The Relationship between Stock Return and Monetary Variables: A Case Study for Iran

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ABSTRACT: The purpose of this study is to investigate the effects of interest rate, inflation, money supply and exchange rate on the stock market index in Iran over the period 1380-1392. A vector error correction model (VECM) approach to co-integration analysis is used to study both the short-run and long-run movements of Tehran stock market. The results show that the value of interest rate, inflation and exchange rate have significant negative effects on the stock index in Iran. The results also indicate that the money supply has a significant positive effect. The result of error correction model indicates that 0.28 percent of the deviation of the stock index from its equilibrium path is corrected in each period.

Keywords: Stock Market, Vector Error Correction Model, Long Run Co-integration.

INTRODUCTION

The stock markets have taken considerable amount of attention of many researchers throughout the history. The researchers have tried to explain the factors that affect the stock prices using different models and econometric techniques. The relation between the stock prices and macroeconomic variables such as the inflation rate, the interest rate, the industrial production has been the subject of various studies in the fields of economy and finance in the last few decades. A number of studies carried on in developed markets like the U.S. and Japan revealed that the macroeconomic variables have an effect on share prices. Fama (1981) found that macroeconomic variables have an influence on stock returns. These studies have paved the way for further examination of similar relations in emerging markets since they constitute a good channel of diversification for global investors. According to the International Finance Corporation (IFC), portfolio flows to emerging markets has kept rising since the early 1980’s and trend has continued even after a number of financial crises.

Having been classified as an emerging market, the Turkey has the world’s eighteenth largest nominal Gross Domestic Product with is $773 billion. The Turkish stock market (Istanbul Stock Exchange) is one of the fastest growing emerging stock markets in the world. In 1986 the market capitalization of the ISE was $0.9 billion which increased to $201.9 billion in 2011. The number of listed companies also increased from 80 to 373 in the same time period. Considering the significant size of the Turkish economy and rapid growth of the Turkish stock market, analyzing the stock return behaviors in Turkey is capturing the attention of increasing number of researchers recently.

However, there exists a gap in the empirical identification of the macroeconomic variables affecting returns, mainly due to the fact that there are very limited amount of studies analyzing the relationship between the Turkish stock market returns and macroeconomic variables.

The purpose of this study is to analyze whether there exists a short- and/or long-run relationship between the stock market prices and selected macroeconomic variables in Turkey. The study is organized in a way that first the review of the relevant literature will be provided and past studies about the subject will be briefly summarized. Then basic numerical facts and information about the development process of the Istanbul Stock Exchange will be given. The development of the main research question will follow together with what the theory of finance suggests about the subject under consideration. After completing the theoretical background, the characteristics of the data used in the
study will be described and the methodology of the study will be explained in detail. Finally, the estimation results will be analyzed and some concluding remarks and suggestions for further research will be provided.

**Review of the relevant literature**

The informational efficiency is an important subject since it ensures the stock market to play an effective role in channeling the financial resources to the most productive players in the economy. The Efficient Market Hypothesis (EMH), in its semi-strong form, states that the stock prices reflect all past publicly available information and they instantly adjust to reflect new public information (Fama, 1981). According to the EMH, one cannot estimate future price changes on the basis of past economic data, thus neither technical analysis nor fundamental analysis will be able to reliably produce excess returns. As for the effect of macroeconomic variables such as the exchange rate and interest rate on stock prices, the EMH suggests that competition among the profit-maximizing investors in an efficient market will ensure that all the relevant information currently known about changes in macroeconomic variables are fully reflected in current stock prices, so that investors will not be able to earn abnormal profit through prediction of the future stock market movements.

In the light of the Efficient Market Hypothesis, there have been different attempts to analyze the effects of economic forces in a theoretical setting and estimate these effects empirically. In the framework of the Arbitrage Pricing Theory (APT) model developed by Chen et al (1986) found that economic factors have a systematic effect on stock market returns. The economic forces affect discount rates, firms’ cash flow generating ability and future dividend payments. Thus, through this mechanism macroeconomic variables are considered as risk factors in equity markets. The APT approach essentially seeks to measure the risk premier related to these risk factors and attempts to assess whether they are significant and if they are priced into stock market returns.

The co-integration analysis is another approach to investigate the relationship between economic variables and stock market returns. The basis for the belief that there exists a long-term equilibrium between economic variables and stock prices was provided by Chen et al (1986). Engle and Granger (1987) proposed that this equilibrium relation can be verified through co-integration analysis.

In the last few decades, several studies incorporating the above mentioned techniques and examining the relationship between stock price indices and selected macroeconomic variables took place in the literature. While some of the researchers have found evidence against the efficiency of stock markets some of them have failed to do so. Some researchers have studied whether there exist a relation between the stock market prices and selected macroeconomic variables in Spain and they found no significant relationship. Similarly, Poon and Taylor (1991) have analyzed the relationship between macroeconomic variables and the UK stock market prices and they found that the macroeconomic variables do not have a significant influence on stock returns.

They analyzed the link between stock prices and real economic activities in the United States. He stated that the findings seem to confirm previous findings of Fama (1990), such that a large fraction of stock return variances can be explained by future values of measures of real activity in the U.S. over the period 1953-1995. However, when the analysis is made over subsamples, his paper presents evidence that there exists a breakdown in the relation between stock returns and future real activity in the US economy since the early 1980’s.

Contrary to the above mentioned findings, the findings of researchers on the Norwegian stock market revealed that real interest rate changes affect stock returns and stock market responds accurately to oil price changes. However, they also detected that stock market responds inaccurately to changes in domestic real activity which is an indicator of a degree of inefficiency.

Researchers showed significant long-run relation between macroeconomic variables such as broad and narrow money supply, nominal exchange rates, and foreign currency reserves and stock market prices with the help of the co-integration analysis. According to their study, three of the four macroeconomic variables are co-integrated with the stock prices. The causality tests and forecasting equations, on the other hand, revealed inconsistent findings about the significance of the relation between macroeconomic variables and stock prices in the short-run. Similarly, the study of some researchers revealed that the Korean stock market reflects macroeconomic variables on stock prices. They found that the stock prices are co-integrated with foreign exchange rate, trade balance, production level, and money supply, which is an indication of direct long-run and equilibrium relations with those variables. But they also noted that stock price indices are not a leading indicator for economic variables, which in turn is inconsistent with the notion that stock market rationally signals changes in real activities.

Researchers analyzed the relationship between Singapore stock index and selected macroeconomic variables. They found a co-integrating relation between Singapore’s stock market level and changes in price levels, money supply, short- and long-term interest rates, and exchange rates. They also stated that while changes in interest rates and exchange rates are significant in explaining stock prices in the long-run, those in price levels and money supply are not.

Researchers studied the relation between market returns and macroeconomic indicators in four Latin American countries using the vector autoregressive (VAR) model. He also included the MSCI world index and the U.S. 3-month T-bill yield to his model to proxy the effects of global variables. He showed that shocks from the country variables are transmitted to the markets at varying magnitudes and significance. Together with this, the global variables are found to be consistently more important than domestic variables in explaining returns across markets.
There have been only few studies analyzing the relation between stock market index and selected macroeconomic variables in Turkey, mostly due to the fact that the stock market was found in 1985 and analyzing such relationships requires a relatively longer time period. Researchers analyzed the relationship between stock returns and inflation, industrial production, interest rate, exchange rate, and money supply in Turkey for the period 1986-1998. His study revealed that interest rate and industrial production have a significant effect on stock returns. Similarly, Bernanke and Kuttner (2005) found that selected macroeconomic variables such as inter-bank interest rates, gold prices, and international portfolio investments have significant effects on the returns of the securities in financial sector in Turkey. They showed that gold prices, inflation rate, money supply, capacity utilization rate, and exchange rate are statistically significant in explaining the returns of securities in ISE-30 index with the help of arbitrage pricing model.

**Development of the main research question**

Having mentioned briefly the current state of the literature and gone through the development phase of the Istanbul Stock Exchange, it is crucial to consider what the intuitive financial theory suggests about the relationship between the stock market prices and selected macroeconomic variables before developing the research question. I have selected four basic macroeconomic indicators – the industrial production Turkey, the industrial production of the OECD countries, the exchange rate and the oil price – to analyze their effects on the stock market returns.

**The Relation between the Exchange Rate and the Stock Prices**

The international financial system has been passing through significant changes like gradual abolishment of capital inflow barriers, emergence of new capital markets, and establishment of more flexible exchange rate regimes in emerging and transition countries since the early 1990’s. One advantage of this new structure of the international financial system is that it proposes a broader variety of investment opportunities to the investors, but on the other hand it increases the volatility of exchange rates and thus associated risk premium, which in turn grasps the attention of researchers to the link between the exchange rates and stock prices.

In the literature, there is theoretical consensus neither on the existence of relationship between stock prices and exchange rates nor on the direction of this relationship. The relationship between the stock prices and exchange rates is explained by the help of two different approaches, namely the “flow-oriented” models and the “stock-oriented” models in which a main disagreement exists.

According to the flow-oriented models the exchange rate is determined largely by a country’s current account or trade balance performance. These models assume that a change in the exchange rate has an impact on the real economic variables such as real output through its effect on the international competitiveness of the country (Dornbusch & Fischer, 1980). In this context, the degree of openness and the degree of trade imbalance of the country is important in the determination of the degree of exchange rate fluctuations. From a micro level, a change in the exchange rate affects the competitiveness of the firm in the international area hence influences the firm’s earnings and cost of funds, which in turn affects its stock prices. Thus, flow-oriented models suggest a positive relationship between the exchange rate and the stock prices with direction of causation running from exchange rates to stock prices. The conclusion of positive relation stems from the fact that the exchange rate is defined as the price of one unit of foreign currency in domestic currency, so domestic currency depreciation means an increase in exchange rate.

Elsewhere, stock-oriented models focus more on the role of capital account in the exchange rate determination and they are distinguished as portfolio balance models and monetary models. Portfolio balance models propose a negative relation between stock prices and exchange rate, and also draw a conclusion that stock prices affect exchange rates. The mechanism can be explained as a rise in domestic stocks prices leads to the appreciation of domestic currency through direct and indirect channels. A rise in prices leads to a rise in demand for domestic assets and at the same time a fall in demand for foreign assets, since the investors will sell foreign assets to obtain domestic currency in order to buy new domestic stocks. The described shifts in demand and supply of currencies cause domestic currency appreciation. Moreover, the effect of the indirect channel can be explained such that an increase in domestic assets prices results in growth of wealth, which leads investors to increase their demand for money, which in turn raises domestic interest rates. In the end, the demand of foreign investors for domestic currency will increase since they will be attracted by those higher interest rates, subsequently causing the appreciation of domestic currency.

Having considered the two different approaches determining the exchange rate, it is seen that the financial theory suggests both positive and negative relationship between the stock prices and the exchange rate.

**Custom Terminology**

Custom made from the root word in French and English Komrsyom means of Komrs trade and exchange of goods are known. It also means that the goods and merchandise rights granted and according to some authors, after the Ottoman conquest of Constantinople by the Greek-derived word and pronunciation in Turkish, means Komro used. In Persian the word is derived from Turkish, while treaties with Sultan Shah Mahmoud Khan, the king of the Ottoman Empire (1195 AD) also mentions the word customs. Iran Customs Administration of the Ministry of Economy and
Finance has affiliate organizations. Customs Cooperation Council and the World Customs Organization, Customs have been defined as follows: "Customs is a government agency responsible for the enforcement of customs laws and obtaining input duty (import) and outgoing (export) and also responsible for the enforcement of other laws relating import, transit and export of goods. "Customs duty is actually an indirect way. According to historical evidence, which indicates that the Median tribe of civilization and rule the people of Iran that time, could be argued that certain customs regulations and customs of the way there when the Medes.

Similarly, at the time of the Achaemenes dynasty, in the vast land of Egypt, from East India to point in time, and in north and South continues, more prosperous trade of the Medes and the organization was also established. Organizational structure of the Islamic Republic of Iran Customs Administration customs Organization, Iran is composed of a headquarters and 10 field monitoring. Head of the Customs Office of the Deputy Minister of Economic Affairs and Finance enjoys the highest ranking Iranian customs. Headquarters of the ten areas of customs administration and monitoring of executive based in Tehran and four Deputy General Administration was formed. Decathlon monitoring areas in different parts of the country, the customs administration are monitoring. In Tehran Mehrabad customs, Shahryar, West, south of Tehran, PO and Trade under the Trust headquarters working. Number of administrative customs in Tehran and other cities around the border and some islands in the Persian Gulf and border markets are based, consists of 129 units. Iran Customs headquarters of the role of guiding and coordinating units in the areas of supervision and customs of the country and in each case, the notification rules, guidelines and legislation and other measures necessary for the implementation, the action shall or the final maturity or in case of questions deals with the differences from the customs of the country, have been extracted. To this end, the Department of Safeguards, Office of the State Coordination, Office of Public and International Affairs, Office of Inspection and Investigation Commission to resolve disputes under the supervision of the customs, task altogether.

The Relation between the Oil Price and the Stock Prices

The recent surge in oil prices over the past decade has taken considerable attention to the relationship between oil price and financial markets. Analyzing and understanding the relationship between oil price and the emerging stock market prices is an important topic to study since as emerging markets grow, they will have a larger influence on the global economy. While the demand for oil in developed economies is steady or declining slightly, the demand for oil in emerging economies is rapidly growing. In Turkey, the dollar amount of oil exported increased 467.2% only from 2000 to 2011.

From a theoretical perspective, the relationship between oil price changes and stock prices can be explained using an equity pricing model. Where P0 is the current value of the stock, CFt is the cash flow at time t, and kit is the discount rate. In an equity pricing model, the price of equity at any point in time is equal to the expected present value of discounted future cash flows. Together with labor, capital and materials, oil represents an important component in the production process of most of the goods and services. Thus, changes in the price of oil affect cash flows. When the oil price rises, if we assume that there is no complete substitution effects between factors of production, the production costs of the firm will also rise, which in turn will lower the cash flows and stock prices. Addition to this, oil prices also affect the discount rate used in the above mentioned equity pricing formula. Considering the fact that rising oil price is often an indication of an inflationary pressure, central banks can interfere to keep the inflation at a steady level by raising interest rates. The investors will prefer bonds to stocks in a rising interest rate environment thus causing the price of stocks fall down. As clearly explained above, the financial theory suggests a negative relationship between oil price and stock market prices.

Co-integration Test

Using non-stationary series, co-integration analysis has been used to examine whether there is any long run equilibrium relationship. For instance, when non-stationary series are used in regression analysis, one as a dependent variable and the other as an independent variable, statistical inference becomes problematic (Engle and Granger, 1987). Co-integration analysis becomes important for the estimation of error correction models (ECM). The concept of error correction refers to the adjustment process between short-run disequilibrium and a desired long run position. As Engle and Granger (1987) have shown, if two variables are cointegrated, then there exists an error correction data generating mechanism, and vice versa. Since, two variables that are cointegrated, would on average, not drift apart over time, this concept provides insight into the long-run relationship between the two variables and testing for the co-integration between two variables. In the present case, Johansen’s Maximum Likelihood procedure for Co-integration has been applied. Johansen method can be illustrated by considering the following general autoregressive representation for the vector Y.t.

\[ Y_t = A_0 + \sum_{j=1}^{p} A_j Y_{t-j} + \epsilon \]
\[ \Delta Y_t = \Delta \beta + \sum_{j=1}^{r} \Gamma_j \Delta Y_{t-j} + \Pi Y_{t-r} + \epsilon_t \]

The issue of potential co-integration is investigated by comparing both sides of equation (4). As \( t Y \sim I(1) \), \( t Y \sim I(0) \), so are \( t-j Y \). This implies that the left-hand side of equation (4) is stationary. Since \( t-j Y \) is stationary, the right-hand side of equation (4) will also be stationary if \( t-p Y \) is stationary. The Johansen test centers on an examination of the matrix. The can be interpreted as a long run coefficient matrix, since in equilibrium, all the \( t-j Y \) will be zero, and setting the error terms, \( \epsilon_t \), to their expected value of zero will leave \( t-p Y = 0 \). The test for co-integration between the \( Y \)’s is calculated by looking at the rank of the matrix via eigenvalues. The rank of a matrix is equal to the number of its characteristic roots (eigenvalues) that are different from zero. There are three possible cases to be considered: Rank (\( ) = p \) and therefore vector \( X_t \) is stationary; Rank = 0 implying absence of any stationary long run relationship among the variables of \( X_t \) or Rank (\( ) < p \) and therefore \( r \) determines the number of co-integrating relationships. Thus, if the rank of equals to 0, the matrix is null and equation (4) becomes the usual VAR model in first difference. If the rank of is \( r \) where \( r < n \), then there exist \( r \) co-integrating relationships in the above model. In this case, the matrix can be rewritten as \( = ' \) where and are \( n \times r \) matrices of rank \( r \). Here, is the matrix of co-integrating parameters and is the matrix of weights with which each co-integrating vector enters the above BVAR model.

The test for the number of characteristic roots that are insignificantly different from unity can be conducted using the following two statistics, namely, the trace and the maximum eigenvalue test.

\[
\hat{\lambda}_{\text{trace}}(r) = -T \sum_{j=r+1}^{\infty} \ln(1-\hat{\lambda}_j)
\]

\[
\hat{\lambda}_{\text{max}}(r, r+1) = -T \ln(1-\hat{\lambda}_{r+1})
\]

**The Data**

The relationship between stock prices, represented by the ISE Composite Index and several monetary variables are examined. These variables are overnight interest rates, several definitions money supply (M1, M2 and currency in circulation), and foreign exchange rates of US dollar, German mark, British sterling and Japanese yen. In the choice of these variables two criteria are used: (1) availability of daily observations; and (2) high frequency of use by the financial media that makes data collection not costly for investors. Money supply variables represent monetary expansion in nominal terms which is expected to result in increased investments in stocks. Interest rates and foreign exchange rates however, are included into the analysis as possible substitutes for stock investment. The entire sample, from January 1988 to April 1995, consists of 1831 daily observations for log levels of each series.

**CONCLUSION**

The purpose of the present study is to explore the causal relationships between stock prices and the key macro variables representing real and financial sector of the Indian economy. These variables are the index of industrial production, exports, foreign direct investment, money supply, exchange rate, interest rate, NSE Nifty and BSE Sensex. The present analysis is based on quarterly data from March, 1995 to March, 2007. Johansen’s approach of co integration and T-Y Granger causality test have been applied to explore the long-run causal relationships while BVAR modeling for variance decomposition and impulse response functions has been applied to examine short run causal relationships.

Co-integration regressions indicate the presence of a long run relationship between stock prices and FDI, stock prices and MS and stock prices and IIP. However, except for interest rate and exports, the pattern of co integration and long-run Granger causality in each market indicates differential pattern. In NSE, movement in NSE does not have effect on exchange rate and IIP while movement in BSE Sensex seems to cause these variables. In this context, it is important to highlight that the composition of NSE Nifty and BSE Sensex vary from each other. Nifty is a benchmark index that is composed of 50 stocks i.e. shares of 50 companies. Sensex, on the other hand, is an index that is composed of thirty stocks i.e. shares of 30 companies. The rate of change in variation may happen because every stock in an index has some index-weightage and it is varying in each index. In case of short run, there is no differential impact of causal pattern as indicated by variance decomposition and impulse response functions. In this case, the results reveal that NSE Nifty causes exchange rate, exports, IIP and money supply while interest rate and FDI causes NSE Nifty. Broadly, these patterns are valid also in the case of BSE Sensex. The study reveals that movement in stock prices causes movement in IIP. It clearly implies that stock prices leads real economic activity. It reveals that growth rate of real sector is factored in the movement in stock prices. One possible explanation is that major players such as FIIs and mutual funds are well aware in advance of business plan of major industrial houses. Another explanation is the higher demand of stocks created by positive growth.
expectations. Higher demand has been created by increased participation of domestic retail investors and trader directly or through mutual fund as the expected returns in alternative investment opportunities such as bank deposits, deposits in post offices, etc. are less than the expected return in stocks. Further, FIIs inflows has increased in recent years due to expected higher growth of rate of return in Indian compared to USA, EU and other developed economies. This has been possible due to change in legal and institutional trading environment. This study also reveals that FDI does cause movement in stock prices while movement in stock prices does not have significant effect on FDI. This links may be the outcome of positive effect of FDI inflows on expectations regarding growth, earning and profit prospect of the sector. Results indicate that the movements in stock prices seem to affect export flows, possibly through its effect on exchange rate. It is to be noted that the movement in Sensex and Nifty are causing changes in exchange rate at least in the short run. One possible inference may be drawn from the present study that the stock market movement in India seems to be driven by the performance of industry in domestic market rather than in export market. It seems to be intuitively correct as the export segment of major listed companies is small barring IT and textile sector. The study indicates that exchange rate does not influence the BSE Sensex and NSE Nifty while movement in BSE Sensex and NSE Nifty does cause change in exchange rate. It indicates towards large FII inflows in recent years. It is causing serious problem to the real sector of the economy. As of October, the rupee had appreciated close to 13 per cent on a year-on-year basis against the greenback.

Nearly 7.5 per cent of this appreciation came in the months of April and May. In recent months, net FII inflows have picked up around $5.7 billion in October itself. The recent cuts in the Fed rate are likely to provide a further impetus to the inflows and put more pressure on the rupee. One of the major worries of rupee appreciation is the hit exports are expected to take. The relationship between money supply and stock prices has been widely studied because of the belief that money supply changes have important direct effects through portfolio changes, and indirect effects through their effect on real economic activity, which in turn postulated to be the fundamental determinants of stock prices. However, the study indicates that money supply does not affect movement in stock market indices while interest rate causes change in stock indices. The possible explanation may be the lack of understanding on the part of players in the stock market about the complex linkage of money supply with cost and profit margin of industry. Further, major player are either not able to predict the possible effect of money supply and monetary measures related to money supply taken by RBI or they could not form their expectation on the basis of changes in money supply. Given the demand for money, there is a direct inverse relationship between money supply and interest rate. Probably, stock market reacts to money supply only if it causes changes in interest rate. It may be inferred that monetary policy measures affecting interest rate are critical in influencing stock market in Iran.

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