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THE EFFECT OF MACROECONOMIC CHANGES ON ISTANBUL STOCK EXCHANGE

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MSC IN LOGISTICS TRADE AND FINANCE
LONDON OCTOBER 2003

Cass Business School
City of London

MSc in Logistics, Trade and Finance 2002-2003

"The Effect Of Macroeconomic Changes on Istanbul Stock Exchange"

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This dissertation is submitted as part of the requirements for the award of the MSc in Logistics, Trade and Finance.

London, October 2003

ABSTRACT

Macroeconomic variables play an active role in the price determination of stocks. This is why this issue has been one of an interest for many years. This paper investigates the relationship between the stock returns of sectors within Istanbul Stock Exchange and the predetermined macroeconomic factors including, export, foreign exchange rate, industrial production index, interest rate, import and wholesale price index for the periods between January 1990 and April 2003. Arbitrage Pricing Theory and Multifactor Pricing Model is implemented to discover the interrelationships between the dependent and the independent variables. It is found out that in coordinance with the expectations and the literature analyzed, interest rates always affect the stock prices negatively. This result is basically due to the substitutability characteristic of the money markets and stock exchanges that gives an initiative to the investors to invest in the securities markets whenever interest rates fall, which consequently increases the stock prices. However, as opposed to the anticipations made from the previous studies analyzed, wholesale price index, which represents inflation, affected the stock returns positively. This conflicting reality is primarily because of inflation that results from the expansion of the Turkish economy, which also increases the real economic activity that consequently raises the firm values and therefore the stock prices. According to our results, Turkish Stock Market has developed over the years in terms of efficiency and due to the contemporaneous relationship between the dependent and the independent variables; it has now reached the levels of semi-strong form efficiency. This paper is unique due to its characteristic of being the first study that implemented the Arbitrage Pricing Theory on a sector basis within Istanbul Stock Exchange. This is why this study will be used both by the financial world, especially by asset liability managers in designing and pricing portfolios as well as by the macroeconomic policy makers and by the academic world for which this study opens a new research area that has to be investigated further for the other emerging, as well as the developed markets.

ACKNOWLEDGEMENT

Initially, we would like to thank our enthusiastic supervisor, Dr. Gulnur Muradoglu, who always inspired us with her brilliant ideas not only in our academic lives but also in our daily lives. The completion of this work would not be possible without her invaluable assistance and supervision.

We would also like to thank our families and especially our parents, Sıddık-Emine Erdogan and Husnu-Mesude Bilyay, who always supported us with patience and who always shared our sorrow and happiness through our student years.

Last, but definitely not the least, we would like to thank each other for always being there in the good days and in the bad days. This success could not have been realized without you.

TABLE OF CONTENTS

LIST OF TABLES

1.INTRODUCTION

1.1 PURPOSE OF THE STUDY

Macroeconomic variables are counted among the most important set of independent variables to forecast stock prices. This is especially true if the stock market in investigation is one of a developing country and has a thin equity market characteristic, where the volume of trade is rather low, information on company performances is limited and untimely, and capital accumulation is dominated by the state organs.

The major purpose of this study is to analyze the effects of the changes in macroeconomic variables on Istanbul Stock Exchange (ISE) and on different sectors within ISE. Although many studies have been completed on this subject, none of them have concentrated on the sectors specifically. Therefore the most important differentiation point of this study from the previous ones is its detailed analysis on the individual sectors. The companies within Istanbul Stock Exchange are grouped into 49 different sectors and each sector exhibit very different characteristics and this is why it is worthwhile to analyze each sector individually. Every single sector may be affected differently from every single different macroeconomic variable. In order to take advantage of the existing opportunities, it will be appropriate to use the results of this analysis, because an unexpected change in a macroeconomic variable can be associated with a profitable opportunity in one of the few sectors within the stock exchange. At the end of the analysis we will be able to answer the following question:

"Which macroeconomic variables affect which sectors in what direction and to what extent?"

In this paper, various macroeconomic variables representing the basic indicators of an economy are employed in the factor analysis processes and factor realizations of principal economic phenomena are derived. The idea of this kind of analysis is that the macroeconomic variables are considered to be just quantitative indicators of basic economic phenomena. Deriving basic factors from macroeconomic variables and employing these factors in pricing models can provide valuable information about the content of priced factors in different sectors within Istanbul Stock Exchange.

Another purpose of this analysis is to test the Istanbul Stock Exchange for efficiency. Market efficiency is concerned with whether prices at any point in time "fully reflect" available information. According to the previous studies, ISE is inefficient such that profit opportunities exist for domestic and foreign investors who could use the easily accessible policy variables for forecasting stock returns. By testing the characteristic (contemporaneous or through lags) of the interrelationship between macroeconomic variables and stock prices, we will be able to decide whether or not the Turkish Stock Exchange has improved in terms of efficiency.

The main tool that we will be using in our analysis is the "Arbitrage Pricing Theory" (APT), which basically states that stock returns are a function of the macroeconomic variables. By implementing a stepwise multifactor regression analysis, we will be able to observe the significant macroeconomic variables affecting the returns of the stocks. The independent variables in our analysis are the macroeconomic variables, which are interest rate, foreign exchange rate, industrial production index, wholesale price index, export and import and which reflect economic activity and government policy action. The dependent variables are the price index of ISE National-100 and that of the selected sectors, which represent the activity in Istanbul Stock Exchange.

In a nutshell, in Istanbul Stock Exchange, which is a relatively thinly traded market, macroeconomic variables are expected to be good predictors of stock price forecasting models and this expectation will be the subject of this empirical investigation. The outcome of this analysis could be used by asset liability managers in the process of constructing and pricing their portfolios, as well as individual investors who are indecisive of which sector to invest in. The departments within the government that deal with the macroeconomic variables, i.e. Ministry of Finance, the Treasury, Central Bank of Turkey, would also be utilizing the results of this investigation in preparing macroeconomic policies.

1.2 OVERVIEW OF ISTANBUL STOCK EXCHANGE and the TURKISH ECONOMY

The aim of this empirical study is to analyze the effects of macroeconomic variables on different sectors within ISE. Therefore before proceeding with the analysis, a closer look at Istanbul Stock Exchange and the Turkish economy is useful in order to have a general idea about the stock exchange that is being analyzed.

The Turkish economy passed through a structural change from a government regulated economic regime to a market oriented one with the commencement of the stabilization package sponsored by IMF in 1980. One of the aims of this package was to attain financial liberalization and integration of the financial markets. To reach this objective, the deregulation of interest rates, liberalization of the foreign trade regime and convertibility of Turkish Lira were counted among the first items to be accomplished. Therefore with the implementation of an IMF-supported stabilization program, the Turkish economy switched from an inward looking development strategy to an outward-oriented one. (Muradoglu, Berument and Metin, 1999, p.229). In 1986, the Turkish Stock Market - Istanbul Stock Exchange, became operational with 42 companies being listed in the stock exchange. During two years, individual investors could execute their orders directly and hence trade floor activities were not limited to licensed brokers. In 1989, in order to further liberalize the Turkish financial system, foreign investors were permitted to hold stock portfolios at ISE. Starting from 1990, with the help of foreign investors, who were mainly institutional investors, the volume of trade expanded by a considerable amount and the market became highly sensitive to the changes in foreign exchange rates. Computer aided trading procedures were introduced in 1993, which increased the volume of trade even further. Starting from November 1994 all of the stocks, which exceeded 250 by 1997, has been traded by a computer-assisted system. Today, 272 stocks are being traded during two sessions (morning and afternoon) every day and daily trading volume has exceeded $300 million on average.

The attempts to liberalize the Turkish economy have not reached all of its objectives. Usually, after the liberalisation of the capital markets not only segmented stock markets are transformed into more integrated ones, but also further impact is expected on the dynamics of the rest of the domestic economy. Tighter linkages between the domestic stock market, macroeconomic variables and world markets are established in most emerging markets following the capital market liberalisations. In spite of the expectations, almost a decade after

capital market is liberalised, Turkey could not open up to the world and the financial and real sectors of the domestic economy remained segmented. Due to this, foreign capital and consequently cost of capital could not be reduced to boost investments and growth rates.

In a nutshell, although Istanbul Stock Exchange, with its relatively low trading volume and low free float, has the characteristics of an emerging securities market, it still possesses the potential to grow and become more developed as well as more efficient.

1.3 OUTLINE

The organization of this paper is as follows: The literature review on Arbitrage Pricing Theory and its application both worldwide and in Turkey is given in Section 2, which is primarily researched and written by Seda Erdogan. Section 3 provides a detailed analysis about the data chosen and the methodology used that is mainly explored and implemented by Ramazan Erdogan. While the empirical results and their interpretation are presented in Section 4, Section 5 states the final remarks and the conclusions drawn from this empirical study, in which all the findings and outputs are discussed, examined and scrutinized by both authors.

2. LITERATURE REVIEW

The literature review section presents an overview of "Arbitrage Pricing Theory" (APT) and the evaluation of the empirical studies completed in this subject. This section will be divided into two, of which the first part investigates the literature about APT and its implementation worldwide, including the first studies of this topic like Chen, Roll and Ross as well as studies from Korea and India. The second section focuses on the previous empirical studies that only analyzed the effects of macro economic variables on the stock returns of Istanbul Stock Exchange.

2.1 ARBITRAGE PRICING THEORY and ITS APPLICATION WORLDWIDE

In this part of the literature review, initially Arbitrage Pricing Theory is conceptualized which is then verified with the empirical studies accomplished worldwide including the milestones in this area like Chen, Roll and Ross and Fama and French. Through analyzing various empirical studies completed in this subject, having a general idea about the validity of the "Arbitrage Pricing Theory" and seeing which macro economic variables affect which country's stock exchange and to what extent will be the aim of this section.

Asset prices are believed to react to economic events. Some macroeconomic changes affect asset prices stronger than others and some do not even affect them at all. The theoretical question of "which economic factors have significant effects on the pricing mechanism" is investigated by many empirical studies, which employ multifactor models.[1] APT depends on the law of one price and categorizes the risk of an asset into two parts: systematic risk, which is a result of more than one common factor, and unsystematic risk. Thus, in the APT framework, a linear relation between the expected return and "k" number of common factor betas is proposed under the assumptions of homogeneous investor expectations, risk averse utility maximizing investors, a frictionless and perfectly competitive capital market with no asymptotic arbitrage opportunities. As opposed to *k* factor framework of the APT, CAPM employs only Market Portfolio in the center of the pricing relation, which as the only risk

[1] Some of the empirical researches that employ macroeconomic variables as explanatory variables in the pricing models are as follows: Chan, Chen and Hsieh (1985), Chen, Roll and Ross (1986), Beenstock and Chan (1988), Chang and Pinegar (1990), Kryzanowski and Zang (1992), Chen and Jordan (1993) and Rahman, Coggin and Lee (1998).

source, is not capable of explaining returns on average. With its multifactor return generating structure, the APT is thought to fill the gap stated in empirical results found on the CAPM.

One of the most famous APT tests on this subject was implemented by Chen, Roll and Ross (1986). In order to figure out whether the predetermined macroeconomic variables are related to the underlying factors that explain pricing in the stock market, a version of Fama Macbeth (1973) was employed by Chen et al (1986). In their study Chen et al (1986) considered some significant economic variables to have systematic influence on asset returns, which are: the spread between long and short term interest rates, expected and unexpected inflation, industrial production, and the spread between high- and low-grade bonds. By choosing a sample of assets and by finding estimates of assets' exposure by regressing the assets returns on unanticipated changes in the economic variables, t-test is implemented on the mean of the estimates to test for difference from 0. Chen, Roll and Ross (1986) explored a set of economic state variables as systematic influences on stock market returns and they have analyzed their influence on asset pricing. Industrial production, changes in risk premium, twists in the yield curve, unanticipated inflation were found to be significant in explaining expected stock returns. Chen et al (1986) concluded that stock returns are exposed to systematic economic news and they are priced according to their exposures.

Another milestone in the Arbitrage Pricing Theory history is Fama and French (1988). The previous literature before Fama and French (1988) was concerned with the proposition that stock prices follow a random walk. In their paper, Fama and French (1988) quoted the following lines from a study by Poterba and Summers (1988): "The hypothesis that stock prices are random walks cannot be rejected, even with variance ratios estimated on returns from 1871 to 1985". In contrast, however, Fama and French (1988) set out to show that stock returns could be forecasted by dividend yields. This analysis looked at the relationships between both nominal and real portfolio returns and measures of the dividend yield for both value-weighted and equally weighted portfolios.

In a further paper, Fama and French (1989) attempted to model both stock and bond returns and introduced two further variables, "the default spread", the difference between the yield on a market portfolio of corporate bonds and the yield on AAA bonds and "the term spread", the difference between the yield on the AAA corporate bond portfolio and the one-month Treasury bill rate. Again, the dividend yield was positively related to both value-weighted and

equally weighted stock portfolios and the default spread was also positively and significantly related to stock returns.

In a further paper published by Balvers, Cosimano and McDonald (1990), a general equilibrium model of stock returns is provided, which, in contrast to the efficient market hypothesis, conceptualized stock returns as a predictable stochastic process. In the same issue of the Journal of Finance, Fama (1990) drew on earlier research to argue that valuation models assume three sources of variation in stock returns;

(a) Shocks to expected cash flows
(b) Predictable return variation due to variation through time in the discount rates that price expected cash flows
(c) Shocks to discount rates (Fama, 1990, p.1092)

By shocks to expected cash flows, Fama (1990) referred to the fact that there is much evidence that substantial proportions of the variances of stock returns can be attributed to economic variables such as real economic growth, industrial production, and investment. Similarly, there is evidence that expected returns, and so the discount rates that price expected cash flows, vary through time. Finally, Fama (1990) quoted a study by French et al. (1987), which found that part of the variation in stock returns can be attributed to shocks to expected returns and discount rates that generate opposite shocks to prices.

Some other empirical studies of the APT are only focused on determining the number of risk factors that systematically explain the stock market returns by implementing Factor Analysis Methods. There is a great number of papers that employ Factor Analysis methods. For example, Roll and Ross (1980) found that 3 or 4 systematic risk factors are statistically adequate to explain the asset returns in the period of 1962-1972, while on the other hand Chen (1983) found 5 factors in the NYSE and AMEX between 1963-1978. Dhrymes, Friend and Gultekin (1985) found a changing number of factors depending on the period length and the size of the stock groups under analysis. Although the number of factors can be estimated in these kinds of analysis, the identification of priced factors is impossible. But in the analysis, which employ macroeconomic factors additional information can be obtained by analyzing the links between asset returns and macroeconomic events.

Roll (1992) compared 24 stock price indices in order to find patterns concerning the industrial structure of the countries between the years 1988-1991. He found that the exchange rate effect on local currency stock index returns is neither "entirely neutral" nor "entirely non-neutral" for several countries. Still, for a majority of countries, a part of national equity index behavior can be attributed to exchange rate behavior. He concludes that the amount explained by exchange rates is less than the amount explained by the industrial structure in most countries. In contrast, according to the empirical research involving cointegration method and Chow test made by Charikleia Sidiropoulou (2000) in UK, US and Japanese stock markets, the stock and foreign exchange markets seem to move independently.

There are several previous empirical studies of the APT for German Stock Exchange. For example, Winkelmann (1984) used monthly returns of 93 assets from Germany in the period between 1971-1981 and implemented the principle components analysis method in order to test the APT. Another study done by Peters (1987) in Germany analyzed the 1975-1985 period with 21-day stock returns. Frantzman (1989) employed daily returns for 1980-1985 periods by using the maximum likelihood factor analysis method. Verlerger (1993) implemented an APT test for weekly stock returns for the period of 1972-1985. Sauer (1994) analyzed the 1970-1989 periods by implementing the maximum likelihood factor analysis method and also used some macroeconomic variables as potential common risk factors. Adelberger and Lockert (1999) analyzed the Frankfurt Stock Exchange in the 1976-1991 periods by calculating values of weekly and monthly asset returns. All these analyses that have different time periods support the evidence of more than one statistically significant factor explaining the asset returns in the German Stock Market.

Usually, the level of real economic activity is associated with a positive effect on future cash flows. Therefore stock prices and cash flows are affected in the same direction. In order to analyze further the effects of macroeconomic variables, conventional time-series models are generally used. APT does not denote the individual economic variables as risk factors and leaves this issue to empirical researchers, some of which we will be analyzing below:

Geske and Roll (1983) state that foreign exchange rates influence stock prices through the terms of trade effect. In case of a depreciation of domestic currency, volume of exports increase. Provided that exports have an elastic demand characteristic, the cash flows of domestic companies will increase which in turn will increase its stock prices.

The relationship between inflation and stock returns is highly controversial. According to empirical studies done by Fama and Schwert (1977), there is a negative relation between inflation and stock prices. An increase in inflation is expected to be associated with an increase in nominal discount rates. As long as the contracts are nominal and accordingly cash flows cannot increase immediately, the effect of using higher rates to discount cash flows will have a negative impact on stock prices. In contrast to Fama and Schwert (1977), Graham (1996), who studied the relationship between stock returns and inflation in the United States between the years 1953 and 1990, found out that a stable relationship did not exist, i.e. the relationship was negative before 1976 and after 1982 and positive between these years. According to Chen et al (1986), nominal interest rate is expected to have a negative effect on stock prices.

Abdalla and Murinde (1997) investigated the interactions between exchange rates and stock prices in emerging markets including Korea, India, Pakistan and the Philippines using the Granger causality method. They found unidirectional causality between exchange rates and stock prices in all of the countries except the Philippines.

In the UK literature, similar conclusions have been drawn about the predictability of stock returns. Both Mills (1991) and Fraser and Power (1992) used the variance ratio statistic to test for predictability and both concluded that stock returns are predictable. In their UK model, Black and Fraser (1995) not only eschewed the use of leading variables, but also employed different definitions of both the term and default spreads.

Lovatt and Parikh (2000) investigated the relationships between real stock returns and a number of financial and economic variables for the UK economy for the period 1980 to 1994 by re-estimating the model proposed by Fama (1990) on the UK data and also using Phillips-Loretan (1991) estimator and unit root tests. According to their results, a reasonable proportion of the variance of real stock returns in the UK can be explained by variables like dividend yield, the inverted yield curve, the expected growth of real GDP, and the expected rate of consumer price.

Hanousek and Filer (2000) investigated the possibility of newly-emerging equity markets in Central Europe to exhibit semi-strong form efficiency such that no relationship exists between lagged values of changes in economic variables and changes in equity prices. They reached

the conclusion that while there are interrelations between the real economy and equity market returns in Poland and Hungary, these links are realized through lags; which suggests the opportunity of profitable trading strategies based on public information, which automatically rejects the semi-strong efficiency.

In an empirical study done by Sotiris Fournaros (2000), who used OLS and GARCH models, it is found out that although stock prices in Asian emerging markets are mainly influenced by residuals of the log of the change of their consumer price index and by the log of the change of their exchange rates, the main factor affecting Latin American stock prices is the residual of the log of their industrial production.

Muradoglu, Taskin and Bigan (2000), who investigated the compatibility of economic policy and stock returns, took the set of all emerging markets and employed Granger-type causality tests for each country. The striking result is that only 12 (which are the leading countries in their geographical locations) out of the 19 countries exhibit any type of causal relationship between macroeconomic variables and stock returns and only two countries exhibit bi-directional causality. The results of the Muradoglu et al (2000) study show that the two-way interaction between security markets and the rest of the economy is mainly due to the size of the security markets and their integration with the world markets through various measures of financial liberalization. The higher the per-capita income, the higher the liberalization and the more integrated the stock exchange is, the more causality will be between security markets and the rest of the economy.

As can be analyzed from the empirical studies stated above, no single stock exchange is affected from the macro variables in the same quantity and in the same direction with another stock exchange. Therefore it can be concluded that although the macroeconomic variables do have an effect on the returns of the stocks, the amount and the direction of this effect changes from one stock exchange to the other. This changing characteristic of the effect of the macro variables on the stock exchanges makes the analysis of each and every securities market valuable.

2.2 APPLICATION OF ARBITRAGE PRICING THEORY ON TURKISH STOCK MARKET

The previous section mostly dealt with empirical tests of APT in the developed stock markets, therefore comparative investigations on ISE, which is an emerging market, will give valuable information on the validity of the theory's proposals, for example, the number and the identification of the factors on these markets. The aim of this paper is to investigate the effects of macroeconomic changes on Istanbul Stock Exchange; therefore looking at the literature that only analyzed ISE will give us an overview of what has been accomplished up to this point in time, which will help us differentiate this study from the previous ones.

A research by Ozcam (1997) can be considered an example of APT testing in Istanbul Stock Exchange. In this research, seven macroeconomic variables of the Turkish economy are separated into expected and unexpected series by a regression process and two-step testing methodology is implemented on these series. A sample population of 54 stocks for the period between 1989 and 1995 is used. As a result, beta coefficients of expected factors including industrial production, money supply and retail sales are found significant for asset returns.

Altay (2001) is another example of two different APT tests in Istanbul Stock Exchange. In the first test, factor analysis method is employed in daily returns of 121 to 265 stocks in the 1993-2000 period for each year and one dominant significant factor is found among several minor significant factors for each year. The second test employs multivariable regression process in order to examine the significance of macroeconomic variables on asset returns. As a result only expected treasury bill interest rate beta is found significant for explaining asset returns.

The studies stated above employ Factor Analysis Methods in order to derive basic common factors from stock returns or utilize regression processes to test the significance of macroeconomic variables and their betas on asset returns.

Altay (2003), who implemented a two-stage testing methodology in the German and Turkish Stock Markets which is extensively used in both CAPM and APT testing literature, for example by Fama MacBeth (1973), Roll and Ross (1980), Chen (1983), Chen, Roll and Ross (1986), Lehman and Modest (1988), used macroeconomic factors which are derived by employing main financial sector and real sector variables of these economies in different factor analysis procedures. Altay (2003) used factor analytic techniques for deriving factor

realizations from a group of main economic indicators of both the German and the Turkish economy in order to test the effect of economic factors on asset returns in an APT framework. The factor structure of the German economy yields 4 factors, which are interest rate level, foreign trade, inflation and production level; whereas the Turkish economy has only 3 factors including inflation, foreign trade and interest rate level even though the same economic indicators (in total 8 factors) are employed in the factor analysis procedures. They found some evidence of the unexpected interest rate factor and the unexpected inflation factor beta coefficients having significant effects on asset returns of the German Stock Market. But they were not able to find any unexpected macroeconomic factor beta with a significant influence on asset returns in the Turkish Stock Market. First of all, unexpected potential risk factors are derived and then several portfolios are constructed for testing procedure. In the first stage, factor beta coefficients of each portfolio are estimated by time series regression, and in the second stage a cross sectional regression process is run to estimate the relation between factor betas and average asset returns.

Metin and Muradoglu (2000), who compares the forecast performance of three time series models including VAR, SSM and seasonal ECM, which employ macroeconomic variables as predictors of stock prices in the Istanbul Stock Exchange (ISE), provides evidence that stock prices and macro-economic variables cointegrate at the ISE. Metin and Muradoglu (2000) prove that stock prices can be forecasted which consequently proves that the Turkish stock exchange is inefficient with respect to monetary policy variables. This suggests that profit opportunities exist for domestic and foreign investors who can use these easily accessible policy variables for forecasting stock returns. A variety of profitable trading rules can be based on the available information on macroeconomic policies by examining several forecasting models. (Metin and Muradoglu, 2000,p.28)

According to the empirical study performed on the data collected through a questionnaire administered to investment bankers, advisers and dealers in the stock market done by Ceki Altaras (1992), while short term interest rate is the most influential on the stock prices among the primary economic variables, unemployment rate and income distribution are the variables with the lowest effect in the determination of the stock prices.

According to the investigation involving Granger model made by Muradoglu and Taskin (2001), interactions between the macroeconomic fundamentals and the domestic stock returns are enhanced after capital market liberalization in the emerging markets.

In a further paper, Taskin and Muradoglu (2003) examined the changes in the interactions between domestic capital market, domestic economic fundamentals and world capital markets of this economy before and after the liberalisation of capital markets in Turkey by using multivariate Granger causality analysis. (Taskin and Muradoglu, 2003, p.14) They expected the stock markets to carry the impact of globalisation to local capital markets when the liberalization occurs and the remainder of the economy to be better integrated with the world.

We have seen in Taskin and Muradoglu (2003) that the stock markets and domestic economies become more integrated with the world following the liberalization process. In that context, they have also shown with panel estimations that linkages were strengthened between the economic fundamentals and stock returns and between the economic variables themselves. In Muradoglu, Taskin and Bigan (2000) however no such relationship is observed for Turkey. However in the study of Muradoglu et al (2000), post and pre-liberalization periods for individual countries were not differentiated. Therefore similar results would be expected in Taskin and Muradoglu (2003) for Turkey when country specific estimations for the two different periods were conducted: before and after financial liberalization.

According to Taskin and Muradoglu (2003), during the post-liberalisation period, unlike the stock markets of other emerging countries, Turkey could not establish strong empirical links with world returns. Neither direct information flow is observed from world returns to other variables to make them sensitive to changes in world capital markets. Despite popular belief, Turkey still remains disintegrated from the world even after capital market liberalisation. When domestic economic fundamentals are the dependent variables in the regressions, there is no indication that the real side of the economy has become sensitive to either global factors or local variables following capital market liberalization. Real growth is not susceptible to changes in either world capital markets or to direct information flows from the rest of the economy but only to real cost of borrowing represented by the real interest rates.

Macroeconomic variables that affect the stock returns may change according to the situation the economy is in. This is exactly what Muradoglu, Berument and Metin (1999) analyzed in

their empirical study by implementing GARCH-M model. The results of their analysis show that macroeconomic variables that explain the behavior of stock returns change before, during and after the crisis. Just like Fama and Schwert (1977), they also found a negative relationship between interest rates that proxy for expected inflation and stock returns before the crisis (Muradoglu, Berument and Metin, 1999, p.245). This study also shows that not even one macroeconomic variable has predictive power during the crisis period, giving 1994 Turkish economic crisis as an example. After the crisis, interest rates affect the stock returns as expected.

The findings of Muradoglu et al (1999) are supported by Muradoglu, Metin and Argac (2001). Muradoglu et al (2001); who investigated the long run relationship between stock returns and monetary variables in an emerging market, i.e. Turkey, implemented a cointegration technique and they found out that variables that explain stock prices might change through time and therefore these variables should not be used for formulating investment strategies since they can be misleading. For example, as ISE became more mature, the effect of monetary expansion and interest rates decreased as the effect of foreign currency prices increased.

From the literature that is analyzed for the Istanbul Stock Exchange, it is observed that the literature is mostly dominated with studies that dealt with the number and the changing characteristic of significant factors affecting ISE. It is noticed that only a few of the empirical studies analyzed aimed at directly finding the variables that affect ISE and none of the studies analyzed even went further to see the effects of macroeconomic variables on different sectors within ISE. Therefore our study will be unique among the other analysis because it will contribute to the literature by providing an answer to a very essential question of "which macroeconomic variables affect which sectors within ISE and to what extent?"

In a nutshell, it can be concluded that according to the empirical tests of Arbitrage Pricing Theory implemented for the stock exchanges worldwide including Turkey, macroeconomic variables play a major role in the price determination of the stocks. Table 1 presents a brief summary of the empirical findings of the studies mentioned in the literature review. The table, which constitutes an essential guide as to which variables have been used in the literature, includes the significant macroeconomic variables associated with the direction of their effects on the securities market.

Table 1: Macroeconomic Variables That Are Employed In Previous APT Tests

Macroeconomic Variables	Effect of Macroeconomic Variables on Returns	Previous Studies which Employ Indicated Variables
Industrial Production	Positive (+) & Negative (-) Mixed Effect	Chen, Roll and Ross (1986), Beenstock and Chan (1988), Chang and Pinegar (1990), Kryzanowski and Zhang (1992), Chen and Jordan (1993), Sauer (1994), Ozcam (1997), Rahman, Coggin and Lee (1998), Altay (2001)
Inflation	Negative (-)	Chan, Chen and Hsieh (1985), Chen, Roll and Ross (1986), Chang and Pinegar (1990), Kryzanowski and Zhang (1992), Chen and Jordan (1993), Sauer (1994), Rahman, Coggin and Lee (1998), Altay (2001), Graham (1996)
Risk Premium	Positive (+)	Chan, Chen and Hsieh (1985), Chen, Roll and Ross (1986), Chang and Pinegar (1990), Kryzanowski and Zhang (1992), Chen and Jordan (1993), Sauer (1994), Rahman, Coggin and Lee (1998)
Term Structure	Negative (-)	Chan, Chen and Hsieh (1985), Chen, Roll and Ross (1986), Sauer (1994), Chang and Pinegar (1990), Kryzanowski and Zhang (1992), Chen and Jordan (1993), Rahman, Coggin and Lee (1998)
Money Supply	Positive (+)	Sauer (1994), Ozcam (1997), Altay (2001)
Capital Flows	Positive (+)	Altay (2001)
Wages	Positive (+)	Beenstock and Chan (1988), Sauer (1994)
Consumer price Index	Positive (+) & Negative (-) "Mixed Effect"	Fournaros (2000), Lovatt and Parikh (2000), Altay (2001)
Exports	Positive (+)	Beenstock and Chan (1988), Sauer (1994)
Short term Interest Rates	Negative (-)	Ozcam (1997), Altay (2001), Muradoglu, Berument and Metin (1999)
Foreign Exchange Rate	Positive (+) & Negative (-) "Mixed Effect"	Sauer (1994), Ozcam (1997), Altay (2001), Abdalla and Murinde (1996), Geske and Roll (1983), Fournaros (2000)
Unemployment	Negative (-)	Sauer (1994)
Budget Balance	Positive (+)	Ozcam (1997)
Current Accounts Balance	Positive (+)	Ozcam (1997), Altay (2001)

While different empirical researchers have found different results for industrial production, consumer price index and foreign exchange rate, the results for the other macroeconomic variables are consistent between different empirical findings. This demonstrates that the effect of industrial production, consumer price index and foreign exchange rate may differ from one stock exchange to the other and from one time frame to another one. Therefore,

analyzing the effect of these variables that have the probability to affect Istanbul Stock Exchange both positively and negatively will provide an insight about the direction of the impact of these variables in the Turkish Stock Market.

In the literature review section, the worldwide studies on Arbitrage Pricing Theory including examples from the milestones of this subject like Chen, Roll and Ross and Fama and French, as well as the theory's application on the Istanbul Stock Exchange is analyzed. From all the studies examined, it is observed that for ISE, the studies focused on either the number of significant factors or the altering characteristic of the significant factors in case of crisis. No single study has investigated the effects of macroeconomic variables on different sectors within ISE and this will be the main focus of this empirical study, which makes it a unique one. Therefore this analysis will contribute to the literature by precisely providing a list of the variables that affect different sectors within ISE that can be used to a great extent by the financial as well as the academic world.

3. DATA and METHODOLOGY

3.1. DESCRIPTION OF DATA SETS and SAMPLE PERIOD

Two different data sets are used in this analysis. The first data set consists of ISE-100 index and monthly stock returns of the Turkish Stock Market on a sector basis. The second data set includes the predetermined monthly macroeconomic variables of the Turkish economy, which will be analyzed later on in the analysis.

The sample period is January 1990-April 2003. The Turkish Stock Market, Istanbul Stock Exchange, was founded in 1985 with a relatively small number of listed stocks. For this reason, analysis of the Turkish Stock Market starts in January 1990, when there were relatively higher numbers of stocks. The sample period chosen is wide enough to cover sufficient number of observations in the data set and the sample period starts late enough to cover high number of stocks who entered the stock market relatively lately.

The price index data of Istanbul Stock Exchange on a sector basis is obtained from DataStream, at which an aggregate index of all the sectors available in Turkey are calculated. Although 49 sector price indexes are available, we will be investigating 17 sectors that have the major weight in the Turkish economy. In contrast to fixed history indices, DataStream's existing equity market sector indices are recalculated historically to show the long-term performance of current constituents, and to avoid distortions by stocks entering or leaving a sector.

3.2. STOCK RETURN DATA:

The purpose of this analysis is to investigate the effects of macroeconomic changes on the individual sectors of ISE; therefore the first data set that we are required to analyze is the monthly stock returns of selected sectors that we will be examining. DataStream has partitioned the stocks in ISE into 49 different sectors according to the stock's main roles in the economy. Among these 49 sectors, 17 sectors are selected that have complete data set between the period January 1990 and April 2003. Complete data set in the sample period was especially required in order to avoid the possible misleading results that may occur due to the lack of data in the sample period. In order to obtain more realistic results, the limitation of

selecting uninterrupted data guided us to choose the 17 sectors of which the details are given in Table 2. Therefore the selection criteria for the sectors were based on the interruption characteristic of the data sample. The selected sectors have leading positions in the Turkish economy and they constitute the backbone of the real economy. Also, in order to have a general view of the effects of macroeconomic variables on ISE, the same analysis will be done on the ISE National 100 index. Both for the 17 sectors selected and for the ISE-100, monthly closing stock prices are used by acquiring the daily closing prices and eliminating the stock prices for all the days except the last day of the month.

Table 2. Sectors Used In The Analysis

VARIABLE	SYMBOL	SOURCE
ISE NATIONAL 100	ISE 100	DS
Airlines and Airports	AL & AP	DS
Autos and parts	AUTO	DS
Banks	BNK	DS
Basic industries	B.IND	DS
Building and Construction Materials	BLD&CNS	DS
Brewers	BRW	DS
Cyclical Consumer Goods	C.GDS	DS
Defense	DFS	DS
Electricity	ELCT	DS
General Industrials	G.IND	DS
Household Goods and Textiles	HHS&TEX	DS
Household Appliances	HHLDAPP	DS
Soft Drinks	S.DRNK	DS
Steel Industry	STL	DS
Telecom, Media and IT	TM&IT	DS
Textiles and leather	TEX&LTH	DS
Tires and Rubber	TR&RB	DS

DS= DataStream

In this part of our analysis, brief information will be given for each sector, which will help us in gaining an overview about them. Among the sectors given in Table 2, while "airlines and

airports" include 100% domestic airline, terminal and ground handling service firms, "autos and parts" sector consists of foreign invested firms as well as domestic ones. The "bank" sector is comprised of all the private banks in Turkey. As the "Basic Industries" sector contains several industries that constitute the backbone of every single sector like the cement industry and the steel industry, the "Building and Construction" sector includes all the industries that contribute to the development of any estate like the glass, cement, pipe and brick industries. The "brewers" sector encompasses two brewer-producing companies of which one of them is a 100% domestically owned company, while the other one is an affiliate of a foreign company. The "cyclical consumer goods" represent all the goods that are consumed in intervals like the cosmetic industry (i.e. toothpaste and shampoo). The "defense" sector is a unique one because it is comprised of only one company, which also constitutes the only company in the aerospace sector. Both the "electricity" sector and the "general industrials" sector, which basically includes the mining and the steel molding industries, is comprised of numerous companies some of which are domestic and supply their demand from the domestic sources while still some are affiliates of foreign companies and use their foreign sources to supply their demands. While "household appliances" sector refers to the industries that produce electrical tools used in the houses, "household goods and textile" sector is comprised of the furniture manufacturing companies. The "soft drink" sector includes only the companies that produce non-alcoholic drinks and the "steel industry" sector embraces steel plants from all around Turkey. Both the "Telecom, Media and IT" and the "Textile and leather" sector is rather huge and broad sectors such that the former includes the mobile phone companies as well as computer firms and companies of the TV channels in Turkey, while the latter almost represents 10% of the firms administered in the Istanbul Stock Exchange. "Tires and rubber" sector includes products from the raw material of rubber to cable and the products are produced from 100% privately owned companies to 100% government owned ones. The brief information provided in this section about every single sector will constitute a viewpoint during the interpretation of the empirical studies.

ISE-100 index and the 17 sub-sectors are processed in order to find the monthly continuous increase rate by taking their first logarithmic differences by formula 3.1:

$$R(Vj)t = \ln P(Vj)t - \ln P(Vj)t\text{-}1 \qquad (3.1)$$

where $R(vj)_t$ is the continuous return of index j in month t and $P(vj)_t$ is the index of sector j in month t.

3.3 MACROECONOMIC DATA:

In the decision process of choosing which macroeconomic variables to utilize in this empirical study, various factors were kept in mind, which can be listed as follows:

(i) Variables should be the main economic indicators of the country

(ii) Variables should be available in the time frame required

(iii) Monthly series of the variables should be available

Taking into consideration the cointegration relationship, as well as the accessibility and the higher frequency of use of information by the ultimate investor and the factors listed above, the 6 data sets of macroeconomic variables presented in Table 3 which contain monthly series over the period of January 1990- April 2003 are decided to be used in our analysis.

Table 3. Macroeconomic Variables Used In The Analysis

VARIABLE	SYMBOL	DATA SOURCE	EXPLANATION	EXPECTED EFFECT ON RETURN
Export	EXP	DIE**	Billion USD	Depends on Sector
Foreign Exchange Rate	FEX	TCMB*	Turkish Lira/ USD	Positive(+) & Negative(-)
Import	IMP	DIE**	Billion USD	Depends on Sector
Industrial Production Index	IPI	DIE**	1992 base year	Positive (+)
Interest Rate	IR	TCMB*	Weighted interest rate on 1 year maturity deposits	Negative (-)
Wholesale Price Index	WPI	DIE**	1981 base year	Negative (-)

*TCMB=Turkish Republic Central Bank

**DIE= State Institute of Statistics

Next, the macroeconomic variables will be analyzed one by one and our expectation of their effect on the stock returns will be expressed.

3.3.1 EXPORT and IMPORT:

Foreign trade, including export and import, is one of the most important indicators to value the position a country is standing at. In giving sound decisions about a country's economical politics and in deciding which investments to make both by the public and the private sector, export and import levels play an essential role. Also, in order for the governments to reach balance of payments, the export and import levels have to be scrutinized carefully. Although no special statistical technique is implemented to calculate the foreign trade levels, it is important to note that in the process of converting foreign exchanges into USD, Euro or Turkish Lira, always the foreign exchange rate indicated by the Central Bank of Turkey should be used. Export and import statistics are obtained from the State Institute of Statistics and they are expressed in the form of billion USD. Therefore "export" and "import" level variables are also included in the analysis to account for the foreign side of the macroeconomic variables. The expectation of whether the export and import levels will affect the stock returns positively or negatively depends on whether or not the firms included in the sectors are export or import oriented. If a sector is dominated with export-oriented firms and the export levels increase, which is a sign of increasing future cash flows, this will augment the stock prices of these firms. Similarly, for import-oriented firms, an increase in imports means an increase in future cash flows, which consequently signifies an increase in the stock prices of the import-oriented firms. Therefore, we expect that export levels will have a positive effect on export-oriented firms and import levels will have a positive effect on import-oriented firms.

3.3.2 FOREIGN EXCHANGE RATE:

The effects of "foreign exchange rates" on the Turkish economy are so essential that it is almost seen as one of the most important indicators of the well being of the economy as a whole. Turkey has lived through major devaluations of the Turkish Lira (TL) and to be able to see whether these factors played a role in the pricing mechanism of ISE, the monthly percentage change of "foreign exchange rates" in relation with the USD is included to reveal the effects of international competitiveness. Foreign exchange rate data set is obtained from the Central Bank of Turkey (TCMB) in the form of "sell USD, buy TL". We expect foreign exchange rate to have both a positive and a negative effect on the stock returns working against each other at the same time. In case of a devaluation, the volume of exports increase.

The cash flows of domestic companies will increase assuming that exports have an elastic demand characteristic and this will in turn increase the stock prices of these companies. This trade effect demonstrates the positive effect of foreign exchange rates on the stock returns. The negative effect comes into action due to the substitutability characteristic of the two markets. Once the domestic currency appreciates, and therefore the foreign exchange rates fall down, it signals to the markets that the domestic currency is getting stronger, the budget deficit is decreasing, the balance of payments is getting better, which all increases the trust towards the Turkish Lira. Therefore, investors find it more advantageous to invest in the stock markets, rather than the money markets. Hence the intention of the investors to leave the foreign exchange markets in order to hold on to the more valuable domestic currency and enter the stock markets, make the returns increase while the foreign exchange rates fall. The net effect of these two adverse effects and therefore the net effect of the foreign exchange rate, which will be empirically investigated in the next section, will be determined according to the absolute values of the two changes occurring head to head.

3.3.3 INDUSTRIAL PRODUCTION INDEX:

Industrial production index is a volume index measuring the production by physical output. This index aims to measure the change in the physical output of the major plants from the mining, production, electricity, gas and water sectors, including both the private and the public sectors. Industrial production index is calculated with the base year weighted Laspeyres quantity index by the "State Institute of Statistics" of Turkey. For the purposes of this study Industrial Production Index will be employed to reflect the changes in the domestic real economic activity. The level of industrial production index and hence the real economic activity is expected to have a positive effect on future cash flows and therefore will affect stock prices in the same direction. An unexpected increase in the growth rate of real activity not only causes an increase in stock prices, but also a decrease in the price levels and hence a decrease in inflation because of its impact on money demand. In a nutshell, since industrial production index increases the expected cash flows and since the value of a firm is directly related to the cash flows expected, it is anticipated that the level of industrial production index will have a positive effect on the returns of the stocks, which will be tested for ISE in the next section.

3.3.4 INTEREST RATE:

Interest rates also play a very important role as an indicator of the situation the Turkish economy is in. It is often perceived as a substitute to other investment alternatives like the stock exchange and this is why it is essential for us to see the effects of the interest rates on ISE and on different sectors within ISE. Interest rates are obtained from the Central Bank of Turkey and it is the monthly weighted interest rate given to 12-month domestic deposits. "Domestic cost of borrowing" is represented by "interest rates", which is basically 1 year weighted interest rate. We expect that interest rates will have a negative effect on the stock returns due to two reasons. The first one is that money markets and stock markets are substitutes of each other and the investors will choose to invest more on the stock exchange whenever interest rates fall down. Therefore there is an inverse relationship between the two markets. Another reasoning behind our anticipation is that, once the interest rates fall, there is an incentive for the investors to borrow money from the money markets at a low rate and invest the borrowed money at the stock exchange, which increases the returns of the stocks. Due to these two reasons we expect the interest rates to have negative effects on the prices and therefore the returns of the stocks.

3.3.5 WHOLESALE PRICE INDEX:

For the purposes of this study, inflation will be reflected by the "Wholesale goods price index", which is an indicator of the change in the wholesale prices of goods and commodities, which are subject to wholesale. This index, which is calculated by the Laspeyres formula and which includes the agriculture, mining, production and energy sectors, reflects the changes only in prices because it includes the same goods with the same quantity and same quality. Therefore the monthly percentage change of "wholesale price index", which is downloaded from the State Institute of Statistics, takes its place among the macroeconomic variables in order to capture the effects of inflation. We expect that wholesale price index will affect the stock returns negatively. According to the empirical findings, expected inflation, unexpected inflation and changes in expected inflation are all negatively related to stock returns. There is a negative relation between actual inflation rate and growth rate of real activity. Since stock returns predict real activity, inflation should induce a negative effect on the stock returns. Also, an increase in inflation has been expected to increase the nominal risk-free rate, which in turn will increase the discount rates used in stock valuation. If the contracts are nominal

and cannot adjust immediately, the effect of increasing inflation will be negative. Due to these reasons, it is expected that the effect of wholesale price index on the stock returns will be negative.

All 6 macroeconomic variables are converted to monthly continuous increase rate by finding their percentage increase for each month by formula 3.2:

$$R\,(Vj)t = \frac{[P\,(Vj)t - P\,(Vj)t\text{-}1\,]}{P\,(Vj)t\text{-}1} * 100 \qquad (3.2)$$

Where R (Vj)t is the percentage increase of variable *j* in month *t* and P (Vj)t is the level of variable j in month t. Finding the percentage increases lets us to only deal with the monthly changes occurring in each month, not the relative levels, which will make us derive more accurate results.

3.4 ANALYSIS OF MACROECONOMIC DATA & ISE 100:

3.4.1 DESCRIPTIVE STATISTICS of MACROECONOMIC DATA & ISE 100:

In order to have a general idea of the macro variables, it will be appropriate to start from the descriptive statistics, which is presented in Table 4. The descriptive statistics for the 17 selected sectors can be analyzed in Appendix I.

Table 4. Descriptive Statistics

	ISE 100	WPI	EXP	FEX	IMP	IPI	IR
Mean	0.039	0.0435	0.0155	0.0433	0.0201	0.007	0.0012
Median	0.0252	0.0398	0.0094	0.0393	0.0202	0.0025	0.0003
Maximum	0.5866	0.2387	0.4895	0.5091	0.5106	0.2301	0.4419
Minimum	-0.495	-0.012	-0.358	-0.082	-0.42	-0.196	-0.353
Std. Dev.	0.1695	0.0302	0.1368	0.0592	0.1578	0.0882	0.0692
Skewness	0.1761	2.0046	-0.015	3.8532	-0.058	0.0853	1.228
Kurtosis	3.9632	12.927	3.8947	29.403	3.4528	2.7999	18.358
Jarque-Bera	7.0123	764.15	5.3426	5043.4	1.457	0.4612	1612.7
Probability	0.03	0	0.0692	0	0.4826	0.7941	0
Sum	6.2343	6.9543	2.4792	6.9339	3.2135	1.123	0.1992
Sum Sq. Dev.	4.566	0.145	2.9769	0.5571	3.9572	1.236	0.7619

The table above is the descriptive statistics for the monthly percentage change of the macroeconomic variables and ISE 100 index. Since the mean of all six variables are positive, it can be concluded that on average the macro variables increased from one month to the other. Except for export and import, the other four factors are positively skewed indicating that for the change in these four variables there are more extremely (relatively) high positive values than there are negative values. The import and export data are negatively skewed demonstrating that both the import and the export levels fell down considerably from one to the other that made the whole data set negatively skewed. All the monthly changes in six variables and the return of ISE 100 index have positive kurtosis and except for industrial production index, all the other variables have kurtosis which are greater than 3, i.e. they are leptokurtic and the data sets have peaked distributions relative to normal distributions. In order to test the data sets for normality Jarque-Bera test statistic will be used. Only those variables that have Jarque-Bera probabilities exceeding 5% would have normal distributions. In our case, only the data of "export", "import" and "industrial production index" are normally distributed while the data of "ISE 100", "wholesale price index" and "foreign exchange rate" are not normally distributed, since their Jarque-Bera probabilities cannot exceed 5%.

3.4.2 UNIT ROOT TEST OF MACROECONOMIC DATA & ISE 100:

Before starting with the multifactor regression analysis it is important to make the unit root tests of both the dependent and the independent variables because standard inference procedures do not apply to regressions, which contain an integrated dependent variable or integrated regressors. Therefore, it is important to check whether a series is stationary or not before using it in a regression. The formal method to test the stationarity of a series is the unit root test and under the unit root test we will be implementing Augmented Dickey-Fuller test. The null and the alternative hypothesis that we will be testing is as follows:

Ho : The variable has a unit root.

H1 : The variable does not have a unit root.

The results of the test for the six macroeconomic variables and ISE 100 index are given in Table 5. Appendix II gives the unit root test results for each individual sector.

Table 5. Unit Root Test

	t-statistic	t-critical	Probability
ISE 100	-12.71398	-2.879846	4.01E-20
WPI	-6.782329	-2.87961	1.22E-08
EXP	-3.134856	-2.88126	0.0262
FEX	-9.521491	-2.879846	1.78E-14
IMP	-3.907276	-2.880987	0.0025
IPI	-4.36986	-2.881123	0.0005
IR	-9.657755	-2.880211	9.35E-15

Since all the t-statistic values are less than the t-critical values and since all the probabilities of the t-tests are less than 5%, which is the significance level used throughout this analysis, it can be concluded that the null hypothesis is rejected in favor of the alternative one. None of the variables that will be used in the regression analysis have a unit root and therefore all of them are stationary and can be used in the regression analysis.

3.4.3 CORRELATION OF MACROECONOMIC DATA & ISE 100:

In order to go into further detail and to be able to observe the interrelations between the six macroeconomic variables and ISE 100 index, correlation test will be made, which is presented in Table 6. Appendix III provides the correlation matrix of the returns of 17 sectors and macroeconomic variables, which will allow the readers to view the interrelationships between the macro variables and the individual sectors.

Table 6. Correlation Matrix of 6 Macroeconomic Variables & ISE 100

	ISE100	WPI	EXP	FEX	IMP	IPI	IR
ISE100	1.0000	0.0834	-0.1536	-0.0858	0.0653	-0.0774	-0.3430
WPI	0.0834	1.0000	-0.1097	0.4670	-0.2155	-0.1214	0.2413
EXP	-0.1536	-0.1097	1.0000	-0.0769	0.5879	0.5994	0.0611
FEX	-0.0858	0.4670	-0.0769	1.0000	-0.1477	-0.0671	0.3653
IMP	0.0653	-0.2155	0.5879	-0.1477	1.0000	0.6121	-0.1557
IPI	-0.0774	-0.1214	0.5994	-0.0671	0.6121	1.0000	-0.0528
IR	-0.3430	0.2413	0.0611	0.3653	-0.1557	-0.0528	1.0000

The correlation matrix presented above will guide us in choosing the variables that will go into our regression analysis, since very highly correlated variables will not be included in the

regression analysis. The benchmark multicollinearity is 70%, which means that if the correlation between any two variables is more than 70%, only one of those two variables will enter the multifactor regression analysis. The first striking result from the correlation matrix is that while the correlation between the five variables and ISE 100 is around 10%, the correlation between interest rate and ISE 100 is 34%, which makes us expect interest rate to have high influence on the returns of stocks and also make us anticipate that interest rate will enter the regression equations very often. Among the correlations between the six macroeconomic variables, there are three significant interrelationships that attract attention. Export has a very high correlation of 59% and 60% with import and industrial production index, respectively. Overall the highest correlation is 61%, which occurred between import and industrial production index. The correlations of these variables are significant at 1% significance level in two-tailed T-test. The high correlation between import, export and industrial production is not against general expectations, since the increase in the export levels would only be possible with the increase in the industrial production and once the welfare of the society is getting higher, consumption and therefore import increases. Since none of the relations are greater than the 70% benchmark, all of the variables will enter the regression analysis, so that we will be able to see their effects separately on the returns of indexes. Usually with two macro variables that have such high correlations (i.e.60%) we would expect to obtain the same results from the regression analysis that will be explained in the next section, i.e. if import has a significant effect on the stock returns, we would also expect to have industrial production rate to have at least a slight impact on the returns of the stocks. Therefore in the multifactor pricing model, the expectation of having similar results from highly correlated variables will also be tested. Also, usually very high correlation is expected between interest rate and inflation, which is reflected by wholesale price index in our case. In our data sample the correlation is 24%, which is relatively low compared to other countries. The reason behind the relatively low correlation between these two variables could be the huge steady inflation rates in Turkey and the interest rates, which reached abnormally high levels from time to time.

3.5. MULTIFACTOR PRICING MODEL:

The main objective of this analysis is to study whether the returns of stocks belonging to different sectors in Istanbul Stock Exchange are influenced by macroeconomic variables. In general, the stock returns are considered to be affected by either domestic or foreign variables.

Among the domestic variables, interest rates would be an example of financial variable and industrial production and wholesale price index would be an example of real shocks. Among the foreign variables, exchange rate would be counted as one of the financial foreign variables and stock market price index would be a real shock example. Most emerging markets and especially Turkey are influenced from domestic variables to a great extent, mainly due to the fact that it is segmented from the world markets and even after the liberalization process the unification could not be achieved. In order to see the degree of influence of these variables, the econometric models that we will be using are described below:

Arbitrage Pricing Theory begins with the assumption that asset markets are perfectly competitive and frictionless. The *k* factor linear pricing model of APT can be shown for the system of N assets under no arbitrage condition as follows:

$$Rt = \mu t + B\,\delta\, t + \varepsilon\, t \tag{3.3}$$

$$E\,(\varepsilon\, t|\, \delta\, t) = 0, \quad E(\delta\, t) = 0\,, \quad E(\varepsilon\, t\, \varepsilon\, 't|\, \delta\, t) = \Sigma \tag{3.4}$$

where Rt is a (Nx1) vector of asset returns, μt is a (Nx1) vector of expected asset returns, B is a (NxK) matrix of factor beta coefficients (factor loadings), δ t is a (Kx1) vector of common factor realizations and ε t is a (Nx1) vector of idiosyncratic return.

In the absence of riskless arbitrage opportunities in large economies, Ross (1976) shows that there is an approximate relation between expected returns and factor betas:

$$\mu t \approx \iota\, \lambda_0 + B\lambda_K \tag{3.5}$$

where ι is a (Nx1) vector of ones, λ_0 is a scalar of zero beta parameter and λ_K is a (Kx1) vector of factor risk premia. The above approximate relation becomes an exact relation with additional assumptions. The exact pricing relation can be shown as follows:

$$\mu t = \iota\, \lambda_0 + B\lambda_K \tag{3.6}$$

As explained in the data section, for the macroeconomic variables monthly percentage changes are calculated and for the stock index prices of selected sectors in ISE, stock returns are calculated by subtracting the logarithm of this months' index from that of the previous

months' index. This way, both for the macro variables and for the stock returns monthly continuous increase rate are calculated which brought all the data to the same comparable level.

Following the model as described in Chen, Roll and Ross (1986), equation 3.7 will guide us through the multifactor regression analysis.

$$R = a + b_{WPI}\ WPI + \beta_{IR}\ IR + \beta exp\ EXP + \beta imp\ IMP + \beta ipi\ IPI + \beta fex\ FEX + e, \qquad (3.7)$$

The model assumes the following, where R is individual stock return, betas are the loading factors on the macroeconomic variables, "a" is the constant term, and "e" is an idiosyncratic error term.

The market indices' exposure to the economic state variables is estimated by regressing their returns on the unanticipated change in the economic variables over 160 months estimation period. The multiple regression analysis is done with "Eviews" and the results of the regression analysis are analyzed in the next section. In the multiple regression analysis, the independent variables are the 6 macroeconomic variables described in the previous section. According to their significance of t-tests, we will be able to decide whether or not the independent variables have an influence on the dependent variables. The dependent variables are the returns of ISE 100 index and all the sector indexes that are calculated in the preceding section. Primarily all the six macroeconomic variables are put into the regression analysis. The hypothesis that we are testing is as follows:

Ho: Beta is equal to 0.

H1: Beta is not equal to 0.

Since our significance level is 5% ($\alpha = 0{,}05$), the probabilities of t-tests that are less than 5% will make us reject the null hypothesis in favor of the alternative one. Therefore macroeconomic variables that have t-test probabilities of less than 5% are the significant variables, i.e. they have an impact on the returns of the ISE stocks. Once the regression is done and the results of the t-tests are obtained, the insignificant variable with the highest t-test probability is taken out of the regression and the multifactor regression is repeated with the remaining five independent variables. The action of taking out insignificant variables relative

to their t-test probabilities (stepwise multiple regression analysis) is repeated until all the independent variables remaining in the regression equation become significant. The objective in drawing out the insignificant variables is that, the true coefficients of the significant variables can only be found by putting only those variables that have more than 95% probability of being different than 0, i.e. putting only the significant variables into the regression equation. At the end of this analysis, we will be capable of deciding which variables are influential on which sectors in the Istanbul Stock Exchange.

Another important notion that we have to take into consideration is the "lag" concept. We have to take into account the fact that the macro variables may not affect the returns of the stocks immediately but they may affect with 1-month lag or 2 months lag or even 3 months lag. Therefore in our analysis, we also have to run the multiple regression analysis with up to 3 months lag in order to see the optimum lag length that the macro variables affect the returns of the stocks. The optimal lag will be chosen according to the regression of each lag's Akaike Info Criterion (AIC). The AIC is often used in model selection for non-tested alternatives and always smaller values of the AIC are preferred. Therefore the optimal lag will be chosen according to the lowest Akaike Info Criterion and the regression equation will be written according to the optimal lag. The reasoning behind investigating the relationship between macro variables and the returns with lags is that, some of the statistics of the variables like industrial production index is announced at the end of two months and while some of them like wholesale price index is announced at the end of the month and while the statistics of others like interest rate and foreign exchange rate are readily available to public every day. To be able to observe whether or not the variables from previous months affect the returns of this month the regression analysis will be implemented with up to three lags. In the empirical results section terms like "contemporaneous", "1 month lag" are used. While "contemporaneous" refers to this month's variables affecting this month's returns, "1 month lag" means previous month's macroeconomic variables affecting this month's returns.

The regression equation with 1-month lag will be as follows:

$$R_t = a + b_{WPI}\, WPI_{(t-1)} + \beta_{IR}\, IR_{(t-1)} + \beta exp\, EXP_{(t-1)} + \beta imp\, IMP_{(t-1)} + \beta ipi\, IPI_{(t-1)} + \beta fex\, FEX_{(t-1)} + e$$

The regression equation with 2-month lag will be as follows:

$$R_t = a + b_{WPI}\, WPI_{(t-2)} + \beta_{IR}\, IR_{(t-2)} + \beta exp\, EXP_{(t-2)} + \beta imp\, IMP_{(t-2)} + \beta ipi\, IPI_{(t-2)} + \beta fex\, FEX_{(t-2)} + e$$

The regression equation with 3-month lag will be as follows:

$$R_t = a + b_{WPI}\, WPI_{(t-3)} + \beta_{IR}\, IR_{(t-3)} + \beta exp\, EXP_{(t-3)} + \beta imp\, IMP_{(t-3)} + \beta ipi\, IPI_{(t-3)} + \beta fex\, FEX_{(t-3)} + e$$

Once four separate regression analysis are completed and all the insignificant variables are removed from the regression equation, leaving only those variables that are significantly different than 0, the optimal lag between the four options should be chosen. The lag that has the lowest Akaike Info Criterion will be the optimal lag and only that lag will be presented in the empirical results section.

4. *EMPIRICAL RESULTS and INTERPRETATION*

4.1 RESULTS OF THE EMPIRICAL STUDY

Table 7. Contemporaneous Multifactor Regression Results:

SECTOR	SIGNIFICANT FACTORS	ADJUSTED R-SQUARED	SIGNIFICANCE OF F-STATISTIC	CONSTANT
ISE-100	WPI, IR, EXP, IMP	0.157574	0.000003	-0.00391
AL & AP	IR	0.07678	0.000382	0.039431
AUTO	WPI, EXP, IMP, IR	0.118823	0.000091	-0.012682
BNK	WPI, IR	0.153744	0.000001	-0.036035
B.IND	WPI, IR	0.131956	0.000006	-0.014216
BLD&CNS	WPI, IR	0.138907	0.000003	-0.021274
BRW	WPI, EXP	0.072528	0.001004	0.003031
C.GDS	WPI, EXP	0.07942	0.000559	0.006338
DFS	IR	0.110998	0.000016	0.043509
ELCT	FEX	0.035521	0.009695	0.03711
G. IND	WPI, EXP, IMP, IR	0.100343	0.000404	-0.006536
HHS&TEX	WPI, IR	0.106785	0.000052	-0.011998
HHOLDAPPL	EXP, IR	0.104936	0.000062	0.049222
S.DRNK	IR	0.105879	0.000016	0.032831
STL	EXP, IMP, IR	0.083104	0.000871	0.027616
TM & IT	IR	0.098802	0.000031	0.041798
TEX&LTH	WPI, IR	0.14119	0.000002	-0.056076
TR&RB	IR	0.126504	0.000002	0.032412

In Table 7, the significant macroeconomic factors for each sector, associated with their "adjusted multiple coefficient of determination" (adjusted R-squared), the significance level of F-statistic and the constant term of the multiple regression equation are given. For ISE-100 index, the significant factors are "wholesale price index, export, import and interest rate". For the other sectors, significant factors vary; but what is the striking empirical result is that "interest rate" is the only macroeconomic variable that explains the fluctuation of the majority of the sector's stock return, which is exactly what was predicted from the correlation matrix. Multiple correlation coefficient gives the linear correlation between the observed and model-predicted values of the dependent variables, i.e. stock returns. Except for a few examples, most of the adjusted R-squared values are greater than 10%, indicating that around 10% of the

variation of the stock returns is explained by the model specified. The fact that adjusted R-squared values is greater than 10% makes us use this model safely.

The regression analysis also presents the "Anova" table, which tests the acceptability of the model from a statistical perspective. F-test tests the overall significance of the model; it is used to determine whether there is a significant relationship between the dependent variable, i.e. stock return and the set of all independent variables, i.e. macroeconomic factors. In Table 7, the significance levels of F-tests are given.

The hypothesis that will be tested with the F-test is as follows:

$$Ho: \beta_1 = \beta_2 = \ldots = \beta_6 = 0$$

Ho: One or more of the factor loadings is not equal to zero.

Significance of F-test for all the sectors is less than the level of significance (α=0.05), which makes us reject the null hypothesis in favor of the alternative one. This shows us that, one or more of the betas is not equal to 0, or some of the macroeconomic variables take active roles in explaining the variability of the stock returns. We can conclude that both for ISE National 100 index and for all the sectors, the variation explained by the model constructed is not due to chance.

4.2 RESULTS OF REGRESSION ANALYSIS ON A SECTORAL BASE WITH LAGS

The regression equation for the optimal lag will be presented for each section and the effects of each macroeconomic variable will be analyzed. The actual results of the empirical study will be compared with the expectations that were analyzed in the previous section and possible explanations will be discussed. The regression results of each sector for each lag associated with the significant factors can be analyzed in Appendix IV.

4.2.1 ISE NATIONAL 100:

$$R = -0.00391 + 1.01811 * WPI - 0.8461 * IR - 0.2694 * EXP + 0.19176 * IMP + e$$

The lowest AIC has been realized while both the dependent and the independent variables are contemporaneous and therefore the optimal lag for the ISE-100 index is contemporaneous. For the return of ISE-100 composite index, while WPI and IMP have positive effects, IR and EXP have negative effects. If wholesale price index increases by 1%, the return will increase by 1.018%; if import increases by 1%, return will augment by 0.1917%. If interest rates increase by 1%, the effect will be a 0.8461% decrease in the return of ISE-100 and if export increases by 1%, the effect will be a 0.2694% decrease. This multifactor pricing equation clearly states that while two factors will ameliorate the returns of the stocks, the other two factors will worsen the returns.

At the beginning of the analysis, interest rates were expected to have a negative effect on the stock returns and the empirical finding from the ISE 100 index proved this result. This result demonstrates that the money market and the securities market are substitutes of each other. If the interest rates fall, investors and also the speculators shift to the stock exchange to invest their money which in turn increases the stock prices. Another possible explanation for the inverse relationship between the interest rates and the stock returns can be attributed to the fact that once the interest rates fall, an incentive is born for the investors to borrow money from the money markets at a low rate and invest the borrowed money in the stock exchange. The repeated action of borrowing at a low rate and earning higher rates increases the stock prices and therefore the returns. Due to these two reasons, the expected result of the negative effect of interest rates on the stock returns is obtained.

Although interest rates results came out to be as expected, we cannot reach the same conclusion for the wholesale price index. The empirical findings of this study are in conflict with our expectations that inflation has a negative effect on stock returns. The negative relationship observed in the previous studies between common stock returns and various measures of expected and unexpected inflation is "troublesome" because it appears to contradict both the results of our empirical study and Fisher's (1930) prediction of a positive relationship between expected inflation and nominal asset returns, and the received wisdom that common stocks are hedges against inflation. Financial economists argue that the relationship between stock returns

and actual inflation should be positive since stocks are claimed on physical, or "real", assets, and are treated as a possible hedge against unexpected inflation. An equity investment is believed to be relatively a good hedge against inflation. Thus, the stock return-inflation relationship has been an intriguing anomaly for financial economists as well as investors. According to our results, higher inflation does not depress stock values. If investors and business managers correctly anticipate variations in the inflation rate over the life span of capital investments at the time these projects are undertaken, real equity values may neither rise nor fall in response to the inflation rate. The accuracy of the inflation predictions signal to the investors that there is nothing unexpected with the market, which creates a further initiative to the investors who are reluctant to invest due to the instability of the economic conditions. Also, when considering the economic and social conditions Turkey is in, it is observed that the Turkish economy goes through an "expansionary inflation" process. As the economy is improving and the investments are increasing there is more demand for money supply. If the money demand is met with printing more money, inflation increases because of the expansion in the real economic activity. Because real economic activity and stock prices are directly and positively related, the expansionary inflation indirectly and positively affects the stock prices. Hence, due to the expansion in investments and consequently the growth in real activity, both the inflation and the values of the firms and therefore the stock prices increase, leading to expansionary inflation. Therefore it can be concluded that, in the Turkish economy, inflation and hence wholesale price index has a positive effect on stock returns both because the finance sector including the investors anticipate the levels the inflation will be flowing at and also because the inflation in the Turkish economy is due to the expansionary movements of the economy itself which subsequently leads to increasing stock returns.

Another important result concerns the effects of export and import. The fact that export has a negative effect on the stock returns while import has a positive effect shows that ISE is dominated by firms, which are local market oriented. When the imports increase only the cash flows of the firms that have accomplished the imports will increase, which means that the cash flows of the local market oriented firms will be raised. This, in turn will increase the stock prices of these firms. Since for ISE 100 index, the overall result is a negative effect from export and a positive effect from import, it can be concluded that the majority of the firms administered in ISE are domestically oriented firms.

4.2.2 AIRLINES and AIRPORTS:

$$R = 0.039431 - 1.0648 * IR + e$$

For the airlines and airports sector, contemporaneous relationship is the optimal lag and the only significant macro variable is the interest rate, which has a negative affect on the return of this sector. A 1% increase in interest rates will decrease the returns of the stock by 1.0648%. Just like anticipated, interest rates have a negative effect on stock returns both due to the substitutability of money and stock markets and the intention of investors to borrow from one market and invest in the other one.

4.2.3 AUTOS and PARTS:

$$R = -0.012682 + 1.11504 * WPI - 0.3014 * EXP + 0.27077 * IMP - 0.9091 * IR + e$$

Just like for the ISE 100 index, the optimal lag for "autos and parts" is "contemporaneous" and again just like ISE 100, for the significant factors in the determination of the returns, wholesale price index, import, export and interest rates take the leading roles. 1% increase in WPI, EXP, IMP and IR will affect the return by 1.115%, -0.301%, 0.271% and –0.909%, respectively.

In co-ordinance with our expectations, interest rate has a negative effect on stock returns while as opposed to our expectations wholesale price index has a positive effect on the returns of stocks. Because export affects this sector positively and import affects negatively, it can be concluded that this sector mostly works for the domestic consumption. Also, the autos and parts sector mostly imports raw materials and sells them in the domestic market, indicating the increase in the cash flows of these firms, which subsequently increases the sector's stock prices in total.

4.2.4 BANKS:

$$R = -0.036035 + 1.57964 * WPI - 1.0187 * IR + e$$

For the "banks" sector, the optimal lag occurs when the macroeconomic variables and the return of the banking sector are contemporaneous. Wholesale price index and interest rate are

the main variables affecting the returns of the bank sector. 1% increase in WPI would result in 1.579% increase in the return. The same amount of increase in interest rate would result in 1.0187% decrease in the bank stock returns.

Due to the substitutability effect between the money and securities market, the anticipated result of negative effect from interest rate is reached. The anticipated effect from the wholesale price index cannot be obtained both because expansionary inflation exists in the Turkish economy, which lets the stock returns increase as the inflation increases and also because the investors can predict the inflation rates and make their investment calculations accordingly, which prevents the occurrence of inflation's negative effect.

4.2.5 BASIC INDUSTRIES:

$$R = -0.014216 + 1.14575 * WPI - 0.9841 * IR + e$$

"Contemporaneous relationship" gives the lowest AIC and therefore it is the best lag alternative. For the basic industries, WPI has a 1.145% increase and IR has a 0.9841% decrease effect for the 1% change in their absolute values. The basic industries sector, which includes the industries that constitute the backbone of the majority of the other industries like cement and steel industry is negatively affected from the interest rates, as expected. As opposed to our expectations, the basic industries are positively affected from the wholesale price index due to the financial analyst's precise predictions and the existence of expansionary inflation in Turkey.

4.2.6 BUILDING and CONSTRUCTION MATERIALS:

$$R = -0.021274 + 1.25213 * WPI - 0.6398 * IR + e$$

The optimal lag for the building and construction materials sector occurs when the dependent and the independent variables are contemporaneous and the significant factors affecting the return are WPI and IR. A 1% increase in WPI would increase the return by 1.252% and a 1% increase in IR would decrease the return of this sector by 0.6398%. Therefore the increase made by WPI would partly be offset by the decrease made by IR. It is anticipated that interest rates affect the return negatively because the securities market and the money market act as

substitutes to each other. As opposed to interest rate, the expectations for wholesale price index do not reflect the findings of our empirical study. According to the literature analyzed, inflation negatively affects the stock returns. However, Turkish economy is rather a special case where the inflation occurs due to the expansion in the economy, and the increases in inflation raises the stock prices, because expansion of the economy means the growth of the firm values. Also because the analysts in the Turkish economy can make intelligent assumptions about the inflation rates, they do not make huge unexpected inflation differences, which do not cause negative effect on the stock returns. Furthermore, while the inflation expectations are realized, it signals to the financial markets that everything is going well, which creates incentives for the potential investors who are considering to invest in the ISE.

4.2.7 BREWERS:

$$R = 0.003031 + 1.34097 * WPI + 0.40764 * EXP + e$$

For the brewers sector, the lowest AIC belongs to "2 months lag", therefore 2 months lag is the optimal one. The macro variables from 2 months before affect the returns of this month for the brewers sector. Wholesale Price Index and Export are significant in explaining the returns where a 1% increase in WPI and EXP affect the returns by 1.341%, and 0.4822% respectively.

The majority of this sector's revenues belong to two big Turkish Brewery companies and as the export levels increase the revenues of these two firms and therefore their stock prices increase. The outward looking characteristics of the above mentioned two firms that constitute the backbone of the brewery sector explain why export has a positive effect on the returns of the stocks. As opposed to the inflation expectations, wholesale price index positively affects the stock returns both because expansionary inflation exists in Turkey and because the majority of the inflation predictions coincide with the reality. The increases in the inflation rates would depress the stock values only when they are unexpected. In Turkey, although from time to time unusually high inflation levels are reached, because they are anticipated it does not depress the stock prices. As long as the expected inflation levels coincide with the real inflation, wholesale price index would positively affect the stock returns.

4.2.8 CYCLICAL CONSUMER GOODS:

$$R = 0.006338 + 1.37321 * WPI + 0.24048 * EXP + e$$

For the "cyclical consumer goods" sector, the lowest AIC is realized in 2-months lag, which is therefore the optimal lag. Wholesale price index and export are the two significant variables and both of them affect the return of this sector positively. 1% increase in WPI and EXP would increase the returns by 1.373% and 0.2404% respectively.

The companies within the cyclical consumer goods sector are export-oriented companies; they mostly export the cyclical products to foreign countries. This explains why export levels positively affect the returns of this sector. When exports increase, the future cash flows of these companies also augment which consequently increases the returns and therefore the stock prices of the companies within the cyclical consumer goods sector. Wholesale Price Index also affects this sector's returns positively due to the accuracy of the inflation predictions made by the financial analysts and the existence of expansionary inflation.

4.2.9 DEFENSE:

$$R = 0.043509 - 1.1477 * IR + e$$

For the defense sector, the optimal lag arises contemporaneously and the only significant factor is the interest rate, which has a negative 1.1477% effect on the defense returns for the 1% change in the interest rate. The negative impact of interest rate on the defense sector, which is comprised of one single company that is partly owned by the government, indicate that an increase in interest rates would also decrease the stock prices of a sector that would mostly be managed by the decisions taken by the government.

4.2.10 ELECTRICITY:

$$R = 0.03711 + 0.58096 * FEX + e$$

The electricity sector reaches its optimality in 2-months lag at which the only significant variable is the foreign exchange rate. If FEX increases by 1 %, the return of the electricity

sector will be positively affected by 0.581%. Electricity sector is a very unique sector because it is one of the few sectors that reach its optimality in 2-months lag and it is the only sector that is affected from the foreign exchange rate. The raw materials of electricity and the electricity, itself, is either domestically supplied or it is imported from the foreign countries. When devaluation occurs, which depreciates the Turkish Lira, it becomes more expensive to import either the raw material or electricity, which converts all the demand to the domestic suppliers that become relatively cheaper with the devaluation. Therefore, the sales and the revenues of the domestic electricity producing companies increase which subsequently increases the stock prices. Hence, the increase in foreign exchange rates result in an increase in the stock prices of the domestic companies belonging to the electricity sector.

4.2.11 GENERAL INDUSTRIALS:

$$R = -0.006536 + 1.18316 * WPI - 0.3992 * EXP + 0.35886 * IMP - 0.6577 * IR + e$$

For the general industrials sector the lowest AIC occurs contemporaneously and there are four factors significantly affecting the return of this sector. WPI and IMP positively affect the return by 1.1832% and 0.3588% for a 1% change in their absolute values. EXP and IR negatively affect the return by 0.3992% and 0.6577% for a 1% change in their values.

The fact that general industrials is affected from export negatively and import positively clearly demonstrates that this sector is an inward-looking one, of which the prices increase in direct relation with the increases in imports. Also, the raw materials of this sector is generally imported from the foreign countries, indicating that as the imported raw materials increase production and therefore the sales and revenue increase which consequently augments the stock prices of the general industrials sector. While interest rates negatively affect this sector's stock prices due to the substitutability of the money and securities market, wholesale price index positively affects the returns due to the accuracy of inflation predictions.

4.2.12 HOUSEHOLD GOODS and TEXTILES:

$$R = -0.011998 + 1.27776 * WPI - 0.8196 * IR + e$$

The optimal lag for the household goods and textile sector occurs contemporaneously as it has the lowest AIC and this sector is mainly affected by wholesale price index and interest rates. 1% increase in WPI and IR would make an effect of "1.2778%", "-0.8196%" on the return of household goods and textile respectively. In accordance with the expectations interest rates also affects the household goods and textile sector negatively. In conflict with the expectations wholesale price index positively affects this sector.

4.2.13 HOUSEHOLD APPLIANCES:

$$R = 0.049222 - 0.2439 * EXP - 0.803 * IR + e$$

Household appliances sector has the optimal Akaike value when both the dependent and the independent values are at the same time, i.e. contemporaneous. Both export and interest rate negatively affect the return of household appliances by 0.24395% and 0.803% respectively. The negative effect from the interest rates is as we have expected. The negative effect from export indicates that household appliances sector is not foreign markets oriented. The increase in exports is not capable of increasing the stock prices of this sector demonstrating that the increase in exports is not associated with the increase in cash flows of this sector. Hence, the sales of household appliances are not foreign country-oriented.

4.2.14 SOFT DRINK:

$$R = 0.032831 - 1.0771 * IR + e$$

The soft drink sector is realized best contemporaneously and the only variable that affects soft drink is the interest rate, which has a negative impact of 1.0771% on the return for an increase of 1% in the variable. Therefore, our expectation of interest rates based on the substitutability characteristic of money and securities markets is empirically proved with the soft drink sector.

4.2.15 STEEL INDUSTRY:

$$R = 0.027616 - 0.3882 * EXP + 0.27394 * IMP - 0.6769 * IR + e$$

For the steel industry, the lowest AIC takes place contemporaneously, which makes "no lag" the optimal one. While export and interest rate have negative effect on the return, import has a positive effect. As a 1% increase in export and interest rate would decrease the returns of steel industry by 0.3882% and 0.6769% respectively, a 1% increase in import would increase this sector's return by 0.2739%. The steel industry is mostly domestic-oriented, because it is negatively affected from exports while being positively affected from imports. The imports both in the form of finished goods and raw materials will increase the sales of this industry, which consequently increases the future cash flows, and therefore the stock prices of the steel industry. The negative impact from the interest rates is as anticipated because the money and securities markets can be used as alternatives to each other.

4.2.16 TELECOM, MEDIA and IT:

$$R = 0.041798 - 1.0241 * IR + e$$

Telecom, Media and IT sector has the lowest AIC when the return of this sector and the macroeconomic variables are in the same time frame, i.e. they are contemporaneous and therefore this is the optimal lag. The only significant variable affecting this sector is the interest rate and it has a negative 1.024% effect for the 1% increase in interest rates. This result coincides with both our expectations and the literature review that is analyzed.

4.3.17 TEXTILES and LEATHER:

$$R = -0.056076 + 2.09204 * WPI - 0.7753 * IR + e$$

The optimal lag for the textiles and leather sector is same time option, contemporaneous relationship exists. There are two significant factors affecting the returns of this sector. While WPI positively affects the return by 2.092%, IR partly offsets this positive effect by its own negative 0.775% effect. Unlike the inflation anticipations stated in the previous section, wholesale price index positively affects the returns of the textiles and leather sector proving

that in case of an expansionary inflation, the stock values are not depressed and also demonstrate that the expectations of the finance world does not let the unexpected high inflation rates to negatively affect the stock returns. As predicted, the interest rates negatively affect the returns.

4.2.18 TIRES and RUBBER:

$$R = 0.032412 - 1.1316 * IR + 0.31244 * EXP + e$$

Akaike Info Criterion is the lowest in the contemporaneous relationship, which makes it the optimal lag. The significant variables are IR, IPI and EXP. A 1% increase in IR, IPI and EXP would have a net effect of -1.1316%, -0.5801% and 0.31244% on this sector's stock returns respectively. The positive effect from the export level indicates that the tires and rubber sector is an export-oriented sector. Since an increase in export levels increases their stock prices, a considerable amount of their sales and hence their revenues come from their sales to foreign countries. The negative effect of interest rates is as expected.

5. CONCLUSION

In this analysis, with the use of Arbitrage Pricing Theory and Multifactor Pricing Model, we tried to investigate whether or not there were certain macroeconomic variables that were active in determining the price and therefore the return of the stocks in the Istanbul Stock Exchange. In order to be able to capture all the effects of the macroeconomic variables, we also implemented the "lag concept" to our analysis. The results of this empirical study are rather important both for the investors who are in the process of investing in ISE as well as for the macroeconomic policy makers.

The most significant finding is that "interest rate" takes active role in the fluctuation of the majority of the sectors analyzed in this study and moreover, interest rates negatively affect the returns of each sector, which is in accordance with the expectations. When the interest rates fall, investors hesitate to invest their money in the money markets, they rather prefer to invest in the securities markets and earn greater profits. The intention of investors to stay away from the money markets and invest their money in the stock exchanges, when the interest rates fall, illustrate the substitutability characteristic of the two markets which result in an inverse relationship between them. Also when the interest rates fall, investors find it more advantageous to borrow money from the money markets at a low rate and invest the borrowed money in the securities markets, which will make them earn higher yields. Once interest rates rise we would expect to have the price and therefore the returns of the stocks to fall and vise verse. Another important result concerning the interest rates is that there are only three sectors that are not significantly affected from the interest rates and all three of them reach their optimality at the 2-months lag. This result is basically due the instant announcements made for the interest rates, which lets the interest rates to affect the stock prices immediately and contemporaneously. Interest rates occupy a very important position in Turkey, because they are taken into consideration in almost every single financial decision taken from investing in real estates to getting credits from the banks. Therefore in an economy where everything is clearly related to the interest rates, the inverse relationship between the interest rates and the stock prices would help the investors to a great extent in the timing of their investments.

The second most dominant factor in determining the stock prices is the "wholesale price index", which basically reflects the inflation rate occurring in Turkey. As opposed to interest

rate, wholesale price index has a positive effect on the returns of the sectors within Istanbul Stock Exchange. From the literature that was analyzed, it was predicted that inflation would have negative effects on the returns of the stocks. But according to our empirical results, wholesale price index positively affected the stock returns. The reasoning behind the conflicting reality is due to the expansionary characteristic of inflation present in Turkey. Because the Turkish economy is growing, there is more demand for money supply. Once this demand is met, both the inflation and the investments and therefore the cash flows of the firms increase. The increasing firm value corresponds to increasing stock prices. Hence the inflation positively affects the stock prices due to its expansionary characteristic. Also the accuracy of the inflation predictions plays an important role. High inflation levels do not necessarily depress the stock prices. If the forecasts are made by taking into consideration all the economic, financial, political and social factors, an accurate inflation figure can be attained which will make the investors make their decisions according to the predetermined inflation rate. Once the investment decisions are taken by already knowing what the inflation rate is going to be, the high levels of inflation will not depress the stock values, in fact they will have a positive effect on the prices of the stocks. Therefore, wholesale price index in the Turkish economy positively affects the stock prices within Istanbul Stock Exchange.

The effect of "export" level on ISE is rather controversial. While export affects ISE-100, Autos and parts, General Industrials, Household Appliances and Steel Industry negatively; it affects Brewers and Cyclical Consumer Goods positively. This shows us that export does not have a general single influence, its' effect rather depends on the sector, itself. If the sector is mostly dominated by export-oriented companies, the increase in export means an increase in their sales and revenues, which consequently augments their future cash flows. The increasing cash flows will increase the stock prices. Therefore for the foreign country-oriented sectors an increase in exports will raise their stock prices, while for domestic market-oriented ones an increase in export will have a negative effect on the stock prices, decreasing the stock returns.

Although "import" affects only a few sectors including ISE 100, Autos and Parts, Brewers, General Industrials and Steel Industry, the net effect of import is always positive. The sectors that are positively affected from import include companies that are inward-market oriented, i.e. the majority of the sales of these companies come from the domestic market. Once the level of import increases, the revenues of the import-oriented companies also augment, which set grounds for the increase in their stock prices. Another striking result is that imports do not

affect negatively even one single sector. This shows that when the imports increase, even the export-oriented companies are not negatively affected. Therefore it can be concluded that once the import levels increase, we would expect to have increases in the stock returns of the sectors that are significantly affected from import, while no negative effect is expected for the export-oriented firms.

Another important conclusion we can draw from the results is that "foreign exchange rate" is the significant variable for only one sector, which is the "electricity sector". This is not surprising since, 40% of the raw material of the electricity produced in Turkey is bought from the foreign countries and so the price of the raw material and therefore the price of the electricity are directly related to the foreign exchange rates. When a devaluation of the Turkish Lira occurs, which depreciates the domestic currency and increases the foreign exchange rate, the demand of electricity's raw material is tried be supplied from the domestic sources, which increases the revenues of the domestic electricity companies. Therefore when the foreign exchange rates increase, the returns of the domestic electricity producer companies increase, which consequently raises their stock prices. Therefore it is expected to have foreign exchange rate to have direct positive influence on the price of electricity and therefore the return of the electricity sector.

The last independent variable that we should be considering is the "industrial production index" that has no significant influence on any of the sectors that are under analysis. This may be due to the fact that industrial production index is announced at the end of two months which decreases the value of this data for the investors since when the data is announced it is no longer current and so investors do not prefer to make their investments according to the data that belongs to the reality of two months ago.

As can be observed from the empirical results section, except for three sectors the optimal lag for all the sectors occurred contemporaneously. For "Brewers", "Cyclical Consumer Goods" and "Electricity" sectors, the 2-month lag is the optimal lag. Therefore for these three sectors, the macroeconomic variables from 2 months ago affect the stock return of this month. For all the other sectors and for ISE-100 index contemporaneous relationship exists. One of the purposes of this analysis was to test the Istanbul Stock Exchange for efficiency. According to the semi-strong form efficiency, no relationship should exist between the lagged values of the changes in economic variables and changes in the equity prices. According to the empirical

findings of this study, the interrelations between the real economy and the equity market are realized without any lags except for three sectors. The contemporaneous relationship between the macroeconomic variables and the stock returns removes the opportunity of profitable trading strategies based on public information. In the previous empirical studies, the results for ISE indicated that the stock prices could be forecasted with lags, the information that belonged to the previous months would affect today's stock exchange, which consequently proved that ISE was inefficient with respect to monetary policy variables. The most significant factor that differentiates this empirical study from the previous ones is that our empirical study demonstrated that the Turkish Stock Market has improved over time and reached the levels of semi strong form efficiency such that no profit opportunity exists for domestic and foreign investors who could use the easily accessible policy variables for forecasting stock returns.

The reasoning behind the contemporaneous relationship is that, expectations play a major role in the determination of macroeconomic variables. For example although wholesale price index is announced at the end of the month, there is always the expectation of the wholesale price index throughout the month. From our results it is evident that, the expectations of the statistics rather than the statistics themselves play a major role in the determination of the stock prices and therefore the returns.

This empirical study will be used by asset managers in the decision process of which sectors to include in the portfolios. As well as the asset managers, individual investors can use the results in order to choose which sector to focus on and the asset liability managers can use the outcomes in the pricing process. All the individuals and the institutions that take active role in the arrangement process of macroeconomic policies and the political decisions concerning these issues, including the related departments of government and IMF, the Ministry of Finance, the Treasury, Central Bank of Turkey will be using the empirical findings of this analysis. Further research that will analyze the effects of macroeconomic variables on the sectors of the other emerging markets, as well as the developed markets, is expected from the academic world that will set the grounds for comparison between different stock exchanges on a sector basis. Concisely, all the related parties that have interest in the macroeconomic

variables of Turkey as well as the academic world that will develop our study can benefit from the results of this analysis.

In a nutshell, while Istanbul Stock Exchange has become more efficient as of 2003, in a contemporaneous relationship, interest rates play the most important role in the price determination of the stocks in ISE and industrial production index does not have an influence at all. The investors should always take into account the statistics as well as the expectations of these statistics in the decision process of where to invest, otherwise only taking into account the statistics themselves may make them to take unsuccessful decisions. This empirical study that will be used by the financial, as well as the academic world opens a new research area in which further investigation is required in order to fully comprehend the effects of macroeconomic variables on sectors within securities markets worldwide.

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7. APPENDICES INDEX

APPENDIX I. Descriptive Statistics Of Sectors

	AL & AP	AUTO	BANK	BASIC IND.	BLD & CNS	BREWERS
Mean	0.03818	0.041415	0.034913	0.038957	0.035442	0.050153
Median	0	0.04056	0.02622	0.020075	0.028765	0.01638
Maximum	0.88804	0.7557	0.63293	0.61702	0.44667	0.59306
Minimum	-0.7938	-0.54367	-0.49582	-0.69418	-0.50143	-0.55859
Std. Dev.	0.265838	0.208273	0.186598	0.184311	0.135715	0.172828
Skewness	0.36115	0.30925	0.208413	0.090522	-0.039468	0.399115
Kurtosis	4.045784	4.419261	3.776379	5.32337	4.560278	4.03703
Jarque-Bera	9.961526	14.78054	4.788468	33.49008	15.05098	10.56104
Probability	0.006869	0.000617	0.091243	0	0.000539	0.00509
Sum	5.65068	6.12949	5.1671	5.76561	5.24547	7.42258
Sum Sq. Dev.	10.38849	6.376507	5.118371	4.993664	2.707516	4.390826

	C.GDS	DEFENSE	ELECTRICITY	GEN. IND.	HHLDAPP	HHS & TEX
Mean	0.040407	0.048546	0.03669	0.046492	0.042044	0.042848
Median	0.03359	0.03149	0.015045	0.032495	0.033869	0.035005
Maximum	0.52744	0.87973	0.6498	1.00209	0.635048	0.51166
Minimum	-0.5712	-0.53349	-0.54859	-0.60209	-0.504737	-0.58014
Std. Dev.	0.168768	0.236574	0.208095	0.205727	0.191715	0.174888
Skewness	0.260448	0.568534	0.311009	0.676349	0.04855	
Kurtosis	4.069192	4.295695	3.506569	6.022958	3.156046	3.421054
Jarque-Bera	8.72278	18.32581	3.968364	67.63639	0.208302	1.107152
Probability	0.012761	0.000105	0.137493	0	0.901089	0.57489
Sum	5.980166	7.18475	5.43009	6.88078	6.222467	6.3415
Sum Sq. Dev.	4.186968	8.227216	6.365615	6.22156	5.402907	4.496109

	S.DRNK	STEEL	TM & IT	TEX & LTH	TR & RB
Mean	0.034617	0.032306	0.044725	0.033035	0.038547
Median	0.026155	0.02108	0.030235	0.014945	0.02819
Maximum	0.69314	0.75686	0.85905	0.58447	0.57358
Minimum	-0.49809	-0.83533	-0.48855	-0.58954	-0.69283
Std. Dev.	0.227287	0.227672	0.219189	0.178156	0.208878
Skewness	0.345924	0.121593	0.359478	0.085464	-0.35947
Kurtosis	3.257261	4.365335	4.188903	3.609281	3.809937
Jarque-Bera	3.359827	11.86022	11.90406	2.469381	7.232707
Probability	0.18639	0.002658	0.002601	0.290925	0.026881
Sum	5.12337	4.78132	6.61925	4.88923	5.705
Sum Sq. Dev.	7.593949	7.619707	7.062466	4.665694	6.413605

APPENDIX II. Results Of Unit Root Tests

	t-statistic	t-critical	Probability
AL & AP	-14.017564	-2.88112	5.02E-21
AUTO	-12.630618	-2.87961	5.25E-20
BANK	-12.50611	-2.87961	7.92E-20
B. IND	-12.83506	-2.87961	2.73E-20
BLD & CNS	-11.76058	-2.87961	1.13E-18
BRW	-13.53911	-2.87961	3.58E-21
C. GDS	-14.03232	-2.87961	1.06E-21
DFS	-11.90128	-2.88059	1.26E-18
ELCT	-13.48279	-2.87961	4.15E-21
G.IND	-13.96002	-2.87961	1.25E-21
HHOLDAPP	-13.59888	-2.87961	3.06E-21
HHS & TEX	-12.79166	-2.87961	3.13E-20
S.DRNK	-12.16955	-2.87961	2.52E-19
STL	-13.85834	-2.87961	1.60E-21
TM & IT	-11.96966	-2.87961	5.19E-19
TEX & LTH	-12.57929	-2.87961	6.21E-20
TR & RB	-12.02534	-2.87961	4.24E-19

***APPENDIX III.* Correlation Matrix Of 17 Selected Sectors & Macro Variables**

	AIR	AUTO	BNK	B.IND	BLCON	BRW	C.GDS	CPI	DFS	EXP	FEX	IMP	IPI	IR	ELCT	G.IND	H.APL	H&TEX	S.DRK	STL	TM&IT	TXLTH	TR&RB
AIR	1.000	0.438	0.540	0.654	0.534	0.283	0.351	0.039	0.507	-0.029	-0.090	-0.041	-0.079	-0.288	0.373	0.484	0.553	0.518	0.525	0.517	0.530	0.472	0.588
AUTO	0.438	1.000	0.675	0.620	0.623	0.579	0.690	0.055	0.586	-0.078	-0.058	0.097	-0.065	-0.314	0.575	0.783	0.766	0.753	0.585	0.608	0.737	0.681	0.700
BNK	0.540	0.675	1.000	0.673	0.716	0.503	0.592	0.179	0.610	-0.083	-0.089	0.110	-0.045	-0.330	0.491	0.753	0.735	0.725	0.564	0.620	0.663	0.684	0.625
B.IND	0.654	0.620	0.673	1.000	0.761	0.410	0.515	0.100	0.646	-0.094	-0.021	0.061	-0.045	-0.334	0.566	0.667	0.713	0.690	0.667	0.857	0.645	0.667	0.696
BLCON	0.534	0.623	0.716	0.761	1.000	0.558	0.627	0.204	0.577	-0.053	0.044	0.004	-0.104	-0.268	0.541	0.672	0.728	0.730	0.657	0.646	0.639	0.738	0.666
BRW	0.283	0.579	0.503	0.410	0.558	1.000	0.941	0.124	0.433	0.000	0.084	0.041	-0.077	-0.222	0.410	0.616	0.533	0.612	0.394	0.357	0.586	0.597	0.384
C.GDS	0.351	0.690	0.592	0.515	0.627	0.941	1.000	0.090	0.537	0.014	0.033	0.092	-0.042	-0.277	0.465	0.714	0.646	0.684	0.475	0.454	0.659	0.638	0.521
CPI	0.039	0.055	0.179	0.100	0.204	0.124	0.090	1.000	0.017	-0.102	0.467	-0.224	-0.127	0.249	-0.031	0.092	0.053	0.127	-0.059	0.035	0.006	0.265	-0.035
DFS	0.507	0.586	0.610	0.646	0.577	0.433	0.537	0.017	1.000	-0.071	-0.126	0.096	0.032	-0.345	0.489	0.605	0.664	0.643	0.626	0.617	0.661	0.604	0.635
EXP	-0.029	-0.078	-0.083	-0.094	-0.053	0.000	0.014	-0.102	-0.071	1.000	-0.075	0.603	0.627	0.059	0.028	-0.051	-0.146	-0.165	-0.082	-0.131	-0.068	-0.160	-0.028
FEX	-0.090	-0.058	-0.089	-0.021	0.044	0.084	0.033	0.467	-0.126	-0.075	1.000	-0.151	-0.068	0.368	-0.162	-0.107	-0.067	-0.013	-0.164	-0.044	-0.160	0.091	-0.208
IMP	-0.041	0.097	0.110	0.061	0.004	0.041	0.092	-0.224	0.096	0.603	-0.151	1.000	0.620	-0.169	0.090	0.124	0.052	0.023	-0.018	0.105	0.071	-0.023	0.110
IPI	-0.079	-0.065	-0.045	-0.045	-0.104	-0.077	-0.042	-0.127	0.032	0.627	-0.068	0.620	1.000	-0.054	-0.019	-0.031	-0.079	-0.084	-0.102	0.003	-0.078	-0.097	-0.011
IR	-0.288	-0.314	-0.330	-0.334	-0.268	-0.222	-0.277	0.249	-0.345	0.059	0.368	-0.169	-0.054	1.000	-0.208	-0.242	-0.310	-0.274	-0.339	-0.255	-0.332	-0.215	-0.386
ELCT	0.373	0.575	0.491	0.566	0.541	0.410	0.465	-0.031	0.489	0.028	-0.162	0.090	-0.019	-0.208	1.000	0.518	0.521	0.511	0.539	0.535	0.483	0.504	0.544
G.IND	0.525	0.585	0.564	0.667	0.657	0.394	0.475	-0.059	0.626	-0.082	-0.164	-0.018	-0.102	-0.339	0.539	0.560	0.657	0.626	1.000	0.585	0.604	0.589	0.703
H&APL	0.484	0.783	0.753	0.667	0.672	0.616	0.714	0.092	0.605	-0.051	-0.107	0.124	-0.031	-0.242	0.518	1.000	0.791	0.776	0.560	0.644	0.812	0.657	0.618
H.TEX	0.553	0.766	0.735	0.713	0.728	0.533	0.646	0.053	0.664	-0.146	-0.067	0.052	-0.079	-0.310	0.521	0.791	1.000	0.934	0.657	0.682	0.758	0.727	0.698
S.DRK	0.518	0.753	0.725	0.690	0.730	0.612	0.684	0.127	0.643	-0.165	-0.013	0.023	-0.084	-0.274	0.511	0.776	0.934	1.000	0.626	0.671	0.745	0.872	0.672
STL	0.530	0.737	0.663	0.645	0.639	0.586	0.659	0.006	0.661	-0.068	-0.160	0.071	-0.078	-0.332	0.483	0.812	0.758	0.745	0.604	0.606	1.000	0.636	0.658
TM&IT	0.517	0.608	0.620	0.857	0.646	0.357	0.454	0.035	0.617	-0.131	-0.044	0.105	0.003	-0.255	0.535	0.644	0.682	0.671	0.585	1.000	0.606	0.637	0.604
TXLTH	0.472	0.681	0.684	0.667	0.738	0.597	0.638	0.265	0.604	-0.160	0.091	-0.023	-0.097	-0.215	0.504	0.657	0.727	0.872	0.589	0.637	0.636	1.000	0.631
TR&RB	0.588	0.700	0.625	0.696	0.666	0.384	0.521	-0.035	0.635	-0.028	-0.208	0.110	-0.011	-0.386	0.544	0.618	0.698	0.672	0.703	0.604	0.658	0.631	1.000

APPENDIX IV. Regression Results With Up To Three Lags

1. ISE NATIONAL 100:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-0.853115	CPI	1.01811
		IR	-0.8461
		EXP	-0.2694
		IMP	0.19176
1 MONTH LAG	-0.745268	-	-
2 MONTHS LAG	-0.764522	CPI	1.02499
3 MONTHS LAG	-0.735799	CPI	0.57124

2. AIRLINES & AIRPORTS:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	0.121676	IR	-1.0648
1 MONTH LAG	0.187685	-	-
2 MONTHS LAG	0.189128	-	-
3 MONTHS LAG	0.198308	-	-

3. AUTOS & PARTS:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-0.355724	CPI	1.11504
		EXP	-0.3014
		IMP	0.27077
		IR	-0.9091
1 MONTH LAG	-0.263364	-	-
2 MONTHS LAG	-0.267003	-	-
3 MONTHS LAG	-0.259236	-	-

4. BANKS:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-0.68553	CPI	1.57964
		IR	-1.0187
1 MONTH LAG	-0.593193	CPI	1.35237
		EXP	0.22563
2 MONTHS LAG	-0.59846	CPI	1.361
3 MONTHS LAG	-0.56155	-	-

5. BASIC INDUSTRIES:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-0.699419	CPI	1.14575
		IR	-0.9841
1 MONTH LAG	-0.5677	EXP	0.14675
2 MONTHS LAG	-0.580938	FEX	0.54884
3 MONTHS LAG	-0.551402	-	-

6. BUILDING & CONSTRUCTION MATERIALS:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-1.353022	CPI	1.25213
		IR	-0.6398
1 MONTH LAG	-1.21263	-	-
2 MONTHS LAG	-1.236503	CPI	0.92204
3 MONTHS LAG	-1.193357	-	-

7. BREWERS:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-0.72034	CPI	1.13826
		IR	-0.6653
1 MONTH LAG	-0.68144	-	-
2 MONTHS LAG	-0.78477	CPI	1.34097
		EXP	0.40764
3 MONTHS LAG	-0.70131	CPI	1.00388

8. CYCLICAL CONSUMER GOODS:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-0.70083	CPI	0.92831
		IR	-0.7563
1 MONTH LAG	-0.65069	-	-
2 MONTHS LAG	-0.72392	CPI	1.37321
		EXP	0.24048
3 MONTHS LAG	-0.66616	-	-

9. DEFENSE:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-0.13428	IR	-1.1477
1 MONTH LAG	-0.01371	-	-
2 MONTHS LAG	-0.03911	FEX	0.67474
3 MONTHS LAG	-0.01391	-	-

10. ELECTRICITY:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-0.33431	IR	-0.6103
1 MONTH LAG	-0.34282	-	-
2 MONTHS LAG	-0.36158	FEX	0.58096
3 MONTHS LAG	-0.33702	-	-

11. GENERAL INDUSTRIALS:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-0.29461	CPI	1.18316
		EXP	-0.3992
		IMP	0.35886
		IR	-0.6577
1 MONTH LAG	-0.23766	-	-
2 MONTHS LAG	-0.28868	CPI	1.89953
		IMP	0.21201
3 MONTHS LAG	-0.23029	-	-

12. HOUSEHOLD GOODS& TEXTILES:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-0.73214	CPI	1.27776
		IR	-0.8196
1 MONTH LAG	-0.63656	-	-
2 MONTHS LAG	-0.66249	-	-
3 MONTHS LAG	-0.65404	-	-

13. HOUSEHOLD APPLIANCES:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-0.52102	EXP	-0.2439
		IR	-0.803
1 MONTH LAG	-0.48457	EXP	0.22755
2 MONTHS LAG	-0.47087	-	-
3 MONTHS LAG	-0.4597	-	-

14. SOFT DRINK:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-0.26022	IR	-1.0771
1 MONTH LAG	-0.17782	-	-
2 MONTHS LAG	-0.18481	FEX	0.66262
3 MONTHS LAG	-0.16496	-	-

15. STEEL INDUSTRY:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-0.20003	EXP	-0.3882
		IMP	0.27394
		IR	-0.6769
1 MONTH LAG	-0.14046	-	-
2 MONTHS LAG	-0.16686	FEX	0.89085
3 MONTHS LAG	-0.11665	-	-

16. TELECOM, MEDIA & IT:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-0.28797	IR	-1.0241
1 MONTH LAG	-0.21748	-	-
2 MONTHS LAG	-0.22182	-	-
3 MONTHS LAG	-0.21507	-	-

17. TEXTILES & LEATHER:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-0.66406	CPI	2.09204
		IR	-0.7753
1 MONTH LAG	-0.5289	-	-
2 MONTHS LAG	-0.60138	-	-
3 MONTHS LAG	-0.58093	-	-

18. TIRES & RUBBER:

LAG NUMBER	AKAIKE	SIGNIFICANT FACTORS	BETA
NO LAG	-0.3535	IR	-1.1316
1 MONTH LAG	-0.26011	IPI	-0.5801
		EXP	0.31244
2 MONTHS LAG	-0.24642	-	-
3 MONTHS LAG	-0.23503	-	-