Investigation of the relationship between macroeconomic variables and the stock cash return index in Tehran Stock Exchange

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ABSTRACT: This study has been done to determine the long-run relationship between the growth rate of stock index yields returns and a set of macroeconomic variables such as inflation rate, money supply growth rate, and exchange rate and oil revenues. In this research, data was analyzed quarterly for a period of 2002-2011 (1381-1390 Persian calendar) using vector autoregressive with distributed lags. Generalized Dickey Fuller unit root test showed that the level of liquidity growth rate and other variables in first differences are permanent. The co-integration test results also indicate the existence of long-run relationship between economic variables and the rate of cash return. Long-run relationship between growth rates and yields of oil revenues and a negative exchange rate, and inflation are positively related. More, the significance of factor is the growth rate of cash flows, in the ninety percent confidence level, was rejected.

Keywords: macroeconomic variables, stock cash return index, Vector Autoregressive Distributed Lag, monetary inflation theory, arbitrage pricing theory.

INTRODUCTION

In studying the factors affecting the market, and therefore the market economy, recognizing the variable or variables that explain the relationship between the financial parts of the economy with the real part, is very important. Money and capital markets as pillars of the financial sector are responsible for financing the real economy. Efficiency of the financial sector can do the optimal allocation of scarce resources to the economic activity. Optimal allocation of resources, in turn, benefits optimal savings and investment, and consequently the growth of national economy pretty close to its potential. Economists such as Goldsmith (1969), Miknon (1973) and Shaw (1973) believed that financial markets are playing a key role in economic growth and development. They believe the difference in the quantity and quality of services provided by financial institutions can tell an important part of the difference in growth rates between countries.

Iran’s Stock Exchange resumed its activity more widely in 1990 in line with the government’s macroeconomic policy, and after people's participation in the war and to shift investment capital stagnate economically productive and non-productive activities and the financing of productive enterprises and consequently the supply. Ever since the post-war economic conditions and the impact of changes in macroeconomic variables including inflation, stock market index has been volatile. The first reason for doing research on the impact of economic variables on stock returns and consequently stocks is that it could answer the main question of how stock pricing is completed. The answer can be a significant part of the need to satisfy investors and shareholders. There is no doubt that to eliminate the need by correct orientation of economic developments stimulate the capital market in a way that the supply and demand of the market funds can be done more efficiently. The phenomenon of financial investment (as opposed to investing in real assets) is characteristic of developed economies. Development of capital markets and advanced financial institutions facilitates the real investment. In fact, both real and financial investments are complementary.

The importance of financial asset pricing has flourished the rise of theory and models in the last half century. Models like Markowitz (1952), Sharpe (1963), Lintner (1965), Mucin (1966), Ross (1976) and the Black-
Scholes (1973) are the most important ones. Designing advanced models and deployment of information technology provides the various estimates of the risk and return of financial assets. Another reason for doing this research is to help correct pricing of financial assets, and the usefulness of research in relation to examine the influence of economic information on the stock price.

Recent research conducted in America implies a fundamental change in understanding the pricing of financial assets. Fama and French (1993) showed that limiting systemic risk based on the capital asset pricing model does not help in understanding shareholders and investors. Thus, the influence of other factors such as economic variables can be important. This is an approach that seeks to investigate the macroeconomic data set used in this context.

Considering the key role of the state in managing the economy and its strong influence in decisions and policies of the stock market, it can be concluded that the study on the impact of macroeconomic factors such as inflation, interest rates, currencies, growth rate and liquidity etc. could lead to a new understanding on this issue in a way that investors and shareholders can predict the effects of the macroeconomic indicators on changes in stock prices and indices.

**Theoretical foundations of the study**

It is believed that stock prices are determined by some macro-economic variables such as interest rates, currencies, and prices. Several investigations were carried out to show the effects of economic forces in different countries on stock returns. For example, arbitrage pricing theory by Ross (1976), Chen et al (1986) was used to describe the impact of macroeconomic variables on stock returns in the capital markets in America. Their findings showed that industrial production, changes in the risk premium and changes in the term structure had a positive relation with returns, respectively. However, the relationship between anticipated and unanticipated inflation, and expected stock returns was significantly negative.

Stephen Ross (1976) offered arbitrage pricing theory as a substitute for capital asset pricing model. Capital asset pricing model begins the process with the fact that how investors can create an "efficient portfolio". However, arbitrage pricing theory looks and measures the risks completely with a different perspective. When arbitrage profits are lost, they are in equilibrium stock prices. Market efficiency in this theory is defined as the absence of arbitrage situations.

The basic concept in arbitrage pricing theory is the "law of one price": Risks and returns that are similar in the two assets cannot be sold at different prices. When analyzing the capital asset pricing model, a simplified version of the arbitrage pricing theory assumes that only one operating system will affect the returns.

Supporters of arbitrage pricing theory argue that this model has two major advantages over the capital asset pricing model. First, the arbitrage pricing theory suggests assumptions about investor preferences towards risk and return that some claim that is less constrained. Second, they believe that this model can be empirically valid. The main problem in the theory of arbitrage is determining factors affecting pricing and differentiation of the changes anticipated from unanticipated changes in measuring the sensitivity (Fisher and Jordan, 1991). In other words, from among the assumptions of the capital asset pricing model, only three of the following are essential in arbitrage pricing theory:

- Investors seek returns with balanced risks; they evade risks and seek to maximize their final wealth,
- Investors can borrow and lend in a risk-free rate.
- There are no market restrictions, such as transaction costs, taxes or restrictions on sale and borrowing (Harrington, 1987).

These are three assumptions of the behavior of investors in general terms, but they fail to explain their decisions based on factors that are described, and this is an important difference between the two models. Arbitrage pricing theory recognizes the actual yield securities as a function of economic variables. Unlike the capital asset pricing model, enables the use of more than one systematic risk factor. In the investment portfolio, risk is not specific to a single share. Error of individual stocks is not interdependent, and their correlation coefficient is zero. In these circumstances, the risk variables are important and indicate that systemic risk cannot be eliminated, but unsystematic risk is eliminated with diversity in investment. Roll and Ross (1980-1984), and Chen et al (1986), believed that the truth lies in the five economic factors and different stocks with different sensitivities to the five factors, and these factors are a significant part of the origin of the systematic risk of portfolio. In their view, these five factors are:

- Changes in expected inflation rate.
- Unexpected changes in inflation.
- Unexpected changes in industrial production.
Unexpected changes in the yields-to-maturity securities difference between junk bonds and preferred securities (bond risk premium) and Unexpected changes in the yields to maturity of the difference between long-term and short-term bonds.

The first three factors on the enterprise cash flows, and finally, on dividends and growth, and the next two affect the discount rates, and stock valuation. Based on the model, investors set the portfolio due to their tendency to deal with each of the five risk factor since different investors have different preferences regarding the risks. Roll and Ross argue that the capital asset pricing model beta has several limitations in risk assessment. Several stock may have the same but different risk factors. Thus, if investors take note of the risk factors, capital asset pricing model would not be a model for estimating the expected rate of return.

Tests showed that the theory of arbitrage pricing model outstrips the capital pricing model (Chen 1983). With this understanding of the arbitrage pricing theory one can assume that the stock market acts as a reasonable way.

Poon and Taylor (1991) conducted a study similar to that of Chen et al (1986) the UK market. Their results showed that macroeconomic variables have no effect on stock returns in the UK. This conclusion was contrary to the findings of Chen about America stock market. Poon and Taylor argue that because of their different conclusions other macroeconomic factors have an impact on the UK stock returns or the method used by Chen et al has been ineffective.

Inflation as one of the most important economic variables affecting the stock price has long been considered. Topics like the relationship between inflation and stock returns have been controversial among researchers. Market equilibrium may not emerge based on nominal values and investors consider inflation as one of the most important macroeconomic variables affecting the decision to an investment. To achieve a real return on a share they use the following equation:

\[ R'_j = R_j - \rho \]

In which:
- \( R \) = Stock return in real conditions
- \( R_j \) = Stock return based on the share value
- \( P \) = Inflation in the period of investment.

If inflation is easily predictable investors simply add a percentage increase of inflation so that the market reaches equilibrium. So, as long as inflation is anticipated, there is no source of instability and uncertainty, and we can tell the share risk with systematic and unsystematic risk regardless of the risk estimates are based on actual values or face values. However, when inflation is unexpected and unpredictable the situation will be different.

In the inflation situations nominal profit of the company increases after a period of time. Actually profitability is not increased, but profits have increased nominally as affected by inflation. When nominal profit rises, the nominal price of the stock will increase in value. Another effect is that inflation will reduce the intrinsic value per share. In the high inflation rate, real earnings quality of firms (economic profit) comes down. In addition, inflation reduces the purchasing power of people. Increase in cost of living, will take away the opportunities for investment and savings from them, and people will now be spending more money. On the other hand, declination in investment leads to a decrease in investment demand in the stock market and stock index is consequently reduced. Ross and Roll in their article showed the negative relationship between New York stock index returns with average expected and unexpected inflation.

According to Fisher’s theory (1930), the expected nominal interest rate should reflect all inflation expectations in order to achieve a real rate of interest. The real rate will be determined by factors such as the productivity of capital and consumer time preference and is independently of expected inflation. In fact Fisher’s hypothesis can be applied to any asset, such as stock, real property and other risky financial securities.

One of the most important theories in the context of inflation is monetary theory. According to this theory, inflation emerges solely due to the disproportionate increase in the amount of money. Advocates of this school like Laidler and Parkin (1975) argue that the "necessary and sufficient condition for extended inflation is the continued increase of the money supply at a rate more than the rate of growth of real income multiplied by the income elasticity of demand for money". In short, monetary theory of inflation can be summarized in several propositions:

A) In the long run, inflation is a monetary phenomenon. This means that high and sustained growth rate of money supply will cause inflation and low growth of the money supply reduced inflation.
B) The relationship between prices and the money supply in the long term is correspondent. This means that a ten percent increase in the money supply will increase the general level of prices by ten percent.

C) The cause-effect relationship is from money to prices. This means that changes in the money supply cause price fluctuations and not caused by it.

D) Nominal money balances is "exogenous" and "controllable" and is determined by the monetary authorities. In other words, the endogenous money supply is not determined macro-economic variables and activities.

Monetary theories are divided into two schools. According to the first school inflation is always and everywhere a monetary phenomenon which is caused when money supply growth is faster than real production. Increase in the money supply in the short term raises real production and employment, but in the long-term only the long-run inflation rate increases. According to the second school number two, only unpredictable changes in the money supply have real effects on the economy and therefore cannot be used as a regular economic policy. Accordingly, the anticipated changes in the money supply can only proportionately affect the prices.

The claim that economic variables such as inflation, liquidity, exchange rate etc. are effective in stock prices has been widely accepted. However, in the past decade, efforts to examine the impact of economic forces to the theoretical and experimental evaluation of its effects have been carried out. Dynamic relationship between macroeconomic variables and stock returns has been widely studied. The research is based on the theory that stock prices reflect the present value of its future cash flows share (the current model). For this reason, the future cash flows and the expected rate of return (discount rate) are required. Hence, the economic variables on the rate of return and the expected future cash flows are impacted. Therefore, they can have an impact on stock prices (Alten and Graber, 1991).

**Literature review**

In this paper, history of some researches done on the relationship between economic factors and prices, yields, and the stock market indices, is presented.

Martin Feldstein (1980), in a study found the inverse relationship between inflation and stock prices in 1970. Gasike and Roll (1983) also found a negative correlation between stock returns and changes in the documents rates which represent the inflation rate. On the other hand, Fert (1979), based on the results of his study showed that the relationship between stocks returns and inflation in the UK is positive.

Gultekin (1983), investigating the relationship between stock returns and inflation in twenty-six countries, examined Fisher hypothesis that the real stock returns and expected inflation rates are independent of each other and the nominal return on equity prices as exactly suddenly change and found that for most countries studied, the relationship between stock returns and inflation is not statistically significant and it is negative and significant in only four countries; in two countries, the relationship was positive and significant.

Boud Dukh and Richardson (1993) concluded that there is a one to one relationship between predictable inflation and stock returns. Graham’s experimental findings (1996) revealed that the relationship between inflation and stock returns is unstable; that is, in in some periods the relationship is negative and in other periods is positive. Findings of kaparale and Jung (1997) also showed that inflation has a negative impact on stock prices. Thorbecke (1997), and Rozeph (1974), showed that monetary policy has a significant effect on stock returns and increase in the growth rate of will lead to increase in stock returns.

Jung Soly (1992) conducted the causal relationships test between real activity and inflation using data of America and unlike the Fisher hypothesis, he concluded that the nominal stock returns and inflation negative have weak correlation, but relationship between nominal interest rates and inflation is positive. Rahman and Cozier (1988) made out the inverse relationship between real stock returns and inflation in Canada. While Leonardo Hernandez (1990) reached a significant relationship between real stock returns and inflation.

Unro Lee (1996) in a study concluded that there is a negative significant relationship between actual stock returns and inflation. Song, Ramchander and Chatrath (1997) showed the negative relationship between real stock returns and unexpected inflation. Najand and Rahman (1991) investigation realized a causal relation between stocks returns and inflation. Fama (1991) showed that expected inflation is negatively related to stock prices.

Firouzeh Azizi (2007) in a study tested the relationship between inflation and stock returns in Tehran Stock Exchange. Using monthly data on inflation, yields, total returns (cash price) and the price index in the period from 1998 till 2003 via VAR method and Grager causality test, examined the relationship between the variables. Results from the study showed that inflation explains cash returns index and total returns, but does not explain the stock price index. On the other hand, cash return, total return and share price index cannot explain inflation. This finding was also confirmed with results from the Grager causality test on price return, total return and share price index.
Fama and Gibbon (1982) tested the relationship between inflation and investment real return. Their research findings were in agreement with those of Mundell (1963) and Tobin (1965) who stated that the real return and the expected inflation rate is expected to be negatively correlated. The researchers believe that this relationship is resulted from a positive relationship between expected real return on the financial assets and real activities.

Geske and Roll (1983) also concluded that America's stock price inflation is negatively and positively correlated with inflation and real economic activity, respectively. Lee (1992) has stated that stock returns due is an outcome of changes in the expected inflation rate and the changes are caused by the relationship between the money supply and expected real activity.

According to research findings, the relationship between inflation and stock returns is various. In some countries, the relationship between these two variables is positive and in the others is. Of course, in some countries there is no significant relationship. Thus, we can conclude that despite extensive research in both developed and developing countries, there is no consensus regarding the relationship between inflation and stock returns.

Murinle and Abdollah (1997) study concluded that in Korea, India and Pakistan changes in exchange rates leads to changes in stock prices, but argued that the Philippine stock market prices are responsible for foreign exchange rates; their conclusion was in agreement with findings of Smith (1993, stock returns have significant impact on exchange rates in Germany, Japan and the United States).

Development and evolution of co-integration provided other ways to test the relationship between economic variables and stock markets. Chen et al (1986) provide a basis to argue that there is a long-term equilibrium between stock prices and macroeconomic variables. Granger (1986) suggested that the examination of this relationship be done via the co-integration analysis. A series of time-series variables are co-integrated they have the same order and their linear combination is stationary. Such a linear combination shows a long-run relationship between these variables (Johansson and Juselius, 1990). Development of co-integration analysis and provided other methods to test the relationship between macroeconomic variables and stock returns.

Mukherji and Naka (1995), to examine the co-integration of a set of macroeconomic variables and the stock index in Tokyo, Japan, used Johansson co-integration test and vector error correction model for 240 monthly observations for each variable, from January 1971 to December 1990. They found that the Japanese stock market has been co-integrated with six macroeconomic variables such as exchange rates, money supply, inflation, industrial production, long-term government bond rate, short-term loan interest rate.

Baron and Otsaki (1990) examined the impact of variables such as money supply, the manufacturing index, crude oil prices, exchange rates, interest rates and short-term loans in the Japanese market pricing and arbitrage pricing theory framework. They found that these variables are associated with a risk premium.

Hama (1988) conducted Chen, Roll and Ross's study (1986) on arbitrage pricing theory applied in the context of America's stock market, similarly, in the Japanese stock market. Also, he noted that the production of monthly changes in economic conditions have weak effects on pricing and unexpected changes in exchange rates and changes in oil prices affect stock market price.

Mayasmal and Koh (2000), using monthly data from January 1988 to January 1995 in the form of time series data, as well as Johansson multivariate co-integration analysis in the vector error correction model studied the long-run relationship between Singapore stock market indices and a series of macro-economic variables. They found that there is a co-integration relationship between the changes in the Singapore stock market index and changes in the price level, the money supply, short-term and long-term interest rates and exchange rates. The co-integration relationship, changes in exchange rates and interest rate variables change are more effective compared to the money supply and the price level. The result showed that the Singapore stock market is sensitive to the changes in exchange rates and short-term and long-term interest rates.

Moreover, in their study they used a multivariate model to study the Singapore stock market indices with those of America and Japan stock markets. They found that these three indicators are highly co-integrated. These findings indicate that changes in America and Japan stock markets have major impacts on Singapore's stock market; all the more Singapore has a positive long-term relationship with the two countries' stock markets.

Cheung and Ng (1998) used Johansson co-integration test for seasonal data from Canada, Germany, Italy, Japan and America and concluded that the national stock index and some specific economic variables such as real oil prices, real consumption, real money supply and real GDP in the five countries have a long-term co-movements.

Christopher Gan et al (2006) analyzed the interactions between New Zealand stock index and macroeconomic variables for a series of seven monthly data from January 1990 until January 2003 using co-integration tests. Economic variables such as inflation, exchange rates, GDP, money supply, interest rates, long-term and short-term interest rates and domestic retail oil price (ROIL). The Johansson co-integration test results revealed that there is a long-term relationship between New Zealand share price index and the economic variables. Granger causality test results also revealed that the stock price index in New Zealand is not the Granger
causality for the changes in economic variables. It's because of New Zealand small market share compared to the markets of developed countries.

Darrat (1990) examined the impact of fiscal and monetary policy on stock returns in the stock markets of Canada and concluded that macro-economic variables such as the budget deficit, the rates of long-term bonds, interest rate and industrial production determines the stocks return.

Gulnur, Muradoglu, Kivlicim and Metin (1996) investigated the long-term relationship between Istanbul Stock Exchange stock price index with interest rate, exchange rate (Dollar), inflation rate and money supply for the period from 1986 till 1993 using monthly data of Turkish economy. Engel and Granger’s and Johansson methods revealed that the stock price index has a long-term relationship with monetary variables, so that the relationship between stock price index and amount of money is positive, but its relationship with the exchange rate, interest rate and inflation is negative.

Jacoob Mudsen (2002) examined the causal relationship between Bombay stock prices and macroeconomic variables such as exchange rates, foreign exchange reserves and trade balance. He regarded variables such as the exchange rate, foreign exchange reserves and trade balance as variables affecting the stock price index of India for the period for April 1990 to March 2001 on a monthly basis. The results showed that there is no causal relationship between the macroeconomic variables and stock price index.

Mohammad Barazandeh (1997), using data from the Tehran Stock Exchange stock price index variables and variables such as exchange rates, the price index for vehicles and housing price index for the period from 1987 till 1997 examined the impact of macroeconomic variables on stock price index. He analyzed data using self-describing vector methods and the results showed that the changes in stock prices are not mainly caused by the mentioned variables. These results suggest that disorder and fluctuations in the currency markets, vehicles are not as strong and substantial to affect the stock market.

Hassan Ghalibaf Asl (2002) in his study examines the relationship between stock returns and exchange rates in Tehran Stock Exchange for the period between 1996 to 2001. Return variables (resulted from changes in the stock price index), percentage of change in the exchange rate and market index returns were selected in six-month periods. His results showed that changes in the exchange rate have negative effect on stock returns, however, is positively influences the firms' stock returns.

Mostafa Karimzadeh (2006) examined the long-run relationship between Tehran Stock Exchange stock price index and macroeconomic monetary variables; to achieve this, he used monthly data for the years 1990 to 2002 for variables such as stock price index, liquidity, the exchange rate, and banks real interest rate. To get the econometric estimation of the equation he used Auto-regressive distribution lag method. Estimation results showed that there is a co-integration vector between macroeconomic variables and the stock index price. The estimated long-run relationship shows the significant positive impact of liquidity and significant negative real interest rates and real bank stock price index on stock price index.

Mehdi Sadeghi (1992), in a research on the stock market reaction to unexpected macroeconomic news conducted for the International Monetary Fund in for Australia a period of eleven years, from 1980 to 1991, reached the conclusion that any transformation or news that are expected have no effect on the prices of stocks. However, unexpected real news coming from the macroeconomic level moves the stock price.

Lili and Zvliv (1998) in their recent study titled "The stock market reaction to the economic news in different economic conditions," dealt with the effect of macroeconomic news on stock markets in different economic circumstances in the United States of America. They review evidence on the impact of unforeseen changes in economic variables such as money supply, interest rates and real economic activity on the stock market. Regarding the supply of money, they suggested that the increase in the money supply leads to an immediate unforeseen increase in interest rates. Rising interest rates reduce the present value of future cash flows and eventual stock price decrease.

Kwon and Shin (1999) employed Granger causality tests and Engle-Granger co-integration test through vector error correction model and found that Korean stock market index of economic variables such as production; exchange rates, trade balances and the money supply are co-integrated. However, using Granger causality test for the Korean stock market index and macroeconomic variables, the researchers found that the Korean stock index is not preceding the economic variables.

Leigh (1997) studied Singapore stock market and found that the Singapore stock index is positively related to the demand for money. Fung and Lie (1990) obtained results similar to Leigh’s in Taiwan stock market. Gjerde and Saettem (1999), Achasani and Strohe (2002) examined small regional markets such as Norway and Indonesia markets. They found that stock returns are negatively correlated with changes in interest rates, and changes in oil prices and real economic activity is positively associated. Achasani and Strohe’s investigation revealed that the relationship between stock prices and inflation is negative. However, the relationship between stock prices and
inflation is vague and ambiguous. In addition, the researchers did not detect a strong and effective relationship between stock prices and exports and long-term interest rates. However, they were able to identify a positive relationship between stock prices and GDP, money supply and exchange rate.

**Research Variables and hypotheses**

In this study, four macroeconomic variables are selected as independent variables and the growth rate of cash return as the dependent variable. In the following table each variable has been defined along with their corresponding symbols:

<table>
<thead>
<tr>
<th>Research Variables</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange rate (Dollar) in the free market</td>
<td>EX</td>
</tr>
<tr>
<td>The growth rate of the price index for goods and services</td>
<td>CPI</td>
</tr>
<tr>
<td>Liquidity Growth Rate</td>
<td>RCASH</td>
</tr>
<tr>
<td>Oil revenue</td>
<td>OR</td>
</tr>
<tr>
<td>The growth rate of stock market cash return index</td>
<td>RTEDIX</td>
</tr>
</tbody>
</table>

Data for each of the variables have been extracted out of Central Bank website, economic indicators and stock indicators on a seasonal basis.

This study aims at investigating the relationship between macroeconomic variables such as inflation, exchange rate, liquidity rates, oil revenues and the rate of stock price cash returns; in what follows research hypotheses and theoretical foundations of it are put forward:

**Inflation rate**

In inflation circumstances the nominal profit of firms after a period of time increases due to devaluation of money. Thus, increase in inflation rate increases dividend profit and consequently stock cash return index. So, there is expected a positive relationship between the increase in the inflation rate and stock cash return index. The first hypothesis is formulated as follows:

H₀: There is no positive relationship between the inflation rate and the growth rate of cash return.

H₁: There is a positive relationship between the inflation rate and the growth rate of cash return.

**Exchange rates**

The role of exchange in economic systems, especially in underdeveloped countries, is undeniable. The reason is so clear; developing countries in most economic sectors are dependent upon industrialized countries and need more foreign exchange for importation. Most manufacturing enterprises to purchase raw materials, machinery and technology manage to import. If the rate of exchange increases, firms are forced to pay more money for imports. Increase in the exchange rate on the one hand, increasing debt, and increases the cost of products and services offered by these companies. Debt causes liquidity shortage and lack of liquidity has a negative effect on economic forms. Thus, the second hypothesis is formulated as follows:

H: There is no negative relationship between the exchange rate and the growth rate of cash return.

H: There is a negative relationship between the exchange rate and the growth rate of cash return.

**Liquidity growth rate**

Based on the monetary theory of inflation, continuous growth of liquidity at a rate of more than multiplication of real income growth and income elasticity of demand for money is a necessary and sufficient condition for sustained inflation. So, generally liquidity increase leads to increase in current costs and demand. Research conducted in the field of monetary theory of inflation in Iran has shown that increased liquidity is not consistent with the GDP increase rather it is the aggravating factor of inflation. Therefore, it is expected that the relationship between the growth rate of cash return a positive relationship as in the first research hypothesis. Hence, the third hypothesis is formulated as follows:

H: There is no positive relationship between liquidity growth rate and the stock price rate index.

H: There is a positive relationship between growth rate and the stock price rate index.

**Oil revenues**

Although oil price increase causes GDP growth for oil exporting countries, however, one should bear in mind that the ultimate consumer of oil products derivatives are mainly the developing countries. Because most oil-
exporting countries lack the ability and technology to produce crude oil derivatives, they have to import products; since Iran is among this countries, therefore, it is expected that the relationship between the increase in oil revenue and cash returns of stocks is an inverse one. Hence, the fourth research hypothesis is formulated as follows:

H: There is no positive relationship between oil revenues and the stock price rate index.
H: There is a positive relationship between oil revenues and the stock price rate index.

Research time and place
Data has been collected from April 2002 till late 2010 from Tehran Stock Exchange (in which the information is intended to be seasonal). The spatial scope of the study includes all companies in Tehran Stock Exchange during the test. Active companies are the ones whose price calculated by the Stock Exchange have been effective. In case, companies are off the stock record, indices calculated by the Exchange in this regard have been modified.

MATERIALS AND METHODS

The Augmented Dicky- Fuller Unit Root Test
Since time series are often unreliable in macroeconomic analysis and this may cause false regression in empirical studies, therefore, the reliability of variables was tested by The Augmented Dicky- Fuller Unit Root Test. Summary of the results is shown in Table 2. The results indicate that the liquidity growth rate variable in surface and other variables in the first degree differences are reliable. To select the optimal lag, the Schwarz- Bizen criterion has been used.

<table>
<thead>
<tr>
<th>Row</th>
<th>Time series</th>
<th>Test statistic value ADF</th>
<th>Critical value ADF</th>
<th>Collective degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EX</td>
<td>-6.6834</td>
<td>-2.9287</td>
<td>I(1)</td>
</tr>
<tr>
<td>2</td>
<td>CPI</td>
<td>-11.1736</td>
<td>-2.9287</td>
<td>I(1)</td>
</tr>
<tr>
<td>3</td>
<td>RCASH</td>
<td>-3.7716</td>
<td>-2.9287</td>
<td>I(0)</td>
</tr>
<tr>
<td>4</td>
<td>OR</td>
<td>-8.4214</td>
<td>-2.9287</td>
<td>I(1)</td>
</tr>
<tr>
<td>5</td>
<td>RTEDIX</td>
<td>-26.9879</td>
<td>-2.9287</td>
<td>I(1)</td>
</tr>
</tbody>
</table>

Table 3: the coefficients of the model

<table>
<thead>
<tr>
<th>Explanatory variable</th>
<th>Coefficient</th>
<th>Standard deviation</th>
<th>Statistics t</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTEDIX (-1)</td>
<td>0.89</td>
<td>0.07</td>
<td>6.4</td>
<td>0.00</td>
</tr>
<tr>
<td>CPI</td>
<td>0.74</td>
<td>8.7</td>
<td>0.08</td>
<td>0.93</td>
</tr>
<tr>
<td>CPI (-1)</td>
<td>13.9</td>
<td>9.2</td>
<td>1.5</td>
<td>0.14</td>
</tr>
<tr>
<td>CPI (-2)</td>
<td>34.4</td>
<td>8.6</td>
<td>4</td>
<td>0.001</td>
</tr>
<tr>
<td>RCASH</td>
<td>5</td>
<td>7.6</td>
<td>0.6</td>
<td>0.5</td>
</tr>
<tr>
<td>RCASH (-1)</td>
<td>2.7</td>
<td>4.9</td>
<td>0.5</td>
<td>0.58</td>
</tr>
<tr>
<td>RCASH (-2)</td>
<td>16.2</td>
<td>6.8</td>
<td>2.4</td>
<td>0.03</td>
</tr>
<tr>
<td>RCASH (-3)</td>
<td>20.7</td>
<td>7.39</td>
<td>2.8</td>
<td>0.01</td>
</tr>
<tr>
<td>EX</td>
<td>0.01</td>
<td>0.01</td>
<td>1.06</td>
<td>0.3</td>
</tr>
<tr>
<td>EX (-1)</td>
<td>0.02</td>
<td>0.01</td>
<td>1.5</td>
<td>0.15</td>
</tr>
<tr>
<td>EX (-2)</td>
<td>0.03</td>
<td>0.01</td>
<td>2.9</td>
<td>0.008</td>
</tr>
<tr>
<td>OR</td>
<td>0.001</td>
<td>0.001</td>
<td>1.06</td>
<td>0.3</td>
</tr>
<tr>
<td>OR (-1)</td>
<td>0.002</td>
<td>0.001</td>
<td>1.63</td>
<td>0.11</td>
</tr>
<tr>
<td>OR (-2)</td>
<td>0.003</td>
<td>0.001</td>
<td>2.2</td>
<td>0.04</td>
</tr>
<tr>
<td>OR (-3)</td>
<td>0.004</td>
<td>0.001</td>
<td>3.8</td>
<td>0.00</td>
</tr>
<tr>
<td>T</td>
<td>51.6</td>
<td>13.7</td>
<td>3.7</td>
<td>0.00</td>
</tr>
<tr>
<td>DW = 2.17</td>
<td></td>
<td>PROB (F-STATE) = 0.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scalar quantity at the bottom of Table 3 indicates the lack of correlation between the variables in the model, the lack of explicit modeling, and lack of error variance in the model. Calculation quantity in the
statistics F at 5% significance level shows that the whole regression equation cannot be rejected. Furthermore, the explanatory power of the model is /99. Before estimating long-term coefficients by ARDL method, to ensure the long-term relationship between economic variables and growth rate of cash return index, it is necessary to do the co-integration test. To perform this test, the sum of the coefficients with dependent lag (RTEDIX (-1)) are subtracted form one and divided by the sum total of standard deviations as follows:

\[
t = \frac{\sum_{i=1}^{p} \phi_i - 1}{\sum_{i=1}^{p} \sigma_{\phi_i}} = \frac{0.69 - 1}{0.07} = -4.42
\]

Since the absolute value of t is larger than those obtained from the absolute critical values provided by Banerjee, Dola and Master (-3.9), so the null hypothesis that there is no long-term relationship with a 95% confidence is rejected. Thus, there is a long-term relationship between macroeconomic variables and the growth rate and stock return cash index rate. Accordingly, a long-term model was estimated using ARDL; the results are summarized in Table 3:

**hypotheses test using vector self-regression method with distribution lags**

Since the aim of this study is investigation of the long-run relationship between macroeconomic variables and the stock index cash return, and due to the different degrees of collective variables, hence the best model with appropriate lag has been determined using Microfit 4 software and Schwartz-Bizen criteria using ARDL. Schwartz-Bizen criteria save the number of lags. As a result, estimates have higher degrees of freedom (Pesran and Shin, 1997). Results from the estimation of the model are shown in Table (4).

**Table 4. Long-term ARDL pattern**

<table>
<thead>
<tr>
<th>Explanatory variable</th>
<th>Coefficient</th>
<th>Standard deviation</th>
<th>Statistics t</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX</td>
<td>-0.08</td>
<td>0.04</td>
<td>-2.1</td>
<td>0.04</td>
</tr>
<tr>
<td>RCASH</td>
<td>-39.9</td>
<td>39.4</td>
<td>-1.01</td>
<td>0.32</td>
</tr>
<tr>
<td>OR</td>
<td>-0.03</td>
<td>0.01</td>
<td>-1.9</td>
<td>0.06</td>
</tr>
<tr>
<td>CPI</td>
<td>69</td>
<td>33.2</td>
<td>2.07</td>
<td>0.05</td>
</tr>
<tr>
<td>T</td>
<td>168</td>
<td>22</td>
<td>7065</td>
<td>0.00</td>
</tr>
</tbody>
</table>

According to calculation statistics t in Table 3, the coefficient of variables exchange rates, oil, inflation, and the process until in ninety percent confidence level are significant, but significance of liquidity growth rate at a confidence level of ninety percent would be rejected. In the mentioned long-term relationship, exchange rates and oil revenue variable have negative relationship; and inflation and the growth rate of cash returns are positively related. Interpretation of the coefficients of scalar quantity is that if in the long run, the exchange rate and oil revenue will increase by one hundred units, 8 and 3%, respectively, the growth rate of cash return decreases. Moreover, the passage of time and increasing inflation rates has a positive effect on increasing the rate of cash return. A reason can be the increase in dividing policies by firms that are present in the stock exchange.

After estimation of the long-term model, the associated error correction model was also presented. Table 4 summarizes the results of the error correction model:

In the table, d represents the first-order difference of variables. As can be seen, except for the coefficients of first- and second-order difference of explanatory variable of liquidity rate, and first-order difference of exchange rate, inflation and oil revenues rates, the other coefficients of the model according to statistical parameters t are significant at 90 percent level of confidence.

The important thing in short-term equation ECM is the coefficient ECM (-1) which represents the speed of adjustment in short-term disequilibrium toward long-term equilibrium. As shown in Table 4, ECM (-1) estimation coefficient is approximately -0.3 which shows the relatively high rate of short-term imbalance elimination toward long-run equilibrium. This indicates that disequilibrium is eliminated by 0.3 units in each period.
Since people maintain a whole range of financial assets in the portfolio including various combinations of cash, shares, bank deposits, bonds, gold and foreign currencies, variations in the quantity of money, exchange rate, inflation and interest rates can affect the demand for stock and this in turn has an effect on stocks indices. It is believed that stock prices are determined by macroeconomic variables like inflation rate, exchange rate, interest rate and liquidity.

In this study, to estimate the econometric model and long-term relationship, ARDL method was used. Results of co-integration test show that there is a long-term relationship between variables such as inflation, exchange rate, liquidity and, oil revenues and stock prices cash return index. Hence, the long-term relationship was estimated using the ARDL. As expected, in the long run and in inflation conditions, the average nominal corporate profits increases due to currency devaluation. Thus, increasing inflation, and consequently the dividend profit and stock prices cash return index. Results obtained from testing the first hypothesis, also showed a positive relationship between inflation and output growth rate of cash dividends and confirmed the hypothesis. However, the coefficient of liquidity growth in long-term ARDL, in 95 percent confidence level, was not significant. Therefore, the third research hypothesis was rejected. Test results of the second and fourth research hypothesis as to the existence of a negative relationship between exchange rate and oil revenue rate were accepted in 95 percent confidence level.

Although the relationship between inflation and financial performance indicators is positive, but since this increase is due to compensation of the real benefit, so it is recommended that economic decision and policy makers take into consideration the impacts of these decisions on stock market indices and other financial markets.

REFERENCES


CONCLUSION

Table 5. Short-term dynamic structure

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>SD</th>
<th>Statistics t</th>
<th>prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>dRCAHS</td>
<td>5</td>
<td>7.7</td>
<td>0.65</td>
<td>0.52</td>
</tr>
<tr>
<td>dRCASH1</td>
<td>4.5</td>
<td>8.8</td>
<td>0.51</td>
<td>0.61</td>
</tr>
<tr>
<td>dRCASH2</td>
<td>20.7</td>
<td>7.4</td>
<td>2.8</td>
<td>0.01</td>
</tr>
<tr>
<td>dEX</td>
<td>0.01</td>
<td>0.01</td>
<td>1.06</td>
<td>0.3</td>
</tr>
<tr>
<td>dEX1</td>
<td>0.03</td>
<td>0.01</td>
<td>2.9</td>
<td>0.00</td>
</tr>
<tr>
<td>dOR</td>
<td>0.001</td>
<td>0.001</td>
<td>1.05</td>
<td>0.3</td>
</tr>
<tr>
<td>dOR1</td>
<td>0.007</td>
<td>0.002</td>
<td>3.3</td>
<td>0.00</td>
</tr>
<tr>
<td>dOR2</td>
<td>0.004</td>
<td>0.001</td>
<td>3.8</td>
<td>0.00</td>
</tr>
<tr>
<td>dCPI</td>
<td>0.74</td>
<td>8.7</td>
<td>0.08</td>
<td>0.93</td>
</tr>
<tr>
<td>dCPI1</td>
<td>34.4</td>
<td>8.6</td>
<td>4</td>
<td>0.00</td>
</tr>
<tr>
<td>dT</td>
<td>51.6</td>
<td>13.7</td>
<td>3.7</td>
<td>0.00</td>
</tr>
<tr>
<td>ecm (1)</td>
<td>0.3</td>
<td>0.1</td>
<td>2.8</td>
<td>0.00</td>
</tr>
</tbody>
</table>


