Investigating Macroeconomic Effects on Stock Exchange’s Price Index

Ali Faez and Jahangir Parizan Hafashjani

Department of Management, Semnan branch, Islamic Azad University, Semnan, Iran.

ABSTRACT
Predicting the direction of stock exchange index and effective factors which have the most influences on the index has always been one of the major concerns of both financial academics and financial analysts. The aim of this study is to see what are the major effects of most relevant macroeconomic variables on stock exchange index. For this purpose the sample was 20 registered firms in Tehran Stock Exchange and the financial information was gathered with use of their financial reports within 12 years beginning from 2000 and ending to 2012. Results show that there is a significant relationship between investigated macroeconomic variables and price index of stock exchange market. Managerial implications and directions for future researches are presented for further studies.

INTRODUCTION

The literature on financial economics contains a considerable number of empirical analyses that investigate the interactions and dynamic linkage between stock returns and macroeconomic variables. Among various macroeconomic variables gross domestic product (GDP), investment, money supply, and consumer price index (CPI) etc. has perhaps receive the most attention. Theoretically the influence of macroeconomic variables such as GDP, CPI or exchange rate may be motivated by using such model as the standard stock valuation models or standard macroeconomic text book models. According to stock valuation model, stock prices reflect discounted expected future cash flows earned by owner of the stocks. This means that any change in the economic variables that have a bearing on the future cash flows or the discount factors affect the stock prices. The standard aggregate demand and aggregate supply (AD/AS) framework also allows for the roles of equity markets in the transmission mechanism of monetary policy include not only the normal interest rate channel (traditional liquidity effect) but also other channels, one of which h involve equity prices via Tobin’s q theory, wealth effects and household liquidity effects. These theoretical foundations, unfortunately, do not provide unambiguous testable implications on the directional influences of macroeconomic variables on stock prices. The argument from the monetary transmission mechanisms highlights both positive and negative effects of macroeconomic variables on stock prices. Arguing through the stock valuation model, Mukherjee and Naka (1995) note that the effects of an increase in money supply on real economic activity, and thus expected future cash flows, suggest a positive relation between them. Conversely if the money supply generates inflation uncertainty and, consequently raises discount factor, then monetary expansion may exert a negative influence on equity markets. Ahmed, M. F (2000) found causal relation from change in stock price to consumption expenditure. The findings also reveal a causal relation from stock price to investment expenditure and very weak or no causal relation between stock price and industrial production index.

Literature review:
Emerging stock markets have been identified as being at least partially segmented from global capital markets. As a consequence, it has been argued that local risk factors rather than world risk factors are the primary source of equity return variation in these markets. Accordingly, Bilson, Brailsford, and Hooper (1999) aimed to address the question of whether macroeconomic variables may proxy for local risk sources. They found moderate evidence to support this hypothesis. Further, they investigated the degree of commonality in exposures across emerging stock market returns using a principal components approach, and found little evidence of commonality when emerging markets are considered collectively. At the regional level, however, considerable commonality was shown to exist.

Corresponding Author: Ali Faez, Department of management, Semnan branch, Islamic Azad University, Semnan, Iran
E-mail: a_faez87@yahoo.com Tel: (+98) 9121318610
Maysami and Sims (2002, 2001a, 2001b) employed the Error-Correction Modelling technique to examine the relationship between macroeconomic variables and stock returns in Hong Kong and Singapore (Maysami and Sim, 2002b), Malaysia and Thailand (Maysami and Sim 2001a), and Japan and Korea (Maysami and Sim 2001b).

Through the employment of Hendry’s (1986) approach which allows making inferences to the short-run relationship between macroeconomic variables as well as the long-run adjustment to equilibrium, they analyzed the influence of interest rate, inflation, money supply, exchange rate, and real activity, along with a dummy variable to capture the impact of the 1997 Asian financial crisis. The results confirmed the influence of macroeconomic variables on the stock market indices in each of the six countries under study, though the type and magnitude of the associations differed depending on the country’s financial structure.

Islam (2003) replicated the above studies to examine the short-run dynamic adjustment and the long-run equilibrium relationships between four macroeconomic variables (interest rate, inflation rate, exchange rate, and the industrial productivity) and the Kuala Lumpur Stock Exchange (KLSE) Composite Index. His conclusions were similar: there existed statistically significant short-run (dynamic) and long-run (equilibrium) relationships among

The macroeconomic variables and the KLSE stock returns.

Ibrahim (1999) also investigated the dynamic interactions between the KLSE Composite Index, and seven macroeconomic variables (industrial production index, money supply M1 and M2, consumer price index, foreign reserves, credit aggregates and exchange rate). Observing that macroeconomic variables led the Malaysian stock indices, he concluded that Malaysian stock market was informational inefficient.

Chong and Koh’s (2003) results were similar: they showed that stock prices, economic activities, real interest rates and real money balances in Malaysia were linked in the long run both in the pre- and post-capital control sub periods.

Mukherjee and Naka (1995) applied Johansen’s (1998) VECM to analyze the relationship between the Japanese Stock Market and exchange rate, inflation, money supply, real economic activity, long-term government bond rate, and call money rate. They concluded that a co-integrating relation indeed existed and that stock prices contributed to this relation. Maysami and Koh (2000) examined such relationships in Singapore. They found that inflation, money supply growth, changes in short- and long-term interest rate and variations in exchange rate formed a co-integrating relation with changes in Singapore’s stock market levels.


The analysis of weekly price indices in Kuwait, Bahrain, and Oman stock markets showed that: (1) share prices were co-integrated with one co-integrating vector and two common stochastic trends driving the series, which indicates the existence of a stable, long-term equilibrium relationship between them; and (2) prices were not affected by short-term changes but were moving along the trend values of each other. Therefore, information on the price levels would be helpful for predicting their changes.

Omran (2003) focused on examining the impact of real interest rates as a key factor in the performance of the Egyptian stock market, both in terms of market activity and liquidity. The co-integration analysis through error correction mechanisms (ECM) indicated significant long-run and short-run relationships between the variables, implying that real interest rates had an impact upon stock market performance.

Vuyyuri (2005) investigated the co-integrating relationship and the causality between the financial and the real sectors of the Indian economy using monthly observations from 1992 through December 2002. The financial variables used were interest rates, inflation rate, exchange rate, stock return, stable over time. Sun and Brannman (1994) similarly found a single long-run relationship among the SES All-S Equities Industrial & Commercial Index, Finance Index, Hotel Index, and Property Index from 1975 to 1992.

The current study builds upon and extends the literature through the employment of Johansen’s (1988) VECM to examine the long-run equilibrium relationship between selected macroeconomic variables and stock market sector indices represented on the Stock Exchange of Singapore (recently demutualized and renamed the Singapore Exchange (SGX)): the Finance Index, the Property Index, and the Hotel Index. The choice of macroeconomic variables and the hypothesized relations with the sector indices are discussed next.
Analysis:

Accumulated test:

With use of accumulated test we can test the existence of accumulation which is case of existence; we can test the propriety of variables. In this research, with use of Johanson method, co-aggregated vectors are extracted by which the long term relation among variables was investigated which is shown in table below:

<table>
<thead>
<tr>
<th>Null hypothesis</th>
<th>Alternative hypothesis</th>
<th>Statistical $\lambda_{max}$</th>
<th>Significance level in 95%</th>
<th>probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>$r = 0$</td>
<td>$r = 1$</td>
<td>260.31</td>
<td>103.85</td>
<td>0.000</td>
</tr>
<tr>
<td>$r = 1$</td>
<td>$r = 2$</td>
<td>171.98</td>
<td>76.93</td>
<td>0.000</td>
</tr>
<tr>
<td>$r = 2$</td>
<td>$r = 3$</td>
<td>111.91</td>
<td>54.08</td>
<td>0.000</td>
</tr>
<tr>
<td>$r = 3$</td>
<td>$r = 4$</td>
<td>64.78</td>
<td>35.19</td>
<td>0.000</td>
</tr>
<tr>
<td>$r = 4$</td>
<td>$r = 5$</td>
<td>29.53</td>
<td>20.68</td>
<td>0.0020</td>
</tr>
<tr>
<td>$r = 5$</td>
<td>$r = 6$</td>
<td>11.45</td>
<td>9.16</td>
<td>0.0181</td>
</tr>
</tbody>
</table>

Regarding the maximum amount in table 1 and considering the factors of this test, 6 convergence vectors among variables of the model are extracted and the existence of a long term significant relation between variable of time series are proved.

Test of determination of number of co-summation based on effect test (test of hypotheses)

Regarding the results of table 2 and with consideration of factors of this test which all the probabilities are less than 0.05, 6 convergence vectors among variables of the model are identified and the long term significant relation of time series variables are proved to be true.

Table 2: Results of research based on EVIEWS estimations.

<table>
<thead>
<tr>
<th>Null hypothesis</th>
<th>Alternative hypothesis</th>
<th>Statistical $\lambda_{max}$</th>
<th>Significance level in 95%</th>
<th>probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>$r = 0$</td>
<td>$r = 1$</td>
<td>88.32</td>
<td>40.96</td>
<td>0.000</td>
</tr>
<tr>
<td>$r = 1$</td>
<td>$r = 2$</td>
<td>60.07</td>
<td>34.80</td>
<td>0.000</td>
</tr>
<tr>
<td>$r = 2$</td>
<td>$r = 3$</td>
<td>47.13</td>
<td>28.59</td>
<td>0.000</td>
</tr>
<tr>
<td>$r = 3$</td>
<td>$r = 4$</td>
<td>35.24</td>
<td>22.30</td>
<td>0.005</td>
</tr>
<tr>
<td>$r = 4$</td>
<td>$r = 5$</td>
<td>18.08</td>
<td>15.89</td>
<td>0.0223</td>
</tr>
<tr>
<td>$r = 5$</td>
<td>$r = 6$</td>
<td>11.45</td>
<td>9.16</td>
<td>0.0181</td>
</tr>
</tbody>
</table>

Considering results of Johonso and Josilos, equation for convergent and normal vector for estimation of the model is as below:

$$\text{TEPIX} = -210844.1 + 0.00844 \text{RLB} + 0.56014 \text{M1} + 59117.77 \text{IR} - 555.270 \text{HI} + 822.855 \text{CPI}$$

$$\begin{bmatrix} 0.08686 \end{bmatrix} \begin{bmatrix} 0.12313 \end{bmatrix} \begin{bmatrix} 8924.0 \end{bmatrix} \begin{bmatrix} 172.047 \end{bmatrix} \begin{bmatrix} 346.005 \end{bmatrix}$$

Coefficients of the variables are indicating that there is a relation among each variable with TEPIX variable. In parenthesis numbers are indicators of analyze of variance which by estimation of t statistics, is a prove for significant variables. As it is show in the equation, surpluses and deficits are indicating that government expenditures have a long term effect on price index of Tehran Stock Exchange.

Money volume has a long term effect on stock price index because with increase in money volume, demand for consumption and financial property will be boost up in return and finally there will be more production in different sectors of economy. The final consequence will be more financial transactions and increase in price index in Tehran Stock Exchange.

Increase in CPI will be result in increase in price index because inflation has a negative return for deposits and therefore tendency for keeping cash will be decrease and tendency for keeping other kind of assets like stocks will grow. In fact, in this situation, stock will be considered as inflation guard.

Growth in real state will cause the price index to decrease in the long term. From theory perspective, real state is among that kind of property which its price changes will cause changes in other properties prices. Investment in real state is considered as one of the main investment methods among investors. From economic
point of view, the relation between real state and stock prices is not clear because increase in real estate prices makes this market favorable for investors and will cause demand for stock exchange to be decreased and from other hand, those investors who cannot afford to invest in real state, will invest their money on stock which will result on increase in stock prices.

**Pattern of fallacy correction and near term result:**

Method of fallacy correction can both determine the causality between variables and discriminate long term and short term causality. Existence of convergence among variables is a basis for using correcting models. Patter of fallacy correction is in fact relating short term volatilities among variables to long term relation of them. According to Angel and Gerner (1987), each long term relation has a short term model which will provide balance.

According to results, coefficients for model in the equation are equal to 0.062138. Therefore, when going from time t to time t+1, the variance of the stock price will be corrected by the variables of the pattern and will move toward long term balance.

**Reflection functions of pattern:**

Reflection functions are useful tools for analyzing dynamic behavior of variables of the model in times of unpredicted shocks on other variables of the model. This ability is because this function reflects the shock on all of the variables in one of the variables. Reflection function, will present reflection of an endogenous variable in comparison to change to one of the variables in time. In fact, this function shows the effect of shock to independent (exogenous) variables which are M1, RLB, IR, HI and CIP to endogenous variable which is TEPIX in this research. Therefore analyzing the reaction to the force is a proper tool for analyzing effects among variables.

**Diagram 1:** response to Cholesky.

As it is shown in the diagram above, the effect of positive shocks of money volume on price index in short term will makes the price index to increase. From theory perspective, money volume will have a positive effect on price index of stock exchange because increase in money volume will increase demand and production in different sections in economy will increase in tern which gradually increase price index of stock exchange.

Positive shock by deficit or surplus of the budget is a indication of increase in government’s expenditures and in short term will decrease price index of stock exchange. this is because imbalance in budget in short term is presented as a consumption expenditure in short term and decrease in production will have a negative effect on price index of stock exchange.
Positive effect of interest rate in short term will make price index to increase. From theory perspective, increase in interest rate must have a negative effect on stock prices because increase in inflation will increase interest rate and increase in interest rate will increase expected payoff of stockholders. Expected payoff of stockholders is considered as discount rate for investors. Therefore, increase in payoff rate of investors will decrease present value of future assets and will gradually lead to decrease in stock values. It worth mentioning that the value of financial assets is equal to present value or discounted value of future returns of that asset. Thus, increase in inflation will decrease present value of future return of stocks. The reason is that in Iran the nominal interest rate is often lower than real interest rate and in fact real interest rate is often negative. Therefore increase in interest rate could not be considered as motivating act for investors to deposit in banks or bonds and people prefer to use assets like stocks to maintain the value of their money.

The effect of positive shock of index of real state will decrease stock prices in short term. With regard to portfolio theory these to assets are exchangeable and therefore from economic perspective, this relation is rationale.

The effect of positive shock on consumer prices in short term will lead to increase in price indexes because present value of firms in stock market will increase by inflation and increase in current prices will cause prices of stocks to increase and therefore price index of stock exchange market will increase eventually.

**Analyze of variance:**
While reaction functions will depict shock effect of an endogenous variable on other variable of the model, analyze of variance will discriminate changes of endogenous variable from other exogenous variables. In this method the share of a imported shocks to different variables will be anticipated in variance of error on short term and long term variables. With analyzing variance of error, share of each variable in response to shocks will be shared to all the variables of the model. In this condition it is possible to measure the share of each variable on other variables through the time.

<table>
<thead>
<tr>
<th>Period</th>
<th>TEPIX</th>
<th>RLB</th>
<th>M1</th>
<th>CPI</th>
<th>HI</th>
<th>IR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>2</td>
<td>96.23</td>
<td>2.11</td>
<td>0.04</td>
<td>0.08</td>
<td>0.66</td>
<td>0.87</td>
</tr>
<tr>
<td>10</td>
<td>71.13</td>
<td>0.91</td>
<td>0.47</td>
<td>1.51</td>
<td>1.40</td>
<td>24.58</td>
</tr>
<tr>
<td>20</td>
<td>29.16</td>
<td>20.08</td>
<td>5.67</td>
<td>15.92</td>
<td>4.67</td>
<td>21.47</td>
</tr>
<tr>
<td>30</td>
<td>35.53</td>
<td>5.78</td>
<td>13.64</td>
<td>10.94</td>
<td>6.38</td>
<td>27.73</td>
</tr>
<tr>
<td>40</td>
<td>17.71</td>
<td>8.65</td>
<td>9.89</td>
<td>21.89</td>
<td>6.19</td>
<td>35.66</td>
</tr>
</tbody>
</table>

By looking at the table we can see in the first period, 100% of the changes of price index is explained by the variable itself and other variables had not any part in it. In the other periods, this explanations is reduced which is a indication that in long term the contribution of other variables for changing the price index is increasing.

RLB variable in the second period explained 2.1% of the variation in price index but explanation will increase to 20% in 20 period and then decreasing trend is followed which decreased this explanation to 8.6% in period 40.

M1 variable has increasing trend in the periods and its explanation is increased from 0.04% to 13.6% in period 30 and then a decreasing trend is followed.

CPI variable which explain 0.08% of the variance of price index in second period, has increasing trend and reached 21.8% of explanation at the last period. According to volatilities it has, it is one of the effective variables.

IR variable has reached 0.8 in the second period and increased to 35.6 in following periods. Although interest rate is our peripheral variable, it has pretty strength in explaining the variation in price index.

HI variable is one of the effective variables due to reaching 6.1 from 0.6 in the second period which show an increasing trend.

**Conclusion:**

Main conclusion of the research is as below:

The increase in money volume has a significant positive relationship with price index of stock exchange. Surplus and deficit in budget in Iran has a significant positive effect on price index of stock exchange market.

According to research hypotheses, first hypothesis which is existence of a long term relationship among surplus and deficit in budget and price index has been confirmed. Second hypothesis which is existence of a long term relationship between money supply and price index has been confirmed either. Other conclusions are as below:
1- Deficit and surpluses in budget in long term have positive effect and in short term has negative effect on stock price index.
2- Money volume has positive effect on stock price index in both long and short term.
3- Increase in interest rate has increasing effect in both long and short term on stock price indexes.
4- Increase in real state price has decreasing effect on stock price index in long term.
5- Consumer price index has a significant positive effect on stock price index.

According to this research and since the results show key role of inflation on stock price index, stock market could be considered as a guard against inflation in the mind of people, and therefor development of capital market is a good plan for motivating people and investors to participate in this market. Black side of considering stock market as a guard against inflation is possibility of bubble formation in the long term. The reaction of money volume to price bubbles must be different in comparison with reaction to money volume, central bank must concentrate on this variable and put higher attention on it in comparison to other variables.

Since in Iran price index of stock exchange is more influenced by money volume, central bank must concentrate on this variable and put higher attention on it in comparison to other variables.

REFERENCES