

# Macroeconomic Determinates Of Stock Price for Industrial Companies Listed In Istanbul Stock Exchange

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**Abstract---** *This paper investigates the impact of changes in selected macroeconomic variables on BIST-KYD Price Index in the Turkish stock market. The essential objective of the study is to examine the relation between the Industrial Index in Turkish stock market and the macroeconomic factors. To determine macroeconomic factors influencing SPI. Detect the significant variables and their percent of influence on SPI. The study will examine the relationship between Turkish stock market activities by identifying variables that affect particularly the Industrial Index of the market by employing monthly data for the period January 2003 to December 2013. This study uses the computer software SPSS for applying the analysis. Ordinary Least Squares regression is applied on the series. A Multivariate Regression Model computed on Standard OLS Formula has been used to estimate the relationship. Based on regression coefficient, it was found that Inflation, Exchange rate, Money supply and Interest rate all had negative influence on BIST-KYD index. The model was tested for Autocorrelation and heteroscedasticity and multicollinearity and was approved to be clear. All the independent variables can explain 87.4% of change in the price of BIST-KYD index in Turkey. As an attempt to add to the growing body of empirical studies on the role of the macroeconomic environment and the stock market's activity and to answer the question of whether or not the selected macroeconomic variables influence the stock market in the case of Turkey, this study will use developed econometric techniques to empirically investigate this question. Based on the results of this study investors and policy makers may see a reason to improve the financial system in an attempt to achieve higher levels of return and less risks.*

**Keywords---** *Industrial stock price index, Macroeconomics variable, and Turkey.*

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## I. INTRODUCTION

Studies investigating the interrelation between macroeconomic variables and the stock prices/returns have been extensively done on developed capital markets as early as in the 1970s. Scholars applied multifactor models to study the variations in the equity prices and their affect from various factors. Many studies recently gave interest in the

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Emerging Stock markets (ESM) especially after the 1980s. According to a study by Mukherjee, (1995) [24] he found that returns and risks in ESMs are relatively higher than developed markets. Capital markets and the role it plays as an intermediary among investors and entrepreneurs has been given extra importance as the economic structures, policy and financial institutions rapidly improved under globalization. According to Ahmed, (2000) [1], not all developed economies succeed in efficiently mobilizing its savings. He adds that this inefficient allocation of funds might be due to drawbacks of informational asymmetry or low degree of ownership management. The clearance of the prevailing interrelation between the stock market and the macroeconomic environment surrounding it is predominantly important in order to stabilize any economy and reach the utter of its outcome. The main objective of the study is to analyze the linkage between the Industrial Index in Turkey and five macroeconomic specific variables namely, Interest rate (INR), Consumer price index as a proxy of Inflation (INF), aggregate money supply (M2) and Exchange rate (EXR). The study seeks to investigate the impact of these variables on the Turkish stock market. The study was examine the relationship between Turkish stock market activities by identifying variables that affect particularly the Industrial Index of the market. Considering that the Industrial Index represents the performance of all 401 listed companies in the Turkish stock market. The index consists of all stocks traded on Bursa İstanbul markets. Moreover this index may show a better reflection of the stocks market affection from the Turkish economy's restructuring period and how it affected the overall activity of the market.

The essential objective of the study is to examine the relation between the Industrial Index in Turkish stock market and the macroeconomic factors. To determine macroeconomic factors influencing SPI; Detect the significant variables and their percent of influence on SPI. As an attempt to add to the growing body of empirical studies on the role of the macroeconomic environment and the stock market's activity and to answer the question of whether or not the selected macroeconomic variables influence the stock market in the case of Turkey, this study will use developed econometric techniques to empirically investigate this question. Based on the results of this study investors and policy makers may see a reason to improve the financial system in an attempt to achieve higher levels of return and less risks.

## **II. LITERATURE REVIEW**

### ***A. Economic Review***

Prior to the series of economic crashes Turkish economy experienced, the country's economy was showing dynamic and growing performance. Like any other country that has a history, over four decades ago, Turkish economy was basically an agricultural economy till it moved to the modern and commerce economy. The Recession that hit the Turkish economy during the late 1970's as a result of the problem in balance of payment forced the government to adopt a new industrialization strategy which made it able to alleviate this problem. Between the period 1970's and 1980's the one promising economy experienced a relatively high inflation coupled with unsuccessful disinflation attempts. The average inflation rate was 29 percent in the 1970's, 35-40 percent in the early 1980's and 60-65 percent in the late 1980's. This to some extent mounted pressure on the government to take an action to control this persistent increase in the inflation rate. As a result, the government declared its intention to liberalize the economy to pursue an export led- growth policy.

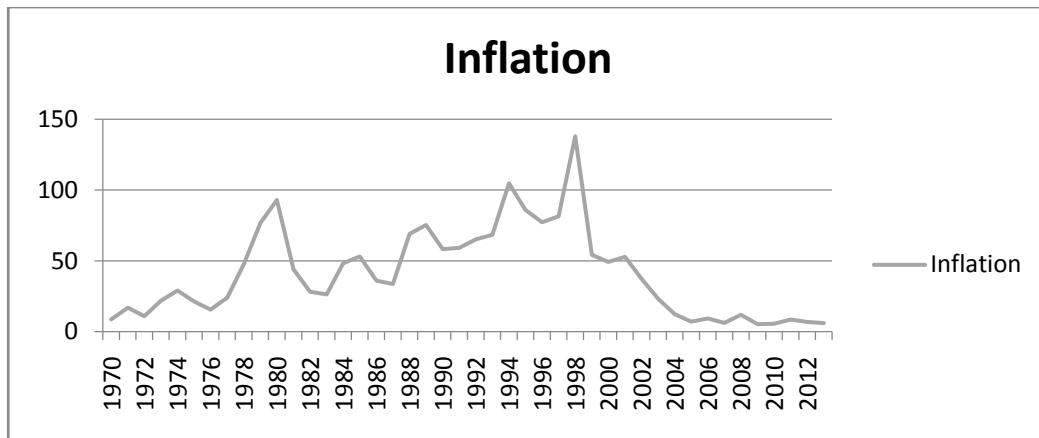


Figure 1: Inflation Trend for Turkish Economic

Source: World Bank Database.

This new policy helped to reduce the inflation rate during the first half of 1980's [12] and accordingly succeeded in its new export led- growth strategy passed in early 1980's. Averagely, the annual growth rate of Gross Domestic Product (GDP) was pegged at 5.8 percent between the years 1981-1987. During this period the economy did not experienced any recession, making Turkey a model in the annual reports of international financial institutions, such as IMF. Also, the real increase in industrial value added averaged 8.1 percent was above the GDP growth rate during the same period. And with the inception of a comprehensive stabilization programs in January 1980, an outward oriented development strategy was acknowledged and external balance became a major concern of governments as protracted current account imbalances made the government more sensitive about the sustainability of external imbalance [12].

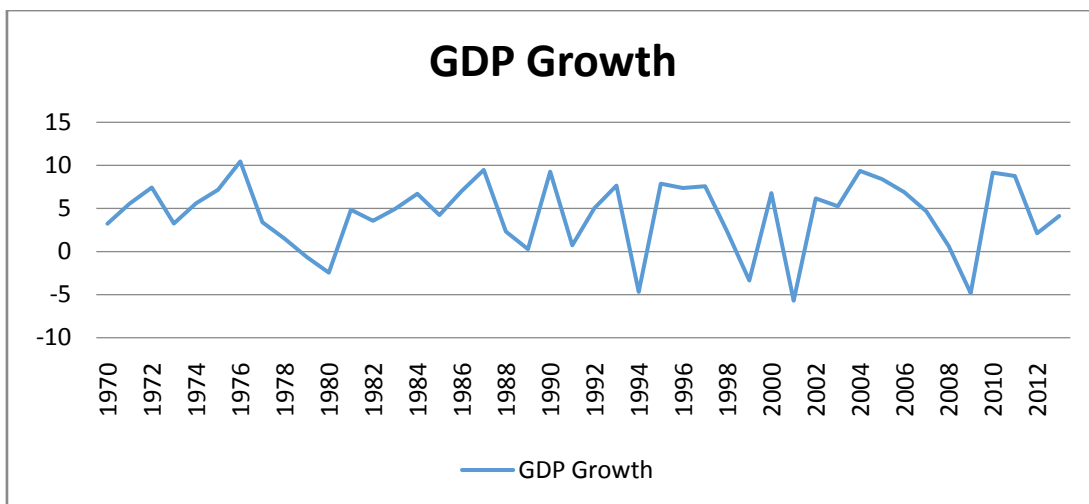


Figure2: The Trend of Economic Growth

Source: World Bank Database

After the liberalization program, Turkey started looking for economic cronies. Specifically, in 1987 Turkey applied for the European Union (EU) membership. The European Committee responded in December 1987 by confirming Ankara's (association agreement) eventual membership, but also by deferring the matters to more favourable talks. In 1988, the economy was ushered into a new phase where the growth performance remained inactive. The annual GDP growth fell down by 2.1 percent comparing with the previous period (1980-1987) despite 4.4 percent increase in the annual average growth rate of industrial value. During early 80's the model economy became a textbook case of "boom-bust" growth performance with a relatively lower average growth rate and high volatility in the 1990's. The deterioration in the economy could be attributed to the unsuccessful disinflationary efforts and debt financing policies of the government. Even though, efforts joined to savage the Turkish lira from further depreciating in order to control the inflation, restrictions were put in place to borrow easily from the domestic markets [12]. The instability in the GDP growth seen as a major factor that underpinned the country's economy triggered the uncertainty and the risk premium in the economy at that period.

Regarding to the fluctuations in economic growth during 1990's, the three recessions (1994, 1999, 2001 crisis) respectively hit the Turkish economy. The 1994 crises were preceded by substantial increase (appreciation) in the real Exchange rate. This crisis was driven by the government policy which aimed at decreasing the nominal interest rates in order to take interest payment under control. In another words, it aimed to increase the amount of credit transferred from the Central Bank to the treasury, so that the treasury would limit its reliance on domestic borrowing. The government took a critical decision to place out the Treasury auctions a policy intended to boost the government's main aim to save interest rate in order to increase maturity of credit. Due to this, shortly, the Central Bank credit to the Treasury reached as high as 30 percent of the net foreign assets of Central Bank [7]. When the treasury cancelled several auctions, the liquidity pumped by the Central Bank into the system allowed commercial banks with large open positions. Meanwhile, private consumers also resorted to foreign currency as a precaution. Both developments resulted in substantial loss of the Central Bank foreign reserve.

Following the Standard and Poor's (S&P) and Moody's credit rating scores in response to the Turkish economy deteriorating macroeconomic indicators, foreign capital left the country overnight which led to the 1994 liquidity crises. Right after April 1994 crises, a stabilization program was announced by the government; the IMF approved a standby agreement of US \$ 742 million, extended over a 14 months horizon and strongly urged the rapid implementation of the structural reform measures. The government was to reform the tax and social security system; to speed up privatization and to restrict the mechanisms whereby the Treasury could utilize the Central Bank to finance the public deficit [17]. After the stabilization program, the strong economic recovery which began in the second quarter of 1995 continued into the third quarter where GNP rose by 10% on the same period of 1994. This performance was particular impressive in view of the slower rate of decline in the third quarter of 1994 than the second quarter.

Industrial sector once again supported the growth in the third quarter of 1995, pegging the growth rate at 17.9%, only a modest slowing from the previous quarter of 20.3%. Whilst 3.9% and 1.6% support to the growth rate came from agricultural sector and construction sector respectively. These two sectors were less affected by the country's downturn and as a result had less catching up to do than industry. With respect to the strong economic recovery after

the 1994 crises, in December 1995 European Parliament took the decision to finalize the Customs agreement while the final stage of Customs Union (CU) was entered into force in January 1996. The last crises terminated the country's long lasting experience with some form of managed Exchange rate and free floating regime became inevitable. Foreign Exchange risk was at the end left to the markets putting in place incentives for responsible investment decisions that would prevent excessive risk taking [14]. The needs for new economic stabilization programs and reforms have been raised. Fiscal and monetary policies in line with structural reforms in the new economic program were formulated aimed to place the country's economy on the track of structure to sustained low-inflationary growth. In other words, the essential goal of such incepted policies was to make the economy more elastic to adverse shocks, less volatile to crises, more equitable in income distribution, and more conducive to foreign and domestic investment.

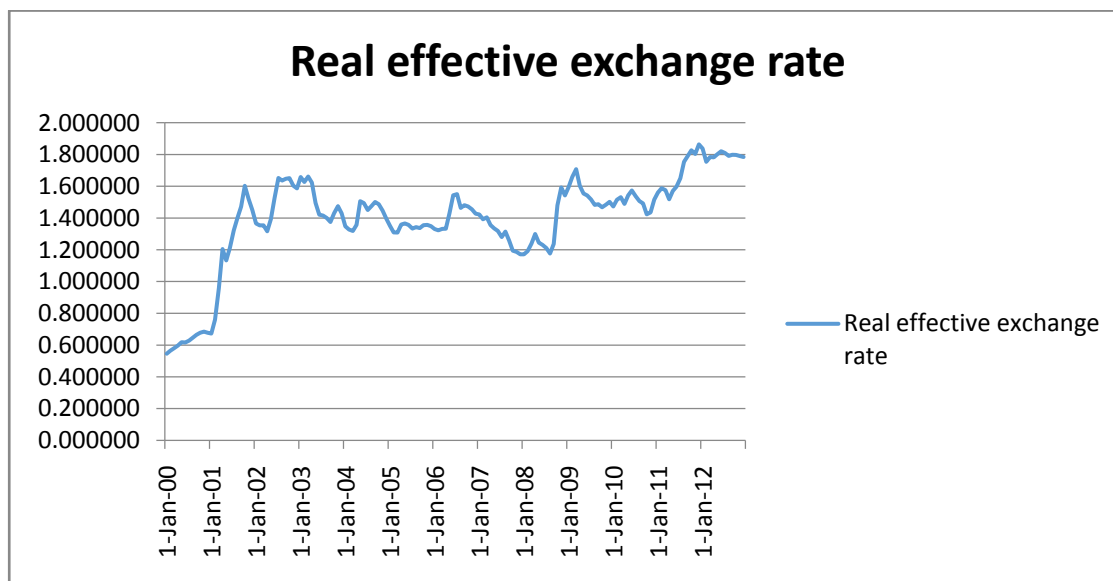


Figure 3: The Turkish exchange rate Trend.

Source: World Bank Database

The new programs included the extensive re-capitalization of the banks as well as re-structuring of state-owned banks. The priority was given to enhance the role of private sector. A decision was then taken to drive-out state involvement from production and manufacturing to pave way for private sector. After the 2001 crises, the policymakers were given the opportunity to pay more attention on the microeconomic problem which fueled the crises. The increasing pressure of competition and the need to develop an extensive set of risk controls became expected problems for banks, following the macroeconomic problems which arise in the late 1990's and early 2000's. Due to this, a stabilization program was set for the banking sector including, sustaining profitability under heightened global volatility, managing foreign Exchange risk under a floating Exchange rate regime when private sector was heavily indebted in foreign currency and at least expands locally to compete among challenges for banks, to meet the new economic conditions.

### ***B. Borsa Istanbul Stock Exchange***

Borsa Istanbul (BIST) was established in early 1986. The BIST is the only securities Exchange in Turkey established to provide trading in securities. The BIST was governed by an executive Council composed of five members elected by general assembly. One of the five appointed as the chairman and chief executive officer of the BIST by the government on Oct 25, 1997. BIST as a professional organization enjoys a high degree of self-regulation. Its revenue is generated from fees charged on transactions, listing procedures and miscellaneous services. The profit of the ISE are retained to meet the expenses or to undertake investments and are not distributed to any third parties. The BIST has its own budget. Turkish securities market has its roots in the second half of the 19th century. Also created a medium for European investors who were seeking higher return in the vast ottoman markets, following the proclamation of the Turkish Republic on the ruins of the Ottoman Empire; a new law was enacted in 1992 to recognize the fledging capital markets under the new name of "Istanbul securities and foreign Exchange Bourse". At the early phase of 1980's is a market improvement in Turkish capital markets which accordingly gave birth to the Turkish Capital Market Law in 1981. One year later, the main regulatory body responsible for the supervision of regulation of the Turkish securities market, the capital market Board based in Ankara, was established. A new decree was issued in Oct 1983 foreseeing the setting up of securities Exchange in Turkey. The Regulations for the establishment and functions of securities Exchange was published in official gazette in October 1984. The regulations concerning operational procedures were approved in the subsequent extraordinary meeting of the general assembly of the Istanbul Stock Exchange was formally inaugurated at the end of 1985.

### ***C. Empirical Review***

The censuses around macroeconomic variables and its impact on the prices in stock market has been confirmed and widely accepted in the financial theory. Many attempts have been done and still going to study these affects in details and in an empirical way. Effects of announcing discount rate on interest rate and stock prices were the main focus of Waud (1970) [38], He used the data for discount rate and the Standard & Poor's 500 for the period from 1952:6 to 1967:6. He assumed that what is meant by the notion of an announcement effect, associated with Federal Reserve's discount rate changes, is an effect that alters the expectations of businessmen, financial institutions, and other economic factors about the future course of the economy. He found a significant and immediate response of stock prices to discount rate changes.

Sellon Jr (1980) [33] discussed the assumption that changes in the discount rate given by the Federal Reserve Bank may affect prices in the stock market. He justified this by showing that an increase in the fed's discount rate restricts the ability of lending by banks and vice versa. Secondly, he states that the Fed's discount rate not only affects the banks but also may affect the confidence of the borrowers themselves.

Smirlock and Yawitz (1985) [35] studied the relationship of both technical and nontechnical discount rate changes and their influence on the stock prices. Their study revealed that the technical discount rate variations are endogenous whilst non-technical variations contain information about monetary policy. For the pre 1979 period they found no evidence of announcement effects. Contrary, for the post-1979 period they found significantly negative announcement effect, but only for nontechnical discount rate changes.

Chen, Roll, and Ross (1986) conducted a study on the basis of the Arbitrary Pricing Theory (APT) using a multivariate regression model. The macroeconomic variables regressed on the USA stock market returns index were namely Exchange rate, money supply, long/short interest rate and the industrial production index. These variables were selected due to their influence on the future cash flow of the stocks directly or their influence on the cash-flow's risks [8].

Hardouvelis (1987) [19] tested the response of stock prices to the announcement of 15 representative macroeconomic variables (M1, discount rate, surcharge rate, free reserves, inflation rate proxied by both CPI and PPI, consumer credit, personal income, industrial production index, unemployment rate, durable goods order, index of leading indicators, retail sales, housing starts, and trade deficit).

Pilinkus (2009) [27], analyzed the relationship between selected macroeconomic factors and two of the Lithuanian stock indexes namely (OMX, VILNIUS). He used 40 macroeconomic factors covering the period of study from December 1999 to March 2008. After applying Granger causality test the results showed that there is granger causality between OMX price index and some macroeconomic factors namely: consumer goods and money supply (M1 and M2).

Bulmash and Trivoli (1991) [5] investigated the time-lagged interaction between US. With many independent variables, along with a variety of assumed time lags, their model is large with an extensive degree of statistical multicollinearity or autocorrelation. They used an autoregressive procedure, and their results indicate that the actual inflation measured by the CPI is spurious; the monetary effects (M2) are positively related for short lags but negatively correlated for longer lags. Furthermore, they report that both short-term and long-term interest rates have a negative impact on the stock prices.

Issahaku and Ustarz (2013) [20], investigated the macroeconomic indicators of Ghana's economy and its effect on the stock market over the period starting from Jan 1995 to Dec 2010. After applying the Vector Error correction model to the selected variables namely: Exchange rate, money supply, inflation rate and foreign direct investment, the results revealed the existence of a long run relation between the stock price and foreign direct investment, also the existence of a short run relation with the interest rate. Moreover inflation and money supply showed both long and short run relationships with the stock price of Ghana.

Dhakal, Kandil, and Sharma, (1993) [10] aimed to investigate the impact of the aggregate money supply in the United States of America on the activity of New York Stock Exchange. They implemented the study on a Vector Autoregressive Model hence added some other convenient factors to the model namely: inflation rate, interest rate and real GDP. Their findings came in line with the casual relationship from money supply to stock prices. However they also found that stock prices do have a notable influence on the industrial real output in USA economy.

Habibullah and Baharumshah (1996) [18] employed tri-variant Cointegration approach to check the ability of aggregate money supply (M2, M1) and real output (GDP) to predict changes in stock prices in Malaysia. They used monthly data covering the time period of January 1978 to September 1992. The Cointegration analysis suggested that there is no Cointegration relation among money supply, GDP and the Malaysian stock prices. This suggests that

the stock price indexes in Malaysia, during the period of study, have already reflected all past information regards the selected macroeconomic factors, money supply and real GDP, which confirms the efficient market hypothesis.

Rjoub (2012) [29] examined the dynamic relationship between Exchange rates, US stock prices as a world market and the Turkish stock prices index, for the period span from August 2001 to August 2008. By applying Vector Autoregression (VAR) framework, the finding revealed that there was a long run relationship. Also Granger causality test indicated that there are bidirectional relationships between Exchange rates and stock prices. Also the shocks were temporary on the Turkish stock prices; US stock price and Exchange rates as indicated by the impulse responses.

Ahmet and Abdioglu (2010) [2] empirically examined the linkage between the stock price of (ISE100) and some macroeconomic factors particularly: consumer price index as a proxy of inflation (CPI), the Foreign Exchange rate, aggregate money supply (M1), Industrial production index and gold prices. The study was applied From March 2001 to June 2010 on a monthly basis. By using long run Granger non-causality techniques, the result showed that there is long run causality from (ISE-100) to all macroeconomic variables selected in one direction.

Kandir (2008) [21], studied the interrelationamong changes in the Turkish stock marketand a group of macroeconomic factors such as the foreign Exchange rate, money market interest rate (IR), money supply (M2), the consumer price index (CPI), industrial production index also gold and oil prices on the Turkish stock market represented by the (ISE-100) index for the period spans from Jan 2003 to Mar 2010 via applying a multiple regression model. The findings revealed that all the macroeconomic factors had a negative effect on the Istanbul stock Exchange (ISE-100) index returns EXRept the money supply showed a positive influence on ISE 100 index return. Moreover, CPI and gold price did not show any significant effect on (ISE-100) index.

Çağlı and Halaş (2010), investigate the relationship between stock price index (ISE-100) and a groupof related factors namely: Exchange rate, GDP, industrial production index, inflation rate, 17 money supply (M2), interest rate and oil price. By applying Gregory-Hansen test for the period span from January 1998 to December 2008. The result revealed a long run relationship, between deployed the variables and ISE100 for the tested period with a presence of structured break [6].

Zugul and Sahin (2009) [39], investigated whether there is cooperation concerning the (ISE-100) index and some macroeconomic variables as; Exchange rate, money supply (M1), deposits interest rate and inflation for the period spans from January 2004 to December 2008. The findings revealed that money supply, Exchange rate and interest rate have a negative relationship with stock return index. On the other hand, the findings reveal a positive relationship between price levels and (ISE-100) index for the analyzed period.

Ozbay (2009) [25], investigated the casual relationship between stock price (Index 30) and macroeconomic factors as; interest rate, inflation, and Exchange rate, money supply and the real economy spanning between January 1998 - December 2008 of ISE. The findings revealed that overnight interest rate, consumer price index, current deficit as percentage of GDP and foreign sales do granger-cause stock prices. Moreover, it indicated that stock prices do granger-cause money supply, overnight interest rate, and Exchange rate. Also revealed negatively that the purchase price index and positively that the in turkey, foreign transactions determined stock prices.



Güler and Nalm (2014) [16], investigated the association between the stock price (ISE-100) Index and consumption expenditure, industrial production, employment level, fixed investment and consumer price index, covering the period from January 1989 to February 2006. The findings revealed a negative association between the inflation and stock price. With an EXReption of industrial production index, employment level and fixed investment which were statistically significant, a positive relationship was revealed between the other macroeconomic variables and the stock prices.

Kaplan (2008) [22] investigated the correlation between the stock market performance, real macroeconomic activity and dynamic response of real economic activity to shocks in the stock prices of the Turkish economy from the period of 1987 to 2006 on a quarterly basis. The study finally revealed a long-run relationship between the real economic activity of Turkey and its stock prices over the studied period.

Erdem et al, (2005) [11] examined the instability spillover from inflation, interest rate, Exchange rate, money supply and industrial production to Istanbul Stock Exchange's stock prices index. The study analyzed the period span from January 1991 to January 2004. The findings revealed that there is a significant unidirectional spillover from macroeconomic variables to stock prices indexes EXRept for the services index. Also, the findings showed a positive volatility spillover in cooperation with the Exchange rate and both the (ISE-100) and industrial indices.

Subburayan and Srinivasan (2014) [37] investigated the long-run relations between macroeconomic factors and CNX Bank returns Index. Macroeconomic variables such as the foreign Exchange rate, short term interest rate and inflation rate were chosen for the analysis. The study was conducted on monthly time series data gathered from the related Institutions for the time span of 2004 to 2013. ADF Unit root test, Johansen Cointegration test and Granger causality test were implemented on the data. It was that the Bank stock returns have a long-run relationship with the selected macroeconomic factors. No Granger causality linkages between CNX Bank index and both the short-term Interest rate and Inflation. In contrast unidirectional Granger causality existed between CNX Bank's return Index and Exchange rate. Moreover Exchange rate and Interest rate both affected positively on the CNX Bank's Index stock returns.

Saeed&Akhter (2012) [30] performed econometric diagnostic tests to indicate that the data used to determine the impact of macroeconomic factors on banking index in Pakistan had no econometric problem. Whereas oil prices were revealed to have a positive impact on the banking index, variables such as short term interest rate, money supply as well as Exchange rates were revealed to have a negative impact on the banking index. Their regression results indicated that Industrial Production, Short Term Interest Rate, Exchange Rate, and Money Supply affected the banking index negatively whereas oil prices had a positive impact on the Banking index. Demir and Ersan (2018) [9], the study examined the impact of selected macroeconomic variables on the stock returns of bank industries in Malaysia. The monthly data for the period of 2006-2010 collected from Malaysia's Negera Bank were empirically analyzed. Ordinary least squares applied showed statistically significant relationship between the selected macroeconomic variables and the stock returns of the various banks. Stock returns of the various banks were affected by the Exchange rate where as a considerable effect of money supply was shown on banks' stock returns.

Shahbaz, Shamim and Aamir (2010) [34], the study sought the interactions among Pakistan's financial sector's performance and macroeconomic factors using both the Fully Modified Ordinary Least Square (FMOLS) method to test for cointegration in the long-run and the Error Correction method to test for the existence of a short run relation. Before further analysis, the stationarity of the series were defined using Ng-Perron unit root test. Findings reveal that a rise in both government spending and foreign remittances increased the performance of the financial sector. Moreover trade openness associated with capital inflows opened new opportunities to improve the development of the Pakistani financial markets. On the contrary, appreciation in inflation rates and the high savings rate decreased the efficiency in the overall financial sector.

Öztürk and Karabulut (2018) [26], the researchers investigated the relationship between macroeconomic factors and the banking and finance's stock prices using quarterly data during the period Q1/1988 to Q2/1990. The study conducted cointegration tests and an error correction model were used to determine the long run relationship between stock price and the selected macroeconomic factors. The study revealed a cointegration between the banking and finance stock prices and the three economic factors. The interest rate had a negative effect and in contrast a positive effect of GDP was shown on the stock prices. Moreover, inflation did not show any significant effect. Sohail and Zakir (2010) [36], this study explored both the short run and long run effect of five macroeconomic factors on the General Index of Karachi stock Exchange using Johansen cointegration technique and vector correction model. This study used monthly data from Nov 1991 to Jun 2008. The study revealed a positive impact of consumer price index, the real effective Exchange rate, as well as industrial production index on the stock prices. Contrary, the issue of money (money supply) and the quarterly treasury bills rates had a negative effect in the long run. The VECM revealed that it spent more than eight months to eliminate the disequilibrium. The variance decompositions showed that consumer price index and money supply had greater forecast error than the industrial production index, the three month treasury bills rate and the real effective Exchange rate for the General Index.

Saldanli and Bektaş(2017) [32], this study analyzed the stock price movement of the financial industry in which fall into three sectors that were tracked by the following indexes: (a) Banking sector index, (b) Finance and Securities sector index, and (c) Insurance sector index, on the Stock 20 Exchange of Thailand (SET) over a 10-year period starting in Jan 1995 to Dec 2004. This study employed three major analysis techniques. The three techniques were (a) Durbin-Watson test statistic, (b) Generalized Autoregressive Conditional Heteroscedasticity in Mean methodology (GARCH-M), and (c) the Granger causality test. The study was designed to analyze the movement of the SET Index and three financial industry group indexes (Banking sector index, Finance and Securities sector index, and Insurance sector index). First, the Durbin-Watson test statistic was used to analyze the autocorrelation within each sector. Second, the GARCH-M model was used to analyze the relationship between the variances of each financial sector series and the SET Index. Third, the Granger causality test was used to analyze Granger causality among sectors in the financial industry.

### III. METHODOLOGY

This study explains the methods in which the research was carried out and the tools employed. It centers on the research methodology used in the study, this is considered a very important study due to the fact that it makes a huge

difference on the quality from any research work [3]. It is also seen as the background through which the findings of a research work is deregulated and it concludes the content of any reader in understanding the analysis carried out in the course of the study, moreover it also was aid help to clarify the procedures used for the research. This research was employ the use of SPSS program for computing the relevant data for the purpose of this study for the analysis, and further explained. Specifically an ordinary least square (OLS) multiple regression model was adopted. The benefit of using ordinary least square (OLS) settles on the fact that it shows a blue property which is the best linear unbiased estimator [15].

Variables Descriptions and terms was used in this part to examine our study, they are explained as follows. BIST-KYD Industrial Index (SPI), Interest Rate (INR) Exchange Rate (EXR), Inflation (Consumer Price), Money supply (M2). Methodology and Econometric Model, In the previous part we explained the parties of our study by identifying the dependent variable and the independent variables. In second half of this chapter we will continue to clarify how we intend to link analytically between these variables in order to come to an outcome and interpret the statistical results of our study, Descriptive Statistics, Ordinary Least Square Multiple Regression (OLS), Autocorrelation test, Multi-Collinearity. The coefficient of multiple determinations (R2) this is used in checking the goodness of fit from the regression results. The data used for this analysis will mostly be sourced from World Bank, and the International Financial Statistics as well as Istanbul stock Exchange.

#### IV. DATA ANALYSIS

##### A. Pearson's correlation test

Correlation is a statistical measure that allows for the investigation of linear association between two or more quantitative variables. Pearson's correlation coefficient denoted as (R) measures the strength of the linear relationship among the studied variables. From the formula below it is conducted that the outcome of this correlation analysis must be (+1) and (-1). If positive correlation was indicated then that is interpreted as both variables increase and decrease simultaneously. On the other hand if negative correlation was indicated this clears that an increase in one variable was decrease in the other. The significance of the correlation test was not much in consideration as the significance was tested by the regression analysis, so only the direction of the correlation was considered. The following is the mathematical expression of correlation formula.

$$R = \frac{\sum_{i=1}^n (X_i - X_{bar})(Y_i - Y_{bar})}{\sqrt{\sum_{i=1}^n (X_i - X_{bar})^2} \sqrt{\sum_{i=1}^n (Y_i - Y_{bar})^2}}$$

It's good to note that it's not about the presence or absence of multi-collinearity rather than the degree of this linear relation between the variables [15]. From the correlation matrix below, we can see that the correlation between the explanatory variables is not present at an extreme high level (perfect multi-collinearity). The highest correlation is between Inflation and logm2 with a value of 94.5%.

Table 1: Pearson's Correlation

		exr	inr	inf	logm2	spi
exr	Pearson Correlation	1	-.454**	.712**	.533**	.535**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	132	132	132	132	132
inr	Pearson Correlation	-.454**	1	-.882**	-.945**	-.881**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	132	132	132	132	132
inf	Pearson Correlation	.712**	-.882**	1	.947**	.913**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	132	132	132	132	132
logm2	Pearson Correlation	.533**	-.945**	.947**	1	.896**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	132	132	132	132	132
spi	Pearson Correlation	.535**	-.881**	.913**	.896**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	132	132	132	132	132

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Despite the fact that our results show presence of multi-collinearity, according to Gujarati, (1998) In the case when  $R^2$  is high multi-collinearity may not pose a serious problem. Moreover OLS estimators still retain the property of BLUE even in the presence of multi-collinearity..

**B. Justification and Auto-correlation test**

The coefficient of multiple determinations ( $R^2$ ) is used for checking the goodness of fit from the regression results. Our results gave a value of  $R^2$  0.874, whereby the change in the predictor variables explains 87.4 % of change in SPI. In other words on the long run 87.4% of the variations in SPI is a reflection of variations in the independent variables INR, EXR, INF and M2. Therefore the 12.6% change left can be related to the effect of other factors not present in the model. With the given expected change we can say that our model is accurately expected.

Table 2: R square and serial correlation test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
dimension0 1	.935 <sup>a</sup>	.874	.870	7.16227	1.837

a. Predictors: (Constant), logm2, exr, inr, inf

b. Dependent Variable: spi

Table 2 also reports the results of Durbin-Watson serial correlation test. This test's null hypothesis states no first order serial correlation both neither positive nor negative. In order to decide whether to reject or accept H<sub>0</sub>, we first need to determine a lower bound  $d_L$  and an upper bound  $d_U$ . According to Gujarati, (1998) if our computed  $d$  from lies outside these critical values, a decision can be made regarding the occurrence of negative or positive auto-correlation. Also if the computed  $d$  is between the lower and upper bound, no serial correlation is found in the model. Our expected model holds a  $d$  value of 1.83 and is between the lower value  $d_L = 1.679$  and the upper bound  $d_U = 1.788$  (see appendix D in Gujarati for calculation details). We conclude that our model is free from first-order serial correlation meaning that our estimated model is accurate and no correlation exists between its residuals.

### C. Statistical F-test ANOVA

Table 3: ANOVA<sup>b</sup>

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	45160.798	4	11290.200	220.090	.000 <sup>a</sup>
Residual	6514.861	127	51.298		
Total	51675.659	131			

a. Predictors: (Constant), logm2, exr, inr, inf

b. Dependent Variable: spi

Table 4: Residuals Statistics<sup>a</sup>

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.4665	73.6710	43.3409	18.56715	132
Residual	-17.15165	13.81947	.00000	7.05207	132
Std. Predicted Value	-2.309	1.634	.000	1.000	132
Std. Residual	-2.395	1.929	.000	.985	132

F-test has been used to compute the statistical significance of the regression coefficients. In this test, we have assumed that all the regression coefficients estimated earlier is equal to zero as null hypothesis (null hypothesis:  $\beta_1$ )

=  $\beta_2 = \beta_3 = 0$ ). Table 4 present the statistical significance F-test output. In this test the combined F-statistic value that our null hypotheses of all the regression coefficients are zero was rejected. That means our multivariate regression estimates for our estimated model is statistically significant at 5 percent.

**D. Expected Model and Interpretation of the Results**

Table 5: Expected relationship and actual results comparison

Variables	Significance level	Expected sign	Actual Sign
EXR	Significant at 5 %	(+/-)	(-)
INF	Significant at 5 %	(+)	(+)
INR	Significant at 5 %	(+/-)	(-)
LOGM2	Significant at 5 %	(+/-)	(-)

As can be seen from Table 5, the actual results coincide with the expected results in terms of all the variables as exchange rate, interest rate and money supply all show a negative relationship with economic growth as expected and along with the theory. Inflation on the contrary shows a positive expected relation with SPI.

**Model Estimation**

The table below shows the empirical results of the estimated parameters and its t-statistics with other diagnostic tests of equation. From the F-statistics probability we can conclude that our model is significant at 1% level, meaning that change at least in one explanatory variable has an effect on the change in the dependent variable. The result gotten from the estimation technique is presented in the table below:

Table 6: Estimated Model

**Coefficients<sup>a</sup>**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	245.319	100.301		2.446	.016*
exr	-20.481	5.528	-.215	-3.705	.000*
inr	-.604	.168	-.351	-3.595	.000*
inf	.983	.135	1.105	7.287	.000*
logm2	-9.123	3.887	-.367	-2.347	.020*

a. Dependent Variable: spi, \*= 1% level of significance

Our linear expected model is in the following form;

$$SPI = 245.319 - 9.123 \log M2_t - .604 INR_t - 20.481 EXR_t + 0.983 INF_t + \varepsilon_t$$

### *Interpretation of results*

**Short Term Interest Rate:** The INR shows a negative and statistically significant. With a t-value of -3.595 at 5% level of significance. In effect, with a coefficient of  $-.604$  that interprets an increase would lead to concerning 60.4% reduction within the stock price. Due to the use of the short-term interest rate as an anchor to fight inflation in the Turkish economy, an increase in the short term interest rate was increase the cost of capital therefore was decrease the prices of the stocks. This negative relation is consistent with the findings of [31, 39] from the Turkish stock market.

**Exchange Rate:** The result of the EXR is negatively significant with a t-statistics value of -3.705 and a coefficient of -20.481. This explain that during the period under study depreciation in the local currency tends to affect the expectations of investors whom hold SPI stock's, by exposing these portfolios to more exchange rate risk investors require a higher rate of return which increases the price consequently. The negative long-run relation is consistent with previous empirical literatures such as: [23,28].

**Inflation (INF):** with the result for coefficient for INF which is .983, this result shows that there is a positive relationship with SPI and significant relationship. This positive relation is consistent with Basak, Suleyman& Yan, Hongjun, (2009) which found that prices are positively related to unexpected inflation [4].

**Log Money Supply:** The coefficient of M2 is -9.123, and is statistically significant with a t-statistics value of -2.347. This result shows there is a negative and significant relationship with SPI. Friedman and Schwartz (1986) through the modern quantity theory of money suggest that there is directly proportional relationship between money supply and the price level [13].

## **V. CONCLUSION**

The present study has been undertaken to investigate the impact of changes in selected macroeconomic variables namely: Inflation, Exchange rate, Money supply and Interest rate, on BIST-KYD Index in the Turkish stock market for the time span from 2003 to 2013, this period took in consideration the transition in the Turkish economy. A Multivariate Regression Model computed on Standard Ordinary Least Squares (OLS) has been used to estimate the impact. Based on regression coefficient, it was found that Inflation, Exchange rate, Money supply and Interest rate all had negative influence on SPI. So the results of the present study support the findings of previous studies regards the Turkish economy and regards other economies. The model was approved to be clear Autocorrelation, heteroscedasticity and multi-collinearity tests. The selected independent variables in our model can explain 87.4% of change in the price of the all share price index in Turkey. Our study implemented multiple regression analysis and some stability tests to test the model like autocorrelation and heteroscedasticity. However our findings revealed that the selected independent variables in our model can explain only 87.4% of change in the price of the all share price index in Turkey. Apply advanced analysis technique to confirm and precise the results. We recommend using more advanced analysis techniques to reach a more efficient model and apply other econometric techniques.

## RECOMMENDATION

Our study implemented multiple regression analysis and some stability tests to test the model like autocorrelation and heteroscedasticity. However our findings revealed that the selected independent variables in our model can explain only 87.4% of change in the price of the all share price index in Turkey. Apply advanced analysis technique to confirm and precise the results. We recommend using more advanced analysis techniques to reach a more efficient model and apply other econometric techniques.

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