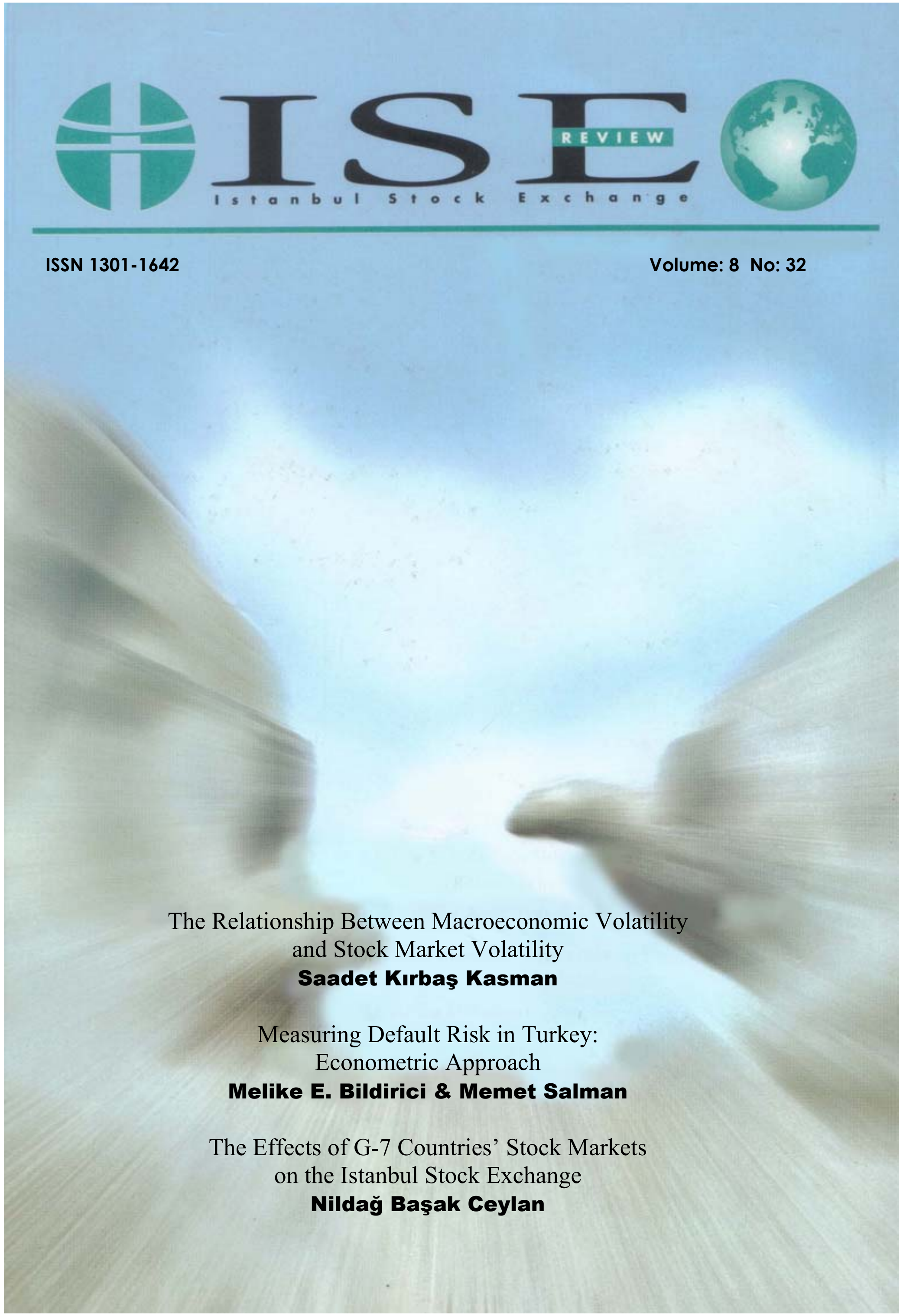

The ISE Review

Volume: 8 No: 32

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The ISE Review is included in the "World Banking Abstracts" Index published by the Institute of European Finance (IEF) since 1997, in the Econlit (Jel on CD) Index published by the American Economic Association (AEA) as of July 2000, and in the TÜBİTAK-ULAKBİM Social Science Database since 2005.

The ISE Review Volume: 8 No: 32
ISSN 1301-1642 © ISE 1997

THE RELATIONSHIP BETWEEN MACROECONOMIC VOLATILITY AND STOCK MARKET VOLATILITY

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Abstract
This paper attempts to determine the relationship between conditional stock market volatility and macroeconomic volatility using monthly data for Turkey from 1986 to 2003. The macroeconomic variables used include industrial production, the money supply M1, inflation, an exchange rate variable, namely Turkish Lira / US Dollar and oil prices. Conditional monthly volatility is measured from GARCH estimations. The results show that volatility of money supply has a strong predictive power for stock market volatility while stock market volatility has a predictive power for exchange rates and inflation volatility. Tests of joint and simultaneous explanatory power of macroeconomic volatilities indicate that only volatility of industrial production and exchange rates have significant effect on stock market volatility and 6% of the changes in aggregate stock volatility might be related to macroeconomic volatility.

I. Introduction

The periods of high stock market volatility in developed and emerging markets have intensified discussion about the sources of such price movements. Attempts have been made to examine the relationship between stock market volatility and macroeconomic variables. Theoretical motivation for such a link comes from a simple discounted present-value model for the stock price. In this model, the conditional variances of stock price depend on the conditional variances of expected future cash flows and of future discount rates, and on the conditional covariances between them. If constant discount rate is assumed, then the conditional variance of stock prices and of expected cash flows should be proportional to one another. Therefore, the value of corporate equity on the aggregate level depend on the health of the economy and a change in the level of uncertainty about future macroeconomic conditions would cause a proportional change in stock return volatility.

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JEL classification: E44; C19
Keywords: Macroeconomic variables, Conditional volatility; Conditional variance, ISE, GARCH.

Most of the previous studies in this area of research focused on the relationship between macroeconomic variables and stock return. There are only few studies in this literature that investigated the impact of macroeconomic volatility on the conditional stock market volatility. Schwert (1989) studied how macroeconomic variables, namely inflation, industrial production, and money predict stock market volatility for the US. His findings showed weak evidence that macroeconomic volatility predicts stock market volatility. A study by Liljeblom and Stenius (1997) based on Finnish data found that between one-sixth and more than two-thirds of changes in conditional stock market volatility was related to conditional macroeconomic volatility, namely inflation, industrial production, and money supply. Morelli (2002) studied the relationship between conditional stock market volatility and conditional macroeconomic volatility based upon UK data. His findings showed that macroeconomic volatility do not predict stock market volatility. More recently Davis and Kutan (2003) extended the study of Schwert (1989) using the data of 13 stock markets. They found that macroeconomic volatility measured by movements in inflation and real output, have a weak predictive power for stock market volatility.

The purpose of this paper is to investigate whether changes in the Istanbul Stock Exchange volatility through time can be attributed to time-varying volatility of a set of macroeconomic variables. This paper contributes to the literature in several significant ways. First, there is not any study that provides empirical evidence about the relationship between conditional macroeconomic volatility and conditional stock market volatility in emerging markets even though in those markets, market participants and the information availability and its quality change more rapidly than in the developed markets. Second, although several studies investigated the volatility of the ISE, none of them examined the impact of macroeconomic volatility on conditional stock market volatility[1]. Third, such study has important implications for investors and policymakers. If stock market volatility is a measure of stock market risk or uncertainty, how volatility of macroeconomic variables affect the volatility of stock market can help us to understand better the determinants of such risk and also allows it to be priced more efficiently. Moreover, policymakers may take appropriate policy actions to reduce the risk of macroeconomic volatility on stock market volatility.

The remaining of the paper is organized as follows. Section 2 describes the data set. Conditional volatility models and estimation are presented in section 3. The relationships between conditional stock

[1] Some of them are Yılmaz (1997), Yavan and Aybar (1998), Durukan (1999), Harris and Küçüközmen (2001), Balaban (1999), Muradoğlu (1999) and Payaslıoğlu (2001).

market volatility and conditional macroeconomic volatility are analyzed in section 4. The paper's concluding remarks are provided in section 5.

II. Data

The data consists of logarithmic differences of monthly values of the ISE-100 Index, a price for the Turkish stock market, for the period between January 1986-December 2003. The stock prices are the closing prices of the last trading day in each month. The macroeconomic variables used are monthly data for the same time period as the stock market data, obtained from International Financial Statistics (IFS) of IMF and the Central Bank of Turkish Republic. The variables selected include a measure of industrial production IP, the money supply M1, inflation measure CPI (consumer price index), an exchange rate variable, namely the Turkish Lira/the US Dollar and a measure of oil prices. The variables selected do not exhaust all the influential variables. Those selected, however, have been shown in various studies to influence stock returns[2].

Many macroeconomic time series contain unit roots dominated by stochastic trends. Unit roots are important in examining the stationarity of a time series because a non-stationary regressor invalidates many standard empirical results. The presence of a stochastic trend is determined by testing the presence of unit roots in time series data. In this study Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests have used to test for unit roots in the variables.

Logarithmic differences are taken of the macroeconomic variables in order to measure growth rates in industrial production, money supply, inflation, exchange rates and oil prices. Taking the first difference in log may make them stationary. Table 1 presents results for the six time series. The results indicate that we cannot reject stationarity in any series[3].

[2] See Clare and Thomas (1994), Groenewold and Fraser (1997), Kwon and Shin (1999).
[3] The unit root test performed with trend and without trend. Since similar results obtained from both tests, Table 1 presents only test results without trend.

Table 1: Augmented Dickey–Fuller and Phillips–Perron Tests for Stationarity

	Augmented Dickey-Fuller (ADF)	Lags	Phillips–Perron (PP)	Lags
ISE	-7.144 *	2	-10.504*	4
DCPI	-4.599*	4	-8.497*	4
DIP	-10.415*	4	-24.196*	4
DM1	-6.978*	4	-27.167*	4
DEX	-7.815*	1	-9.085*	4
DOIL	-6.547*	6	-11.335*	4

Note: ISE represents the stock returns; DCPI expresses the rates of change in consumer price index; DIP represents the rates of change in industrial production; DM1 represents the rates of change in money supply; DEX represents the rates of change in exchange rates; and DOIL represents the rates of change in oil prices.
The number of lags for augmented terms is based on minimum of Akaike information criterion, AIC.
*Significant at 1% level. Critical value for the augmented Dickey–Fuller test is −3.463, based on MacKinnon (1991)
The truncation lag for Barlett Kernel based on Newey-West suggestion.
* Significant at 1% level and critical value for Phillips–Perron test −3.462.

III. Conditional Volatility

The monthly conditional volatility of stock market return and macroeconomic variables is estimated using the GARCH model developed by Bollerslev (1986). Following Morelli (2002), the GARCH (*p, q*) model was specified as follows:

$$r_t = \beta_0 + \sum_{i=1}^{p} \beta_2 r_{t-i} + \sum_{m=1}^{11} \lambda_m SeasonalD_{mt} + \phi_1\ 94CrisisD_t + \phi_2\ 01\,CrisisD_t + \varepsilon_t \quad (1)$$

$$\varepsilon_t \sim N(0, \sigma_t)$$

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^{q} \delta_i \sigma_{t-j}^2 + \phi_1 94CrisisD_{t-1} + \phi_2 01CrisisD_{t-1} \quad (2)$$

$$r_{MVt} = \beta_0 + \sum_{i=1}^{p} \beta_1 r_{t-i} + \sum_{m=1}^{11} \lambda_m SeasonalD_{mt} + \varepsilon_{MV\,t} \quad (3)$$

$$\varepsilon_{MVt} \sim N(0, \sigma_{MVt})$$

$$\sigma_{MVt}^2 = \alpha_0 + \sum_{i=1}^{p} \alpha_i \varepsilon_{MVt-i}^2 + \sum_{j=1}^{q} \delta_i \sigma_{MVt-j}^2 \quad (4)$$

where r_t and r_{MVt} represent the return on the stock market and the macro economic variables at time *t*. ε_t and ε_{MVt} represents the disturbance terms that are normally distributed. The return series has been seasonally adjusted by using dummy variables in the conditional mean equation. Since the Turkish economy witnessed two major financial crises in recent years we should take the effects of crises on the stock market into account in order to accurately estimate volatility in stock market returns. Therefore, we introduce two dummy variables into the conditional variance equation (Eq. (2))[4].

Following Liljeblom and Stenius (1997), terms with i = 1, 2, 3, 6 and 12 included in the mean equation (Eq. (1) and (3)). Since several empirical studies indicate that GARCH (1,1) model adequately fits many economic time series, initially such models were estimated for all series[5]. If the likelihood-ratio test indicated a better fit for a GARCH (*p, q*) model with a higher *p*, new models with higher *ps* were estimated until no significant improvement in the fit could be detected. Finally, from the estimated variance equation of the GARCH model, conditional volatility forecasts could be obtained. These forecasts, transformed into standard deviation form, will be used as our conditional GARCH volatilities in the analysis further on.

Table 2 reports summary statistics for the volatility estimates from the GARCH models. As seen from Table 2, the high volatility is persistent in all the conditional volatility estimates. The skewness and kurtosis measures are high, especially for the volatility estimates for the stock market index, consumer price index and exchange rates.

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[4] The crisis dummy $94CrisisD_t$ is 1 on January 1994 and 0 otherwise. The crisis dummy $01CrisisD_t$ is 1 on February 2001 and 0 otherwise.

[5] See Bollerslev (1987) and Akgiray (1989).

Table 2: Summary Statistics for Monthly Volatility Series

	ISE-100 GARCH (1,1)	CPI GARCH (2,1)	M GARCH (1,1)	IP GARCH (2,1)	EX GARCH (1,1)	OIL GARCH (1,1)
Mean	0.0205	0.0004	0.0043	0.0029	0.0043	0.0066
Max	0.0926	0.0032	0.0141	0.0036	0.2293	0.0468
Min	0.0149	1.61E-06	0.0022	0.0003	3.60E-05	0.0024
Std. Dev.	0.0081	0.0002	0.0023	0.0006	0.0189	0.0052
Skewness	4.5779	12.3498	1.8027	-1.9046	9.0802	4.1018
Kurtosis	35.4597	167.8870	6.1803	7.2713	100.6280	26.0017
r_1	0.343	0.173	0.915	0.551	0.458	0.777
r_2	0.166	0.102	0.814	0.301	0.266	0.570
r_3	0.065	-0.036	0.742	0.272	0.085	0.449
r_{11}	0.008	0.016	0.493	0.008	-0.023	-0.010
r_{12}	-0.001	0.016	0.467	-0.005	-0.025	-0.024
Obs.	203	203	203	203	203	203

Note : ISE-100, CPI, M, IP, EX, and OIL denote stock market index, consumer price index, money supply (M1), exchange rates (TL/$) and oil prices, respectively. The summary statistics are means, minimum, maximum, standard deviations, skewness, kurtosis and autocorrelation at lags 1, 2, 3, 11, and 12 of the monthly standard deviation estimates from GARCH models.

IV. The Relationship Between Stock Market Volatility and Macroeconomic Volatility

The relationship between conditional volatility in the stock market and in the macroeconomic variables is examined by the estimation of two-variable twelfth-order vector autoregressive (VAR) model. The model is specified as follows:

$$\sigma_t = \alpha_0 + \sum_{i=1}^{12} \beta_i \sigma_{t-i} + \sum_{i=1}^{12} \delta_i \sigma_{MVt-i} + \varepsilon_t \tag{5}$$

$$\sigma_{MVjt} = \alpha_0 + \sum_{i=1}^{12} \delta_i \sigma_{MVjt-i} + \sum_{i=1}^{12} \beta_i \sigma_{t-i} + \varepsilon_t \tag{6}$$

where σ_t is the conditional stock market volatility at time t, σ_{MVjt-i} is the conditional volatility in the macroeconomic variable j at time $t-i$, where $i = 1,2,3.....,12$. Eq. (5) determines whether or not there is a predictive power of a macroeconomic variable volatility on stock market volatility. Eq. (6), however, determines the ability of conditional stock market volatility to predict conditional macroeconomic volatility. Using an *F*-test, the predictive power of conditional stock market volatility and macroeconomic volatility is determined.

Table 3 reports the results from a two-variable twelfth-order vector autoregressive (VAR) model estimated for stock market volatility and the volatility of each macroeconomic variable in turn. In terms of the power of the macroeconomic volatility in predicting stock market volatility, a significant relationship is found only with money supply M1. The stock market volatility, however, is significant in predicting changes in exchange rates and inflation.

Table 3 : F-tests from VAR Models for Conditional Stock Market and Macroeconomic Volatility

Time Period	CPI	M	IP	EX	OIL
A. The predictive power of macroeconomic volatility January 1986-December 2003	0.405	1.819**	0.531	0.421	0.414
B. The predictive power of stock market volatility January 1986-December 2003	4.507*	1.247	0.932	3.573*	1.14

Note: *, ** indicate significance level at 1% and 5%, respectively.

To examine the simultaneous relationships between the variables, a multiple regression of stock market volatility as the dependent variable against macroeconomic volatility is estimated. The regression model is specified as follows:

$$\sigma_t = \alpha_0 + \sum_{j=1}^{5} \varphi_j \sigma_{MVjt} + \varepsilon_t \quad (7)$$

Table 4 reports the results from the regression analysis of conditional stock market volatility on all the macroeconomic volatilities. All the coefficients are positive except for industrial production, which is significantly negatively related to the volatility of the stock market during the sample period. The coefficient on exchange rate volatility is positive and significant. Other macroeconomic volatilities, however, are not significant. The low level of explanatory power is similar to a study in the US by Schwert (1989) who found R^2 between 2.2% and 5% and in UK by Morelli (2002) who found a R^2 value 4.4%.

Table 4: Regression Results of Stock Market Volatility on Macroeconomic Volatility

	Constant	CPI	M	IP	EX	OIL	R^2
Coefficients	0.025* (6.737)	3.193 (1.147)	0.088 (0.359)	-1.898** (-1.981)	0.054*** (1.792)	-0.124 (-1.097)	0.06

*, **, *** indicate significance level at 1%, 5%, and 10%, respectively.

Note: Values in parentheses are *t* values. All tests are based on a heteroscedasticity consistent covariance matrix, according to White (1980).

V. Conclusion

Stock market returns are constantly changing, and the volatility that exists within the stock market can be estimated using GARCH models. The objective of this paper is to examine whether the changing conditional volatility in the stock market can be explained, in part, by the conditional volatility that exists within macroeconomic variables. The results of this study are surprisingly strong as compared to those on the US and UK data.

In terms of the VAR estimation, a significant relationship was found between stock market volatility and volatility of some macroeconomic variables. Results indicate a predictive power from conditional volatility of money supply to stock market volatility and from stock market volatility to conditional volatility of exchange rates and inflation.

Tests of the joint and simultaneous explanatory power of macroeconomic volatilities indicate that only volatility of industrial production and exchange rates have significant relationship with volatility of stock market. Results also indicate that only about 6% variation in stock market volatility is explained by the variation in macroeconomic volatility.

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CBRT Eloctronik Data Delivery System.

IMF International Financial Statistics.

The ISE Review Volume: 8 No: 32
ISSN 1301-1642 © ISE 1997

MEASURING DEFAULT RISK IN TURKEY: ECONOMETRIC APPROACH

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Abstract
In this paper, empirical default risk scoring models are derived by using panel data probit methods with a database which is obtained from annual balance sheets and income statements of firms which are in non-financial sectors in the Istanbul Stock Exchange (ISE). After that, these derived scoring models are used in default risk analysis of firms and compared with Z-Score and O-Score models.

I. Introduction

Default risk is the uncertainty surrounding a firm's ability to service its debts and obligations (Leland, 2000). Prior to default, there is no way to discriminate unambiguously between firms that will default and those that won't (Crosbie, Bohn, 2003).

The main components of default risk can be grouped as follows: Default Risk, Loss Given Default and Default Correlations. While each of these items is critical to the measuring default risk, none are more important or more difficult to determine than the default probability. The remainder of this paper will focus on the determination of default probability.

II. Theory

The modern era of commercial default prediction really begins with the work of Beaver and Altman in the late 1960s. Beaver (1967) found that several ratios differed significantly between failed and viable firms, especially cash flow/net worth and debt/net worth. Beaver documented differences in common ratios such as debt/net worth and cash flow/assets between failed and viable firms increased as the time to failure shortened (i.e., as failure neared, the firms became more measurably dissimilar). Altman (1968) extended this analysis to a multivariate model which is better than any single ratio alone (Moody's Investors Service, 2000).

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There are three approaches for measuring default probability in practice: qualitative human judgement, statistical prediction methods and theoretic models. Qualitative human judgment focus on leverage and coverage measures, coupled with an analysis of the quality and stability of the firm's earnings and cash flows (Morgan,1997).

Although there are many statistical methods focused on building credit quality estimation models, which seek to predict default probability, three basic approaches of these are: qualitative dependent variable models, discriminant analysis and neural networks.

Linear discriminant analysis applies a classification model to categorize which firms have defaulted versus which firms survived. The best example of this approach is Edward Altman's Z-scores (Morgan, 1997). The academic literature is full of alternative techniques ranging from principal components analysis, self-organizing feature maps, logistic regression, probit/logit analysis and hierarchical classification models. All of these methods can be shown to have some ability to distinguish high from low default likelihoods firms.

The applications of neural network techniques to credit scoring include Dutta & Shekhar (1988), Kerling (1995), and Tyree & Long (1994). The popular press reports commercial applications of neural networks to large volume credit decisions such as credit card authorizations, but there do not appear to be commercial application yet of these neural network techniques for large corporate credits (Morgan, 1997).

There are two distinct theoretical approaches modeling default: structural models and reduced form models.

The most popular structural model of default today is the Merton model, which models the equity as a call option on the assets where the strike price is the value of liabilities. This maps into the well developed theory of option pricing. However, there is another structural model, that of the gambler's ruin, which predates the Merton model. Gambler's Ruin model of Wilcox is similar to Merton model, but less well-known. In the gambler's ruin, the value of equity is a reserve, and cash flows either add to or drain from this reserve. In the case of a bankruptcy, the reserve is used up.

In the gambler's ruin, equity and the mean cash flow are the reserve, and a random cash flow exhausts this cushion with a certain probability. Lower volatility or larger reserve implies lower default rates in both the Merton and gambler's ruin models. The distinction between the two is that between cash flow volatility and market asset volatility. These two structural models boil down to a univariate truism: if either market equity goes to zero or if cash flow stays negative, the firm will fail. Under both models, prediction of the key event is based primarily on a targeted ratio. For the Merton model, this ratio uses primarily equity information, and for the Gambler's Ruin model, cash flow information is used.

One extension of the gambler's ruin problem relevant to the Merton model is that a firm's book equity is not the total reserve, as examined by Scott (1981). Although the line of research that followed the Merton approach has proven very useful in addressing the qualitatively important aspects of pricing credit risks, it has been less successful in practical applications. In response to such difficulties, an alternative approach has been developed which still adopts the original framework developed by Merton as far as the default process is concerned but, at the same time, removes one of the unrealistic assumptions of the Merton model, namely, that default can occur only at maturity of the debt when the firm's assets are no longer sufficient to cover debt obligations. Instead, it is assumed that default may occur any time between the issuance and maturity of the debt and that default is triggered when the value of the firm's assets reaches a lower threshold level. These models include Kim, Ramaswamy and Sundaresan (1993), Hull and White (1995), Nielsen, Saà-Requejo, Santa Clara (1993), Longstaff and Schwartz (1995) and others (Altman, et. all, 2002).

KMV's implementation of Merton model makes some useful adjustments to Merton's formulation. The first adjustment addresses the trigger point of default, since the staggered debt maturities that companies actually have imply that the simple Merton formulation is ambiguous in practice. A firm can remain current on its debt even though technically insolvent (liabilities>assets), it can forestall and, with luck, avoid bankruptcy, even though the liability holders would like to liquidate. In view of this complication, KMV uses ½ the value of long term debt plus current liabilities as a proxy for the 1-year default point, a formulation based on empirical analysis. Thus, in their formulation, the default point is not total liabilities as in the Merton model, but current liabilities ½ long term liabilities.

A final adjustment is made in mapping the distance from default into a probability. KMV maps their initial output into actual defaults using historical data, as opposed to using the standard normal probability tables.

The adjustments suggest that the Merton model is more of a guideline than a rule for estimating a quantitative model. The final transformation from standard normal probabilities into empirical probabilities implies that even the strongest proponents of the approach do not take the Merton model literally.

The attempt to overcome the above mentioned shortcomings of structural-form models gave rise to reduced-form models. These include Litterman and Iben (1991), Madan and Unal (1995), Jarrow and Turnbull (1995), Jarrow, Lando and Turnbull (1997), Lando (1998), Duffie and Singleton (1999), and Duffie (1998). (Altman et. all., 2002).

Unlike structural-form models, reduced-form models do not condition default on the value of the firm, and parameters related to the firm's value need not be estimated to implement them. The stochastic processes determine the price of credit risk. Although these processes are not formally linked to the firm's asset value, there is presumably some underlying relation, thus Duffie

and Singleton (1999) describe these alternative approaches as reduced-form models (Salman, 2004).

Reduced-form models fundamentally differ from typical structural-form models in the degree of predictability of the default. A typical reduced-form model assumes that an exogenous random variable drives default and that the probability of default over any time interval is nonzero. Default occurs when the random variable undergoes a discrete shift in its level. These models treat defaults as unpredictable Poisson events. The time at which the discrete shift will occur cannot be foretold on the basis of information available today.

Empirical evidence concerning reduced-form models is rather limited. Using the Duffie and Singleton (1999) framework, Duffee (1999) finds that these models have difficulty in explaining the observed term structure of credit spreads across firms of different qualities. In particular, such models have difficulty generating both relatively flat yield spreads when firms have low credit risk and steeper yield spreads when firms have higher credit risk.

III. Data and Econometric Methodology

In this paper, empirical default risk scoring models are derived by using panel data probit methods with a database which is obtained from annual balance sheets and income statements of firms which are in non-financial sectors in the ISE. After that, these derived scoring models are used in default risk analysis of firms and compared with Z-Score and O-Score models.

3.1. Data

Financial ratios used in this paper are constituted by using the Istanbul Stock Exchange (ISE) data between 1994 and 2002. 188 firms in the ISE in 1994 are reduced to 105 firms by excluding firms which are in financial sector and having missing data in balance sheets and income statements during this 9 years period.

At the stage of ratio selection, some variables had to be excluded from the analysis because of data unavailability or interpretation problems. An example for the first reason of exclusion is the productivity ratio "Net Sales / Number of Employees" mentioned in Crouhy, Galai, and Mark (2001), as in the current data set the number of employees for a particular firm is not available (Hayden, 2003). Interpretation problems would arise if for example the profitability ratio "Net Income / Equity" was considered, as the equity of the observed companies sometimes is negative. Usually we would expect that the higher the return on equity, the lower the default probability is. However, if equity can be negative, a firm with a highly negative net income and a small negative equity value would generate a huge positive return-on-equity-ratio and would therefore wrongly obtain a prediction of low default probability. To eliminate those problems all accounting ratios were excluded from the analysis where the variable in the denominator could be negative. After the ratio selection, the ratios were classified to categories which represent credit risk factors.

Table 1 lists all ratios that were examined in this paper according to credit risk factors.

Table 1: Promising Accounting Ratios

Ratio No	Financial Ratio	Credit Risk Factor	Hypothesis
R2	Short Term Liabilities / Total Liabilities	Leverage	+
R5	Short Term Financial Loans / Short Term Liabilities	Leverage	+
R12	Total Bank Loans / Total Assets	Leverage	+
R14	Shareholder's Equity / Total Liabilities	Leverage	-
R17	Total Liabilities / Total Assets	Leverage	+
R30	Total Financial Loans / Total Assets	Leverage	+
R43	(Liquid Assets + Marketable Securities + Long Term Financial Assets) / Total Liabilities	Leverage	-
R44	Long Term Liabilities / Total Assets	Leverage	-/+
R42	Liquid Assets / (Total Liabilities – Advances)	Debt Coverage	-
R3	Marketable Securities / Short Term Financial Loans	Liquidity	-
R4	Current Assets / Total Assets	Liquidity	-
R8	Long Term Financial Assets / Total Assets	Liquidity	-
R11	(Current Assets – Inventories) / Short Term Liabilities	Liquidity	-
R13	Working Capital / Total Assets	Liquidity	-
R16	Marketable Securities / Total Liabilities	Liquidity	-
R18	Short Term Liabilities / Current Assets	Liquidity	+
R22	Short Term Financial Loans / Current Assets	Liquidity	+
R23	Current Assets / Total Liabilities	Liquidity	-
R24	Short Term Liabilities / Total Assets	Liquidity	+
R25	Liquid Assets / Total Assets	Liquidity	-
R26	Working Capital / Net Sales	Liquidity	-/+
R27	Liquid Assets / Net Sales	Liquidity	-/+
R28	Current Assets / Net Sales	Liquidity	-/+
R29	Liquid Assets / Short Term Liabilities	Liquidity	-
R31	Short Term Bank Loans / Liquid Assets	Liquidity	+
R35	(Liquid Assets + Marketable Securities) / Short Term Liabilities	Liquidity	-

Table 1: Promising Accounting Ratios (Continued)

R1	Total Trade Receivables / Net Sales	Activity	+
R7	Total Trade Payables / Net Sales	Activity	+
R32	Inventories / Net Sales	Activity	+
R41	Short Term Trade Receivables / Net Sales	Activity	-/+
R9	Net Sales / Total Assets	Turnover	-
R40	Operating Profit / Total Assets	Turnover	-
R10	Operating Profit / Net Sales	Profitability	-
R15	Profit Before Tax / Total Assets	Profitability	-
R19	Net Profit / Total Assets	Profitability	-
R20	Operating Profit / Total Liabilities	Profitability	-
R33	Profit Before Tax / Net Sales	Profitability	-
R34	Net Profit / Net Sales	Profitability	-
R6	Reserves / Total Assets	Size	-
R37	Ln(Total Assets / Consumer Price Index)	Size	-
R38	Ln(Net Sales / Consumer Price Index)	Size	-
R21	(Net Profit – Last Net Profit) / (|Net Profit| + |Last Net Profit|)	Growth Rates	-/+
R36	Net Sales / Last Net Sales	Growth Rates	-/+
R39	(Total Liabilities / Total Assets) / (Last Total Liabilities / Last Total Assets)	Leverage Change	+

Not: In the fourth column the expected dependence between accounting ratio and default probability is depicted, where + symbolizes that an increase in the ratio leads to an increase in the default probability and – symbolizes a decrease in the default probability given an increase in the ratio.
R3 (Marketable Securities / Short Term Financial Loans) variable has been dropped out because it generates "number / zero" indefiniteness for some firms in database.

3.2. Econometric Methodologies

In context of panel probate, important progress has been achieved in recent years. Two approach was very important the early 1980s. The first of these was GMM that based on Hansen and was applied panel probate model by Avery et.all. Second is SML (simulated –maximum likelihood) techniques. Lerman and Manski's paper is very important in this context. Both approaches solve multiple integration problem of multivariate normal density functioning panel probit model. GMM was obtained as nonlinear regression model and restricted the first conditional moment function of error term. But SML techniques investigate the full information of error term and Monte-Carlo Integration techniques is dependent upon to simulate likelihood function (Inkman, 2000).

The first applications of Panel Probit GMM are Bertschek (1995), Bertschek-Lechner (1998) and Inkman-Pohlmeier (1995)'s papers. SML was development by McFadden (1989), McFadden and K.Train (2000), Hajivassiliou (1993), Hajivassiliou and McFadden (1990), Hajivassiliou McFadden and Ruud (1994,1996) Pakes and Pollard (1989), Hajivassiliou and Ruud (1994)'s papers. Geweke-Hajivassilou-Keane (GHK) was development the simulator. GHK simulator was applied by Börschsupon and Hajivassiliou, in panel probit application of GHK-SML estimator can be seen Keane (1994) and Mühleisen (1994). (Inkman, 2000).

In Panel probit model, linear function form is below.

$$Y_{it}^{*} = x_{it}^{'}\beta^{0} + u_{it} \quad t=1, \dots, T \ , i= 1, \dots, N,$$

y_{it}^{*}= latent variable, x_i is $kx1$ vector of explanatory variables, β is $kx1$ vector of unknown coefficient. u_i is error term $u_i =(u_1, - - - , u_k)' \ kx1$ vector of error term,

$$u_i \sim iid \ N(0,\Sigma), \quad u_{it} = \Upsilon_i + u_{it} \quad \Upsilon_i \sim iid \ N(0, \sigma_{\gamma}^{2}) \text{ and}$$

white noise error $v_{it} \sim iid \ N(0, \sigma_{v}^{2})$ it was unrelated with x_{it}. y_{i}^{*} is definition of utility of individual i, $y_{it} = 1(y_{it}^{*} \geq 0)$.

Butler and Moffitt's (1982) random effects probit model determines $u_{it} = \varepsilon_{it} + v_i$. u_{it} is normally distributed with mean zero and is independent across all periods and individuals. v_i is uncorrelated with the included variables x_{it} in all periods. It was assumed, $\sigma_{ts} = \sigma_{v}^{2} /(\sigma_{u}^{2} + \sigma_{v}^{2}) = p$ for $t \neq s$ and $\sigma_{tt} = \sigma_{v}^{2} + \sigma_{u}^{2} = 1$. In this context, the model includes only β plus one additional correlation parameter,

p. The log likelihood by Hermite quadrature or by simulation is maximized (Greene, 2002).

The random parameters model is below.

$$Y_{it}^{*} = x_{it}^{'}\beta_i + u_{it} \qquad t= 1, - - - ,T \quad i= 1, - - - ,N \quad \varepsilon_{it} \sim NID[0,1]$$

$$y_{it} \text{ is } 1(y_{it}^{*} > 0) \text{ where } \qquad \beta_i \text{ is } \mu + \Delta Z_i + \Gamma w_i$$

μ is $kx1$ vector of unconditional means, Δ is $k \ x \ L$ matrix unknown location parameters, Γ is kxk lower triangular matrix of unknown variance parameters, Z_i is $Lx1$ vector of individual characteristics, w_i is $Kx1$ vector of random latent individual effects with $E[w_i |X_i, z_i] = 0$ and $Var [w_i |X_i, z_i] = V = KxK$ diagonal matrix of known constants.

The random parameters model estimate by maximum simulated likelihood methods. The joint conditional density of the T observations on y_{it} is

$$f(y_i | X_i, \beta_i) = \prod_{t=1}^{T} \phi[(2y_{it} - 1)X_{it}^{'}\beta_i].$$

Full information maximum likelihood of the parameters are obtained by maximizing this function. Maximum simulated estimation is extremely computation. The process is speeded up by using a quasi –Monte Carlo method.

Log likelihood function of panel probit with random is

$$LL_p = \sum_{i=1}^{N} \ln(P(yi)) \text{ and}$$

$$P(yi) = \int_{-\infty}^{\infty} \frac{1}{(2\Pi)^{1/2}} \exp - \frac{\alpha_i^2}{2} \left\{ \prod_{t=1}^{T} \phi \left[\left(\frac{x_{it}^{'}}{\sigma_v} + \frac{\alpha_i}{\sigma_v} \right)(2y_{it} - 1) \right\} d\alpha i \right.$$

ML estimation of log likelihood function gives efficient and consistent estimates for β. Error term is $v_{it} = \alpha_i + \varepsilon_{it}$. α_i *and* v_{it} are independent, the correlation across i is assumed, being constant. Such as, it is

$$\text{Corr}\ (\varepsilon_{it}, \varepsilon_{is}) = p = \sigma_{\alpha}^{2} \Big/ \left(\sigma_{\alpha}^{2} + \sigma_{v}^{2}\right) \qquad t \neq s .$$

Estimation problem can be converted single integral and to evaluate integral use Hermite integration formula

$$\int_{-\infty}^{\infty} e^{-x^2} g(z) = \sum_{j=1}^{J} Ajg(z_j) .$$

J is number of evaluation point, Z_j are the nodes that *(g(.))* is evaluated

Other technique, the Solomon-Cox (SC) approximation is a general estimation technique. It can be used to provide an analytical solution for maximum likelihood estimation of non-linear panel data models with random effects, the likelihoods of which are often very complex, or indeed, intractable. The final estimation method used is the Gibbs sampler. This method of estimation has simplified the Bayesian analysis of panel data models providing precise finite sample estimates.

IV. Emprical Results

Panel data probit analysis was applied to obtain scoring functions related to default risk. 8 scoring functions were derived and these derived functions were compared with Z-Score and O-Score models in order to find out the scoring model with the best performance.

Scoring Function 1

In order to derive this function, first "probr11" variable was constituted by assigning "1" for the values "R11 < 0.83" and "0" for the values "R11 ≥ 0.83" and then panel data probit analysis was executed by taking "probr11" as dependent variable. The results are presented in Table 2.

Table 2: Panel Data Probit Analysis Results 1

Wald chi2(6) = 116.99
Log likelihood = -488.87019 Prob > chi2 = 0.0000

probr11	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
r7	3.68917	.7965001	4.63	0.000	2.128059	5.250281
r16	-3.928085	1.16861	-3.36	0.001	-6.218519	-1.637651
r19	-2.138394	.8799841	-2.43	0.015	-3.863131	-.4136568
r22	4.184386	.6126525	6.83	0.000	2.98361	5.385163
r37	-.2494387	.0990093	-2.52	0.012	-.4434933	-.055384
r42	-3.660586	.9035481	-4.05	0.000	-5.431508	-1.889664
_cons	.0166358	.9111401	2.02	0.085	-2.769166	1.802438
/lnsig2u	.8677664	.2728965			.332899	1.402634
/sigma_u	1.543239	.2105722			1.181104	2.016406
rho	.7042807	.056836			.5824646	.8026015

Likelihood-ratio test of rho=0: chibar2(01) = 155.38 Prob >= chibar2 = 0.000

Scoring Function 2

In order to derive this function, first "probr12" variable was constituted by assigning "0" for the values "R12 < 0.3" and "1" for the values "R12 ≥ 0.3" and then panel data probit analysis was executed by taking "probr12" as dependent variable. The results are presented in Table 3.

Table 3: Panel Data Probit Analysis Results 2

Log likelihood = -422.16123 Wald chi2(9) = 104.79; Prob > chi2 = 0.0000

probr12	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
r9	-.6428372	.1842229	-3.49	0.000	-1.003907	-.281767
r14	-3.297214	.3816404	-8.64	0.000	-4.045215	-2.549212
r21	.3188806	.1468229	2.17	0.030	.031113	.6066481
r22	.7181218	.144793	4.96	0.000	.4343326	1.001911
r26	1.239091	.2429012	5.10	0.000	.7630134	1.715169
r33	-1.731901	.6006266	-2.88	0.004	-2.909108	-.5546945
r36	.3538519	.1809657	1.96	0.051	-.0008343	.7085381
r39	.7105693	.4345957	1.64	0.092	-.1412227	1.562361
r44	2.236455	.944673	2.37	0.018	.3849296	4.08798
_cons	-.2175002	.6756433	-0.32	0.748	-1.541737	1.106736
/lnsig2u	.552876	.2940647			-.0234802	1.129232
sigma_u	1.318425	.1938512			.9883285	1.758772
rho	.6348026	.0681725			.4941302	.7556972

-Likelihood-ratio test of rho=0: chibar2(01) = 107.12 Prob >= chibar2 = 0.000

Scoring Function 3

In order to derive this function, first "probr17" variable was constituted by assigning "0" for the values "R17 < 0.64" and "1" for the values "R17 ≥ 0.64" and then panel data probit analysis was executed by taking "probr17" as dependent variable. The results are presented in Table 4.

Table 4: Panel Data Probit Analysis Results 3

Log likelihood = -308.03662 Wald chi2(8) = 99.25; Prob > chi2 = 0.0000

probr17	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
r1	1.398917	.441261	3.17	0.002	.5340615	2.263773
r6	-2.390615	1.399472	-1.71	0.088	-5.13353	.3522988
r9	.2270181	.1175236	1.93	0.053	-.0033239	.45736
r21	.2920842	.1492377	1.96	0.050	-.0004163	.5845847
r22	.2722866	.1243935	2.19	0.029	.0284798	.5160934
r33	-5.27853	.8343732	-6.33	0.000	-6.913872	-3.643189
r39	1.510212	.3718116	4.06	0.000	.7814743	2.238949
r44	7.434928	.9885528	7.52	0.000	5.4974	9.372456
_cons	-4.122814	.6270568	-6.57	0.000	-5.351822	-2.893805
/lnsig2u	1.145899	.2152597			.7239976	1.5678
sigma_u	1.77349	.1908805			1.436197	2.189997
rho	.758761	.0394017			.6734867	.8274698

Likelihood-ratio test of rho=0: chibar2(01) = 227.09 Prob >= chibar2 = 0.000

Scoring Function 4

In order to derive this function, first "probr18" variable was constituted by assigning "0" for the values "R18 < 0.92" and "1" for the values "R18 ≥ 0.92" and then panel data probit analysis was executed by taking "probr18" as dependent variable. The results are presented in Table 5.

Table 5: Panel Data Probit Analysis Results 4

Wald chi2(5) = 71.72
Log likelihood = -353.95014 Prob > chi2 = 0.0000

probr18	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
r4	-3.242174	.7943616	-4.08	0.000	-4.799094	-1.685254
r7	2.48031	.7502928	3.31	0.001	1.009763	3.950857
r11	-5.361748	.7426161	-7.22	0.000	-6.817249	-3.906247
r30	4.136872	.8571856	4.83	0.000	2.456819	5.816925
r40	-3.034349	1.064837	-2.85	0.004	-5.121392	-.9473058
_cons	3.438393	.6912098	4.97	0.000	2.083647	4.79314
/lnsig2u	.0821482	.407091			-.7157354	.8800319
sigma_u	1.041929	.21208			.6991656	1.552732
rho	.5205255	.1016012			.3283328	.7068288

Likelihood-ratio test of rho=0: chibar2(01) = 33.32 Prob >= chibar2 = 0.000

Scoring Function 5

In order to derive this function, first "probr19" variable was constituted by assigning "1" for the values "R19 < 0.03" and "0" for the values "R19 ≥ 0.03" and then panel data probit analysis was executed by taking "probr19" as dependent variable. The results are presented in Table 6.

Table 6: Panel Data Probit Analysis Results 5

Wald chi2(9) = 207.16
Log likelihood = -307.7173 Prob > chi2 = 0.0000

probr19	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
r6	-2.527262	1.233682	-2.05	0.041	-4.945235	-.1092901
r7	1.618882	.5521071	2.93	0.003	.5367716	2.700991
r12	1.372612	.6398942	2.15	0.032	.1184427	2.626782
r16	-2.192909	.8087156	-2.71	0.007	-3.777962	-.6078552
r17	2.192394	.6082409	3.60	0.000	1.000264	3.384524
r18	.1320888	.0855191	1.54	0.122	-.0355256	.2997032
r21	-1.415311	.1272773	-11.12	0.000	-1.66477	-1.165852
r36	-.2746733	.121501	-2.26	0.024	-.512811	-.0365357
r42	-.9305331	.4693345	-1.98	0.047	-1.850412	-.0106544
_cons	-1.457653	.4149093	-3.51	0.000	-2.27086	-.6444457
/lnsig2u	-.4330789	.2904158			-1.002283	.1361257
sigma_u	.8053008	.1169361			.6058386	1.070433
rho	.3933914	.0693033			.2684927	.533979

Likelihood-ratio test of rho=0: chibar2(01) = 53.29 Prob >= chibar2 = 0.000

Scoring Function 6

In order to derive this function, first "probr24" variable was constituted by assigning "0" for the values "R24 < 0.45" and "1" for the values "R24 ≥ 0.45" and then panel data probit analysis was executed by taking "probr24" as dependent variable. The results are presented in Table 7.

Table 7: Panel Data Probit Analysis Results 6

Log likelihood = -326.26712 | Wald chi2(4) = 129.47 | Prob > chi2 = 0.0000

probr24	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
r11	-2.542806	.2713499	-9.37	0.000	-3.074642	-2.01097
r12	1.200777	.3986104	3.01	0.003	.4195151	1.982039
r41	.8868385	.3795645	2.34	0.019	.1429057	1.630771
r43	-.5352164	.2531864	-2.11	0.035	-1.031453	-.0389802
_cons	1.650917	.2925428	5.64	0.000	1.077543	2.22429
/lnsig2u	1.10245	.2095888			.6916631	1.513236
sigma_u	1.735377	.1818578			1.413165	2.131057
rho	.7507188	.0392225			.6663368	.8195403

Likelihood-ratio test of rho=0: chibar2(01) = 258.70 Prob >= chibar2 = 0.000

Scoring Function 7

In order to derive this function, first "probr30" variable was constituted by assigning "0" for the values "R30 < 0.3" and "1" for the values "R30 ≥ 0.3" and then panel data probit analysis was executed by taking "probr30" as dependent variable. The results are presented in Table 8.

Table 8: Panel Data Probit Analysis Results 7

Log likelihood = -320.65411 | Wald chi2(7) = 51.74 | Prob > chi2 = 0.0000

probr30	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
r1	2.694137	.6894573	3.91	0.000	1.342826	4.045449
r7	-6.069643	1.092064	-5.56	0.000	-8.210049	-3.929236
r9	-1.330104	.2837883	-4.69	0.000	-1.886319	-.7738897
r12	16.67863	2.496946	6.68	0.000	11.7847	21.57255
r14	-3.534913	.6522205	-5.42	0.000	-4.813241	-2.256584
r18	.6864296	.170247	4.03	0.000	.3527515	1.020108
r23	-1.658279	.6190328	-2.68	0.007	-2.871561	-.4449975
_cons	1.285697	.9191041	1.40	0.092	-.5157138	3.087108
/lnsig2u	.2608214	.4534639			-.6279514	1.149594
sigma_u	1.139296	.2583148			.7305368	1.77677
rho	.5648382	.1114596			.3479752	.7594368

Likelihood-ratio test of rho=0: chibar2(01) = 26.54 Prob >= chibar2 = 0.000

Scoring Function 8

In order to derive this function, first "probr39" variable was constituted by assigning "0" for the values "R39 < 1" and "1" for the values "R39 ≥ 1" and then panel data probit analysis was executed by taking "probr39" as dependent variable. The results are presented in Table 9.

Table 9: Panel Data Probit Analysis Results 8

Wald chi2(4) = 67.35
Log likelihood = -614.59189 Prob > chi2 = 0.0000

probr39	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
r12	.6071784	.3463534	1.75	0.080	-.0716618	1.286019
r17	.9564179	.2863638	3.34	0.001	.3951551	1.517681
r19	-1.354911	.392035	-3.46	0.001	-2.123286	-.5865368
r44	-1.361333	.3925105	-3.47	0.001	-2.13064	-.5920266
_cons	-.2657737	.1418119	-1.87	0.061	-.5437199	.0121725
/lnsig2u	-14	141.8502			-292.0213	264.0213
sigma_u	.0009119	.0646753			3.88e-64	2.15e+57
rho	8.32e-07	.000118			1.5e-127	1

Likelihood-ratio test of rho=0: chibar2(01) = 0.00 Prob >= chibar2 = 1.000

Test Results

To obtain accuracy performance of the models, total 113 firms involving 92 non-defaults and 21 defaults were used. The firms that have traded in the Watch List Companies Market in the ISE and/or that have restructured their debt obligations between 1998 and 2003 were assumed as default or bankrupt.

Table 10: Statistical Summary of the Scoring Models

Variable	Obs	Mean	Std. Dev.	Min	Max
score1	573	-.4261082	37.64598	-65.66	885.81
score2	573	-4.116161	11.49175	-94.49	178.97
score3	573	-2.044276	19.28151	-172.66	367.49
score4	573	-4.606562	8.016983	-102.95	37.52
score5	573	-.8416056	3.193227	-23.3	49.24
score6	573	-1.845201	4.419781	-59.69	4.04
score7	573	-5.157504	13.53459	-109.56	142.65
score8	573	.0894241	.4350961	-.66	5.72
ore-ort	573	-2.368447	10.43812	-64.19	208.93
z-score	573	-2.822792	2.016785	-18.01	9.74
o-score	573	-3.120646	3.389482	-22.52	35.77

The signs of the original coefficients of Z-Score model were changed to provide unity with the other models and so;

$$Z = -1.2R13 - 1.4R6 - 3.3R15 - 0.6R14 - 1.0R9$$

function was used in the calculation of Z-Scores. R6 (Reserves / Total Assets) and R14 (Shareholder’s Equity / Total Liabilities) ratios were used instead of “Retained Earnings / Total Assets” and “Market Value of Equity / Total Liabilities” in the original model.

In the calculation of O-Scores;

$$O = -1.32 - 0.407R37 + 6.03R17 - 1.43R13 + 0.0757R18 - 2.37R19 - 1.83R20 + 0.285(INTWO) - 1.72(OENEG) - 0.521R21$$

function was used.

Score-Ort is the mean of the derived 8 scoring functions.

The model errors of the derived 8 scoring function, Score-Ort, Z-Score, O-Score and some financial ratios that are assumed important for default risk are presented in Table 11 and Table 12. These results show the wrong classifications one year prior to default. Type I error occurs when a default firm is classified as non-default and Type II error occurs when a non-default firm is classified as default. Error rates were obtained according to the cutting points which make total error minimum.

Table 11: Errors of the Models

Models	Cutting Point	Type I Error (%)	Type II Error (%)	Total Error (%)
Score1	0.32	19.05	15.22	17.13
Score2	-0.23	14.29	16.67	15.48
Score3	-0.67	4.76	27.17	15.97
Score4	-0.30	23.81	19.93	21.87
Score5	0.16	14.29	26.45	20.37
Score6	-0.09	14.29	28.80	21.55
Score7	-0.68	4.76	32.25	18.50
Score8	0.19	9.52	33.70	21.61
Score-Ort	-0.08	14.29	21.38	17.83
Z-Score	-1.42	14.29	16.49	15.39
O-Score	-1.39	14.29	24.09	19.19

Table 12 shows errors of some ratios.

Table 12: Errors of Some Ratios

Ratios	Cutting Point	Type I Error (%)	Type II Error (%)	Total Error (%)
R1	0.55	61.90	6.52	34.21
R5	0.395	19.05	40.22	29.63
R11	0.83	23.81	27.72	25.76
R12	0.30	19.05	19.38	19.22
R13	0.075	19.05	24.46	21.75
R17	0.639	9.52	28.08	18.80
R18	0.925	14.29	23.73	19.01
R19	0.028	14.29	35.69	24.99
R22	0.34	19.05	30.80	24.92
R24	0.45	14.29	33.33	23.81
R30	0.30	9.52	27.36	18.44
R35	0.075	23.81	32.43	28.12

Table 13 shows the ranking of the accuracy performance of the models and the ratios. As shown in the table, Z-Score model which has 14.29% Type I error, 16.49% Type II error and 15.39% total error has performed the best results. Subsequent to Z-Score, Score2 with 15.48% total error, Score3 with 15.97% total error and Score1 with 17.13% total error have taken a part. The

accuracy degree of R30 (Total Financial Liabilities / Total Assets) ratio has become sixth by leaving 6 scoring models behind including O-Score. O-Score model has been able to take tenth rank by staying behind R17 (Total Liabilities / Total Assets) and R18 (Current Liabilities / Current Assets) ratios.

Table 13: Ranking of Performance of the Models and the Ratios

Rank	Model or Ratio	Type I Error (%)	Type II Error (%)	Total Error (%)
1	**Z-Score**	14.29	16.49	15.39
2	**Score2**	14.29	16.67	15.48
3	**Score3**	4.76	27.17	15.97
4	**Score1**	19.05	15.22	17.13
5	**Score-Ort**	14.29	21.38	17.83
6	**R30**	9.52	27.36	18.44
7	**Score7**	4.76	32.25	18.50
8	**R17**	9.52	28.08	18.80
9	**R18**	14.29	23.73	19.01
10	**O-Score**	14.29	24.09	19.19
11	**R12**	19.05	19.38	19.22
12	**Score5**	14.29	26.45	20.37
13	**Score6**	14.29	28.80	21.55
14	**Score8**	9.52	33.70	21.61
15	**R13**	19.05	24.46	21.75
16	**Score4**	23.81	19.93	21.87
17	**R24**	14.29	33.33	23.81
18	**R22**	19.05	30.80	24.92
19	**R19**	14.29	35.69	24.99
20	**R11**	23.81	27.72	25.76
21	**R35**	23.81	32.43	28.12
22	**R5**	19.05	40.22	29.63
23	**R1**	61.90	6.52	34.21

Table 14 lists the variables that determine default risk most successfully alone.

Table 14: The Best Determinant Ratios

Ratio No	Financial Ratio	Credit Risk Factor	Hypothesis
R12	Total Bank Loans / Total Assets	Leverage	+
R13	Working Capital / Total Assets	Liquidity	-
R17	Total Liabilities / Total Assets	Leverage	+
R18	Short Term Liabilities / Current Assets	Liquidity	+
R30	Total Financial Loans / Total Assets	Leverage	+

The first four scoring models of the ranking are shown in the following: Z-Score, Score2, Score3, Score1.

The ratios taking part in above models are presented in Table 15. These ratios appear as the most important variables in measuring default risk in Turkey. Especially, R9 (Net Sales / Total Assets) ratio included in Z-Score, Score2 and Score3 and R22 (Short Term Financial Loans / Current Assets) ratio included in Score1, Score2 and Score3 are seen as the most important determinant variables of default risk.

Table 15: The Ratios Included in the Models with the Best Performance

Ratio No	Financial Ratio	Credit Risk Factor	Model(s)	Hypothesis
R1	Total Trade Receivables / Net Sales	Activity	Score3	+
R6	Reserves / Total Assets	Size	Z-Score, Score3	-
R7	Total Trade Payables / Net Sales	Activity	Score1	+
R9	Net Sales / Total Assets	Turnover	Z-Score, Score2, Score3	-
R13	Working Capital / Total Assets	Liquidity	Z-Score	-
R14	Shareholder's Equity / Total Liabilities	Leverage	Z-Score, Score2	-
R15	Profit Before Tax / Total Assets	Profitability	Z-Score	-
R16	Marketable Securities / Total Liabilities	Liquidity	Score1	-
R19	Net Profit / Total Assets	Profitability	Score1	-
R21	(Net Profit – Last Net Profit) / (|Net Profit| + |Last Net Profit|)	Growth Rates	Score2, Score3	-/+
R22	Short Term Financial Loans / Current Assets	Liquidity	Score1, Score2, Score3	+
R26	Working Capital / Net Sales	Liquidity	Score2	-/+
R33	Profit Before Tax / Net Sales	Profitability	Score2, Score3	-
R36	Net Sales / Last Net Sales	Growth Rates	Score2	-/+
R37	Ln(Total Assets / Consumer Price Index)	Size	Score1	-
R39	(Total Liabilities / Total Assets) / (Last Total Liabilities / Last Total Assets)	Leverage Change	Score2, Score3	+
R42	Liquid Assets / (Total Liabilities – Advances)	Debt Coverage	Score1	-
R44	Long Term Liabilities / Total Assets	Leverage	Score2, Score3	-/+

V. Conclusion

In this paper, Z-Score, Score2, Score3 and Score1 are found as the best models in measuring default risk in Turkey. R9 (Net Sales / Total Assets) ratio included in Z-Score, Score2 and Score3 and R22 (Short Term Financial Loans / Current Assets) ratio included in Score1, Score2 and Score3 are seen as the most important determinant variables of default risk.

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The ISE Review Volume: 8 No: 32
ISSN 1301-1642 © ISE 1997

THE EFFECTS OF G-7 COUNTRIES' STOCK MARKETS ON THE ISTANBUL STOCK EXCHANGE

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Abstract
In this paper, the effects of G-7 countries' stock market indices, DAX (Germany), CAC 40 (France), FTSE (United Kingdom), S&P TSX Composite (Canada), NIKKEI 225 (Japan), S&P 500 (USA), DOW JONES (USA), NASDAQ (USA), and MIBTEL (Italy), on the stock market of Turkey, Istanbul Stock Exchange (ISE-100), have been examined by using a block recursive VAR model. The findings of the study suggest that all the indices except for NIKKEI 225, have positive and significant effects on the ISE-100. As a result of the analysis, it is reported that the effects of the other stock market indices on the ISE-100 have decreased for the period between 01.01.1995-31.10.2000 in which there exist no financial crisis for Turkey, however after September 11, as the effects of the globalization have increased, the effects of the stock market indices on the ISE-100 have increased.

I. Introduction

There is a huge concern on the financial integration of the world major stock markets in the finance literature. The globalization has been the main cause of this concern as the financial markets have become more integrated through globalization. There are various studies that examine the linkages among the stock markets in the literature. Of these studies, a few focus on correlation analysis to examine short run relations like DeFusco et al (1996) and Aggarwal et al. (1999), but the majority such as Kasa (1992), Cheunk and Mak (1992), Chung and Liu (1994), Ghosh et al (1998), Pan et al (1999), Huang et al (2000), Fernandez-Serrano and Sosvilla-Rivero (2001), Johnson

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JEL Codes: C22, G10 and G15.
Key Words: Time Series Analysis, Stock Market Integration, G-7 countries.

and Soenen (2002) and Siklos and Ng (2001) focus on the existence of a long run relationship by using cointegration techniques such as Engle Granger or Johansen. In one of these studies, a cointegration relationship is found between the stock markets of US and, Japanese and Asia-Pacific countries. In another study by Kasa (1992), it is reported that there is a single common trend driving the countries' stock markets. Moreover there exists a much stronger evidence of cointegration when using quarterly data than when monthly data are employed. In Ghosh's (1998) study, it is illustrated that nine Asia Pacific markets are separately cointegrated with either the US or Japanese stock markets. Some of the studies focus on the linkage between US and Latin American stock markets like Choudhry (1997) and Fernandez-Serrano and Sosvilla-Rivero (2003). The other studies emphasize on the relationship between the UK capital markets and the world capital markets such as Taylor and Tonks (1989) and Kanas (1999) using Engle and Granger or Johansen and as a result, cointegration relations are reported. In a similar study by Allen and Mac Donald (1995) the integration of the stock markets of Australia and the world major equity markets are examined by using Johansen and Engle Granger cointegration techniques and as a result it is reported that the markets are integrated .

The majority of the studies in the finance literature have mainly dealt with the developed countries. There exists just a few studies which focus on the emerging market countries (see Bekaert (1993), Bekaert and Harvey (1997), Berument and Ince (2005)). Of these few studies, the short-run relationship between the stock markets of Turkey and the other countries are examined by Berument and Ince (2005) while the cointegration is examined by Neaime (2002) and Shachmurove (1996). In Neaime's (2002) study, the financial integration of MENA stock markets are examined and it is concluded that Turkish, Egypt and Morocco stock markets have been integrated with the world financial markets such as US, France and UK. Similar findings are reported by Shachmurove (1996) in which the integration between the stock markets of Middle East countries including Egypt, Israel, Jordan, Lebanon, Morocco, Oman and Turkey, and major index of the USA are investigated. In another study by Berument and Ince (2005) the short-run relationship between SP&500 and Istanbul Stock Exchange is examined by applying a VAR analysis. Their results suggest that SP&500 affects the ISE-100 returns positively up to four days.

In this paper, it is aimed to examine the effects of G-7 countries' stock market indices which are DAX (Germany), CAC 40 (France), FTSE (United Kingdom), S&P TSX Composite (Canada), NIKKEI 225 (Japan), S&P 500 (USA), DOW JONES (USA), NASDAQ (USA) and MIBTEL (Italy) on the ISE-100 index due to the fact that Turkey is special among the emerging markets with its volatile and high inflation. The short-run relationship between the stock market indices of the G-7 countries and Turkey has been investigated by using daily data set in which the period starts from 04.01.1988 to 31.12.2004. The analysis has also been carried out for the period from 01.01.2002 to 31.12.2004 in order to account for the incident in September 11, 2001 due to the impact of globalization on financial markets[1]. The analysis has also been reevaluated for the 01.01.1995 and 31.10.2000 period. This period is between two major financial crises in Turkey in order to eliminate the effect of financial crises. The reason of selecting G-7 countries for this study is because most of the countries in G-7 are major trading partners of Turkey such as Germany, France and the United States. This study differs from the other studies in some ways. Although there is an extensive literature on the integration of stock markets, the effects of G-7 countries' stock markets have not been studied for the case of Turkey, which is an emerging market country with its high and volatile inflation[2]. Therefore, it seems necessary to investigate the case of Turkey in this respect.

The paper has been organized as follows: The methodology and model specification of the study has been explained in Section II while the findings of the estimates have been reported in Section III. Finally, the conclusion takes place in the last section.

II. Methodology and Model Specification

The daily stock closing prices for nine of the indices for G-7 countries and Turkish markets have been used in the study. The indices under the study are DAX (Germany), CAC 40 (France), FTSE (United Kingdom), S&P TSX Composite (Canada), NIKKEI 225 (Japan), S&P500 (US), DOW JONES (US), MIBTEL (Italy) and the ISE-100 (Turkey). The data have been obtained from Datastream database and cover the period from 04.01.1988 to 31.12.2004.

As a model, a structural vector autoregressive (SVAR) model suggested by Cushman and Zha (1997) has been used. Specifically in the block recursive model, the stock market indices of the G-7 countries have been determined by their own lags (an AR process is used as a proxy) and the Turkish stock

[1] Some studies in literature have emphasized that the degree of integration among the stock markets have increased after September 11 (see Ceylan and Dogan, 2004).

[2] In a similar study, Narayan and Smyth (2004) have examined the linkage between the Australian and G-7 stock markets by using cointegration analysis. As a result, they have reported that there is a long run relationship between the Australian stock market and the stock markets of Canada, Italy, Japan and the United Kingdom. The cointegration is found for the stock markets of France, Germany and the USA.

market has been determined both by its own lags and the lags of the G7 countries' stock market indices.

One of the advantages of using a VAR model instead of a conventional single equation model is that it captures the dynamic relationships among variables of interest. Besides, it has a higher predictive power than single equation specifications. In this respect, a VAR model with block exogeneity has been used because in a conventional VAR, the domestic stock exchanges with their lags affect the foreign markets. When the block exogeneity is used, this effect can be easily removed.

The general specification of the identified VAR model of Cushman and Zha (1997) is;

$$A(L)y(t) = \varepsilon(t) \qquad (1)$$

in which the A(L) is an mxm matrix polynomial in the lag operator L, $y(t)$ is the mx1 observations vector, and ε(t) is the mx1 vector of structural disturbances. Equation 2 shows the specification of the model.

$$y(t) = \begin{bmatrix} y_1(t) \\ y_2(t) \end{bmatrix}, \quad A(L) = \begin{bmatrix} A_{11}(L) & 0 \\ A_{21}(L) & A_{22}(L) \end{bmatrix}, \quad \varepsilon(t) = \begin{bmatrix} \varepsilon_1(t) \\ \varepsilon_2(t) \end{bmatrix}. \qquad (2)$$

Here, $\varepsilon(t)$ s are assumed to be uncorrelated with $y(t-j)$ for $j > 0$ and $A(0)$ is non-singular and the block (y_2(t)) exogeneity is represented by $A_{12}(L)$, which is zero. This means $y_1(t)$ is exogenous to the second block not only contemporaneously but also for the lagged values. The modified error bands of Bernanke, Hall, Leeper, Sims and Zha (1996) are used for the computation of the maximum likelihood estimation (MLE) and the inference for the system. This is because the MLE of the VAR model is not applicable to the identified VAR model with block exogeneity[3].

The observation matrices are such that y_1= *[Stock indices of the G-7 countries]*, y_2= *[Turkish Stock Exchange]* and the lag order of the identified VAR model is 5 for each country, which is suggested by the Bayesian Information Criteria. In the study, the Stock market growth (*SR*) of each G7 countries and Turkey at time t is calculated as follows:

[3] See Sims (1986) and Gordon and Leeper (1994).

$$SR_t = [(X_t / X_{t-1}) - 1] * 10000 \quad (3)$$

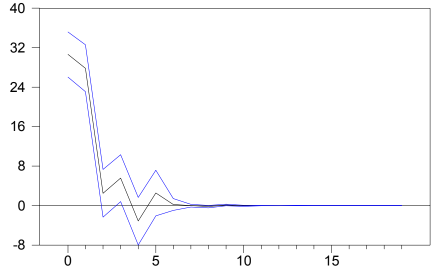
Where; X_t is the stock market index of each G-7 country at time t.

III. Estimates

In this section, the impulse response functions of the Istanbul Stock Exchange to a one standard deviation shock to the stock market indices of G-7 countries for the period from 04.01.1988 to 31.12.2004 are shown.

Figure 1: Impulse Responses of the ISE-100 to a One Standard Deviation Shock to the G-7 Countries Stock Market Indices from 04.01.1988 to 31.12.2004

i. Canada (S&P TSX Composite)



ii. France (CAC 40)

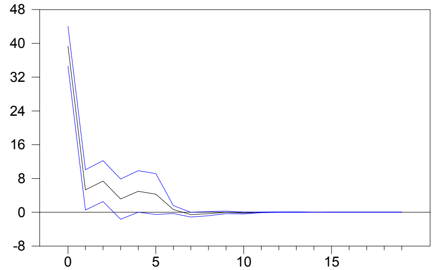
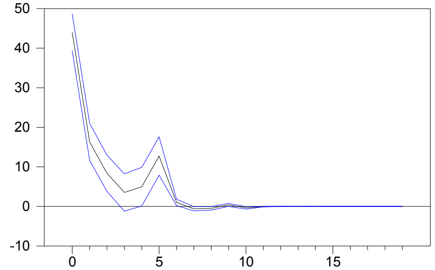
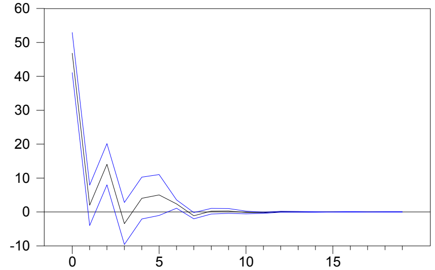


Figure 1: Impulse Responses of the ISE-100 to a One Standard Deviation Shock to the G-7 Countries Stock Market Indices from 04.01.1988 to 31.12.2004 (Continued)

iii. Germany (DAX)



iv. Italy (MIBTEL)



v. Japan (Nikkei 225)

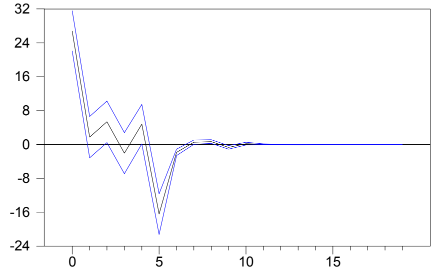
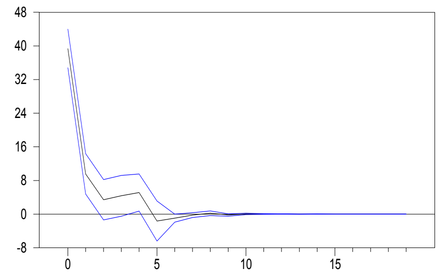
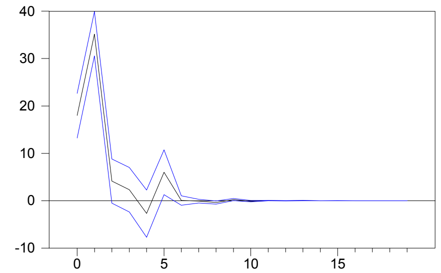


Figure 1: Impulse Responses of the ISE-100 to a One Standard Deviation Shock to the G-7 Countries Stock Market Indices from 04.01.1988 to 31.12.2004 (Continued)

vi. United Kingdom (FTSE)



vii. USA (Dow Jones)



viii. USA (NASDAQ)

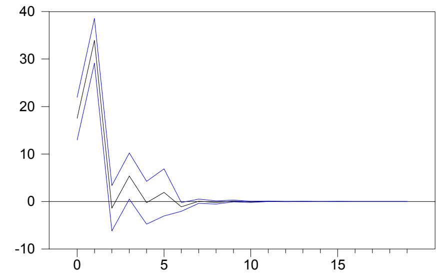
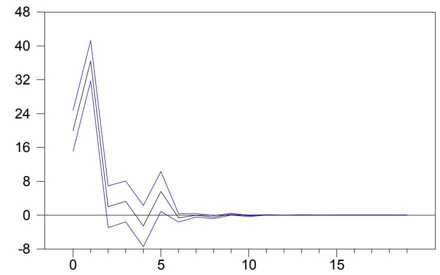


Figure 1: Impulse Responses of the ISE-100 to a One Standard Deviation Shock to the G-7 Countries Stock Market Indices from 04.01.1988 to 31.12.2004 (Continued)

ix. USA (S&P500)



Impulse response analysis illustrates how long and to what extent returns react to unanticipated changes in the other markets that captures the dynamic interactions between those two markets. Figure 1 shows the impulse responses of the ISE-100 index to a one standard deviation shock to nine indices from G-7 countries’ stock markets[4]. The confidence intervals for the impulse response functions are constructed by using the Bayesian Simulation Method, where 2500 replicates have been used for the simulations and confidence bands are reported at the 90% significance level. The middle line shows the point estimates. Thus, if the confidence interval includes the horizontal line, then we cannot reject the null hypothesis which is accepted to be zero for a particular period. Thus, we claim that the evidence for this particular period is statistically insignificant.

For the 04.01.1988-31.12.2004 period, the effects of S&P500 (Panel ix) and DOW JONES (Panel vii) indices on the ISE-100 are positive except for the fourth day where the effect is insignificant however, it is significant in the first and fifth days since the point estimates are between the confidence intervals and are all above the x-axis. The effects of NASDAQ and S&P TSX indices are also positive and significant in the first and third days. For CAC 40, MIBTEL and NIKKEI 225, a positive and significant effect is observed in the second day. In addition to this, CAC 40 has also a positive and significant effect in the first day whereas the effect of NIKKEI 225 turns to negative in the fifth day. The positive and significant effects of FTSE are observed in the first and fourth days and DAX on the first, second and fifth days. For the whole indices studied, positive and significant contemporaneous effects of the shocks on the ISE-100 are recognized. Figure 1 shows that, for all of the G-7

[4] One may see Enders (1995) for the gathering impulse responses for VAR type specifications.

countries' stock market indices, the effect of the shocks on the ISE-100 dissapears after 10 periods. These findings all show parallelism with the studies of Neaime (2002), Shachmurove (1996) in which cointegration relations are investigated and Berument and Ince (2005) in which short-run relation is examined. Therefore, over all we observe the positive effect of G-7 countries' stock markets on the ISE except for NIKKEI 225 in the fifth day.

Table 1 shows the effects of movements of foreign stock market indices on the movement of the ISE-100. That is, it shows how much the ISE-100 index increases or decreases when each of the foreign stock market indices increases by one positive standard deviation shock. In the table, it is possible to see that some of the G-7 countries' stock market indices have positive or negative significant impacts on the ISE-100 after the fifth day. Since their effects are very little, they are not taken into consideration. One may also look at Table 1 for the exact values of impulses for 10 periods.

Ceylan and Dogan (2004) argue that stock market integration has increased after September 11, 2001. In order to account this, the analysis is performed for the post January 2002 era. Figure 2 reports the corresponding impulse responses. The estimation findings for both of the periods are in line except for the case of NIKKEI 225. This index is found to have varying effects on the ISE-100 for the 04.01.1988-31.12.2004 period. The positive effect of the shock in the second day turns to negative in the proceeding day.

The analysis is also reevaluated for the 01.01.1995 and 31.10.2000 period. This is the period between two major financial crises in Turkey. The Figure 3 suggests that, NASDAQ and NIKKEI 225 in the fifth day, and MIBTEL in the third and the seventh days have negative and significant effects on the ISE-100. On the other hand, NASDAQ in the first, MIBTEL in the second and the fourth periods, and NIKKEI 225 in the fourth periods have positive and statistically significant effect. Therefore, these three indices do not have consistent effects on the ISE-100. After reevaluating the study for the post 2002 period, we cannot see any negative effect of NIKKEI 225 on the ISE-100. This might be due to higher globalization that allowed higher effects of shocks on the ISE after 2002. Note that the finding of negative effect of Nikkei 225 return on the ISE- 100 for the post September 11, 2001 disappears. We believe, this further strengthens our results.

The relationship between the stock market indices of G-7 countries and Turkey reported in the study may be stemming from the common shocks that hit the economies simultaneously, like oil price shocks, in the same direction. Moreover, when the foreign stock market fall (or increase) in G-7 countries, investors may prefer to decrease their holdings in Turkey to decrease their risk exposure.

IV. Conclusion

In this study, the effects of nine G-7 countries' stock market indices on the Turkish stock market have been examined by introducing a one-standard deviation shock to the foreign country indices for various periods. The findings of the study show that all the indices except for NIKKEI 225 have statistically significant effects on the ISE-100. The effect of NIKKEI 225 is limited. Thus, all the results gathered from the analysis suggest that G-7 countries' stock market indices have predictive power on the ISE-100 index and due to the globalization their effects on the ISE have increased for the post 2002.

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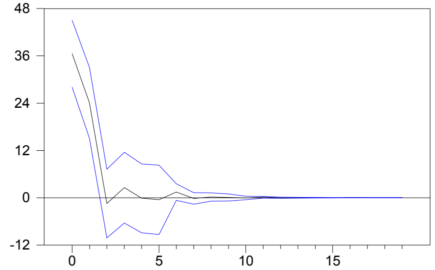
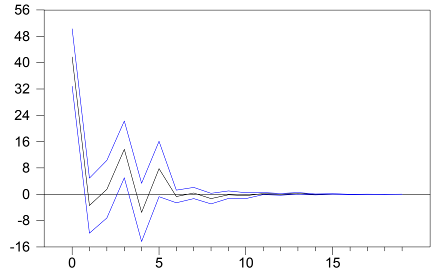
Appendix

Figure 2: Impulse Responses of the ISE-100 Index to a One Standard Deviation Shock to G-7 Countries Stock Market Indices in the Period Between 04.01.2002-31.12.2004

Canada (S&P TSX Composite)



France (CAC 40)



Germany (DAX)

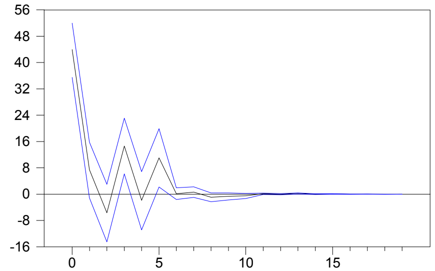
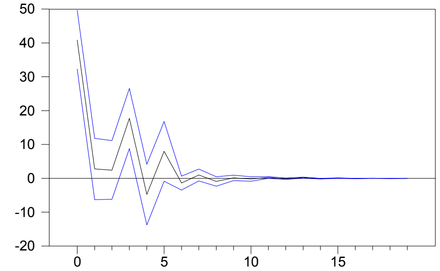
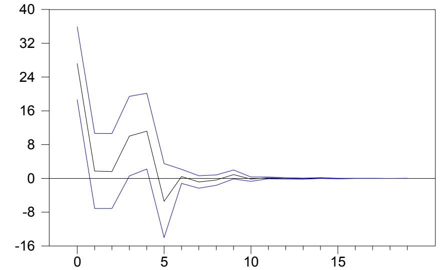


Figure 2: Impulse Responses of the ISE-100 Index to a One Standard Deviation Shock to G-7 Countries Stock Market Indices in the Period Between 04.01.2002-31.12.2004 (Continued)

Italy (MIBTEL)



Japan (Nikkei 225)



United Kingdom (FTSE)

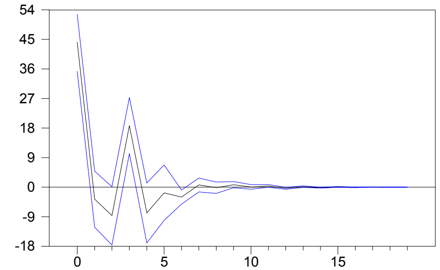
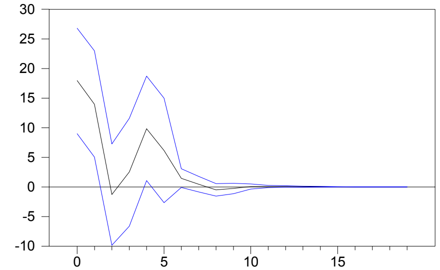
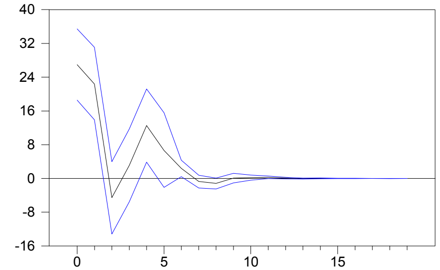


Figure 2: Impulse Responses of the ISE-100 Index to a One Standard Deviation Shock to G-7 Countries Stock Market Indices in the Period Between 04.01.2002-31.12.2004 (Continued)

USA (Dow Jones)



USA (NASDAQ)



USA (S&P500)

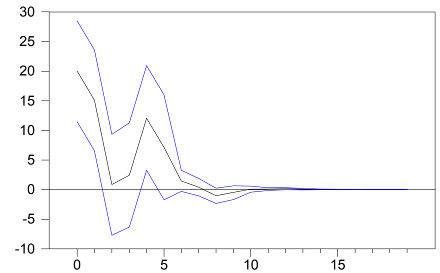
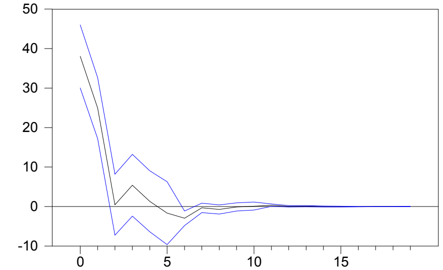
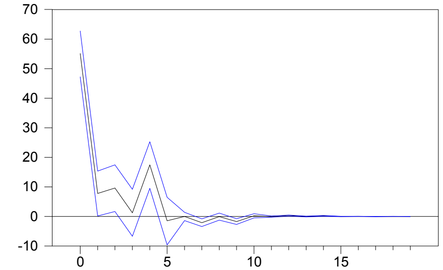


Figure 3: Impulse Responses of the ISE-100 Index to a One Standard Deviation Shock to G-7 Countries Stock Market Indices in the Period Between 01.01.1995-31.10.2000

Canada (S&P TSX Composite)



France (CAC 40)



Germany (DAX)

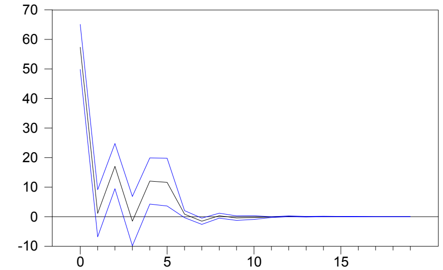
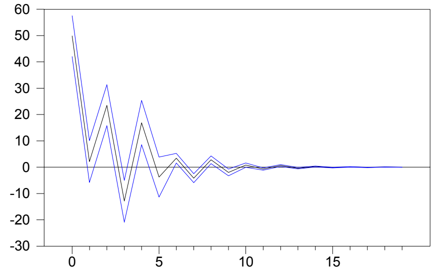
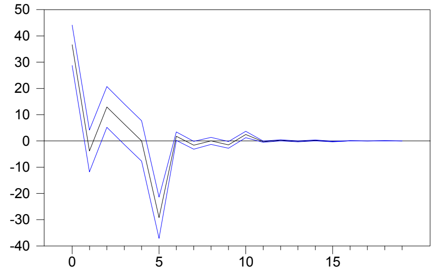


Figure 3: Impulse Responses of the ISE-100 Index to a One Standard Deviation Shock to G-7 Countries Stock Market Indices in the Period Between 01.01.1995-31.10.2000 (Continued)

Italy (MIBTEL)



Japan (Nikkei 225)



United Kingdom (FTSE)

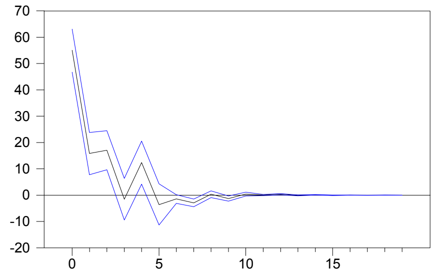
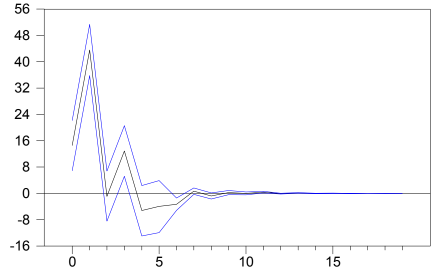
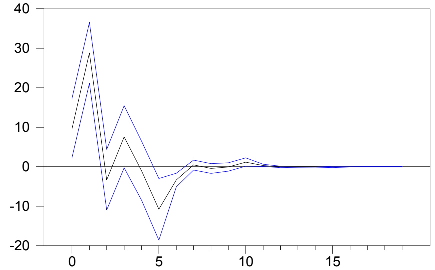


Figure 3: Impulse Responses of the ISE-100 Index to a One Standard Deviation Shock to G-7 Countries Stock Market Indices in the Period Between 01.01.1995-31.10.2000 (Continued)

USA (Dow Jones)



USA (NASDAQ)



USA (S&P500)

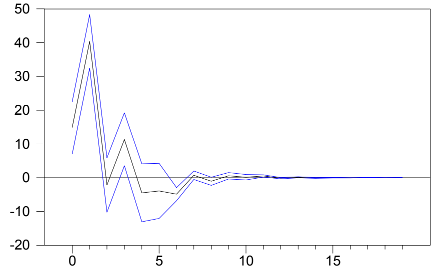


Table 1: The Impact of the G-7 Countries' Stock Indices on the ISE-100 Index for 10 Year Period

	Canada (S&P TSX Composite)	France (CAC 40)	Germany (DAX)	Italy (MIBTEL)	Japan (Nikkei 225)	United Kingdom (FTSE)	USA (Dow Jones)	USA (NASDAQ)	USA (S&P500)
0	30.78*	39.51*	44.03*	46.60*	26.89*	39.43*	17.96*	17.40*	19.89*
1	27.86*	5.32*	16.29*	1.96	1.74	9.56*	35.16*	33.91*	36.45*
2	2.52	7.39*	8.37*	14.05*	5.37*	3.41	4.13	-1.40	2.02
3	5.59*	3.14	3.52	-3.41	-2.04	4.38	2.31	5.35*	3.28
4	-3.12	4.97*	4.97*	4.05	4.81	5.15*	-2.68	-0.25	-2.57
5	2.58	4.29	12.76*	5.04	-16.39*	-1.66	5.98*	1.91	5.62*
6	0.23	0.66	1.02*	2.37*	-1.84*	-0.96*	0.06	-1.13*	-0.65
7	-0.00	-0.57	-0.60*	-1.12*	0.53	-0.25	-0.10	0.04	-0.03
8	-0.21	-0.32	-0.50*	0.23	0.68*	0.21	-0.39*	-0.21	-0.46*
9	0.12	-0.02	0.40*	0.29	-0.69*	-0.21	0.24*	0.10	0.23*
10	-0.04	-0.16	-0.37*	-0.16	0.21	0.04	-0.10	-0.06	-0.15

- The values reported in the table shows how much the ISE-100 index increases or decreases when each of the G-7 countries' stock market indices increases by one positive standart deviations shock. *indicates the level of significance at 5%.

The ISE Review Volume: 8 No: 32
ISSN 1301-1642 © ISE 1997

GLOBAL CAPITAL MARKETS

The global economic recovery has continued to increase led by the United States and China, where the growth momentum has remained strong. Growth projections for 2005 in most other regions have been marked downward, with the important expections of Japan and India. The global equity markets have remained resilient fueled by continued balance sheet improvements in the financial and corporate sectors in most countries. The continuing global economic expansion, together with determined efforts to restructure and cut costs, has enabled many financial institutions and corporations to generate substantial profits over the past three years. The outlook in the euro area is still uncertain while indicators remain subdued incoming data notably for exports and manufacturing have generally strenghtened. GDP growth forecasts for 2005 have been marked down, particularly for ıtaly, given continued weak final domestic demand. In contrast Japan's economy is regaining momentum, with recent data pointing to continued expansion thereafter. GDP growth is now expected to average about 2 percent in both 2005 and 2006.

In the emerging markets financing conditions are very favorable in part reflecting improved economic fundamentals and the increased presence of long term investors. Many emerging market countries have experienced strong growth with moderate inflation, improved their current account and fiscal performance and accumulated substantial reserves.

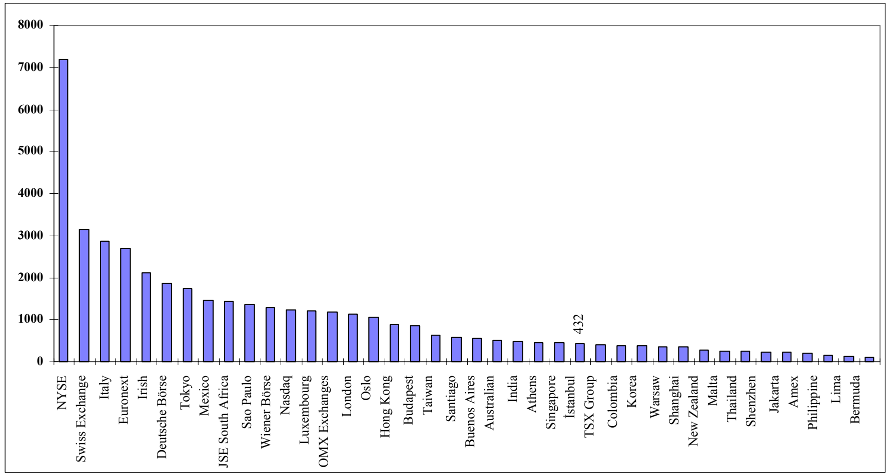
The performances of some developed stock markets with respect to indices indicated that DJIA, FTSE-100, Nikkei-225 and DAX changed by –4.3%, 3.4%, 7.2% and 4.8% respectively at October 5th 2005 in comparison with the Dec. 31st 2004. When US$ based returns of some emerging markets are compared in the same period, the best performer markets were: Egypt (105%), Colombia (64.4%), Russia (64.4%), Turkey (39.1%), S.Korea (36.4%), Hungary (36.4%), Brazil (35%), Peru (34.2%). In the same period, the lowest return markets were: Venezuela (-37%), China (-6.6%), Taiwan (-4.7%), Thailand (1.6%) and Indonesia (2.2%). The performances of emerging markets with respect to P/E ratios as of end-September 2005 indicated that the highest rates were obtained in Jordan (54.4), Argentina (47.4), Russia (22.9), Czech Rep. (22.6), China (21.0) and Korea (18.5), and the lowest rates in Venezuela (4.7), Brazil (10.2), Thailand (10.4), Indonesia (11.9), Pakistan.(12.3), S. Africa (12.9) and Turkey (14.1).

Market Capitalization (USD Million, 1986-2004)

	Global	Developed Markets	Emerging Markets	ISE
1986	6,514,199	6,275,582	238,617	938
1987	7,830,778	7,511,072	319,706	3,125
1988	9,728,493	9,245,358	483,135	1,128
1989	11,712,673	10,967,395	745,278	6,756
1990	9,398,391	8,784,770	613,621	18,737
1991	11,342,089	10,434,218	907,871	15,564
1992	10,923,343	9,923,024	1,000,319	9,922
1993	14,016,023	12,327,242	1,688,781	37,824
1994	15,124,051	13,210,778	1,913,273	21,785
1995	17,788,071	15,859,021	1,929,050	20,782
1996	20,412,135	17,982,088	2,272,184	30,797
1997	23,087,006	20,923,911	2,163,095	61,348
1998	26,964,463	25,065,373	1,899,090	33,473
1999	36,030,810	32,956,939	3,073,871	112,276
2000	32,260,433	29,520,707	2,691,452	69,659
2001	27,818,618	25,246,554	2,572,064	47,150
2002	23,391,914	20,955,876	2,436,038	33,958
2003	31,947,703	28,290,981	3,656,722	68,379
2004	38,904,018	34,173,600	4,730,418	98,299

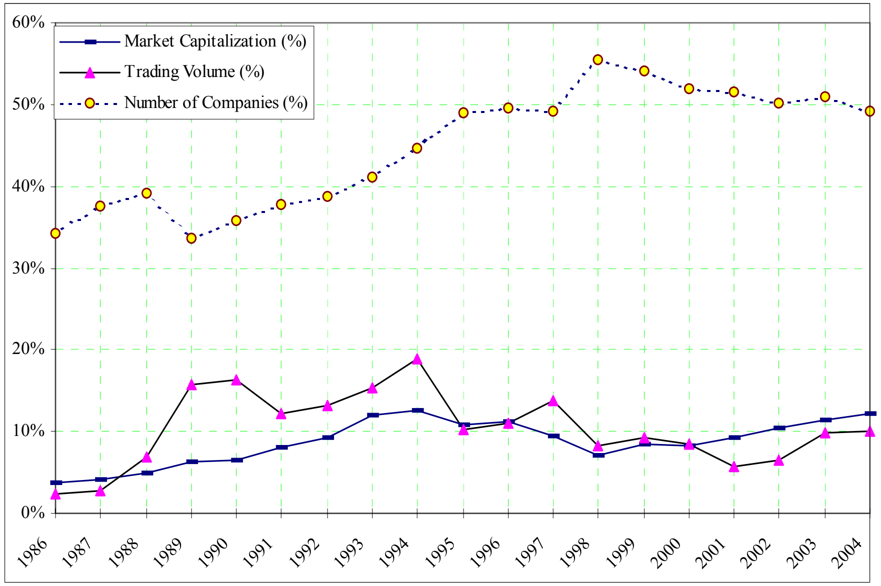
Source: Standard & Poor's Global Stock Markets Factbook, 2005.

Comparison of Average Market Capitalization Per Company (USD Million, September 2005)



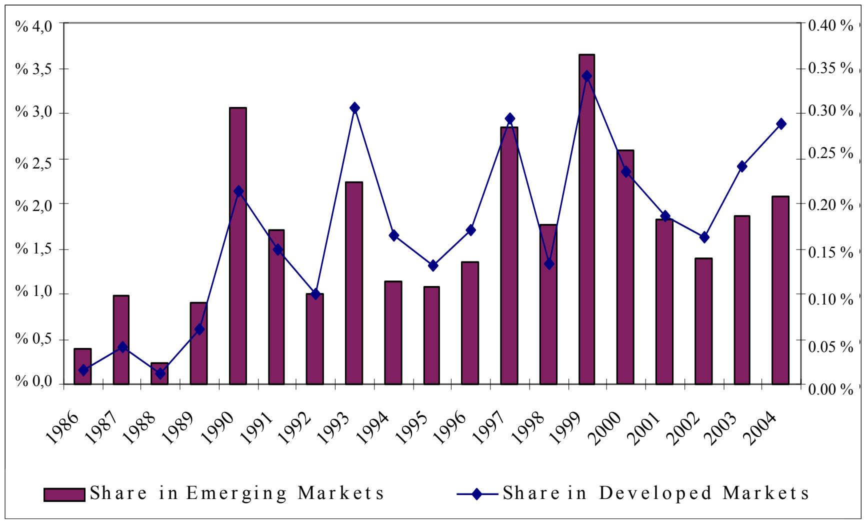
Source: FIBV, Monthly Statistics, Sept. 2005.

Worldwide Share of Emerging Capital Markets (1986-2004)



Source: Standard & Poor's Global Stock Markets Factbook, 2005.

Share of ISE's Market Capitalization in World Markets (1986-2004)



Source: Standard & Poor's Global Stock Markets Factbook, 2005.

Main Indicators of Capital Markets (Sept. 2005)

	Market	Monthly Turnover Velocity (Sept. 2005) (%)	Market	Value of Share Trading (millions, US$) Up to Year Total (2005/1-2005/9)	Market	Market Cap. of Share of Domestic Companies (millions US$) Sept. 2005
1	NASDAQ	249.97	NYSE	10,386,414	NYSE	13,167,413
2	Korea	176.88	NASDAQ	7,484,369	Tokyo	3,954,200
3	Istanbul	175.69	London	4,171,192	NASDAQ	3,525,096
4	Spanish Exchanges	163.22	Tokyo	2,809,010	London	3,035,719
5	Italy	153.71	Euronext	2,168,338	Euronext	2,607,338
6	Deutsche Börse	144.30	Deutsche Börse	1,420,883	Osaka	2,588,574
7	Taiwan	127.99	Spanish (BME)	1,192,102	TSX Group	1,479,488
8	Shenzhen	127.98	Italy	974,075	Deutsche Börse	1,198,468
9	OMX Exchanges	114.75	Korea	787,392	Spanish (BME)	1,047,595
10	Euronext	112.68	Swiss Exchange	737,075	Hong Kong	981,757
11	Oslo	112.63	OMX Exchanges	690,413	Swiss Exchange	880,602
12	Swiss Exchange	110.78	TSX Group	646,893	Australian	809,540
13	London	110.41	Australian	510,385	Italy	778,002
14	Tokyo	99.75	Amex	437,951	OMX Exchanges	774,601
15	NYSE	96.78	Taiwan	416,902	Korea	599,655
16	Thailand	89.67	Hong Kong	350,778	Bombay	512,767
17	Australian	85.82	India	230,633	JSE South Africa	502,010
18	Shanghai	82.28	Shanghai	188,759	India	477,258
19	India	76.85	Oslo	165,725	Sao Paulo	463,829
20	Budapest	68.76	Osaka	160,154	Taiwan	435,184
21	TSX Group	67.30	JSE South Africa	144,951	Shanghai	292,036
22	Jakarta	58.72	Istanbul	143,374	Singapore	247,766
23	Irish	56.36	Shenzhen	121,996	Mexico	216,831
24	Hong Kong	54.02	Sao Paulo	118,175	Oslo	192,104
25	Athens	48.97	Bombay	117,171	Malaysia	186,513
26	Singapore	48.86	Singapore	88,550	Santiago	142,487
27	Tel-Aviv	46.33	Thailand	77,512	Athens	136,310
28	JSE South Africa	45.82	Irish	50,690	Istanbul	129,530
29	New Zealand	43.16	Athens	48,321	Wiener Börse	124,993
30	Sao Paulo	42.55	Malaysia	41,222	Thailand	121,610
31	Wiener Börse	40.67	Mexico	40,651	Shenzhen	120,317
32	Warsaw	40.31	Tel-Aviv	36,562	Tel-Aviv	109,328
33	Bombay	35.09	Jakarta	35,188	Irish	108,254
34	Malaysia	30.73	Wiener Börse	33,586	Amex	98,093
35	Mexico	26.82	Warsaw	21,812	Warsaw	83,456
36	Tehran	23.24	Budapest	17,249	Jakarta	73,611
37	Philippine	21.47	New Zealand	16,037	Buenos Aires	56,100
38	Colombo	18.08	Santiago	13,811	Luxembourg	48,277
39	Colombia	15.38	Tehran	6,570	New Zealand	42,902
40	Santiago	14.70	Philippine	5,900	Colombia	40,244
41	Buenos Aires	12.59	Buenos Aires	5,068	Budapest	37,171
42	Ljubljana	11.82	Colombia	4,811	Philippine	34,951
43	Osaka	7.91	Lima	1,353	Tehran	33,686
44	Lima	7.60	Ljubljana	827	Lima	23,677
45	Malta	3.60	Colombo	799	Ljubljana	7,521

Source: FIBV, Monthly Statistics, Sept. 2005.

Trading Volume (USD millions, 1986-2004)

	Global	Developed	Emerging	ISE	Emerging / Global (%)	ISE/Emerging (%)
1986	3,573,570	3,490,718	82,852	13	2.32	0.02
1987	5,846,864	5,682,143	164,721	118	2.82	0.07
1988	5,997,321	5,588,694	408,627	115	6.81	0.03
1989	7,467,997	6,298,778	1,169,219	773	15.66	0.07
1990	5,514,706	4,614,786	899,920	5,854	16.32	0.65
1991	5,019,596	4,403,631	615,965	8,502	12.27	1.38
1992	4,782,850	4,151,662	631,188	8,567	13.20	1.36
1993	7,194,675	6,090,929	1,103,746	21,770	15.34	1.97
1994	8,821,845	7,156,704	1,665,141	23,203	18.88	1.39
1995	10,218,748	9,176,451	1,042,297	52,357	10.20	5.02
1996	13,616,070	12,105,541	1,510,529	37,737	11.09	2.50
1997	19,484,814	16,818,167	2,666,647	59,105	13.69	2.18
1998	22,874,320	20,917,462	1,909,510	68,646	8.55	3.60
1999	31,021,065	28,154,198	2,866,867	81,277	9.24	2.86
2000	47,869,886	43,817,893	4,051,905	179,209	8.46	4.42
2001	42,076,862	39,676,018	2,400,844	77,937	5.71	3.25
2002	38,645,472	36,098,731	2,546,742	70,667	6.59	2.77
2003	29,639,297	26,743,153	2,896,144	99,611	9.77	3.44
2004	39,309,589	35,341,782	3,967,806	147,426	10.09	3.72

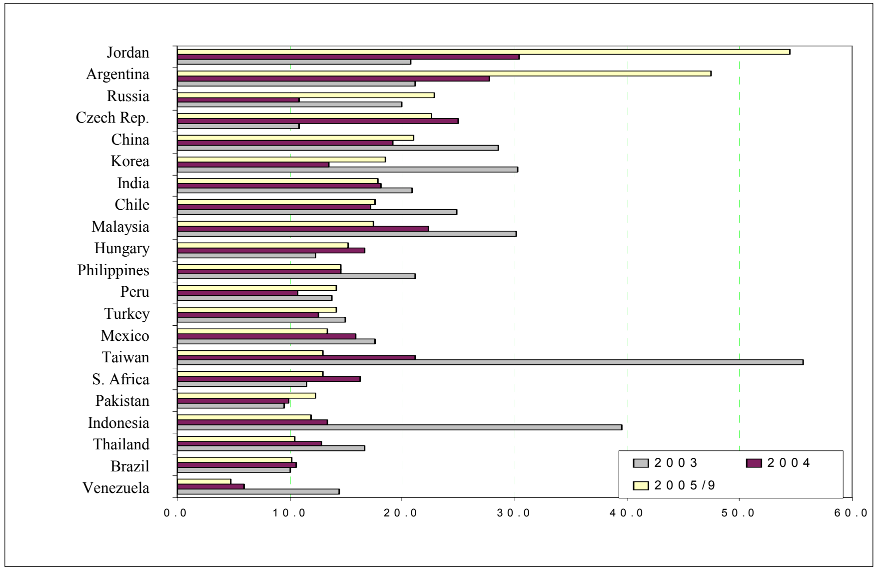
Source: Standard & Poor's Global Stock Markets Factbook, 2005.

Number of Trading Companies (1986-2004)

	Global	Developed Markets	Emerging Markets	ISE	Emerging / Global (%)	ISE/Emerging (%)
1986	28,173	18,555	9,618	80	34.14	0.83
1987	29,278	18,265	11,013	82	37.62	0.74
1988	29,270	17,805	11,465	79	39.17	0.69
1989	25,925	17,216	8,709	76	33.59	0.87
1990	25,424	16,323	9,101	110	35.80	1.21
1991	26,093	16,239	9,854	134	37.76	1.36
1992	27,706	16,976	10,730	145	38.73	1.35
1993	28,895	17,012	11,883	160	41.12	1.35
1994	33,473	18,505	14,968	176	44.72	1.18
1995	36,602	18,648	17,954	205	49.05	1.14
1996	40,191	20,242	19,949	228	49.64	1.14
1997	40,880	20,805	20,075	258	49.11	1.29
1998	47,465	21,111	26,354	277	55.52	1.05
1999	8,557	22,277	26,280	285	54.12	1.08
2000	49,933	23,996	25,937	315	51.94	1.21
2001	48,220	23,340	24,880	310	51.60	1.25
2002	48,375	24,099	24,276	288	50.18	1.19
2003	49,855	24,414	25,441	284	51.03	1.12
2004	48,806	24,824	23,982	296	49.14	1.23

Source: Standard & Poor's Global Stock Markets Factbook, 2005.

Comparison of P/E Ratios Performances



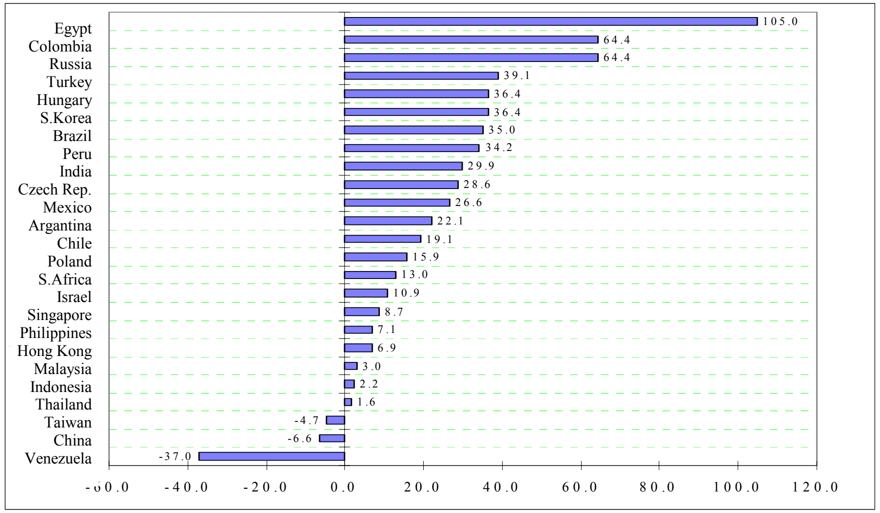
Source: IFC Factbook 2001. Standard & Poor's, Emerging Stock Markets Review, Sept. 2005.

Price-Earnings Ratios in Emerging Markets

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005/9
Argentina	38.2	16.3	13.4	39.4	-889.9	32.6	-1.4	21.1	27.7	47.4
Brazil	14.5	12.4	7.0	23.5	11.5	8.8	13.5	10.0	10.6	10.2
Chile	14.6	14.7	15.1	35.0	24.9	16.2	16.3	24.8	17.2	17.6
China	27.8	34.5	23.8	47.8	50.0	22.2	21.6	28.6	19.1	21.0
Czech Rep.	17.6	37.1	-11.3	-14.9	-16.4	5.8	11.2	10.8	25.0	22.6
Hungary	17.5	27.4	17.0	18.1	14.3	13.4	14.6	12.3	16.6	15.2
India	12.3	15.2	13.5	25.5	16.8	12.8	15.0	20.9	18.1	17.9
Indonesia	21.6	10.5	-106.2	-7.4	-5.4	-7.7	22.0	39.5	13.3	11.9
Jordan	16.9	14.4	15.9	14.1	13.9	18.8	11.4	20.7	30.4	54.4
Korea	11.7	17.9	-47.1	-33.5	17.7	28.7	21.6	30.2	13.5	18.5
Malaysia	27.1	9.5	21.1	-18.0	91.5	50.6	21.3	30.1	22.4	17.4
Mexico	16.8	19.2	23.9	14.1	13.0	13.7	15.4	17.6	15.9	13.4
Pakistan	11.7	14.8	7.6	13.2	-117.4	7.5	10.0	9.5	9.9	12.3
Peru	14.2	14.0	21.1	25.7	11.6	21.3	12.8	13.7	10.7	14.2
Philippines	20.0	10.9	15.0	22.2	26.2	45.9	21.8	21.1	14.6	14.6
Poland	14.3	11.4	10.7	22.0	19.4	6.1	88.6	-353.0	39.9	10.8
Russia	6.3	8.1	3.7	-71.2	3.8	5.6	12.4	19.9	10.8	22.9
S.Africa	16.3	10.8	10.1	17.4	10.7	11.7	10.1	11.5	16.2	12.9
Taiwan	28.2	28.9	21.7	52.5	13.9	29.4	20.0	55.7	21.2	13.0
Thailand	13.1	-32.8	-3.6	-12.2	-6.9	163.8	16.4	16.6	12.8	10.4
Turkey	10.7	20.1	7.8	34.6	15.4	72.5	37.9	14.9	12.5	14.1
Venezuela	32.5	12.8	5.6	10.8	30.5	-347.6	-11.9	14.4	6.0	4.7

Source: IFC Factbook, 2004; Standard&Poor's, Emerging Stock Markets Review, Sept. 2005
Note: Figures are taken from S&P/IFCG Index Profile.

Comparison of Market Returns in USD (31/12/2004-05/10/2005)



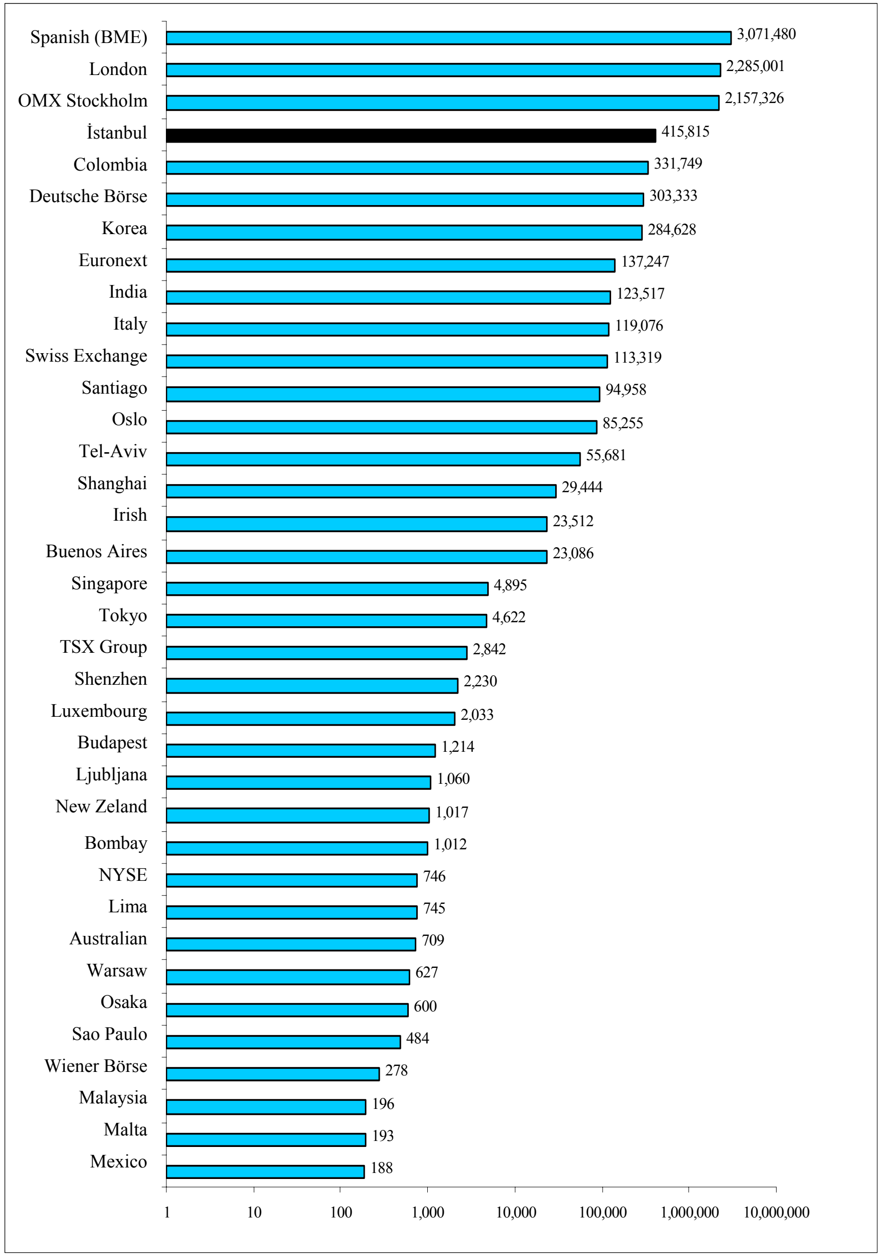
Source: The Economist, October 8th 2005.

Market Value/Book Value Ratios (1996-2005/9)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005/9
Argentina	1.6	1.8	1.3	1.5	0.9	0.6	0.8	2.0	2.2	3.5
Brazil	0.7	1.0	0.6	1.6	1.4	1.2	1.3	1.8	1.9	2.1
Chile	1.6	1.6	1.1	1.7	1.4	1.4	1.3	1.9	0.6	2.1
China	2.1	3.9	2.1	3.0	3.6	2.3	1.9	2.6	2.0	2.3
Czech Rep.	0.9	0.8	0.7	0.9	1.0	0.8	0.8	1.0	1.6	2.2
Hungary	2.0	4.2	3.2	3.6	2.4	1.8	1.8	2.0	2.8	3.5
India	2.1	2.3	1.8	3.3	2.6	1.9	2.0	3.5	3.3	4.7
Indonesia	2.7	1.4	1.5	3.0	1.7	1.7	1.0	1.6	2.8	2.4
Jordan	1.7	1.8	1.8	1.5	1.2	1.5	1.3	2.1	3.0	5.7
Korea	0.8	0.5	0.9	2.0	0.8	1.2	1.1	1.6	1.3	1.7
Malaysia	3.8	1.4	1.3	1.9	1.5	1.2	1.3	1.7	1.9	2.0
Mexico	1.7	2.3	1.4	2.2	1.7	1.7	1.5	2.0	2.5	2.8
Pakistan	1.5	2.3	0.9	1.4	1.4	0.9	1.9	2.3	2.6	3.3
Peru	2.5	2.0	1.6	1.5	1.1	1.4	1.2	1.8	1.6	2.1
Philippines	3.1	1.3	1.3	1.4	1.0	0.9	0.8	1.1	1.4	1.6
Poland	2.6	1.7	1.5	2.0	2.2	1.4	1.3	1.8	2.0	1.6
Russia	0.4	0.5	0.3	1.2	0.6	1.1	0.9	1.2	1.2	2.1
S.Africa	2.3	1.6	1.5	2.7	2.1	2.1	1.9	2.1	2.5	2.8
Taiwan	3.3	3.1	2.6	3.4	1.7	2.1	1.6	2.2	1.9	1.8
Thailand	1.8	0.8	1.2	2.1	1.3	1.3	1.5	2.8	2.0	2.1
Turkey	4.0	6.8	2.7	8.9	3.1	3.8	2.8	2.6	1.7	1.9
Venezuela	3.3	1.2	0.5	0.4	0.6	0.5	0.5	1.1	1.2	0.9

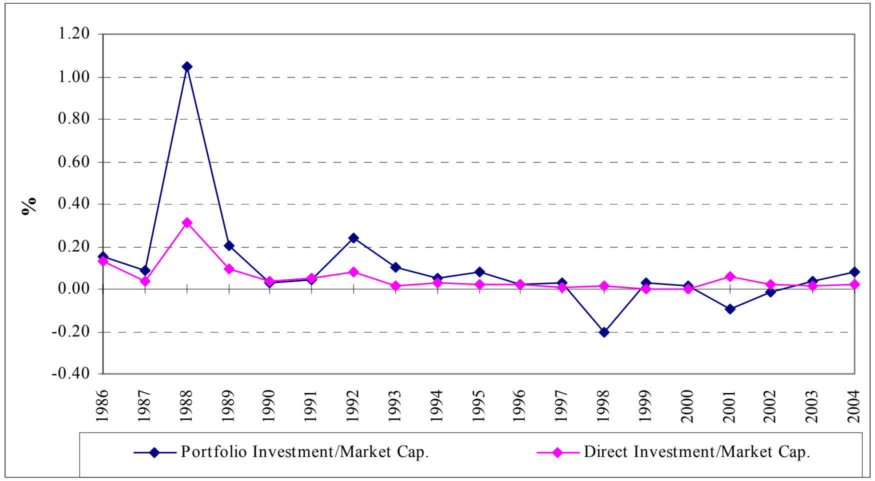
Source: IFC Factbook, 2004; Standard & Poor's, Emerging Stock Markets Review, Sept. 2005.
Note: Figures are taken from S&P/IFCG Index Profile.

Value of Bond Trading (Million USD Jan. 2005-Sept. 2005)



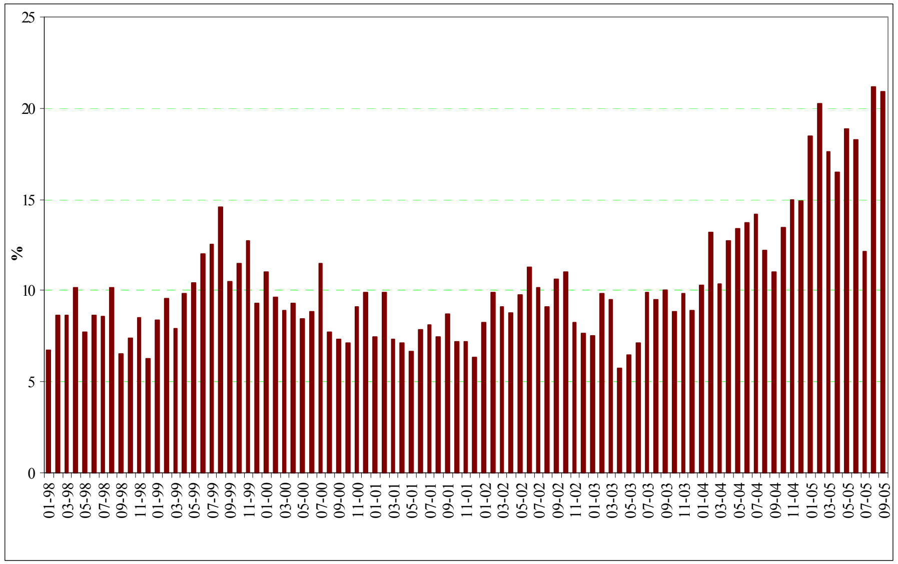
Source: FIBV, Monthly Statistics, Sept. 2005.

Foreign Investments as a Percentage of Market Capitalization in Turkey (1986-2004)



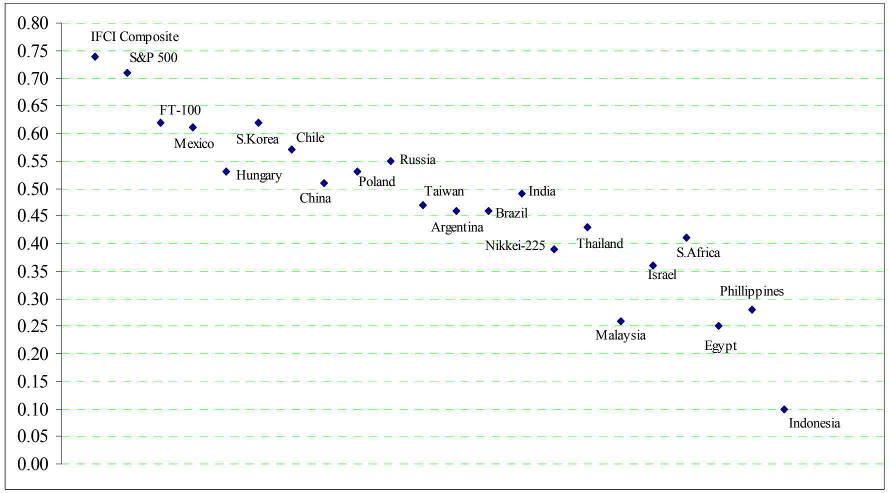
Source: ISE Data. CBTR Databank.

Foreigners' Share in the Trading Volume of the ISE (Jan. 1998-Sept. 2005)



Source: ISE Data.

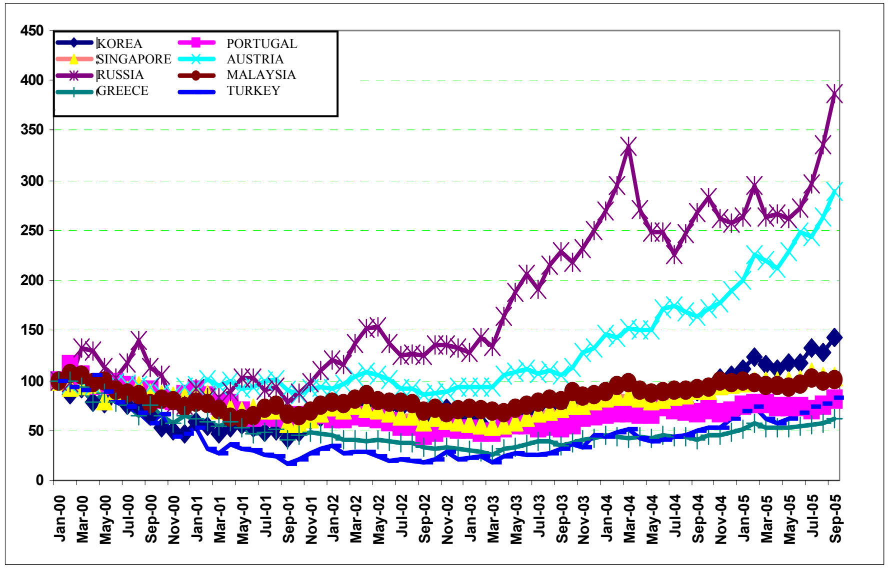
Price Correlations of the ISE (Sept. 2001- Sept. 2005)



Source: Standard & Poor's, Emerging Stock Markets Review, Sept. 2005.

Notes: The correlation coefficient is between -1 and +1. If it is zero. for the given period. it is implied that there is no relation between two serious of returns.

Comparison of Market Indices (31 Jan. 2000=100)



Source: Reuters.

Note: Comparisons are in US$.

The ISE Review Volume: 8 No: 32
ISSN 1301-1642 © ISE 1997

ISE
Market Indicators

STOCK MARKET

	Number of Companies	Traded Value Total (YTL Million)	Traded Value Total (US$ Million)	Traded Value Daily Average (YTL Million)	Traded Value Daily Average (US$ Million)	Market Value (YTL Million)	Market Value (US$ Million)	Dividend Yield (%)	P/E Ratios YTL (1)	P/E Ratios YTL (2)	P/E Ratios US$
1986	80	0,01	13	---	---	0,71	938	9,15	5,07	---	---
1987	82	0,11	118	---	---	3	3.125	2,82	15,86	---	---
1988	79	0,15	115	---	---	2	1.128	10,48	4,97	---	---
1989	76	2	773	0,01	3	16	6.756	3,44	15,74	---	---
1990	110	15	5.854	0,06	24	55	18.737	2,62	23,97	---	---
1991	134	35	8.502	0,14	34	79	15.564	3,95	15,88	---	---
1992	145	56	8.567	0,22	34	85	9.922	6,43	11,39	---	---
1993	160	255	21.770	1	88	546	37.824	1,65	25,75	20,72	14,86
1994	176	651	23.203	3	92	836	21.785	2,78	24,83	16,70	10,97
1995	205	2.374	52.357	9	209	1.265	20.782	3,56	9,23	7,67	5,48
1996	228	3.031	37.737	12	153	3.275	30.797	2,87	12,15	10,86	7,72
1997	258	9.049	58.104	36	231	12.654	61.879	1,56	24,39	19,45	13,28
1998	277	18.030	70.396	73	284	10.612	33.975	3,37	8,84	8,11	6,36
1999	285	36.877	84.034	156	356	61.137	114.271	0,72	37,52	34,08	24,95
2000	315	111.165	181.934	452	740	46.692	69.507	1,29	16,82	16,11	14,05
2001	310	93.119	80.400	375	324	68.603	47.689	0,95	108,33	824,42	411,64
2002	288	106.302	70.756	422	281	56.370	34.402	1,20	195,92	26,98	23,78
2003	285	146.645	100.165	596	407	96.073	69.003	0,94	14,54	12,29	13,19
2004	297	208.423	147.755	837	593	132.556	98.073	1,37	14,18	13,27	13,96
2005	300	191.765	143.816	1.004	753	174.322	129.965	2,08	14,50	14,51	14,80
2005/Q1	297	72.453	54.910	1.169	886	134.350	99.866	2,02	13,41	13,53	14,22
2005/Q2	298	47.952	35.376	749	553	141.328	106.038	2,42	13,24	13,21	13,99
2005/Q3	300	71.360	53.530	1.098	824	174.322	129.965	2,08	14,50	14,51	14,80

Q: Quarter
Note:
* Between 1986-1992, the price earnings ratios were calculated on the basis of the companies' previous year-end net profits. As from 1993,
  TL(1) = Total Market Capitalization / Sum of Last two six-month profits
  TL(2) = Total Market Capitalization / Sum of Last four three-month profits.
  US$ = US$ based Total Market Capitalization / Sum of Last four US$ based three-month profits.
* Companies which are temporarily de-listed and will be traded off the Exchange under the decision of the ISE's Executive Council are not included in the calculations.

Closing Values of the ISE Price Indices

YTL Based

	NATIONAL -100 (Jan. 1986=1)	NATIONAL - INDUSTRIALS (Dec. 31.90=33)	NATIONAL - SERVICES (Dec. 27,96=1046)	NATIONAL - FINANCIALS (Dec.31.90=33)	NATIONAL - TECHNOLOGY (Jun.30.2000=14.466,12)	'INVESTMENT TRUSTS (Dec 27,1996=976)	'SECOND NATIONAL (Dec.27,1996=976)	'NEW ECONOMY (Sept. 02, 2004 =20525,92)
1986	1,71	---	---	---	---	---	---	---
1987	6,73	---	---	---	---	---	---	---
1988	3,74	---	---	---	---	---	---	---
1989	22,18	---	---	---	---	---	---	---
1990	32,56	---	---	---	---	---	---	---
1991	43,69	49,63	---	33,55	---	---	---	---
1992	40,04	49,15	---	24,34	---	---	---	---
1993	206,83	222,88	---	191,90	---	---	---	---
1994	272,57	304,74	---	229,64	---	---	---	---
1995	400,25	462,47	---	300,04	---	---	---	---
1996	975,89	1.045,91	---	914,47	---	---	---	---
1997	3.451,--	2.660,--	3.593,--	4.522,--	---	2.934,--	2.761,--	---
1998	2.597,91	1.943,67	3.697,10	3.269,58	---	1.579,24	5.390,43	---
1999	15.208,78	9.945,75	13.194,40	21.180,77	---	6.812,65	13.450,36	---
2000	9.437,21	6.954,99	7.224,01	12.837,92	10.586,58	6.219,00	15.718,65	---
2001	13.782,76	11.413,44	9.261,82	18.234,65	9.236,16	7.943,60	20.664,11	---
2002	10.369,92	9.888,71	6.897,30	12.902,34	7.260,84	5.452,10	28.305,78	---
2003	18.625,02	16.299,23	9.923,02	25.594,77	8.368,72	10.897,76	32.521,26	---
2004	24.971,68	20.885,47	13.914,12	35.487,77	7.539,16	17.114,91	23.415,86	39.240,73
2005	33.333,23	26.336,25	15.700,73	51.305,43	9.666,80	18.060,71	22.900,89	20.655,75
2005/Q1	25.557,76	21.646,66	13.817,46	36.662,47	9.968,14	16.550,04	19.883,20	24.590,86
2005/Q2	26.957,32	21.888,05	13.789,35	40.033,96	9.415,89	15.460,20	20.759,71	27.032,51
2005/Q3	33.333,23	26.336,25	15.700,73	51.305,43	9.666,80	18.060,71	22.900,89	20.655,75

US $ Based / EURO Based

	NATIONAL - 100 (Jan. 1986=100)	NATIONAL - INDUSTRIALS (Dec. 31, 90=643)	NATIONAL - SERVICES (Dec. 27, 96=572)	NATIONAL - FINANCIALS (Dec.31, 90=643)	NATIONAL - TECHNOLOGY (Jun. 30,2000=1.360.92)	'INVESTMENT TRUSTS (Dec. 27, 96=534)	'SECOND NATIONAL (Dec. 27, 96=534)	'NEW ECONOMY (Sept. 02, 2004 =796,46)	EURO Based: NATIONAL - 100 (Dec. 31, 98=484)
1986	131,53	---	---	---	---	---	---	---	---
1987	384,57	---	---	---	---	---	---	---	---
1988	119,82	---	---	---	---	---	---	---	---
1989	560,57	---	---	---	---	---	---	---	---
1990	642,63	---	---	---	---	---	---	---	---
1991	501,50	569,63	---	385,14	---	---	---	---	---
1992	272,61	334,59	---	165,68	---	---	---	---	---
1993	833,28	897,96	---	773,13	---	---	---	---	---
1994	413,27	462,03	---	348,18	---	---	---	---	---
1995	382,62	442,11	---	286,83	---	---	---	---	---
1996	534,--	572,--	---	500,--	---	---	---	---	---
1997	981,99	756,91	1.022,40	1.286,75	---	834,88	785,65	---	---
1998	484,01	362,12	688,79	609,14	---	294,22	1.004,27	---	---
1999	1.654,17	1.081,74	1.435,08	2.303,71	---	740,97	1.462,92	---	1.912,46
2000	817,49	602,47	625,78	1.112,08	917,06	538,72	1.361,62	---	1.045,57
2001	557,52	461,68	374,65	737,61	373,61	321,33	835,88	---	741,24
2002	368,26	351,17	244,94	458,20	257,85	193,62	1.005,21	---	411,72
2003	778,43	681,22	414,73	1.069,73	349,77	455,47	1.359,22	---	723,25
2004	1.075,12	899,19	599,05	1.527,87	324,59	736,86	1.008,13	1.689,45	924,87
2005	1.446,13	1.142,57	681,16	2.225,84	419,38	783,55	993,53	896,13	1.408,23
2005/Q1	1.105,50	936,33	597,67	1.585,84	431,17	715,87	860,05	1.063,68	1.000,19
2005/Q2	1.176,98	955,65	602,05	1.747,91	411,10	675,00	906,38	1.180,26	1.142,69
2005/Q3	1.446,13	1.142,57	681,16	2.225,84	419,38	783,55	993,53	896,13	1.408,23

Q: Quarter

BONDS AND BILLS MARKET

Traded Value

Outright Purchases and Sales Market

	Total		Daily Average	
	(YTL Million)	(US$ Million)	(YTL Million)	(US$ Million)
1991	1	312	0,01	2
1992	18	2.406	0,07	10
1993	123	10.728	0,50	44
1994	270	8.832	1	35
1995	740	16.509	3	66
1996	2.711	32.737	11	130
1997	5.504	35.472	22	141
1998	17.996	68.399	72	274
1999	35.430	83.842	143	338
2000	166.336	262.941	663	1.048
2001	39.777	37.297	158	149
2002	102.095	67.256	404	266
2003	213.098	144.422	852	578
2004	372.670	262.596	1.479	1.042
2005	375.239	281.183	1.965	1.472
2005/Q1	142.312	108.076	2.295	1.743
2005/Q2	126.042	92.953	1.969	1.452
2005/Q3	106.885	80.154	1.644	1.233

Repo-Reverse Repo Market

Repo-Reverse Repo Market

	Total		Daily Average	
	(Y TL Million)	(US$ Million)	(Y TL Million)	(US$ Million)
1993	59	4.794	0,28	22
1994	757	23.704	3	94
1995	5.782	123.254	23	489
1996	18.340	221.405	73	879
1997	58.192	374.384	231	1.486
1998	97.278	372.201	389	1.489
1999	250.724	589.267	1.011	2.376
2000	554.121	886.732	2.208	3.533
2001	696.339	627.244	2.774	2.499
2002	736.426	480.725	2.911	1.900
2003	1.040.533	701.545	4.162	2.806
2004	1.551.410	1.090.477	6.156	4.327
2005	1.372.588	1.026.163	7.186	5.373
2005/Q1	394.243	299.150	6.359	4.825
2005/Q2	497.823	366.849	7.778	5.732
2005/Q3	480.522	360.164	7.393	5.541

Q: Quarter

ISE GDS Price Indices (January 02, 2001 = 100)

YTL Based

	3 Months (91 Days)	6 Months (182 Days)	9 Months (273 Days)	12 Months (365 Days)	15 Months (456 Days)	General
2001	102,87	101,49	97,37	91,61	85,16	101,49
2002	105,69	106,91	104,87	100,57	95,00	104,62
2003	110,42	118,04	123,22	126,33	127,63	121,77
2004	112,03	121,24	127,86	132,22	134,48	122,70
2005	113,09	123,70	132,01	138,26	142,51	127,69
2005/Q1	112,80	122,87	130,38	135,61	138,66	127,05
2005/Q2	113,00	123,41	131,41	137,24	140,98	128,45
2005/Q3	113,09	123,70	132,01	138,26	142,51	127,69

ISE GDS Performance Indices (January 02, 2001 = 100)

YTL Based

	3 Months (91 Days)	6 Months (182 Days)	9 Months (273 Days)	12 Months (365 Days)	15 Months (456 Days)
2001	195,18	179,24	190,48	159,05	150,00
2002	314,24	305,57	347,66	276,59	255,90
2003	450,50	457,60	558,19	438,13	464,98
2004	555,45	574,60	712,26	552,85	610,42
2005	622,84	647,21	810,60	643,52	710,53
2005/Q1	579,78	599,78	750,31	591,88	653,52
2005/Q2	601,34	624,86	778,20	619,72	684,25
2005/Q3	622,84	647,21	810,60	643,52	710,53

ISE GDS Portfolio Performance Indices (December 31, 2003 = 100)

YTL Based

	Equal Weighted Indices (YTL Based)			Market Value Weighted Indices			
	EA180-	**EA180-**	**EA GENERAL**	**PDA180-**	**PDA180+**	**PDA GENERAL**	**REPO**
2004	125,81	130,40	128,11	125,91	130,25	128,09	118,86
2005	142,26	153,71	147,75	142,49	153,65	148,28	130,06
2005/Q1	131,92	139,26	135,47	132,10	139,13	135,65	122,70
2005/Q2	137,11	146,89	141,83	137,33	146,83	142,20	126,32
2005/Q3	142,26	153,71	147,75	142,49	153,65	148,28	130,06

Q: Quarter