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## The Influence of Global Macroeconomic Factors on Stock Values: A Sector Level Analysis

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### Abstract

Investors and policy makers should carefully analyze stock returns and their possible relationships with microeconomic and macroeconomic factors in both local and global arena. Since the markets are increasingly becoming global, the outcomes may be more important for international factors. Therefore, this study aims to identify the relationship between selected international macroeconomic variables (FTSE-100 England market index, GDAX Germany market index, NYSE Composite market index, Gold prices and Crude Oil prices) and 48 companies in 11 different sectors (electric, food, communication, paper, chemistry, metal-main, metal-product, stone, textile, commerce and transportation) in Istanbul Stock Exchange Market. ARDL is employed on the data for the period between the second month of 2005 and the second month of 2012 including 85 monthly observations. The research provides mix results for the selected sectors. **Crude oil** is found to be significantly effective on almost all the companies in the selected sectors. The extensive influence of gold prices on the sectors except electric and communication sectors is also observed. **Global market indices** (American, English and German) are found to have influence in various degrees through the sectors. This research is expected to be useful in that it provides results for different sectors operating in Turkish Stock Exchange Market.

**Keywords:** Global macroeconomic factors; Sector level analyses; ARDL; ISE.

### Introduction

Fluctuations in macroeconomic variables influence business therefore stock values by changing the tendency of the trade smoothness. Therefore, the predictions of stock market determinants become important. Since the role of macroeconomic variables in asset pricing theories is important, many researches are empirically performed in order to identify the link between macroeconomic variables and stock market volatility. Moreover, investors also want to learn the link between macroeconomic variables and business-cycle fluctuations in order to forecast stock market volatility by improving different theories of pricing, to generate more accurate solutions for optimal portfolio selection problems, and to efficiently observe and manage financial risks. The answer may also help policy makers to better understand potential macroeconomic determinants of systematic financial-sector risk.

The scholars have searched extensively the relationships among stock returns, market risk and firm-specific factors in both developed and emerging markets in order to identify whether beta, measurement for market (or systematic) risk, is the only factor in explaining stock returns variations or the other possible influencing factors in returns.

Modern Portfolio Theory (MPT) argues that market risk is the key influencing factor of the equity prices. It is hard to avoid market risk although an investment is well diversified. MPT asserts that an efficient set of portfolios can be constructed in order to offer the maximum possible expected return for a given level of risk (Markowitz, 1952). As an extension of MPT, Sharpe (1964), Lintner (1965) and Black (1972) try this by developing capital asset pricing model (CAPM) which uses market return in order to explain the behavior of stock returns. However, Ross' (1976) arbitrage pricing theory becomes popular in developing multifactor models in order to explain stock returns.

Capital asset pricing model (CAPM) is basically used to determine risk and return related to a particular security. Capital Asset Pricing Model (CAPM) assumes a constant mean vector and covariance matrix (and therefore a constant beta) (e.g., Black et al., 1972; Fama and MacBeth, 1973). Because of the restrictions of CAPM, unconditional betas cannot explain the cross-sectional variation in average returns (e.g., Gibbons, 1982; Shanken, 1985; Hansen and Jagannathan, 1997).

As an alternative theory to the CAPM, Ross (1976) introduces the Arbitrage Pricing Theory (APT) that links stock returns to some variables by suggesting that the expected return is explained by some macro-economic factors or market indices, where beta coefficients for the factors represent the sensitivity to changes in those factors. While CAPM is allowing only one given factor, the APT enables choosing the investor's own factors.

In the earlier tests of the APT, the model is assumed under closed economic environment. So, Solnik (1983) extends the APT by applying on the international arena without changing. It is observed that the extension substantially changes the APT formulated by Ross (1976).

The research about the effect of macroeconomic variables on stock market indices mostly focus on developed economies but not on less developed countries. Developed countries' financial markets are observed to be more explained compared to the other financial markets. Therefore, the research is essential in order to improve investment decisions by maximizing the expected value of stock returns in developing countries. This research aims to identify the link between international macroeconomic variables including FTSE-100 England market index, GDAX Germany market index, NYSE Composite market index, Gold prices and Crude Oil prices and 48 companies in 11 different sectors (electric, food, communication, paper, chemistry, metal-main, metal-product, stone, textile, commerce and transportation) of Istanbul Stock Exchange Market.

The following sections provide the related literature review, the obtained data and used methodology, the results of the analyses, and the conclusion of the study.

### Literature Review

This section introduces the studies related to the relationship between international macro-variables and stock indices.

Increases in **oil prices** may influence transportation, production and heating costs, which may have negative impact on corporate earnings. Furthermore, it also influence inflation and diminish consumers' discretionary spending. Consequently, oil price fluctuations also influence the financial risk of investments.

The literature is full of studies examining the influence of **oil prices** on stock market index. Sadorsky (2001) and Park and Ratti (2008) find that oil price directly influences the return to Canadian oil and gas stock sector prices. However, Cong et al. (2008) can not identify that oil prices significantly affect the real stock returns of most Chinese stock market indices, except some

manufacturing indices and indices of some oil companies. Nandha and Faff (2008) identify the negative influence of oil price on stock returns for most sectors except mining and some related industries such as oil and gas industries. Sadorsky (2008) find that firm size or oil prices negatively affect stock market price returns and increases in oil prices affect more than decreases in oil prices on stock market returns.

**Gold** is the most popular and recognized metal in every segments of the society (Bali and Cinel, 2011). Gold prices are also one of the most considered macroeconomic factors in the literature.

Chen, Roll and Ross (1986) observe a reliable long term correlation between oil prices and equity prices in United States (US).

Pethe and Karnik (2000) consider Sensex and Nifty indices as the macroeconomic variables by applying unit root test, co-integration and error-correction models and identifies no longrun stable relationship between the stock prices and the considered global variables.

Ibrahim and Abdul Rahman (2003), by using cointegration and VAR modeling, evaluates the long term relationship and dynamic interactions among Malaysian Equity Market and United States and Japan equity markets. According to the results for monthly data from January 1977 to August 1998, there are positive, short- and long-term relationships between the stock prices and two macroeconomic variables.

Chaudhuri and Smiles (2004) search the relationship between stock prices and real oil price in the Australian stock market from 1960 to 1998 for long-term. They find that the American and New Zealand foreign stock markets significantly influence the Australian stock return movement.

Since, the oil exports are largely effective on foreign earnings and governments' budget revenues and expenditures, Hammoudeh and Aleisa (2004) examine the relationships among Gulf Cooperation Council (GCC) stock markets and New York Mercantile Exchange (NYMEX) oil prices from 1994 to 2001. They identify that the UAE stock market index are highly linked with the Saudi Arabia market and Bahrain market.

Gan, Lee, Yong and Zhang (2006) searches the association between the New Zealand Stock Index (NZSE40) and retail oil price for the period between January 1990 and January 2003 by applying Johansen Multivariate Co-integration test and Granger-Causality test, Impulse Response and Error Variance Decomposition analyses. No evidence is found that the New Zealand Stock Index causes changes in retail oil price but co-integrated in the long and short run.

Sari and Soytaş (2006) study the relationship between oil prices and Turkish macroeconomic variables and identify no significant effect on real stock returns in the Istanbul Stock Exchange Market.

Chancharat and Valadkhani (2007) works on the Stock market volatility between January, 1988 and December, 2004 by using Auto regressive Conditional Heteroscedasticity (ARCH) model and the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model on Thailand Stock Index and the indices of Argentina, Australia, Brazil, Germany, Hong Kong, Indonesia, Japan, Korea, Malaysia, the Philippines, Russia, Singapore, Taiwan, the United Kingdom and the United States. Thailand Stock Index is found to be positively affected by neighbor countries' stock markets but not by the others and negatively by oil price changes.

Kandir (2008), on monthly data from July 1997 to June 2005 by using multiple regression model and Augmented Dickey Fuller (ADF) and Phillip Perron (PP) stationary tests, identifies that oil prices (OP) don't have significant influence on stock returns.

Gay and Nova (2008) uses Augmented Dickey-Fuller (ADF) test in order to identify the relationship between oil price and stock market indices of Brazil, Russia, India, and China (BRIC) on the monthly data between 1999 and 2006. The relationship between oil price and the stock market index prices for the countries is not significant. The study suggests a weak-form of market efficiency for the markets of Brazil, Russia, India, and China.

Türsoy, Günsel, and Rjoub (2008) test the Arbitrage Pricing Theory (APT) in Istanbul Stock Exchange (ISE) on monthly basis from February 2001 to September 2005. Their macroeconomic variables include money supply (M2), industrial production, crude oil price, consumer price index, import rate, export rate, gold price, exchange rate, interest rate, gross domestic product, foreign reserve, unemployment rate and market pressure index. Their results reveal no significant impact on stock returns in Istanbul Stock Exchange (ISE).

Eryiğit (2009) employs an extended market model (market return, oil prices and exchange rate) to identify the effects of the oil price changes on market indices in Istanbul Stock Exchange (ISE) from 2000.01.04 to 2008.01.11 by using daily data for the analysis. The significant results reveal that oil price changes positively related to Electricity, Wholesale and Retail Trade, Insurance, Holding, Investment, Wood, paper, printing, Metal-Main, Metal-Product, Machinery and Non-Metal, Electricity and Mineral Products indices.

From June 1998 to June 2008, Hasan and Nasir (2009) search the relationship between oil prices and equity prices by using cumulative sum (CUSUM), cumulative sum of squares (CUSUMSQ) tests, unit root by lag range multiplier (LM) test, Augmented Dickey Fuller (ADF) test and Phillips-Perron (PP) test, VAR models, error correction model, and autoregressive distributed lag (ARDL) test. It is identified that oil prices (OP) are not significant in the long run.

Büyükşalvarcı (2010) aims to analyze the impact of macroeconomic variables including consumer price index, money market interest rate, gold price, industrial production index, oil price, foreign exchange rate and money supply on the Turkish Stock Exchange Market by employing Arbitrage Pricing Theory. Their monthly data covers the period from the January, 2003 to the March, 2010. The results show that interest rate, industrial production index, oil price, foreign exchange rate have negative impacts on ISE-100 Index returns, however, money supply has positive effect on ISE-100 Index returns. Furthermore, it is observed that inflation rate and gold price do not significantly influence ISE-100 Index returns.

Iscan (2010) studies the long-term relationship between oil-prices and stock prices by using daily Istanbul Stock Exchange IMKB100 Index data. The results reveal that there is no relationship between oil prices and stock prices.

Butt, ur Rehman, Khan, and Safwan (2010) study the stock returns variation to specific economic variables by using a multi-factor model on the companies from banking and textile sectors by considering data availability, profitability and performance on the Karachi Stock Exchange for 10 years period. Moreover, GARCH model is used to analyze risk and returns relationship on company stock returns and on the entire industry data to generalize the results. It is observed that market return mainly affects stock returns variation and including other macroeconomic and industry related variables enhance describing ability of the stock returns variation. Furthermore, economic exposure is found to be higher at industry level than firm level stock returns.

Toraman, Başarır and Bayramoğlu (2011) study the influence of oil on four different indices (composite index, services index, industrial index and technology index) of Istanbul Stock Exchange (ISE) by employing Cointegration tests for long-run relationships and Vector Error Correction Model (VECM) for short-run relationships. They find that crude oil prices have positive and negative influence (16.40 % on the ISE 100, 32.71 % on the industrial index, 11.82 % on financial index, 12.60 on services index and 5.38 % on the technology index).

Sayilgan and Süslü (2011) analyze the influence of macroeconomic factors on stock returns in emerging market economies using panel data from 1996 to 2006 and identify the significant influence of the S&P 500 Index. However, the impact of oil prices is not observed.

Hosseini, Ahmad and Lai (2011) study and find the relationships between stock market indices and crude oil price (COP) in China and India for the period between January 1999 and January 2009. Similarly, Oskenbayev, Yilmaz and Chagirov (2011) search and identify the causal relationship between oil price and Kazakhstan stock exchange (KASE) index.

Bali and Cinel (2011) employ the panel data analysis in order to investigate the effects of gold prices on the ISE 100 Index and the direction and magnitude of the effect for the data between August 1995 and March 2011. It is identified that gold prices do not have a direct influence on the ISE 100 Index.

Akar (2011) searches the associations between the Istanbul Stock Exchange (ISE), gold, and foreign exchange returns in Turkey by using monthly data from 1990 to 2010 and applying the dynamic conditional correlations GARCH (DCC-GARCH) model. It is identified that the ISE100-Dollar and ISE100-Gold relationship is clearly negative after the 2001 crisis.

Ozcan (2012) tries to identify a significant relationship between ISE industry index and selected macroeconomic variables which include interest rates, consumer price index, money supply, exchange rate, gold prices, oil prices, current account deficit and export volume. He uses the Johansen's cointegration test in order to find out the relationship and observes that macroeconomic variables show long run equilibrium relationships with the ISE industry index according to the Johansen's cointegration test.

## **Research Methodology**

### **The Data**

This study selects 48 companies in 11 different sectors (electric, food, communication, paper, chemistry, metal-main, metal-product, stone, textile, commerce and transportation) of Istanbul Stock Exchange for the analyses. FORTUNE 500 list for Turkey is considered while selecting the companies. The companies are also selected by considering their data availability, profitability and performance in Istanbul Stock Exchange Market as the representatives of their sectors. This study also employs FTSE-100 England market index, GDAX Germany market index, NYSE Composite market index, Gold prices and Crude Oil prices as the international macroeconomic variables.

The data for international market indices is achieved through the official sites of chosen stock exchange markets. The data of Gold prices and Crude Oil prices are obtained from the websites of Turkish Central Bank and Turkish Statistical Institute. The data covers the period between June, 2004 and May, 2012 including 95 monthly observations.

### **Autoregressive Distributed Lag (ARDL)**

This research employs the autoregressive distributed lag (ARDL) approach in order to identify the relationships between stock returns and international macroeconomic variables. ARDL approach can provide the robust long-run results while working on small sample sizes and it can be applied if the primary variables are entirely I (1) or I (0) or mutually integrated. The formula of the ARDL analysis for the relationship between the stock returns and international macroeconomic variables is given as follows:

$$\begin{aligned}
\Delta \text{Ln}(\text{SR})_t &= \Psi_0 \\
&+ \sum_{i=1}^n \Psi_i \Delta \text{Ln}(\text{SR})_{t-i} + \sum_{i=1}^n \Psi_i \Delta \text{Ln}(\text{FTSE})_{t-i} + \sum_{i=1}^n \Psi_i \Delta \text{Ln}(\text{GDAX})_{t-i} \\
&+ \sum_{i=1}^n \Psi_i \Delta \text{Ln}(\text{NYSE})_{t-i} + \sum_{i=1}^n \Psi_i \Delta \text{Ln}(\text{Gold})_{t-i} + \sum_{i=1}^n \Psi_i \Delta \text{Ln}(\text{Oil})_{t-i} + \alpha_1 \Delta \text{Ln}(\text{SR})_{t-1} \\
&+ \alpha_2 \Delta \text{Ln}(\text{FTSE})_{t-1} + \alpha_3 \Delta \text{Ln}(\text{GDAX})_{t-1} + \alpha_3 \Delta \text{Ln}(\text{NYSE})_{t-1} + \alpha_4 \Delta \text{Ln}(\text{Gold})_{t-1} \\
&+ \alpha_5 \Delta \text{Ln}(\text{Oil})_{t-1} + \zeta_{t-1}
\end{aligned}$$

Where SR, FTSE, GDAX, NYSE, Gold, Oil denote stock returns, FTSE-100 England market index, GDAX Germany market index, NYSE Composite market index, Gold prices and Crude Oil prices respectively.

Before employing ARDL method, unit root is applied for all macroeconomic data in order to identify if the data are stationary through level and 1<sup>st</sup> difference Akaike-Information Criterion and it is identified that the data include both stationary and non-stationary information. Therefore, the data are found to be proper for ARDL approach and ARDL is applied through four lags.

### Empirical Results

According to results, the impacts of international macroeconomic factors on the stock returns are identified by classifying them with respect to their sectors. The results are reported by considering Table 1.

In **Electric Sector**, Crude oil factor is significant for most of the companies. Both NYSE Composite and FTSE-100 England factors have few relationships with the stock returns, while GDAX Germany and gold are not significantly associated with the companies in **Electric Sector**. It may be interesting to note that Akenr is not significantly influenced by any of the considered variables.

Gold, FTSE-100 England and GDAX Germany factors are measured to be effective through **Food Sector**. The other factors are not very much influential on the stock returns in **Food Sector**. On the other hand, it can be seen that both Aefes and Ulker are not significantly associated with the analyzed factors.

About **Communication Sector**, it can be clearly reported that all factors are identified to be significant through this sector.

For **Paper Sector**, crude oil is found to be significant on much of the selected companies. FTSE-100 England, NYSE Composite and gold are not very much influential, while GDAX Germany is not effective within that sector.

According to the results for **Chemistry Sector**, no significant effect of gold is observed on the evaluated companies. The remaining factors have few relationships through **Chemistry Sector**.

Both FTSE-100 England and gold impacted some of the stock returns in **Metal-Main Sector**. However, the other factors do not have much influence on that sector.

When **Metal-Product Sector** is evaluated, the results presented few significant associations with the stock returns. FTSE-100 England, gold and oil are observed to have significant relationships with the company stock returns. However, NYSE Composite has impact on only one company in the sector and GDAX Germany has no influence on any of the companies.

According to the results, **Stone Sector** is impacted mainly by NYSE Composite. It is followed by both FTSE-100 England and gold factors with significant effect on some of the companies within the sector. On the other hand, the remaining factors do not have much influence on this sector.

**Textile Sector** is found to be mainly effected by gold factor. But, its influence is on three of the companies out of five. The other factors are influential on various stock returns through the sector.

In **Commerce Sector**, 60% (3/5) of the companies are significantly influenced by gold. It may not be worthy to report the influence of other factors on the stock returns. However, NYSE Composite index is observed to have no significant influence on the companies. Furthermore, Doas is not influenced by any of the mentioned variables.

The companies are affected by the considered variables variously in **Transportation Sector**. While Thyao is significantly influenced by all the variables, Clebi is influenced by none of the variables.

**Table 1: The Results for International Macroeconomic Factors**

Sector	Company	FTSE-100 England	GDAX Germany	NYSE Composite	Gold	Crude Oil
Electric	Akenr					
	Aksue					Significant
	Ayen			Significant		Significant
	Zoren	Significant		Significant		Significant
Food	Aefes					
	Banvt	Significant	Significant	Significant	Significant	Significant
	Skplc	Significant	Significant		Significant	Significant
	Tatks	Significant	Significant	Significant	Significant	
	Ulker					
Communication	Tcell	Significant	Significant	Significant	Significant	Significant
Paper	Hurgz					
	Ipeke					Significant
	Kartn	Significant			Significant	
	Kozaa					Significant
	Tire	Significant		Significant	Significant	Significant
Chemistry	Aksa		Significant			
	Aygaz	Significant				
	Petkm			Significant		
	Trcas			Significant		Significant
	Tuprs	Significant				Significant
Metal-Main	Brsan	Significant		Significant	Significant	
	Cemts	Significant	Significant		Significant	Significant
	Eregl	Significant			Significant	
	Izmdc					
	Krdmd			Significant		
Metal-Product	Arclk					Significant
	Toaso	Significant		Significant	Significant	

<b>Tttrak</b>						
	<b>Vestl</b>	Significant			Significant	Significant
<b>Stone</b>	<b>Adana</b>	Significant		Significant		Significant
	<b>Afyon</b>	Significant	Significant	Significant	Significant	Significant
	<b>Anacm</b>					
	<b>Golts</b>	Significant	Significant	Significant	Significant	
	<b>Konya</b>					Significant
	<b>Trkcm</b>				Significant	
<b>Textile</b>	<b>Altun</b>		Significant			
	<b>Bossa</b>	Significant	Significant	Significant	Significant	Significant
	<b>Mndrs</b>					Significant
	<b>Sktas</b>					Significant
	<b>Yunsa</b>	Significant				
<b>Commerce</b>	<b>Boynr</b>					Significant
	<b>Doas</b>					
	<b>Kipa</b>					Significant
	<b>Mgros</b>			Significant		
	<b>Sanko</b>	Significant	Significant			Significant
<b>Transportation</b>	<b>Clebi</b>					
	<b>Thyao</b>	Significant	Significant	Significant	Significant	Significant
	<b>Ucak</b>			Significant		Significant

Note: The significance level is 0.05

## Conclusion

The study aims to find the possible relationships between the stock returns and selected international macroeconomic factors. As a conclusion, the considered variables in this section present mix results through the sectors. None of the variables has impact on all the evaluated sectors. Their impacts vary across the companies within the sectors.

**Crude oil** is found to be significantly effective on almost all the companies in the selected sectors. The results for crude oil are not surprising, since the literature reports mixed results about the influence of crude oil on the companies in Istanbul Stock Exchange.

The literature suggests generally negative influence of **gold** on the stock prices in ISE. The extensive influence of gold prices through the sectors except electric and communication sectors are identified as a result of employed analyses.

**Global market indices** including American, English and German indices are found to have influence in various degrees through the sectors. The reason for this may be the companies' varying degree of relationships with the companies in the considered markets.

Since ISE is a relatively young market and the analyses are performed in monthly basis, the study has reached a small amount of data as the main limitation of the study. After some period of time, the same analyses can be performed with the same sectors and same macro-variables.

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