as a revolution in the theory of finance, and a light for the foundation for capital market theory (Jensen, 1972).

Markowitz mainly concentrated on the special case in which investor preferences can be defined over the mean and variance of probability distribution of single period returns.

The major studies are concentrated on two arguments. The first was Tobin's (1958) study which uses the assumptions and foundations of MPT, drawing implications regarding demand for cash balances, and second concerns the general equilibrium models of asset prices, derived by Treynor (1961), Sharpe (1964), Linter (1965-1, 1965-2), Mossin (1969), Fama (1968).

The Capital Market Theory, which is the extension of MPT, is a positive theory which hypothesizes on how investors do behave, rather than how

investors should behave. The MPT focuses on how investors perform diversification to optimize their portfolios. Each of the models, such as Treynor (1961), Sharpe (1964), Linter (1965), Mossin (1969) and Fama (1968) represents an investigation of the Markowitz Model for the equilibrium structure of asset prices. It is important here to understand that the MPT is not based on validity or lack of the capital market theory.

The models involve the following assumptions:

1) All investors can lend or barrow money at the risk-free rate of return.
2) All investors have identical probability distributions for future rates of return; they have homogenous expectations with respect to three inputs of the portfolio model: the expected return, the variance of returns and the correlation matrix.
3) All investors have access to the same information to generate an efficient frontier.
4) All investors are single period expected utility of terminal wealth maximizers.
5) There are no transaction costs.
6) There is no personal income taxation on returns; investors are indifferent between capital gains and dividends
7) No restrictions are placed on short sales of any asset.

8) All investors have identical subjective estimates of the means, variances and covariance of return among all assets.

9) All assets are infinitely divisible and liquid, indicating that fractional shares can be purchased and stocks may be infinitely divisible.

10) There is no taxation.

11) There is no inflation.

12) All investors are price takers.

13) Capital markets are in equilibrium (Sharpe, Alexander, 1990).

The main objective of portfolio management is the selection of assets which maximize the return and minimize the risk for investors.

One of the most popular approaches to portfolio selection is diversification of assets, such that risk is spread over a mixture of asset types. Each asset exhibits a different risk return performance.

As a result, investors tend to furnish their portfolios with assets which either lack of a strong correlation between them, or bear a negative correlation. Thus in this section, the expected return – risk concepts and capital asset pricing models are covered. The Expected Return ("E (R)") is the mean value of the probability distribution of possible returns.

Variance (σ^2) measures the dispersion of a return distribution. It is the sum of the squares of the deviations (from the mean) of the returns, divided by n.

The value will always be greater than or equal to 0 with larger values corresponding to data that is more spread out.

The standard deviation (σ) is the statistical measure of degree to which an individual value in probability distribution tends to vary from the mean of distribution (Davis, 2001).

The objective of the investor is to maximize the portfolio's expected return with an acceptable level of risk. The Markowitz model is a single – period model and it is assumed that investors form a portfolio at the beginning of the period.

The assumption of a single time period allows risk to be measured by the variance (or standard deviation) of the portfolio's return.

These, as in Figure 1, investors are seeking to the upper left hand side of the graph.

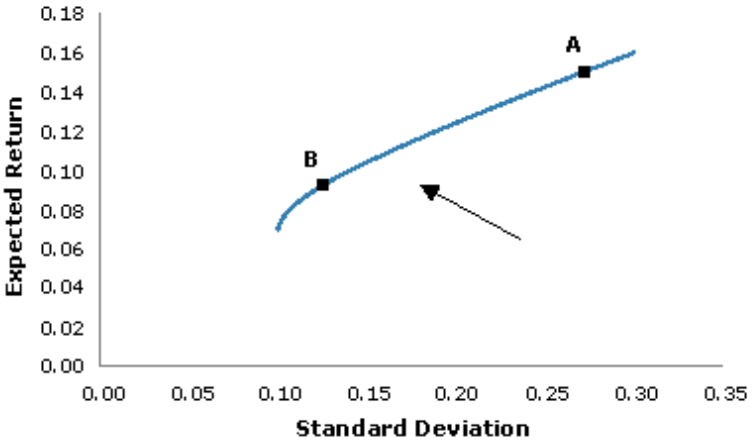

Figure 1 Markowitz Portfolio Selections (Source: Davis, 2001)

The curve is known as efficient frontier. According to the Markowitz model, investors select portfolios along this curve according to their tolerance for

risk. Risk takers will choose point A, which the risk averse investor would be more likely to choose portfolio B.

Building on Markowitz framework, William Sharpe (1964), John Linter (1965) and Jan Mossin (1966) independently developed a model known as the Capital Asset Pricing Model (CAPM).

The CAPM can be considered as the birth of asset pricing theory (Nobel prize for Sharpe in 1990). This model assumes that investors use Markowitz work in forming their portfolios. As a further step, this model accepts that there is a risk free asset that has a certain return, which is riskless or risk-free.

Here, the risk free rate is the current interest rate on a bond, for which there is no risk of default, in the absence of inflation. With a risk free asset, the efficient frontier is no longer the best return that investors can achieve. The capital market line shows the combinations of risk free assets and a risky portfolio. Investors choose portfolios along this line, with the efficient frontier being the tangent. As CAPM assumptions indicate that investors combine the market portfolio and the risk-free asset, the only risk that investors are paid for holding is the risk associated with the market portfolio.

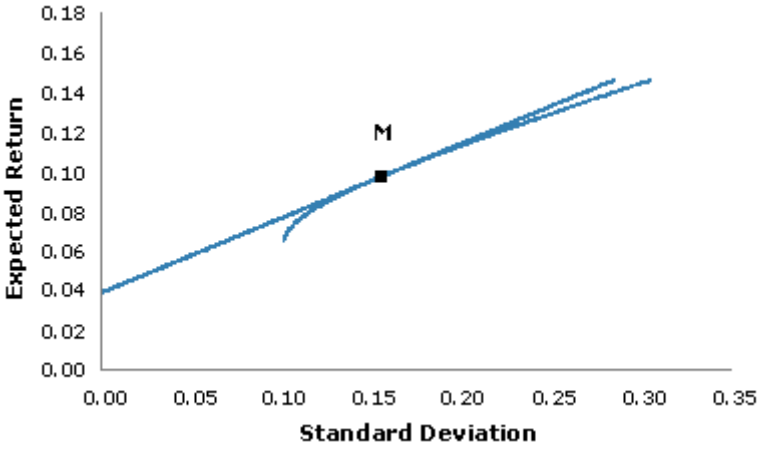

Figure 2 Capital Market Line (Source: Davis, 2001).

$$E(r_p) = R_f + \frac{E(r_m)-r_f}{\sigma_m} * \sigma_p$$

$E(r_p)$: Expected return of the portfolio

R_f : Expected return of the risk free asset

$E(r_m)$: Expected return of the market portfolio

σ_m : Standard deviation of the market portfolio

σ_p : Standard deviation of the portfolio

The gradient of the capital market line represents the price of risk in market and can be explained by the formula as follows:

$$[E(R_m - R_f)] / \sigma_m$$

The ratio of covariance between expected return of the market and the expected return of the asset to the variance of the market portfolio (δ im /

δ m) accepted as a risk and is used for asset pricing. The expected return of an asset will be shown as:

$E(R_p) = X_i \times E(R_i) + (1- X_i) \times E(R_m)$

$E(R_p)$: Expected return of portfolio

$E(R_i)$: Expected return of asset i

X_i : Weight of asset i in total investment

$E(R_m)$: Expected return of market portfolio

The risk of portfolio is as follows:

$$\sigma_p = [X_i^2 \times \delta_i^2 + (1 - X_i^2) \times \sigma_m^2 + 2 \times X_i \times (1 - X_i) \times \sigma_{im}]^{1/2}$$

σ_p : Standard deviation of the portfolio

σ_i^2 : Variance of asset i

σ_m^2 : Variance of the market portfolio

σ_{im} : Covariance asset i and market portfolio

As a result, the Capital Asset Pricing equation will be

$$E(R_i) = R_f + [E(R_m) - R_f) / \sigma_{im}^2) \times \sigma_{im}$$

Under the CAPM, the beta coefficient represents the part of asset risk that can not be diversified away, and represents the risk that investors are compensated for bearing. It represents the systematic risk. So the equation will be rearranged for the beta coefficient as:

$$\beta_i = \frac{\sigma_{im}}{\sigma_m^2}$$

$$\beta p = \sum x_i \cdot \beta_i$$

β_p : Beta coefficient of portfolio

β_i : Beta coefficient of asset I

X_i : Weight of asset i in portfolio

The representation of the CAPM equation is:

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

The CAPM equation states that the expected return of any risky asset is a linear function of its tendency to change with the market portfolio when the beta is included as an explanatory variable.

The assumptions of the CAPM can be summarized as follows:

All investors

1) Aim to maximize economic utility.
2) Are rational and risk averse.
3) Are price takers, i.e. they can not influence the prices.
4) May lend or borrow to an unlimited extent at the risk-free rate of interest.
5) Are not subject to transaction fees or taxes
6) Deal with securities that are highly divisible into small parcels

7) May access information which is available to all investors at the same time

8) Operate in perfectly competitive markets.

Like all other models, the CAPM has some shortcomings. The CAPM assumes that asset returns are normally distributed and that investors have a quadratic utility function; in practice, equity returns are not normally distributed.

Another important assumption of the CAPM is the risk concept. This assumes that the variance of returns is an adequate measurement of risk. However, other risk measures will reflect investor preferences more adequately. In finance, investors tend to perceive risk as a probability of losing. As a result, risk in financial investments is not limited to the variance itself. The CAPM accepts the assumption of homogenous expectations. In practice, there is heterogeneity of information among investors.

Behavioral finance examines investors' different probability beliefs. The CAPM assumes that investors' probability beliefs match the true distribution of returns.

Kent Daniel, David Hirshleifer and Avanidhor Subrahmanyann (2001) performed studies on behavioral finance it uses physiological assumptions to provide alternatives to the CAPM, such as the over confidence based on asset pricing model.

The CAPM does not have an explanation for the variation in stock returns. Empirical studies have found that low beta stocks may offer higher returns than the CAPM would predict.

Black, Jensen, Scholes (1969) published a paper where they found that if the efficient market hypothesis was supported by the CAPM would be wrong or irrational. The opposite is also true i.e. if the CAPM was supported, the Efficient Market Hypothesis would be wrong. In a paper known in literature as Roll's critique, Roll (1977) highlighted that the CAPM may not be empirically testable. The market portfolio should include all types of assets that are held by investors (such as art works, real estate, and human capital).

In practice, such a portfolio is unobservable. As a result, people substitute a stock index as a proxy for the true market portfolio. Unfortunately, in empirical studies it was shown that this substitution may lead to false inferences as to the validity of CAPM.

The CAPM assumes that investors will optimize their assets in one portfolio. The Maslowian portfolio theory stated that investors tend to hold fragmented portfolios. Investors may hold one portfolio for each goal.

The validity of the CAPM was researched by Linter (1971), Sharpe and Cooper (1972), Mayers (1976), Merton (1973), Goredes (1976), Rubinstein (1976), Elton and Gruber (1978) and Breeden, Gibbons and Lizenberger (1989).

Based on the Capital Asset Pricing Model (CAPM) assumptions, new studies have been performed into the CAPM. Applied tests and alternative

models to the CAPM are the Zero – Beta CAPM, the Inter temporal CAPM, the Multi-Beta CAPM, the consumption based CAPM and the international CAPM.

The model developed by Fisher Black (1972) drops the assumption, contained in the CAPM that investors may borrow and lend at the risk-free rate. In fact, the Zero – Beta CAPM treats all assets as risky. It is assumed that there is no such thing as a risk-free asset.

Rather than relying on the existence of risk-free assets, all that this required is the existence of an asset whose return is not correlated with the market portfolio – in other words, a Zero-Beta portfolio (Black, 1972).

It argues that inflation reduces the purchasing power in risk-free bonds and, as such, consists of purchasing power risk. The main assumption is that investors cannot borrow and lend at the same rate of interest. The Capital Asset Pricing Model is static; in other words, a single period model. It ignores the multi period nature of participation in capital markets.

Merton's (1973) Inter temporal Capital Asset Pricing Model (CAPM) captures the multi – period aspect of financial markets. In the Inter temporal model, investors act to maximize the expected utility of lifetime consumption and can trade continuously in time.

Moreover, it is stated that explicit demand functions for assets are derived and it is shown that in contrast with the one period model, current demand is affected by the possibility of uncertain changes in future investment opportunities. The risk-free rate is not stochastic over time (Merton, 1973).

The CAPM is useful in classifying risks relevant to returns as systematic risk. In order to state systematic risk more clearly, the standard CAPM should be developed in such a manner that it can measure the sensitivity to different risk sources. At the end of this development process, the Multi – Beta CAPM is introduced.

The Multi – Beta CAPM examines how different sources of risk affect stock returns. While the CAPM claims that market risk is to be priced, the Multi – Beta CAPM has proven that risks other the market should be considered (Merton, 1973).

Merton suggested that some factors such as uncertainty over wages, the prices of some important consumer goods and increases in the risks of some asset groups could be considered as sources of risk (Bodie, Kane and Marcus, 1999).

The multi – Beta CAPM equation can be set out as below (Elton and Gruber, 1997).

$$R_{pt} - RFR = \alpha_p + \beta_p (R_{mt} - RFR) + \beta_p' (R_m't - RFR) + ep_t$$

R_{pt} : Expected return of portfolio

RFR : Risk – free interest rate

α_p : Constant term

β_p : Sensitivity of the portfolio to the stock index

R_m : Return of the stock index

β_p' : Sensitivity of the portfolio to the bond index

R_m' : Return of the bond index

ep : Error term

The Multi – Beta CAPM considers a wide range of risk sources.

Another alternative to the CAPM is the consumption – Based Capital Asset Pricing Model.

Breeden (1979) provides a logical extension of the previous CAPM. Based on "diminishing marginal utility of consumption", there will be high demand for securities which offer high returns when the aggregate consumption is low, bidding up their prices. In contrast, stocks that change positively with aggregate consumption will require higher expected returns.

Breeden derived the Consumption – Based Capital Asset Pricing Model:

$$E(R_j) = R_f + \beta_{jc} [E(R_m)-R_f]$$

In this model, the market beta coefficient is replaced by a consumption – based Beta coefficient. βjc measures the sensitivity of return asset to changes in aggregate consumption. The main result of the Consumption based asset pricing model is that expected returns should be a linear function of consumption betas (Davis, 2001).

Empirical tests have not supported the predictions set out in the consumption based capital asset pricing model (Breeden, Gibbons and Litzen Berger, 1989).

Grubel (1968), Solnik (1974), Erruza (1985), Harvey (1991), Uppal (1993) developed the International Capital Asset Pricing Model. (I-CAPM).

Literature covering the International CAPM shows that when purchasing power parity does not hold, the asset pricing model includes exchange risk factors. The exchange rate risk factor, as in the International CAPM, is a hedging factor due to predictability of future real exchange rates (Tat, Ng, 2001).

The International capital pricing model treats global market risk and foreign exchange rate risk under the assumption of time variation in all prices of risk. The model takes inflation risk into account. Thus, in I – CAPM assumptions, there are restrictions on international investments, such that it is not possible to determine prices independently. Another assumption of Solnik (1974) is that international investors have different preferences and, accordingly, different satisfaction levels. The equation for the International CAPM developed by Solnik (1974) and Merton (1973) is as follows:

$$E(R_i) = R_{fi} + (E(R_{wm}) - R_{fw}) \times \beta_{wi}$$

$E(R_{wm})$ = Expected return of global market

R_{fi} = Expected return of domestic asset i

R_{fw} = Average international risk-free interest rate

β_{wi} = Systematic risk of asset i which reflects the covariance of world market portfolio and asset i

The Multi beta – forms International Capital Asset Pricing Model is developed for the Arbitrage Pricing Model.

In finance theory, there are two main approaches to explain the variation of return between financial assets. These are Capital Asset Pricing Model and

Arbitrage Pricing Model. In this part of study, we first explain the arbitrage concept and then examine the arbitrage pricing model in detail.

Arbitrage is the practice of taking advantage of a state of imbalance between two (or possible) markets and thereby enjoying a risk-free profit. In the APT context, arbitrage consists of trading in two assets, at least one of which is mispriced. The arbitrageur sells the asset, which is relatively expensive, and uses the proceeds to buy one which is relatively cheap

The literature on asset pricing models has taken on a new lease of life since the emergence of Arbitrage Pricing Model (APM). The APM was formulated by Ross (1976) as an alternative theory to the renowned Capital Asset Pricing Model (CAPM) proposed by Sharp (1964), Linter (1965) and Mossin (1966).

The Arbitrage Pricing Model assumes that the expected return of a financial asset can be modeled as a linear function of various macroeconomic factors or theoretical market indices, where sensitivity to changes in each factor is represented by a factor specific beta coefficient.

Focusing on capital asset returns governed by a factor structure, the Arbitrage Pricing Model is a one – period model, in which the preclusion of arbitrage over static portfolios of these assets leads to a linear relationship between the expected return and its covariance with the factors.

The theory was initiated by the economist Stephen Ross (1976), Brown and Weinstein (1983), Chen (1983), Trzcinka (1986), Cheng and Lewellen (1985), Chen Roll and Ross (1986), Petway and Jordan (1987), Born and

Mosser (1988), Otateye (1992) followed Ross's research and many empirical researches tried different methods to test APT.

On the basis of traditional assumptions that asset markets are perfectly competitive, frictionless and where individuals have homogenous beliefs that random returns on assets are generated by the linear k-factor model, the return on the i^{th} asset can be written of the form:

$$R_i = E_i + bi_1I_1 + bi_2I_2 + bi_3I_3 + \ldots\ldots\ldots + bi_kI_k + e_i \qquad (i = 1\ldots\ldots\ldots n)$$

Where:

R_i is the random rate of return on the ith asset

E_i is the expected rate of return on the ith asset

bi_k measures the sensitivity of the i^{th} asset's returns to the k factor

I_k denotes the mean zero k^{th} factor common to the returns of all assets

e_i is a nonsystematic risk component idiosyncratic to the i^{th} asset mean zero and variance σ^2_{Ri}

With no arbitrage opportunity, it can be shown that the equilibrium expected return on the i^{th} asset is given of the form

$$E_i = \lambda_o + \lambda_1 bi_1 + \lambda_2 bi_2 + \ldots\ldots\ldots + \lambda_k bi_k \qquad (2)$$

If there is a risk-free return E_0, its return will be $\lambda_o = E_0$. Forming a portfolio with unit systematic risk on λ_k ($k = 1\ldots\ldots\ldots k$) and no risk on other factors, the final form of the APM is derived as follows:

$$E_i = E_0 + (E_1 - E_0)\, bi_1 + (E_2 - E_0)\, bi_2 + \ldots\ldots\ldots\ldots + (E_k - E_0)\, bi_k$$

Where:

E_i is the expected return on the i^{th} asset

E_0 is the return on the riskless asset

E_k is the expected return on a portfolio that has a unitary sensitivity to the kth factor and zero sensitivity to all other factors

bi_k is the sensitivity of the i^{th} asset to the k^{th} factor

$\lambda_k = (E_k - E_0)$ $(k = 1…….k)$ is the risk premium associated with the corresponding risk factors; I_k.

As a result, in the event that the equilibrium prices offer no arbitrage opportunities over the static portfolios of the assets, the expected returns on the assets assume an approximately linear relationship to the factor loadings. The factor loadings or betas are proportional to the covariance of the returns with the factors (Ross, 1976). If agents maximize certain types of utility, the linear pricing relationship is a necessary condition for equilibrium in a market (Ross, 1976).

The APM was developed after the CAPM. The APM is very similar to the CAPM. It states that the expected return on any security in equilibrium will be equal to the risk free return plus a set of risk premiums. There are a number of differences between the APM and the CAPM; the CAPM only has one factor (excess return of the market portfolio) to explain the excess return of asset.

The systematic risk of an asset is then stated by the correlation with this factor. In reality, returns are affected by a number of macroeconomic factors besides the market portfolio, like surprises in inflation, GNP or default risk

premiums for bonds, or surprise shifts in the yield curve. The market portfolio in itself does not capture all the sources of systematic risk. The CAPM is an equilibrium model and derived from individual portfolio optimization. The APM, on the other hand, is a statistical model which seeks to capture the sources of systematic risk. The relationship between the sources is determined by the condition of no arbitrage. In contrast to the CAPM, the Arbitrage Pricing Model is derived from an arbitrage argument, not a market equilibrium argument. The risk premium follows from the factor structure of asset returns.

The arbitrage pricing model does not rely on measuring the performance of the market. Instead, the APM directly relates the price of security to the fundamental factors driving it. The problem with this is that the theory in itself provides no indications of these factors are so they need to be empirically determined. Obvious factors are economic growth and interest rates. For companies in certain sectors, other factors are obviously relevant as well, such as consumer spending for retailers.

Such a potentially large number of factors mean more betas need to be calculated. There is no guarantee that all relevant factors have been identified. It is a result of this added complexity that the arbitrage pricing model is more widely used than the CAPM.

Roll and Ross presented methods for estimating the return generating process and for testing whether particular factors in the return generating process were priced in equilibrium. They found that more factors are priced than one would expect to be priced if the Capital Asset Pricing Model were

held. Roll and Ross used the maximum likelihood factor analysis to estimate both the number of factor generating returns and factor loadings. Dhrymes, Friend and Gültekin (1984) observed that the number of significant factors increases with the number of stocks employed in the factor analysis and that tests of the APM depend very much on how the stocks are grouped. Fundamental foundation for the arbitrage pricing model is the law of one price, which states that two identical items will sell for the same price; if they do not, a riskless profit, could be generated by arbitrage, meaning that an item could be purchased in a cheaper market and then sold in a more expensive market. The arbitrage is performed simultaneously because the price discrepancy must be taken the advantage of immediately. Otherwise, it would likely disappear by the time of settlement.

The law of one price, as applied in the arbitrage pricing model, can be stated as follows. It is stated that two financial instruments or portfolios - even if they are not identical - should cost the same if their return and risk is identical. The law of one price requires that any two financial instruments or portfolios that have the some return – risk profile should sell for the same price. If they do not sell for the same price, then a profit can be earned by short-selling the security or portfolio with a lower return and by buying the portfolio with the higher return.

The arbitrage pricing model offers on alternative to the CAPM as a method in computing the expected return on stocks. The basis for the Arbitrage Pricing Model is a factor model of stock returns. This part of paper will start by discussing the factor models. Models are classified according to a

number of factors affecting stock returns. These models can be placed into two groups: single risk factor and multifactor models.

Ross (1976) assumes that there is a lack of arbitrage opportunities in capital markets and accepts a linear relationship between returns and a set of common factors (K common factors), assuming that the expected returns will be linear functions of common weights. This assumption recommends the use of Factor Analysis (FA) which is developed by Spearman and Hatelling as a potential tool for the extraction of the K common factors from the return of assets.

In the context of the APM, the assumption is that the population of a stock return is generated by a factor model. The simplest factor model is the one factor model:

$$r_i = \alpha_i + \beta_i F + \varepsilon_i \qquad E(\varepsilon_i) = 0$$

In the single factor model, the fundamental foundation for the arbitrage pricing model is the law of one price, which indicates that two items will be sold for the same price; unless they have a riskless profit could be generated by arbitrage, which means buying the item in a cheaper market then selling it in a more expensive market. In the event of arbitrage opportunities, the arbitrageur is able simultaneously buy the stock on the cheaper exchange and short-sell it on the expensive exchange for a riskless profit. This process would then continue until the price discrepancy has disappeared. As a natural result of arbitrage, buying on the cheaper exchange would increase

demand, and therefore the price; on the other hand, short selling on the more expensive exchange would increase supply, thereby reducing its price.

$$r_i = \alpha_i + \beta_i F + \varepsilon_i \qquad E(\varepsilon_i) = 0$$

A graph of this line is the arbitrage pricing line for the single risk factor.

In the equation of the single – factor model:

$$r_i = \alpha_i + \beta_i F + \varepsilon_i \qquad E(\varepsilon_i) = 0$$

In the single factor model, factor F is proposed to affect all stock returns, in different sensitivities. Here, the sensitivity of stock i's return is denoted by β_i. It means that stocks with low β values, will only exhibit a slight reaction as F changes; on the other hand, when β_i is high, variations in F cause substantial movements in the return of stock i. In the event that the two stocks in the portfolio have positive sensitivities to the factor, both will tend to move in the same direction.

A second main component in the factor model is the random stock to returns which is assumed to be uncorrelated across different stocks. There is also a term, εi, which represents the idiosyncratic return component for stock i. An important property of εi is that it is uncorrelated with factor F (the common factor in stock returns).

In the equation,

$$r_i = \alpha_i + \beta_i F + \varepsilon_i \qquad E(\varepsilon_i) = 0$$

it is implied that all common variation in stock returns is generated by movements in F. As idiosyncratic components are uncorrelated across assets, they do not bring about co-variation in share price movements.

Numerous studies (Trzcinka 1986, Connor and Korajcyzk 1993; Geweke and Zhou 1996; Jones2001; Merville and Xu 2001) demonstrate the importance of one factor, shown as the market factor, which explains a significant part of the return variation, while identifying other factors such as industry specific factors have been attributed to the lack of formal criteria for choosing the number of factors (Harding, 2007).

Harding (2007) showed that it is not possible to distinguish some of the factors from the idiosyncratic noise by heuristic methods or by a random matrix approach. In short, Harding showed that unless the period of time over the observed portfolio is extremely long, it is not possible to identify all factors of the economy.

As stressed, the APM begins by assuming that asset returns follow a factor model.

A generalization of the structure identifies k factors or sources of common variation in stock returns. Different stocks should be allowed to have different sensitivities to different types of market wide shocks. As a result, multifactor models can provide a better description of security returns.

$$r_i = \alpha_i + \beta 1_i F1 + \beta 2_i F2 + \ldots\ldots + \beta k_i Fk + \varepsilon_i \qquad E(\varepsilon_i) = 0$$

The returns of asset i depend, in a linear fashion, on k factors and unsystematic (idiosyncratic) risk:

The idiosyncratic component is assumed to be uncorrelated across stocks with all of the factors and the idiosyncratic risk is, on average, zero. The factor can be thought of as representing news on macroeconomic factors, financial conditions and political events. It is assumed that each stock has a complement of factor sensitivities or factor betas, which determine the sensitivity of the return on the stock in question is to variations in each of the factors.

To sum up, with a large number of available assets, Ross implies that idiosyncratic risk is diversifiable and prices of securities will be approximately linear in their factor exposures.

As Fama (1991) highlighted, one can not expects any particular asset pricing model to completely describe reality; however, Fama argued that the asset pricing model is a success if it improves our understanding of security market returns. In the light of this view, the APM is indeed a success. On the other hand, the APM has some weakness and gaps. For instance, the model itself does not identify what the right factors are. In addition, if it is supposed that where the model explains the right factors, the factors can change over time. Finally, unless the period of time over which the portfolio covers is extremely long, it is impossible to identify all factors of the economy; thus estimating multifactor models requires more data. The APM would be a better model if it was related to factors more closely identifiable and measurable sources of economic risk. If all strengths and weakness are examined and changes occur, Ross's insight would serve as a fundamental explanatory model in asset pricing theory (Connor, Korajczyk, 1992).

In addition, Connor, Chen, Ingersoll argued that if the numbers of assets are greater than the number of factors, sound diversification would not be a problem in security pricing.

The Arbitrage Pricing Model is based on the assumption of a linear relationship between asset returns and a number of common factors (Trzcinka, 1986). Asset returns are a linear function of a number of risk factors. In this perspective, one weakness of the Arbitrage Pricing Theory is that the model does identify the number of factors, or what the right factors are.

Most research studies in literature concerning the Arbitrage Pricing Model are focused on three types of factor models, which are macroeconomic, fundamental and statistical.

The macroeconomic model identifies macroeconomic indicators as factors. Common factors affecting returns in the market may include inflation shocks, spreads between long and short term interest rates, yields spread between long term corporate and treasury bills, oil prices and the rate of GDP growth.

Chen, Roll and Ross (1986) identified these macroeconomic factors as significant in explaining security returns:

- Surprises in inflation
- Surprises in GNP as indicated by the industrial production index

- ❖ Surprises in investor confidence due to changes in default premium in corporate bonds;
- ❖ Shifts in the yield curve.

Another model which is a fundamental factor model uses company and industry data as factors affecting the stock returns. Here, accounting ratios of a company (such as its debt to equity ratio or fixed rate σ average) can be combined with other relevant financial variables into a leverage risk factor.

On the other hand, as market information, such as share turnover or trading volume can be combined with other relevant financial information and can act as a trading activity risk factor.

Statistical factor models represent factor analysis and principal component analysis. Factor analysis is a statistical method used to describe variability among observed variables in terms of fewer unobserved variables called factors. The observed variables are modeled as linear combinations of the factors. In order to imply the factor analysis to the Arbitrage Pricing Model at first, covariance of asset returns must be estimated; later factors are extracted from the covariance matrix. Factor analysis offers an opportunity for the reduction of number of variables, by combining two or more variables into a single factor. In addition, identification of groups of inter – related variables shows the extent to which they are related to each other

Likewise, principal component analyses are used to determine the factors, which are uncorrelated with each other but explain most of the variability in stock returns. Each factor is a linear combination of stock return. The first

factor's variance explains the maximum percentage of variability in stock returns. The second factor, which is uncorrelated with the first factor, explains most of the remaining variability. For the other factors, the same procedure will be followed (Omron, 2005).

Factor analysis is related to principal component analysis, but not identical to it. PCA takes into account all variability in variables; in contrast, factor analysis estimates how much of the variability is due to common factors. Factor analysis focuses on communality.

Roll and Ross (1980), Chen (1983) and Lehman and Modest, 1985a, 1985b) used factor analysis. However Chamberlain and Rothschild (1983), Connor and Korajczyk (1985, 1986) recommended Principal Component Analysis.

The Arbitrage Pricing Model was first initiated by Ross (1976a, 1976b) in a one period model, in which returns of a capital asset are a linear function of factor structure.

As Ross Stated, returns of a capital asset are consistent with a set of factor structures, such as macroeconomic changes. Some macroeconomic changes affect asset prices more, while some of them do not even affect them at all.

In literature, the theoretical question of "which economic factors have significant effects on the pricing mechanism" is sought to be solved by many empirical studies.

Chen, Roll and Ross (1986), have tested a set of economic data for US stock return. They analyzed the effects of macroeconomic variables, term structure, industrial production, risk premium, inflation, market return,

consumption and oil prices between the periods of January 1953 – November 1984.

They note that if industrial production, changes in risk premium, twists in the yield curve and changes in expected inflation are highly volatile, they are significant in explaining the expected returns.

Some other empirical studies of APM focus on the identification of a number of risk factors that systematically explain the stock market returns by implementing Factor Analysis Methods.

Dhrymes, Friend and Gültekin (1984) examined the techniques used in the work carried out by Roll & Ross and found that if the stocks are categorized into groups, there will be some deviation in the results. They found some limitations to the work carried out by Roll and Ross. In the study performed by Dhrymes, Friend and Gültekin, they found that the number of "factors" extracted increases with the number of securities in the group. At a 5% significance level, with a group of 15 securities, they found the most "common risk" factors with a group of 30 securities. They found three "common risk factors" with a group of 45 securities and four common risk factors with a group of 60 securities and, at most, six "common risk factors" with a group of 90 securities, and they found nine common risk factors. Their study stressed the difficulty of identifying the actual number of factors affecting the returns.

In addition, they found that the number of "factors" increases with the number of time series observations used to estimate factor loading. Finally,

they claim that the constant term differs from risk free rate and that the error term is not statistically equivalent to zero.

Chen (1983), using the factor analysis, tested the APM and compared it with the CAPM. In conclusion, Chen noted that we cannot reject the APM. APM performs better than the CAPM.

Brown and Weinstein (1983) estimated and tested the APM using the same data as Roll and Ross (1980). The difference between Brown and Weinstein's study and Roll and Ross's study was the grouping of securities in batches of 60 instead of 30, and according to their industrial classifications instead of alphabetical order. However, by grouping according to industrial classification rather than alphabetical order, asset prices will be affected by more than three factors. In short, the results support the APM.

Sharpe examined the stock returns of 2,197 companies between 1931 and 1979 and found that the expected return of an asset can also be explained by micro factors, in addition to market beta. The use of micro factors with macro factors can increase the explanatory power of the model.

Poon and Taylor (1991) considered the results of Chen, Roll and Ross to check whether the variables in that model were applicable to the UK stock market. The economic variables used in the work carried out by Chen, Roll and Ross were the monthly and annual growth rates of industrial production, unanticipated inflation, risk premium, the term structure of return value and weighted market index between January 1965 and December 1984. They

showed that the factors put forward by Chen, Roll and Ross for the US market do not influence share prices in the UK market. They claimed that there may be other macroeconomic variables at work, and that Chen, Roll and Ross's work was inadequate when it came to detecting such pricing relationships.

A research study performed by Özçam (1997) can be accepted as an example of APM testing of the Istanbul Stock Exchange. Özçam tested seven macroeconomics variables of the Turkish economy by separating them into expected and unexpected series through regression process. A two-step testing methodology was then implemented on these series. The study was performed for 54 stocks over the period of January 1986 to July 1985. The result supported the APT, where beta coefficients of expected factors were found to be significant in determining the asset return.

Yörük (2000) used ten macroeconomic variables to find the risk premium and sensitivity of stocks listed on the Istanbul Stock Exchange for the period of February 1986 to January 1998, on a monthly basis. The period was divided into three subs – periods, of February 1986 to January 1990, February 1990 to January 1994 and February 1994 to January 1998. The macroeconomic variables used in Yörük's research were the percentage change in the consumer price index, the percentage change in industrial production, the manufacturing production index, current account balances, the consolidated budget, the non cumulative cash balance, money supply (M1), the price of gold (the average selling price in Turkey and in the UK) and the monthly percentage change in ISE 100.

Altay (2001) used two different APT tests on the Istanbul Stock Exchange. In the first test, factor analysis was used for daily returns of 121 to 265 stocks in the period of 1993 – 2000 for each year. One significant factor was found among several factors for each year. The second test was performed through a multivariable regression process in order to examine the significance of macroeconomic variables on asset returns. The study found that the beta of the Treasury bill interest rate was significant for explaining the asset returns.

In another study, Altay (2003) derived the factor analysis process and factor realizations for two countries, Turkey and Germany.

There are several empirical studies on the Arbitrage Pricing Model. The number of factors affecting stock returns has proliferated; however the theoretical question of "which economic factor data sets have significant effects, and the exact number of factors" is not answered clearly.

3. METHODOLOGY AND DATA

The 1980s are the years deregulation and internalization of financial markets in Turkey. Until 1980, the Turkish economy was a closed economy. However, new regulations introduced on January 24, 1980, marked a sharp break with the past economic development policies. Interest rate controls were lifted and entry barriers into the financial system were relaxed (Denizer, Gültekin, Gültekin, 2000).

In 1981, the Capital Markets Board of Turkey (CMB), which is the regulatory and supervisory authority in charge of securities markets in Turkey, was set up.

The CMB has set out detailed regulations for organizing the markets and developing capital market instruments and institutions for the past twenty nine years in Turkey.

In 1984, Turkish residents were permitted to hold foreign currency deposits. This process marked a step towards the opening of the capital account in 1989, which also meant that the opening increased funding options abroad, both for the financial system and for large corporations. These reforms clearly represented major progress towards freeing the operation of the financial markets. By following the development of international financial markets, in 2000, futures markets were set up on cotton contracts.

On 4 February, 2005, VOB – a Turkish derivate exchange - started operations. VOB's products are as follows:

a) Currency Futures Contracts: TRY/US Dollar, TRY/Euro, PDTRY/US Dollar, PDTRY/Euro

b) Interest Rate Futures Contract: T – Benchmark Futures.

c) Equity Index Futures Contract: TurkDEX – ISE 30 Futures, TURKDEX – ISE 100 Futures.

d) Commodity Futures Contracts: Cotton Futures Contract, Wheat Futures Contract, Gold Futures Contract.

3.1 Methodology

In finance theory, there are two main approaches to explain the variation of returns among financial assets. These are the Capital Asset Pricing Model and the Arbitrage Pricing Model.

The Arbitrage Pricing Model assumes that the expected return of a financial asset can be modeled as a linear function of various macroeconomic factors or theoretical market indices, where sensitivity to changes in each factor is represented by a factor specific beta coefficient.

The arbitrageur sells the asset which is relatively too expensive and uses the proceeds to buy one which is relatively too cheap. As a result, if equilibrium prices do not offer arbitrage opportunities over the static portfolios of the assets or the expected returns on the assets, the expected returns on the assets are approximately linearly related to the factor loadings. The factor loadings or betas are proportional to the covariance of the returns with factors (Ross, 1976).

The purpose of the study is to evaluate the return of stocks with sensitivities to macroeconomic variables on the basis of the arbitrage pricing model. Here a multiple regression model is designed to test the effect of macroeconomic factors on the stock returns.

The aim of the study is to investigate the common risk factors which affect the return of stocks and determine the risk premium demanded by investors against risks. In this context, an analysis is initially performed of which macroeconomic factors affect stock returns and the explanatory power of these relationships is examined by multiple regression analysis.

The expected return on a stock is assumed to be generated by its sensitivity to macroeconomic risk sources.

The results gained from the multiple regression analysis are used in the solution of the cross sectional regression equation, and the risk premium of each stock return to each risk is estimated accordingly.

Cross sectional regression is a type of regression model in which the explained and explanatory variables are associated with one period or point in time. This is in contrast to a time series regression, in which the variables are considered to be associated with a sequence of points in time.

The model is forecasted in three steps. In the first step, multiple regression analysis is performed, and the sensitivity coefficient of stock returns against macroeconomic factors is forecasted.

$$R_{it}=E(R_i)+b_{i1}\delta_{1t}+b_{i2}\delta_{2t}+\ldots.+b_{ik}\delta_{kt}+\varepsilon_{it} \text{ (I. Regression Equation)}$$

Here;

R_{it}= Return of asset i ; i=1,2,…,n

$E(R_i)$= Expected Return of asset i

δ_j= Common factors affecting all asset returns; j=1,2,….,k

b_j= Sensitivity of asset i due to common risk factor

ε_{it}= Unsystematic risk of asset

In addition;

$E(\delta_j)=0$, j=1,2,….,k

$E(\varepsilon_i)=0$, i=1,2,….,n

$E(\varepsilon_j\varepsilon_i)=0$, $i\neq h$

$E(\varepsilon_i^2)=\sigma^2<\infty$

Each financial asset (I) has a single sensitivity to each factor; however, each factor has the same value for all stock returns. It is accepted that investors are concerned with the expected rate of return (ERi) and the risk. As a result, it is necessary to calculate the expected rate of return of each asset and the sensitivity coefficient.

In the second step, the risk premiums are forecasted against risk factors.

$E(R_i)=R_f+b_{i1}[E(R_1)-R_f]+b_{i2}[E(R_2)-R_f]+\ldots\ldots+b_{ij}[E(R_i)-R_f]$ (Cross Sectional Regression Equation)

Expected Return of asset i with zero systematic risk, (λ_0),

$\lambda_0=R_f$

$\lambda_j = E(R_i) - R_f$

$E(ri) = \lambda_0 + \lambda_1 b_{1i} + \lambda_2 b_{2i} + \ldots + \lambda_k b_{ik}$

λ_0= Expected Return of asset i with zero systematic risk,

λ_j= Risk Premium for factor j, j=1,2,…,k.

In the third and final step, the sensitivity coefficients and contribution of risk premiums to the stock returns is estimated. The pricing relationship shows that the expected rate of stock return is related to the sensitivity coefficients of the assets and the common risk factors. This is the most important result of the arbitrage pricing model.

3.2 Data

In this part of the study, Turkish companies listed in the ISE – 30 Index, which are open to the public for the January 1999 – December 2009 period are selected. The purpose of the study is to evaluate the return of stocks with sensitivities to macroeconomic variables on the basis of the arbitrage pricing model. Since it includes the most traded stocks, studies were applied to corporations listed on the ISE-30 index. Among the ISE corporations, 13 stocks were examined, which were continuously listed on the ISE – 30 Index. Macroeconomic variables employed in the study are as follows: Foreign Exchange Rate (fx), Capacity Utilization Ratio (Cur), Treasury Bill Yields (Tbr), the ISE-100 Index Return (ISE 100), Money Supply (M2), Industrial Production Index (ipı) Gross Domestic Product (gdp), gold prices (gld), current account deficit (ca).

Data used in the model is taken from (www.tcmb.gov.tr) and (www.dpt.gov.tr).

Macroeconomic variables used in previous studies are listed below:

Macroeconomic variables	**Previous studies which employ indicated variables**
Industrial production	Chan, Chen and Hsieh (1985), Chen, Roll and Ross (1986), Burnmeister and Wall (1986), Beenstock and Chan (1988), Ozcam (1997), Altay (2003).
Inflation	Chan, Chen and Hsieh (1985), Chen, Roll and Ross (1986), Burnmeister and Wall (1986), Chen and Jordan (1993), Altay (2003).
Oil price	Chan, Chen and Hsieh (1985), Chen and Jordan (1993), Clare and Thomas (1994).
Money supply	Beenstock and Chan (1988), Ozcam (1997), Altay (2003), Clare and Thomas (1994).
Exports	Beenstock and Chan (1988), Sauer (1994).
Interest rates	Burnmeister and MacElroy (1988), Ozcam (1997), Altay (2003).
GDP	Kryzanowski and Zhang (1992), Cheng (1995).
Gold prices	Yörük, Nevin (2000), Clare and Thomas (1994).
Import	Altay (2003).
Exchange rates	Ozcam (1997).
Unemployment	Clare and Thomas (1994).

Table 1 Macroeconomic Variables and Previous Studies

(Source: Türsoy, Gunsel, Rjoub, 2008)

The Stock Returns names and tickers used in the study are listed in Table 2

TICKER	**COMPANY NAME**
AKBNK	AKBANK
ARCLK	ARÇELİK
DOHOL	DOĞAN HOLDİNG
DYHOL	DOĞAN YAYIN HOLDİNG
EREGL	EREĞLİ DEMİR ÇELİK
GARAN	GARANTİ BANKASI
HURGZ	HÜRRİYET GAZETESİ
ISCTR	İŞ BANKASI
KCHOL	KOÇ HOLDİNG
SAHOL	SABANCI HOLDİNG
SISE	ŞİŞE CAM
TUPRS	TÜPRAŞ
YKBNK	YAPI KREDİ BANK

Table 2 ISE-National 30 Companies Codes

(Source: www.imkb.gov.tr)

Regarding foreign exchange, which is coded as fx, denotes the monthly percentage change in the real exchange rate index of the currency basket, based on 1 USD +1.50 EUR, relative price calculations producers for USA and EURO area and consumer prices for Turkey are used. Exchange rate policy is an essential anchor for a country regaining its creditworthiness. Furthermore it has positively contributed to growth of output and exports and to the expansion of tradable production. To better explain the reasons for sharp waves, developments in this area should be examined. A floating exchange rate regime was adopted in February 2001, when the shaky

"disinflation programme" and its nominal anchor, the crawling – peg system, which had been in effect since the end of 1999, broke down.

In compliance with the floating exchange rate regime, exchange rates were determined by market conditions. At the beginning of the last global financial crisis, there was again a new peak on exchange rate graphs.

Exchange rates also affect exports and imports of the country, and the effects are seen on stock returns.

An economic crisis in South Asian economies took place, which had also spillover effects on the rest of the world economy. Turkey was not immune to these effects, especially when the crisis hit the Russian economy, a significant partner in Turkish foreign trade, in 1998. The crisis precipitated a recession in Turkey's economy. The year 2000 was a difficult year for exporters, due to the movements in the Euro against the dollar, and a remarkable increase in oil prices. Further, since 2000 was the first year of the Economic Program, the exchange rate policy adopted in line with the Program's inflation target also had negative impact on exports. Following the crisis in 2001, Turkey's exports rebounded. The underlying reasons were the deep devaluation that took place due to the introduction of a "floating exchange rate regime" and companies' strategy of seeking new markets in response to declining domestic demand. Exports continued to grow strongly in 2002 and 2003. The main reasons behind the strong export growth in 2003 were the continuous expansion of production, due to weak domestic demand, the decline in real labor costs, rising productivity, improving finance opportunities, the higher prices of export goods and

movements in the Euro / Dollar exchange rate which were favorable to Turkey. An important are of vulnerability for the Turkish economy during its 2002 – 2007 growth episode was the rising and gaping current account deficits. The current Account deficits increased together with growth / demand and the appreciating currency, rendering the growth unsustainable after mid-2006.

There was a sharp fall in the value of Turkish exports from October 2008. The fall in the value of imports was even more pronounced, leading to slimmer current account deficits from the fourth quarter of 2008. The recent monthly values indicate that imports started to pick up from March 2009, while exports continued to stagnate, with the result that the current account deficit started rising again after March 2009. Another reason for the decline in Turkish exports was that the share of Turkish exports to its main export area was counterbalanced by countries like China and India. As far as foreign trade is concerned, there is a general consensus view that "the recent global crisis raised costs and constraints in the financial sector in providing working capital, pre shipment export finance, export credit insurance and issuance of letters of credit for international trade.

In emerging markets like Turkey, gold is seen as an alternative portfolio investment tool against bond or stocks. As an investment, gold is typically viewed as a financial asset that will maintain its value during periods of political, social or economic distress. As such, gold can provide both individual and institutional investors with a portfolio safety net against sharp downward spikes in complementary assets such as stocks and bonds.

In most cases, it is widely recognized as a hedge against foreign currencies (such as the US Dollar) and as some measure of inflation. For instance, as the value of the dollar falls relative to major currencies, the price of gold tends to move higher, though the correlation is not always perfect.

In the last wave of financial crises throughout the world, gold was internationally regarded as being money. But unlike cash, it is a far safer option in times of economic distress. As confidence throughout the world increases and economies recover, the price of gold is likely to fall back a little. Another two reasons for the increase in gold prices are the shortage of supply and China's reserve. As one of the world's fastest growing economies, China is adding to its gold reserves.

The industrial production index is another macroeconomic variable used in the study. Industrial production is an indicator of growth in a country.

After the turbulence and volatility of the 1990s and early 2000s, the Turkish economy recorded relatively high and stable growth rates between 2002 and mid 2007. However GDP growth started to decline markedly in mid 2007. The sharpest decline was seen in 2009 as the global financial crisis struck. The sharp decline in growth is even more strikingly reflected in the monthly industrial production index. The period analyzed in this study starts with 1999. The 1998 – 1999 recessions, which started with the effects of the Asian and Russian crises, lasted for 15 months. The 2000 – 2002 recessions, which followed an exchange rate targeting regime, also lasted for 15 months between December, 2000 and February, 2002. The latest recession was in

August, 2008. As a result, the ip_1 exhibits sharp declines during periods of economic crisis.

M2 is the broadest measure of total money supply. M2 includes everything in M1 and also savings and other time deposits. M1 is not used in this study; M1 offers a narrower definition of money supply. The relationship between money supply and inflation is one of the important elements in macroeconomic policy, as governments seek to control inflation. Money supply has a powerful impact on economic activity. An increase in money supply precipitates increases in spending, since it places more money in the hands of consumers, making them feel wealthier, driving them to increase their spending. At the beginning of 2001, the aim of new economic policy in Turkey was to attain stability by lowering its deficits, bringing down inflation and achieving higher and more sustainable growth. The IMF program was at the top of the list.

The preconditions would be created for an "implicit inflation targeting" policy and short – term interest rates were to become critical policy variables.

For the period 2002 – 2004, in addition to the base money target, net international reserves become a performance criterion and net domestic assets an indicative criterion.

In short, all well on the monetary policy side until the end of 2005, the years 2006 and 2007 were both difficult years for monetary exchange rate policies. In the summer of 2008, the global crisis also hit Turkey. Through

increasing money supply, the value of the Turkish Lira declined against foreign currencies.

The current account deficit (ca) affects the stock market in an indirect manner. Since the stock market is generally driven by perceptions and speculation over the possibilities of growth or recession, the status of the current account balance offers investors an indication of possible good or bad times. In their speculative nature, investors may start shifting their holdings in fear of losses or in anticipation of growth depending on the perception they get from exchange rates which are in turn directly determined by the current account balance. If exchange rates are persistently dropping, investors tend anticipate economic decline and may tend to shift to economies which are perceived to be performing more strongly. As a compound indicator for all stock returns, the ISE 100 index's closing prices are taken and the monthly percentage change in the ISE -100 index returns is used in the model. As an observation for interest rate, monthly percentage change in Treasury bill rate is used in the model.

GDP is another indicator affecting investor decisions, and stock returns are also affected by GDP. Capacity utilization ratios are another indicator showing the level of real economic activity.

4. FINDINGS

In this study, macroeconomic variables are independent variables of multiple regression model.

The multiple regression equation is examined with 10% and 5% acceptance levels. In the Durbin Watson test, no autocorrelation was found. Independent variables of the equation are not correlated with each other.

Stocks	Fx	Cur	Tbr	ISE-100	M2	Ipi	Gdp	Gld	Ca	DW	R^2
AKBNK	0,002	0,23	-0,179*	0,893*	0,036	-0,004	0,015	0,163	-0,003	2,502	0,656
ARCLK	0,006	-1,364*	0,105	1,109*	-0,525	0,162	0,023	-0,771	0,012	2,488	0,697
DOHOL	0,0041	-0,668	0,11	1,058*	0,881**	0,406**	0,039	0,829	-0,001	1,879	0,595
DYHOL	0	0,471	-0,2	1,258*	0,377	0,044	0,191	-1,11	0,097	1,649	0,513
EREGL	0,0087*	-0,03	0,058	1,175*	-0,486	-0,23	0,063	0,684	-0,08	2,357	0,827
GARAN	0,0039	0,063	-0,08	1,035*	-0,187	-0,113	-0,02	-0,217	0,06	1,889	0,769
HURGZ	0,031*	-0,643	0,026	0,803*	1,288**	-0,06	0,222**	0,937	-0,103	1,937	0,485
ISCTR	0,0011	-0,614	-0,03	0,775*	-0,593	-0,04	-0,02	-1,591	-0,06	1,72	0,473
KCHOL	0,0037	0,249	0,078	1,088*	-1,183*	-0,155	-0,226*	1,433	0,046	2,343	0,621
SAHOL	0,0033	-0,244	0,092	1,056*	-0,896	-0,193	-0,07	-1,693**	0,017	2,48	0,577
SISE	0,01*	-0,184	-0,04	0,884*	-0,524	0,309	0,055	-0,97	0,03	1,78	0,646
TUPRS	0,003	-0,581	0,019	1,317*	0,539	0,589*	0,057	-0,773	0,0033	2,214	0,754
YKBNK	0,0031	-0,319	-0,03	1,179*	-0,664	-0,176	0,313**	-1,077	0,16*	1,956	0,761

Table 3 Regression Equation Results

*, denotes the significance level of 5% and ** denotes the significance level at 10%. Coefficients without *,** are insignificant.

The signs of sensitivity coefficients of macroeconomic factors which affect stock returns, the significance levels which macroeconomic factors affect stock returns and the explanatory power of sensitivity coefficients are summarized in Table 3.3.

Industrial Production Index: In different studies, the industrial production index is used as variable which seeks to test APT. The Industrial Production Index identifies the activities in a country economy. In theory, if the investment opportunities increase in a country, the value of corporations will increase automatically. Accordingly, the price of a stock will also increase as a natural result. It is thus accepted that there will be a positive relationship between stock returns and the industrial production index. As seen in the table, while the returns of five stocks have a positive sensitivity coefficient to the industrial production index, only two of them are statistically significant.

Money Supply: Money supply has a powerful effect on economic activity. An increase in money supply stimulates increased spending because it puts more money in the hands of consumers, making them feel wealthier and stimulating them to increase their spending. In this study money supply is statistically significant only for three stock returns out of thirteen stock returns.

Gold: In emerging markets like Turkey, gold is seen as an alternative to bond or stocks as a portfolio investment tool. As an investment, gold is typically viewed as a financial asset that will maintain its value during times of political, social or economic distress. As such, gold can provide both

individual and institutional investors with a safety net against sharp downward spikes in complementary assets such as stocks and bonds. It is expected that increases in gold prices affect stock returns negatively. However, the relationship between gold prices and stock returns is only found to be significant (with a 5% significance level) for only one stock (SAHOL) among 13 corporations. This contradicts the expectation before the analysis.

Current Account Deficit: The volume of a country's current account deficit is an instructive sign of economic activity. By scrutinizing the four components of it, we gain a clear picture of the extent all activities of country's industries, capital market, services and the money entering the country from other governments through remittances. The current account also highlights what is traded with other countries and is a good reflection of each nation's comparative advantage in the global economy. Current account deficits hurt the overall economy. Therefore, they also affect stock returns negatively. Sensitivity coefficients of stock returns due to the current account deficit would be negative signs. For five stock returns, it is seen as negative; however, among the 5 stock returns with a negative sign, only one, YKBNK, is statistically significant.

Foreign Exchange Rate: It is generally expected that the sensitivity coefficients of stock returns will have a negative sign with respect to positive fluctuations in foreign exchanges. On the other hand, companies have assets which are related to exchange rate risk. As a natural result, identifying the relationship between exchange rates and stock returns is not

straightforward. The results show that stock returns have positive sensitive coefficients due to changes in the foreign exchange rate. With positive sensitivity coefficients, increase in exchange rates will also lead to an increase in stock returns. Statistically significant coefficients regarding to changes in exchange rates are EREGL, HURGZ and SISE.

Treasury Bill Yields: Changes in the treasury funds rate affect the behavior of consumers and businesses. They also affect the stock market. As it is well known, one method of valuing a company is to take the sum of all expected future cash flows from that company and discount them back to the present. The sum of the future discounted cash flows, divided by the number of shares available, then leads to the fair price of stock. This price fluctuates as a result of different expectations which people may have concerning the company at different times; because of these differences, they are willing to buy and sell shares at different prices. If a company is seen to be cutting back on its growth spending, or is generating a lower profit - either through higher debt expenses or reduced revenues - the estimated amount of future cash flows will drop. All else being equal, this will lower the price of a company's stock. As a result, it is expected that the sensitivity coefficient of stock returns to Treasury bill yields would exhibit a negative relationship. In this study, six stock returns exhibit a negative sensitivity coefficient to the Treasury bill yields; however, only one stock return is statistically significant (ARCLK). Interest rates affect but do not determine the stock market. Interest rates are not the only determinant of share prices and there are many considerations that affect share prices and the general trend of the

market. Therefore, one can never say with confidence that an interest rate hike by a government would have an overall negative effect on share prices.

ISE-100 Index Return: The ISE National 100 Index return is an important factor determining share prices of all stocks. Thus, the sensitivity of stock returns to the ISE Index return is found to be positive for all stocks. Stock returns would be expected to exhibit highly similar fluctuations to the ISE-100 index return. All stock returns examined in this study do indeed exhibit a positive sensitivity coefficient, and all of them are statistically significant.

Gdp: In the finance world, economists spend a great deal of time thinking about and forecasting future economic growth. Investors often consider these forecasts when deciding where to invest their money. The conventional view is that countries and regions with strong long-term economic growth prospects are more likely to deliver higher stock returns than those with slower growth expectations.

One popular theory is that aggregate corporate earnings should, constitute a constant percentage of GDP over the long term, and that dividends would therefore rise along with economic growth, thus generating higher stock returns in faster growing economies.

It is seen in the table that sensitivity coefficients of stock returns due to GDP exhibit positive signs. Nine stock return exhibit a positive relationship, although only three of these are statistically significant (HURGZ, KCHOL, YKBNK).

Capacity Utilization Ratio: Capacity utilization is an economic concept which refers to the extent to which an enterprise or a nation actually uses its installed production capacity. Thus, it refers to the relationship between actual output produced and potential output that can be generated with the installed equipment, if capacity is fully used. It is believed that when utilization increases significantly, price inflation will increase accordingly. Bondholders view strong capacity utilization as a leading indicator of higher inflation. Higher inflation decreases bond prices. In this study, stock returns have a negative relationship to the capacity utilization ratio. In practice, it is found to have a positive relationship. Only one is statistically significant.

The explanatory power of the equation where sensitivity coefficients are estimated is shown in the regression equation results table. It is seen that the equation has an explanatory power of more than 50% for 11 stock returns.

In all equations which seek to explain the returns of stocks through macroeconomic factors, the ISE-100 index return is effective in all equations. There is a positive relationship between stock returns and ISE-100 index return.

	Rf	**Fx**	**Cur**	**Tbr**	**ISE**	**M2**	**Ipi**	**Gdp**	**Gld**	**Ca**
Coefficient	0.063	-2.045	0.016	0.123	-0.03	-0.02	0.043	0.06	-0.04	-0.882
Significance Level	0.807	0.669	0.743	0.715	0.896	0.559	0.731	0.81	0.285	0.095

Table 4 Results of the Cross Sectional Regression Analysis

In this study, the constant term of the cross section equation is the risk free rate of interest. On the other hand, beta coefficients show the risk premium

sought by investors in order to compensate these risks. For each stock return, risk premium and sensitivity coefficients of risks which are calculated in the first regression equation are multiplied and the contribution of the risk premium thus leads to the expected return. For each risk factor, risk premium are calculated and summation of all these risk premiums gives the contribution of risk premiums to expected return. As such, when risk free rate is added to these values the amount which investors are expecting is determined. The steps of the calculations are shown in the tables. When expected returns are examined, it is noticed that ARCLK, AKBNK, DOHOL, EREGL, GARAN, HURGZ, ISCTR, KCHOL, SAHOL, SISE, YKBNK have positive expected returns. In other words, when investors invest in these stocks, they are expecting positive returns to cover the risk premium that they committed to.

	AKBNK	ARCLK	DOHOL	DYHOL	EREGL	GARAN	HURGZ
Fx	-0.004	-0.012	-0.008	0	-0.018	-0.008	-0.063
Cur	0.004	-0.011	-0.022	0.008	0	0.001	-0.01
Tbr	-0.022	0.013	0.014	-0.002	0.007	-0.01	-0.003
ISE	-0.027	-0.033	-0.032	-0.038	-0.035	-0.031	-0.024
M2	-0.001	0.011	-0.018	-0.008	0.01	0.004	0.026
Ipi	0	0.007	0.017	0.002	-0.01	-0.005	-0.003
Gdp	0.001	0.001	0.002	0.011	0.004	-0.001	0.013
Gld	-0.007	0.031	0.068	0.044	-0.027	0.009	-0.037
Ca	0.003	-0.011	0.001	-0.086	0.071	-0.053	0.091

Table 5: Contribution of Risk Premiums to Expected Return (1)

	ISCTR	KCHOL	SAHOL	SISE	TUPRS	YKBNK
Fx	-0.002	-0.008	-0.007	-0.02	-0.006	-0.006
Cur	-0.01	0.004	0.004	-0.003	-0.009	-0.005
Tbr	-0.004	0.01	0.011	-0.005	0.002	-0.004
ISE	-0.023	-0.033	-0.032	-0.027	-0.04	-0.035
M2	0.012	0.024	0.018	0.01	-0.011	0.013
Ipi	-0.002	-0.007	-0.008	0.013	0.025	-0.008
Gdp	-0.001	-0.014	-0.004	0.003	0.003	0.019
Gld	0.064	-0.057	-0.033	0.039	0.031	0.043
Ca	0.053	-0.041	-0.015	-0.026	-0.141	-0.003

Table 6: Contribution of Risk Premiums to Expected Return (2)

	AKBNK	ARCLK	DOHOL	DYHOL	EREGL	GARAN	HURGZ
A	-0.053	-0.004	0.022	-0.068	0	0.094	-0.005
B	0.063	0.063	0.063	0.063	0.063	0.063	0.063
C	0.01	0.059	0.085	-0.005	0.063	0.157	0.058

Table 7: Estimation of Excess Expected Returns of Stocks (1)

	ISCTR	KCHOL	SAHOL	SISE	TUPRS	YKBNK
A	0.086	0.121	0.074	-0.015	-0.145	0.014
B	0.063	0.063	0.063	0.063	0.063	0.063
C	0.149	0.184	0.137	0.048	-0.082	0.077

Table 8: Estimation of Excess Expected Returns of Stocks (2)

A**:** Contribution of Risk Factors to Expected Returns

B: Risk Free Interest Rate

C: Excess Expected Returns of Stocks (= A+B)

Another important point regarding the stock return is the correlation between them. Correlation between stock returns will be examined by the correlation matrix. A correlation matrix describes the correlations among M

variables. It is a square symmetrical M*M matrix with the $(ij)^{th}$ element equal to the correlation coefficient r. Ij between the $(i)^{th}$ and the $(j)^{th}$ variable. The diagonal elements (correlations of variables with themselves) are always equal to 1.00 (Gujarati, 1995). Many methods rely on the correlation matrix as the initial data point e.g. principal component analysis, factor analysis. In this study correlation of stock return is around 0.80 and 0.70 which is high. As a result of the high correlation, it is expected that generally the same macroeconomic factors affect these stock return.

	AKBNK	ARCLK	DOHOL	DYHOL	EREGL	GARAN	HURGZ	ISCTR	KCHOL	SAHOL	SISE	TUPRS	YKBNK
AKBNK	1.000	0.675685	0.690387	0.639344	0.642709	0.739276	0.648175	0.807245	0.748711	0.816782	0.771839	0.641210	0.703841
ARCLK	0.675685	1.000	0.671838	0.614968	0.650884	0.762001	0.673398	0.653985	0.784233	0.718674	0.672711	0.644207	0.681481
DOHOL	0.690387	0.671838	1.000	0.842462	0.695349	0.754434	0.753044	0.744493	0.770900	0.758119	0.782459	0.621809	0.743599
DYHOL	0.639344	0.614968	0.842462	1.000	0.561416	0.725683	0.825711	0.696006	0.677661	0.646532	0.701931	0.550129	0.679314
EREGL	0.642709	0.650884	0.695349	0.561416	1.000	0.644066	0.577453	0.695685	0.741604	0.691401	0.701310	0.689661	0.635805
GARAN	0.739276	0.762001	0.754434	0.725683	0.644066	1.000	0.796702	0.808491	0.782675	0.743997	0.746584	0.669741	0.833553
HURGZ	0.648175	0.673398	0.753044	0.825711	0.577453	0.796702	1.000	0.687792	0.733381	0.643422	0.666747	0.601638	0.680413
ISCTR	0.807245	0.653985	0.744493	0.696006	0.695685	0.808491	0.687792	1.000	0.763206	0.802537	0.830331	0.715095	0.821238
KCHOL	0.748711	0.784233	0.770900	0.677661	0.741604	0.782675	0.733381	0.763206	1.000	0.870498	0.728041	0.669022	0.763382
SAHOL	0.816782	0.718674	0.758119	0.646532	0.691401	0.743997	0.643422	0.802537	0.870498	1.000	0.777749	0.667746	0.741510
SISE	0.771839	0.672711	0.782459	0.701931	0.701310	0.746584	0.666747	0.830331	0.728041	0.777749	1.000	0.692129	0.719522
TUPRS	0.641210	0.644207	0.621809	0.550129	0.689661	0.669741	0.601638	0.715095	0.669022	0.667746	0.692129	1.000	0.652185
YKBNK	0.703841	0.681481	0.743599	0.679314	0.635805	0.833553	0.680413	0.821238	0.763382	0.741510	0.719522	0.652185	1.000

Table 9: Correlation Matrixes of ISE-National 30 Companies

5. CONCLUSION

Finance theory explains how financial decisions are taken in risky stock markets. The risk return relationship plays a significant role. The subjects of minimizing risk and maximizing return are investigated. Portfolio management involves deciding the type of asset in the portfolio given the goals of portfolio owner and changing economic conditions. Selection involves some constraints, most typically the expected return on the portfolio and risk related with this return.

The first paper in the history of Modern Portfolio Theory was Markowitz's paper recognized in 1952, which provides a definition of risk and return as the mean and variation of the out come of an investment.

Building on Markowitz's work, the Capital Asset Pricing Model and Arbitrage Pricing Model tried to explain the variation of return of a financial asset.

In this sense, the Arbitrage Pricing Model, developed by Stephen Ross in 1976, implies that the expected return of the financial asset can be explained by various macroeconomic factors where sensitivity to each factor is specified by the specific beta coefficient.

In this study, effects of macroeconomic variables on stock returns in the Turkish Stock market is examined for the period of January 1999 to December 2009 in the light of Arbitrage pricing model. This study uses data for ISE 30 corporations which were listed on the ISE-30 index continuously between January 1999 and December 2009. A multiple regression is

designed to test the relationship between thirteen stock returns and macroeconomic factors.

In this regression model, stock returns are used as dependent variables while the macroeconomic variables are used as independent variables. The results indicate that the ISE-100 index return is generally effective in all stock returns. In all equations, it is observed that there is a positive relationship between the movement of the ISE 100 index and stock returns. Other factors effective in explaining stock returns are the Treasury bill yields, the industrial production index and the current account deficit. The findings do not find a generally positive relationship between M2 money supply and stock returns. Regarding the results, a positive increase in money supply may not result in an increase in stock returns. In addition, another point concerns the relationship between Treasury bill rates and stock returns. Some partial negative relationship between Treasury bill rates and stock returns was observed. It would be difficult to ascertain whether investors view treasury bills as an alternative investment tool to stocks.

Another point of view is that a negative relationship between foreign exchange rates and stock returns would be expected; however, the results indicate although the relationship is not strong. There is a small positive relationship between exchange rates and stocks because of the positions that firms hold.

The other macroeconomic factors – the capacity utilization ratio, the industrial production index, GDP and the current account - show that there is no clear effect of these factors on stock returns.

The results related to gold prices highlight the view that gold is an alternative investment tool to stocks in countries like Turkey. In other words, gold prices and stock returns exhibit a negatively correlation. The results are not generally significant for most of the stock returns.

In this study, risk factors and risk premiums are determined. When it comes to these risk premiums, the return sought by investors is calculated. It is thought that these results will be evaluated by portfolio investors when the risk-return concepts are determined. However, the findings suggest that all stock returns in this study are only sensitive to changes in the ISE-100 index return. If the model constructed in this study does not work for 13 companies, the returns of stocks, which are traded continuously in the ISE-30 between January 1999 and December 2009, it probably would not work for companies listed in the ISE-100 index either. As a result, this study is bounded by the CAPM, and the arbitrage pricing model cannot be constructed for this study. Thus, for further research studies, a different set of macroeconomic variables and longer time horizon on stock returns may be instructive in identifying a better relationship.

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