

## Studying Relationship between Economic Variables on Stock Market Index

**Mehdi Safdari**

*Assistant Professor of Faculty of Economics  
University of Qom, Iran*

**Masoud Abouie Mehrizi**

*Department of Economics, Sirjan branch  
Islamic Azad University, Sirjan, Iran  
E-mail: masoud8162@gmail.com  
Tel: +98 9352995018*

**Marzie elahi**

*Department of Economics, Sirjan branch  
Islamic Azad University, Sirjan, Iran*

### Abstract

In this paper, balance relation and long term of six variables Logarithm of total stock market index, Logarithm of exchange rate, Logarithm of Iran's trade balance, Logarithm of supply money, Logarithm of interest rate and Logarithm of inflation and also their influences on each other in Iran and for years 1975-2008 has been analyzed. In this purpose vector autoregressive model (VAR) has been used. First, stable of variables by the use of dickey-fuller test has been examined. Next, analysis of Johnson test for considering the convergence among six variables has been used. The results of this research show that the variables Logarithm of supply money, Logarithm of interest rate and Logarithm of inflation have a negative effect on Logarithm of total stock market index. Also the Logarithm of exchange rate and Logarithm of Iran's trade balance have a positive relation with Logarithm of total stock market index.

**Keywords:** Stock market – exchange rate -trade balance–supply money -Vector Autoregressive Model (VAR).

**JEL Classification Codes:** C58, F47

### 1. Introduction

According to classical theories of economic, if the efficient sector of economic develops, they will be able to absorb surplus production factors of inefficient sectors, for catching efficiency in society we should realize profitable and efficient companies and projects from unprofitable ones. We can do it easily by an efficient mechanism in capital market.

In economic that its capital market performs well, both investment volume increased and quality and healthiness of investments increased. In such a framework augmentation of economic growth become possible.

Finance markets are one of the basic and effective markets of each country economic.

One important part of finance markets is bourse stock exchange.

bourse stock exchange is center of saving collection and liquidity of private sector in order to financing long term investment project and also is a formal and safe reference which stagnant save holders can look for suitable and safe investment and actuated their fund for investment in companies. Stock market has been used in many articles.

Nielsson (2008) in his article with this title 'Stock exchange merger and liquidity: The case of Euronext' investigated the effects of the Euronext stock exchange merger on listed firms, i.e. the merger of stock exchanges in Amsterdam, Brussels, Lisbon and Paris. Specifically, it examined how exchange consolidation has affected stock liquidity and how the effect varies with firm type, i.e. what types of firms benefit the most in terms of stock liquidity and other financial outcomes. The results showed asymmetric liquidity gains from the stock exchange merger, where the positive effects are concentrated among big firms and firms with foreign sales. There was not a significant increase in stock liquidity of small or medium sized firms, nor of firms that only operate domestically. Beyond the significant size and foreign exposure effects, the analysis founds no systematic pattern in the distribution of merger benefits across industries or listing locations. The merger is associated with an increase in Euronext's market share, where the increase is drawn from the London Stock Exchange. There was however no evidence of Euronext enhancing it was competitive stand in terms of attracting new firm listings.

Walid and et al(2011) in their article titled 'Stock market volatility and exchange rates in emerging countries: A Markov-state switching approach' employed a Markov-Switching EGARCH model to investigated the dynamic linkage between stock price volatility and exchange rate changes for four emerging countries over the period 1994–2009. Results distinguished between two different regimes in both the conditional mean and the conditional variance of stock returns. The first corresponds to a high mean-low variance regime and the second regime was characterized by a low mean and a high variance. Moreover, they provided strong evidence that the relationship between stock and foreign exchange markets was regime dependent and stock-price volatility respond asymmetrically to events in the foreign exchange market. Their results demonstrated that foreign exchange rate changes had a significant impact on the probability of transition across regimes.

Mercereau (2006) in his article 'Stock markets and the real exchange rate: An intertemporal approach' studied the role of financial markets in the dynamics of the real exchange rate. To do so, they developed a model with stock markets, and they derived a closed-form solution for the real exchange rate. This solution stressed that a country's financial structure affected its real exchange rate, as well as the volatility of this exchange rate. They also contrasted other implications of the model with the Balassa–Samuelson effect and with the prediction of traditional Keynesian models.

Foster and Kharazi (2006) in their article titled 'Contrarian and momentum returns on Iran's Tehran Stock Exchange' studied Iran's emerging Tehran Stock Market. Potential foreign investors, who have been able make direct investments since 2003, should studied the recent history of the exchange in order to understand the risks that accompany the high returns. Using data on stock prices and volume over the period 1997–2002, this study looked at the crucial question of pricing efficiency, examining the relation of current prices and volumes to future returns. They applied the analyses of Jegadeesh and Titman , Conrad et al., Cooper, and Gervais et al to this developing market. There was no evidence of "contrarian" behavior. Standard tests of autocorrelation and pricing efficiency found no evidence of anomalies in the short run. There was, however, evidence of "momentum" where past high performers had above-average return over an intermediate (3–12 months) horizon.

Lin and Brooks and Kim (2007) in their article titled 'Financial crisis and stock market efficiency: Empirical evidence from Asian countries' investigated the effects of the 1997 financial

crisis on the efficiency of eight Asian stock markets, applying the rolling bivariate test statistics for the three sub-periods of pre-crisis, crisis, and post-crisis. On a country-by-country basis, the results demonstrated that the crisis adversely affected the efficiency of most Asian stock markets, with Hong Kong being the hardest hit, followed by the Philippines, Malaysia, Singapore, Thailand and Korea. However, most of these markets recovered in the post-crisis period in terms of improved market efficiency. Given that the evidence of nonlinear serial dependence indicated equilibrium deviation resulted from external shocks, the present finding of higher inefficiency during the crisis were not surprising as in the chaotic financial environment at that time, investors would overreact not only to local news, but also to news originating in the other markets, especially when the news events were adverse.

Cumperayot and et al (2006) in their article titled 'Linkages between extreme stock market and currency returns' investigated the link between extreme events on the currency and stock markets for 26 countries by estimating a simultaneous equations probit model, using a sample of 2500 daily returns in the period from 1996 to 2005. In a number of emerging markets that went through a period of crisis an extreme stock market decline increased the probability of extreme currency depreciation on the same day. For currency markets they found evidence of spillover of extreme events within regions, but limited influence outside the region. Extreme events on stock markets were much more interrelated globally, particularly when they originate from the US.

Buttner and Hayo (2011) in their article titled 'Determinants of European stock market integration' analyzed the determinants of stock market integration among EU member states for the period 1999–2007. First, they applied bivariate DCC-MGARCH models to extract dynamic conditional correlations between European stock market, which are then explained by interest rate spreads, exchange rate risk, market capitalization, and business cycle synchronization in a pooled OLS model. By grouping the countries into euro area countries, "old" EU member states outside the euro area, and new EU member states, they also evaluated the impact of euro introduction and the European unification process on stock market integration. They found a significant trend toward more stock market integration, which was enhanced by the size of relative and absolute market capitalization and hindered by foreign exchange risk between old member states and the euro area. Interest rate spreads and business cycle synchronization were also significant factors in explaining equity market integration.

Narayan and Zheng (2011) in their article titled 'The relationship between liquidity and returns on the Chinese stock market' examined the impact of liquidity on returns on the Shanghai stock market (SHSE) and the Shenzhen stock market (SZSE). They proxy liquidity with the trading volume (TV), the turnover rate (TR), and the trading probability (TP). Using daily data for the period January 1997 and December 2003, they found mixed results on the relationship between liquidity and returns. There was greater evidence of liquidity having a negative effect on returns on the SHSE than on the SZSE. However, this evidence was not robust across the three proxies for liquidity that they used.

Enisan and Olufisayo (2008) in their article with this title 'Stock market development and economic growth: Evidence from seven sub-Saharan African countries' examined the long run and causal relationship between stock market development and economic growth for seven countries in sub-Saharan Africa. Using the autoregressive distributed lag (ARDL) bounds test, the study found that the stock market development is co integrated with economic growth in Egypt and South Africa. Moreover, this test suggested that stock market development had a significant positive long run impact on economic growth. Granger causality test based on vector error correction model (VECM) further showed that stock market development Granger caused economic growth in Egypt and South Africa. However, Granger causality in the context of VAR showed evidence of bidirectional relationship between stock market development and economic growth for Cote D'Ivoire, Kenya, Morocco and Zimbabwe. In Nigeria, there was a weak evidence of growth-led finance using market size as indicator of stock market development. Based on these results, the paper argued that stock markets could help

promoted growth in Africa. However, to achieve this goal, African stock markets needed to be further developed through appropriate regulatory and macroeconomic policies.

The rest of the paper is organized into four main sections: Section 1 analyses previous studies. Section 2 describes the data and the econometric methodology. Section 3 discusses the results that emerge from the estimations. The conclusions of this paper are then presented in section 4.

## 2. Data and Methodology

We use this data from 1975 to 2006 of Iran. We found them in Central Bank of Iran. One vector autoregressive (VAR) model which possess  $k$  as exogenous variable. And  $p$  as time's inhibition for each variable, in shape matrix is shown as following:

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \dots + A_p Y_{t-p} + U_t \approx IN(0, \Sigma)$$

This relation,  $y_t$  and it's lags,  $k \times 1$  vectors are related to models variables.  $A_i$ ,  $i = 1, 2, \dots, p$  are model's coefficients for  $k \times k$  matrix. And  $u_t$ ,  $k \times 1$  vector is related to terms of model's error. Now for linking short term behavior of  $y_t$  to long term balance values, we can bring above relation as vector error correction model as following:

$$\Delta Y_t = \beta_1 \Delta Y_{t-1} + \beta_2 \Delta Y_{t-2} + \dots + \beta_{p-1} \Delta Y_{t-p+1} + \Pi Y_{t-p} + U_t$$

Where:

$$B_i = -(I - A_1 - A_2 - \dots - A_p) \quad i = 1, 2, \dots, p-1$$

$$\Pi = -(I - A_1 - A_2 - \dots - A_p)$$

Matrix  $\pi$  contains of information of long term balance variables. We follow the Johansen approach in determining long-run relationships. Patterson (2000) and Doornik and Hendry (2001) provide a full treatment of the issues involved in this method. The first step is to estimate the VAR in levels with an appropriate lag structure. The next stage involves determining the cointegrating rank, i.e. the number of long-run equilibrium relationships or cointegration vectors among the variables. Finally, to allow a reasonable interpretation of the results, cointegration vectors are identified (Abouie Mehrizi, 2011)

### 2.1. Theoretical Principles

The model which is used for studying relationship between economic variables on stock market index is defined as following:

$$LNBI = \beta_0 LNER + \beta_1 LNEX + \beta_2 LNM2 + \beta_3 LNP + \beta_4 LNR + \varepsilon_t$$

Where:

LNBI: Logarithm of total stock market index

LNER: Logarithm of exchange rate

LNEX: Logarithm of Iran's trade balance

LN2: Logarithm of money supply

LNR: Logarithm of interest rate

LNP: Logarithm of inflation

## 3. Findings/Discussion

We use the above formulation to estimate a VAR model containing five variables.

**Table 1:** Variable Definitions and Descriptions

Variable	DESCRIPTION
LNBI	Logarithm of total stock market index
LNER	Logarithm of exchange rate
LNEX	Logarithm of Iran's trade balance
LN2M	Logarithm of supply money
LNR	Logarithm of interest rate
LNP	Logarithm of inflation

In order to fitness of VAR pattern first, it's necessary to investigate the persistent of variables. One of the common examinations which nowadays use for recognition of persistent of one time series process is unit root test; we can do this examination in two ways: Dickey Fuller's Test, Dickey Fuller's generalized Test.

The results of the test for the variables in levels are presented in table2.

The results reported in Table 2 show that all variables are I (0).

**Table 2:** ADF tests for unit roots

Variable	ADF	Critical Value			Lag
		1%	5%	10%	
LNBI	-3.79	-3.57	-2.93	-2.61	0
LNER	-4.07	-3.57	-2.92	-2.61	0
LNEX	-3.15	-3.57	-2.92	-2.61	0
LN2M	-3.17	-3.57	-2.92	-2.61	0
LNR	-4.91	-3.57	-2.92	-2.61	0
LNP	-3.64	-3.57	-2.92	-2.61	0

After investigation of persistent of variables, one of the important stages in evaluation of vector regression model is choosing rank of pattern.

For choosing optimum rank of pattern, we can use criterion of Akaike or Schwarz. The most lag which is given to model is 2, and considering table (3), the least quantity of Schwarz, Akaike statistic is prepared in second lag, we can indicate that the optimum lag of VAR model is equal to 2.

**Table 3:** Determination of magnitude of lag of VAR model

Schwarz information	Akaike information	lag
-21.64	-32.00	0
-26.87	-36.17	1
-31.04*	-38.57*	2

In this article we follows vectors and accumulated vector among variables Logarithm of total stock market index, Logarithm of exchange rate, Logarithm of Iran's trade balance, Logarithm of supply money, Logarithm of interest rate and Logarithm of inflation by the use of Johansson's method. Considering stationary test, variables which are under consideration are I (0). In Johnson's method after doing necessary calculations for studding existence of convergence we use two criterions consist of  $\lambda_{\max}$  and  $\lambda_{\text{trace}}$ . If existence of convergence among variable is verified, we can say that balance and long term relation among variable is established.

Results which are concluded from effect's examination and examination of maximum specific values for determination of accumulated vectors among model's variables are presented in following tables.

Results of maximum of specific values for determination magnitude of accumulated vector are reported in Table 5.

**Table 4:** Test- Statistics for Co integrating rank (Trace tests)

Null	alt	Critical value	$\lambda_{TRACE}$	Probe
$r=0$	$r \geq 1$	102.36	130.14	<b>0.0000</b>
$r \leq 1$	$r \geq 2$	95.74	99.87	<b>0.0000</b>
$r \leq 2$	$r \geq 3$	82.36	84.36	<b>0.0005</b>
$r \leq 3$	$r \geq 4$	42.61	34.15	<b>0.0145</b>
$r \leq 4$	$r \geq 5$	30.25	20.25	<b>0.0435</b>
$r \leq 5$	$r \geq 6$	20.47	15.36	<b>0.0124</b>

**Table 5:** Test Statistics for Co integrating rank (Max tests)

Null	alt	Critical value	$\lambda_{MAX}$	Probe
$r=0$	$r \geq 1$	60.14	65.14	<b>0.0000</b>
$r \leq 1$	$r \geq 2$	55.36	50.31	<b>0.0000</b>
$r \leq 2$	$r \geq 3$	45.14	41.36	<b>0.0007</b>
$r \leq 3$	$r \geq 4$	35.64	30.47	<b>0.0015</b>
$r \leq 4$	$r \geq 5$	24.97	20.36	<b>0.0036</b>
$r \leq 5$	$r \geq 6$	19.25	18.17	<b>0.0147</b>

The magnitudes of vectors which are prepared by statistic of examination effect matrix are equal to 3 vector and magnitudes of vectors which are prepared statistic of maximum specific values are equal to 1. Considering that examination of maximum specific values is stronger than examination of effect matrix. Therefore for determination of magnitude of accumulated vector, examination of maximum specific values is used. considering results of above tables in level of probability of 90 percent magnitude of long term relations among variables compatible pattern with economic theory is equal to  $(r=1)1$  is determined.

**Table 6:** Co integrating vectors

variables	Vector 1
LNBI(-1)	1.00
LNER(-1)	-5.01(3.64)
LNEX(-1)	-1.28(10.26)
LNM2(-1)	+5.29(-9.35)
LNR(-1)	+10.64(8.17)
LNP(-1)	+7.96(4.39)
C	-18.60

In above table, number inside parentheses are statistic of accounting t. estimated coefficients of all variables in a meaning full level, 5 percent are significant from statistical aspect.

Considering prepared results within investigated period, variable of

#### 4. Conclusion

Generally, in this article relation between Economic Variables and Stock Market Index in Iran investigated. In this article, first we presented a model and estimated this model, in order to fitness of VAR pattern we used unit root test, then the magnitude of inhibition of VAR model was determined after that by using of Johansson's and existence of accumulated vectors showed long term relations among variables. After certainty about existence of long term relation, we estimated this relation and then interpreted these coefficients.

The results of this research show that the variables Logarithm of supply money, Logarithm of interest rate and Logarithm of inflation have a negative effect on Logarithm of total stock market

index. Also the Logarithm of exchange rate and Logarithm of Iran's trade balance have a positive relation with Logarithm of total stock market index.

Inflation has a negative effect on general index of bourse stock exchange because of increasing expectation of entrepreneurs and reduction of intrinsic value of shares.

Liquidity has a negative effect on bourse index because of its chain effect on inflation and interest rate.

High interest rate decrease present value of forward cash flow and also decrease investment opportunities and because of this has a negative effect on bourse index.

Exchange rate has a positive effect on bourse index because of its effect on variables related to liquid of shares and also augmentation of exchange rate increase profit of exported industry and in this way increase boom of capital market.

It is suggested for prosperity of market liquid bourse should be controlled in a best way and exchange rate be stabilized and also interest rate inclined down more.

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