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# How do systematic factors affect the cyclical behavior of the stock market in the Iranian economy?

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***Abstract***

Certainly, the stock market in each country is known as a scale to measure that country's economic situation. Therefore, identifying the factors affecting the creation of cyclical behaviors in this market can be useful for both policymakers and investors. The Main purpose of this study is to investigate the effects of systematic variables on cyclical behaviors of Tehran stock market. Statistically, systematic variables affect the stock values of a large number of companies and the entire market consequently. In doing so, in the first stage, the ARDL model was applied to estimate the short and long run coefficients of systematic variables. The results showed that Liquidity volume has a positive and significant effect on the total stock market index without any lag in the short run. GDP has a negative effect on the total stock market index with a lag. This effect indicates that a large part of GDP is financed through the stock market. Also, the only systematic variable that has had a positive and significant effect on the stock market index in the long run is net capital stock. Subsequently, the Co-movement, variability and stability indices have been calculated by using the Markov switching approach with annual data of (1991-2023), the results showed that the demand for money at the level of (M2) was the main driver of Tehran stock market cycles with high stability which means how long the fluctuations tend to persist before reverting to the long-run trend. Under these circumstances, what the Central Bank decides about monetary variables based on the cyclical position of the Tehran Stock Exchange market value can affect the depth of the recession and the inflation rate.

***Highlights***

- The study investigates the cyclical behavior of Tehran Stock Market.
- The results showed that Liquidity volume has a positive effect without any lag in the short run and GDP has a negative effect on the total stock market index with a lag.
- The demand for money at the level of (M2) was the main driver of Tehran stock market cycles with high stability

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## 1. Introduction

Empirical evidence related to recent financial crises has shown that the financial sector has played an important role in transmitting shocks to the real sector of the economy and it is considered as an important factor in business cycles (Jermann & Quadrini, 2009). Thus, documenting and examining the role of financial intermediaries in macroeconomic fluctuations in order to identify the sources of fluctuations and also design appropriate economic policies to deal with fluctuations have great importance. The relationship between money demand and the stock market was first proposed by Milton Friedman. Friedman acknowledged that as the demand for money increases, the desire to save increases. The increased savings are invested in a variety of asset portfolios with different risks. The stock market's share of these asset portfolios is significant (Friedman, 1988). Another factor that affects the overall stock price index is economic growth over business cycles. Economic prosperity (an increase in output relative to the long-run trend) affects investors' expectations about the profitability of activities and investment confidence. Increased economic growth reduces economic uncertainty and increases expected investment profitability. These factors, along with increased expected wealth, lead to increased demand for various assets, including stocks (Miller & Show fang, 2001). Also any Changes in exchange rates can have two different effects on stock prices. An increase in the exchange rate (from the demand side) leads to an increase in the income of companies exporting goods and, consequently, their stock prices, and on the other hand (from the supply side) leads to a decrease in the profits of companies importing intermediate inputs and a decrease in their stock prices (Morley & Pentecost, 2000). Changes in government spending can affect the profitability of industries, affect the financial statements of companies, and affect stock prices. They can also affect investors' expectations about the future of the market as market risk factors (Kluge, 1994). The initial idea of the relationship between inflation and stock returns was expressed by Fisher in 1930. He claimed that nominal stock returns move in line with the expected rate of inflation and real returns are independent of inflation and determined by real factors such as the efficiency of capital and the time preferences of savers. Fisher believed that any increase in the inflation rate causes investors to expect higher inflation in the future, and this will naturally lead to an increase in the nominal rate of return in the future. Subsequently, any decrease in the inflation rate causes investors to expect lower inflation in the future, and as a result, the nominal return will also decrease. The reason for this relationship is that efficient markets compensate investors for changes in the purchasing power of their money (Feldestain, 1980).

On the other hand, changes in interest rates can affect stock prices in two ways: An increase in interest rates can create expectations for investors that interest rates will continue to rise. An increase in interest rates increases the cost of capital for the company and investors. Ultimately, the net effect of an increase in interest rates on stock prices will be the resultant of these two effects (Shiller, 1988).

Increases in capital stock can ultimately be beneficial for investors despite possible dilution of shares. The increase in capital for the company that's raised by selling additional shares of stock can finance additional company growth. The ultimate gains in stock price and dividend payouts realized by investors might be more than sufficient to compensate for the dilution of their shares if the company successfully invests the additional capital. Share dilution occurs when a company issues additional shares to more shareholders (Fama et al., 1999).

This study aims to examine the effects of fluctuations in the Gross Domestic Product, liquidity volume, government spending, net capital stock, bank interest rate, exchange rate and inflation rate on the capital market fluctuations as systematic factors.

Furthermore, an innovatively attempt has been made to measure the average and intensity of the recession and expansion cycles in the stock market by using the Markov switching approach in an unprecedented analysis, on the other hand, by calculating the *co-movement*, *stability* and *variability* indicators, the main driver of the cyclical behavior of the stock market has been identified.

The rest of this article is structured as follows: In Section 2, a brief review of the relevant literature is presented, covering both theoretical aspects and previous studies. Section 3 describes the research data and methodology. The fourth section provides interpretation of the results derived from the model estimation, and conclusion is presented in the final section

## 2. Literature Review

Over the last few years, several studies about stock markets cyclical behavior have been conducted all around the world. For instance: Puneet Vatsa et al. (2024) show that stock markets have been strongly cyclical, lagging industrial output by one to three months in recent decades. There have been considerable changes in the relationship between inflation and stock market cycles. The correlations changed from negative in the 1980s and 1990s to positive in the 2000s and 2010s. The results also show strong relationships between the stock indices, which offer new insights into the interplay between financial markets and economic cycles Writing. Talthip & Sukchareonsin (2024) acknowledged the stock market is driven by the demand and supply of investors. In The Stock Exchange of Thailand (SET), there are four major types of investors consists of foreign investors, domestic institutes, proprietary traders, and retail investors. The competing hypothesis on fund flows to the SET by using (ARDL) model was estimated to test short-run relationships, Cointegration to identify the long-run relationships, and pairwise Granger causality analysis to confirm the causality. The results partly support the feedback-trader hypothesis only for the short-and long-run relationship between market return and fund flow from foreign investors in the recession stage. The results do not support the price-pressure hypothesis for the fund flows from all types of investors to the stock market at any stage of the business cycle. Celebi & Hönig (2019) investigated the effects of macroeconomic factors on the German stock market using annual data (1991-2018) by using an

OLS technique. The results showed that the business confidence index and the unemployment rate have a positive effect and the gross domestic product, net investment and export have a negative effect with a lag on the efficiency of the stock market. Caner Demir (2019) examined macroeconomic indicators on stock market fluctuations in Turkey using quarterly data (2003-2017) by (ARDL) model and the results showed the exchange rate, domestic and foreign investment increased the index of the Istanbul Stock Exchange, while the bank interest rate and the price of Brent oil had a negative effect on the mentioned index. Jain & Biswal (2016) investigated the dynamics between stock prices, exchange rates, gold prices, and oil prices for India by using monthly data during 2003-2017. In order to investigate the dynamics between these markets, Granger causality test was applied. The results showed that a fall in the price of gold and crude oil has caused a decrease in the value of the national currency and the stock index. The findings of this research indicate the expansion of the role of gold as an important asset in the investment portfolio. Gali & Gambetti (2014) investigated the effects of monetary policies on the stock market bubble by using a Vector autocorrelation (VAR) model and quarterly data (1960-2011) in Spain. The results showed that the stock index after a short period of decline, due to a contraction in monetary policy, became permanently upward. Schularick & Taylor (2011) investigate the behavior of money, credit and macroeconomic indicators over the long run based on a historical data for 14 countries during 1870–2008. The evidence show that leverage in the financial sector has increased strongly in the second half of the twentieth century. Decoupling of money, credit aggregates and also credit growth is a considerable predictor of financial crises which suggests that such crises are "credit booms gone wrong" and that policymakers ignore credit at their peril. Chen (2007) investigated the asymmetric effects of monetary policies on stock market returns. Using Markov switching approach, and showed that monetary policy has more effects on stock returns in periods of stock market recession than in periods of stock market expansion. The results confirmed that any contraction in monetary policy increases the probability of moving from the expansion regime to the recession one, while the expansionary monetary policy increases the probability of remaining in expansion periods of the stock market.

Kim & Nelson (1999) tried to make a model for decomposing production into two permanent and temporary components which explain the importance of trade in business cycles according to what Friedman points out by using a Nonlinear Unobserved Component Model. In a model, which is actually an extension of Clark's model (1987) (in which temporary shocks also include an asymmetric component), Kim and Nelson show that in normal periods the level of output is often affected by permanent shocks, and temporary asymmetric shocks typically explain the dynamics of output in recessions.

In Some Iranian articles the authors also attempted to analyze factors and effective variables on Stock Market. Esmaeeli et al. (2023) aim to assess the existence of information asymmetry on the Iranian stock market and its impact on expected portfolio returns by applying Volume-Synchronized Probability of

Informed Trading (VPIN) as a measuring tool. The results affirm that the Iranian stock market priced the asymmetric information risk during the time interval from March 22, 2018, to March 19, 2020. Therefore, it is essential to take into account the information risk factor besides a combination of factors such as market, size, profitability, and investment to obtain the most efficient explanation for the returns of portfolios. Shamsoddini et al. (2023) investigate the role of uncertainty and asymmetric information as the main variables which influence the stock price fluctuations on the intrinsic value and market price relationship of firms active in the Tehran Stock Exchange during 2013-2022. Practically, the findings emphasis to enhance transparency and information quality, thereby reducing asymmetric information and fostering investor confidence. Zeinoddini et al. (2020) investigated the effect of oil price shocks on the performance of the Iranian stock market using quantile regression between stock index returns and macroeconomic variables in the period from 1988 to 2018. According to the results, the interest rate change has a negative effect on the return of the stock index, and the oil price, industrial production index, and exchange rate have a positive effect on the return of this index. The inflation rate has not had a significant effect on the performance of this index. Dehghan & Kamyabi (2018) investigated the effect of economic variables on the performance of stock companies in expansion and recession conditions of the Iranian stock market by using the Markov switching approach during the years 1992-2017. The findings showed that there is a positive and significant relationship between the consumer price index and the total stock price index. Also the Inflation has had considerable effect during the recession than during the expansion period. The main differences between this study and their work include as following: in this study; the estimation of short-run and long-run coefficients from the ARDL model, the error correction coefficients were also estimated. The average of recession and expansion cycles was calculated. The probabilities of transitions between regimes were calculated. The probabilities of occurrence of recession and expansion periods are calculated. The probabilities of remaining in recession and expansion periods are calculated and reported. All three indices of co-movement, variability and stability of systematic variables are calculated and reported. Finally the main factor of cyclical behavior of the stock market is identified.

## 3. The Study Model

In this section, in order to examine the behavior of capital market cycles, the method introduced by Pesaran & Shin (1999) as Autoregressive Distributed Lag is used. They proved that if the Cointegration vector obtained by applying the ordinary least squares method to an autocorrelated model with well-specified distributed lags is obtained, in addition to having a normal distribution, it has less skewness and is more efficient in small samples. This approach has certain advantages over previous methods. First, it distinguishes between dependent and independent variables, solving the endogeneity problem. Second, it estimates the long and short-run components simultaneously, solving the problems of missing

variables and autocorrelation. Thirdly, in this method, unlike the Johansen-Juselius method, in which all stationary variables must be of the same degree, the stationary degree of the variables does not have to be the same and the appropriate model can be selected simply by determining appropriate lags for the variables. Fourth, avoiding the shortcomings of other models, including the existence of bias in small samples and the lack of ability to perform statistical tests, leads us to more appropriate methods for analyzing long-run and short-term relationships between variables, including the autocorrelation approach with distributed lags. Therefore, due to avoiding problems such as autocorrelation and endogeneity, unbiasedness and efficiency, and most importantly, because some variables are stationary and others are non-stationary, the ARDL method is suitable for examining the relationship between the variables of this study as follows:

$$CP_t = f(GDP_t, M_t, EX_t, G_t, K_t, INF_t, INT_t) \quad (1)$$

$$\mathrm{LCP} = \alpha_1 + \alpha_2.\mathrm{LGDP} + \alpha_3.\mathrm{LM} + \alpha_4.\mathrm{LEX} + \alpha_5.\mathrm{LK} + \alpha_6.\mathrm{LG} + \alpha_7.\mathrm{INT} + \alpha_8.\mathrm{INF} + \mathrm{u} \quad (2)$$

In relation (2), the dependent variable is LCP: logarithm of the total stock market index; LGDP: logarithm of gross domestic product; LM2: logarithm of liquidity volume; LEX: logarithm of the exchange rate (US dollar price in Iran); LK: logarithm of net capital stock at constant prices of the base year 2004; LG: logarithm of government spending; INT: bank interest rate; INF: inflation rate.

## 3.1 Data

The statistical population of the systematic variables according to previous domestic and international studies and the theoretical foundations is Seven macroeconomic variables including; The effects of The nominal demand for money at level (M2), nominal gross domestic product (GDP), nominal exchange rate (EX), nominal government spending (G), Inflation rate (INF), Bank interest rate (INT) and nominal net capital stock (K) on stock market index (CP). Time series information related to systematic variables with annual frequency in the period of 1991-2023 was adapted from the time series database of Central Bank of Iran.

## 3.2 Stationarity Tests

***Table 1. Stationary test with structural breaks (Zivot and Andrews test)***

| Variables | Break point | Probability | Result |
|---|---|---|---|
| CP | 2017 | 0.0002 | I(0) |
| M2 | 2013 | 0.0001 | I(1) |
| GDP | 2010 | 0.0016 | I(1) |
| EX | 2017 | 0.0073 | I(0) |
| G | 2013 | 0.0105 | I(0) |
| K | 2016 | 0.0012 | I(1) |
| INf | 2017 | 0.0021 | I(0) |
| INT | 2013 | 0.0022 | I(0) |

***Source**: Research finding*

Before estimating the model using ARDL method, it is necessary to check the variables stationarity to avoid spurious regression based on the Zivot and Andrews test. The results in (Table 1) show that the variables of the demand for money (M2), GDP and net capital stock, are non-stationary; they are retained with one time differentiation and the other variables are stationary.

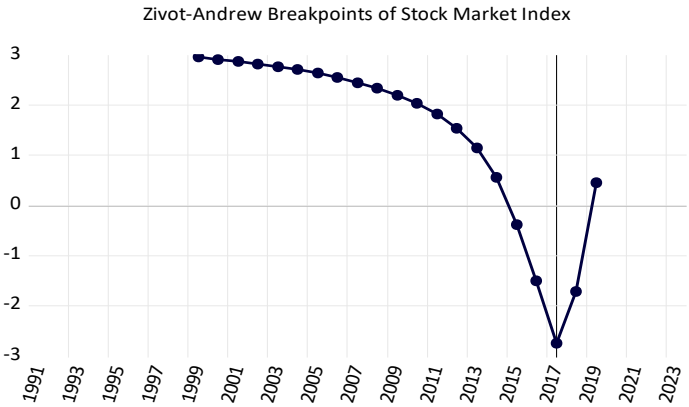


***Figure 1. The Breakpoint of Total Stock Market Index***
***Source**: Research finding*

The graph above helps to demonstrate the structural breaks on stationarity of the Total Stock Market Index (CP). The series plotted above shows a structural break in 2017 and clearly does not revert around the same mean across all time. This is problematic because different modeling techniques should be used for the unit-root series than the series with a structural break.

### 3.3 Cointegration Test

If the Degree of Cointegration of the time series is I(1), the test of Banerjee, Dolado & Mestre (1992) can be used to check whether the dynamic pattern is moving towards long-run equilibrium or not.

***Table 2. Cointegration test results***

| Model | t-statistic | Critical value of Banerjee, Dolado & Mestre Test to 1% | Critical value of Banerjee, Dolado & Mestre Test to 5% |
|---|---|---|---|
| Systematic Variables | -4.20 | -4.53 | -3.76 |

***Source**: Research finding (by Eviews 10)*

As it can be deduced from the results of (Table 2), the absolute value of estimated t-statistic is greater than the critical value of Banerjee, Dolado and Mestre at the 5% level, and the null hypothesis of no relationship between the

variables is rejected, therefore a long-term relationship between the variables of the model is confirmed. As a result, estimating long-term coefficients using the ARDL method is unimpeded.

### 3.4 Short-run results

According to the ARDL method, the short-run coefficients of the model are first estimated. To estimate equation (2), a maximum of two lags according to the Schwartz criterion are considered for the model, considering the number of observations (33 years). The results of the short-run model estimation can be seen in (Table 4).

***Table 3. Short-run Coefficients***

| Variables | Coefficients | t-statistics | Prob. |
|---|---|---|---|
| LM2 | +2.52 | 3.79 | 0.00 |
| LGDP(-1) | -5.52 | -2.36 | 0.04 |
| LEX(-2) | -2.06 | -5.72 | 0.00 |
| LG(-1) | -1.33 | -1.42 | 0.04 |
| LK(-1) | +5.57 | 2.06 | 0.03 |
| INF(-1) | -0.01 | -2.98 | 0.02 |
| INT(-1) | -0.15 | -5.24 | 0.00 |
| INT(-2) | -0.11 | -3.35 | 0.00 |
| C | -8.92 | -0.09 | 0.92 |
| R-Squared | | 0.9979 | |
| Adjusted R-Squared | | 0.9923 | |
| Durbin-Watson Stat. | | 2.14 | |

***Source**: Research finding*

According to the results of the short-run estimation, the variables of liquidity volume, GDP with one lag, exchange rate with two lags, government spending with one lag, net capital stock with one lag, inflation rate with one lag, and bank interest rate with one and two lags have had significant effects on the behavior of the total stock market index. The estimated coefficients for the significant variables indicate that with a one percent increase in M2, the total stock market index increased by 2.52 percent. With a one percent increase in GDP in the previous period, the total index decreased by 25.5 percent in current period. A one percent increase in the exchange rate with two lags also caused a 2.06 percent decrease in the total stock market index. One percent increase in government spending in previous period has caused the total index to fall by 1.33. Also one percent increase in the inflation rate with one lag and the bank interest rate with one and two lags has caused the total stock market index to fall by 0.01 percent, 0.15 percent, and 0.11 percent, respectively. One percent increase in the net capital stock with one lag has increased the total stock market index by 57.5 percent.

## 3.5 Long-run results

In this section, after ensuring the existence of a long-term relationship between the variables of the systematic model according to the results of (Table 5), the estimation of the long-term coefficients is done by using the ARDL method.

***Table 4. Long-run Coefficients***

| Variable | Coefficient | t-stat. | Prob. |
|---|---|---|---|
| LM2 | -1.43 | -2.56 | 0.04 |
| LGDP | -1.30 | -0.24 | 0.81 |
| LEX | -0.94 | -1.21 | 0.26 |
| LG | -1.70 | -2.27 | 0.05 |
| LK | +5.58 | 8.44 | 0.00 |
| INF | -0.01 | -1.82 | 0.11 |
| INT | -0.21 | -3.03 | 0.01 |
| C | -6.76 | -0.09 | 0.92 |

***Source**: Research finding*

The results of the long-run estimation of systematic variables according to the significance level of the variables are shown as below:

$$LCP_t = -1.43\ LM2_t - 1.70\ LG_t + 5.58\ LK_t - 0.21\ INT_t \quad (3)$$

Among the systematic variables, the money demand at level of (M2), government expenses and bank interest rate have negative and significant effects and the net capital stock has a positive and significant effect on the total stock market index during these years. So that for a one percent increase in liquidity volume, government expenses and bank interest rate, the total stock market index has decreased by -1.43, -1.70 and -0.21 percent, respectively. On the other hand, for a one percent increase in the net capital stock, the total stock index has increased by 5.58 percent.

## 3.6 Error correction coefficients (ECM)

Considering the long-term relationship between the research variables, in addition to the ARDL method, the ECM method has been used. According to Engel and Granger, every long-term relationship has a short-term error correction model that ensures the achievement of that equilibrium and vice versa. This model is actually a type of partial equilibrium model, in which the speed of approaching the long-term equilibrium value is measured by imputing the residuals from a long-term relationship.

***Table 5. Error Correction Coefficients***

| Model | ECM(-1) | t-stat. | Prob. |
|---|---|---|---|
| Systematic Variables | -0.89 | 2.33 | 0.01 |

***Source**: Research finding*

According to the results of (Table 6), the error correction coefficient on systematic variables is estimated -0.89 .the result is statistically significant and

indicate that systematic variables will eliminate 89% of short-term deviations in each period.

### 3.7 Extracting capital market cycles

To achieve an estimation of the long-term trend of the components of a time series, the Hodrick-Prescott filter can be used. This filter is obtained by minimizing the sum of the squared deviations of the variable CP (total stock market index) from the $\boldsymbol{CP_t^{TR}}$ trend. In fact, the values of the mentioned trend are the values that minimize the following relationship:

$$Min \sum_{t=1}^{T}(CP_t - CP_t^{TR})^2 + \lambda \sum_{t=2}^{T-1}[(CP_{t+1}^{TR} - CP_t^{TR}) - (CP_t^{TR} - CP_{t-1}^{TR})]^2 \qquad (4)$$

Where T is the number of observations, λ is the balancing parameter that determines the smoothness of the trend; According to Maravall & Del Rio (2001), 100 is considered for annual data. The first part in relation (6), in fact, expresses the goodness of fit, and the second part or the part inside the bracket, shows that the deviation from the trend, both in a previous and in a later period, is the lower the better.

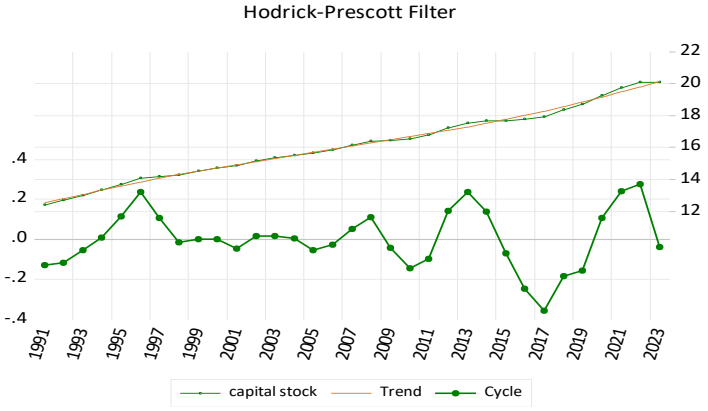


***Figure 2. Recession and expansion periods in the net Capital stock***
***Source**: Research finding*

***Table 6. Identifying recession and expansion periods in the net Capital stock (1991-2023)***

| Recession | Expansion | Recession | Expansion | Recession | Expansion | Recession | Expansion |
|---|---|---|---|---|---|---|---|
| 1991-1994 | 1995-1998 | 1999-2006 | 2007-2009 | 2010-2011 | 2012-2014 | 2015-2020 | 2021-2023 |

***Source**: Research finding*

### 3.8 Markov Switching approach

The Markov switching approach is one of the nonlinear time series models and an approach to investigate the features of economic cycles. This model

includes multiple structures that can examine the behavior of time series in different regimes. The main format of the regime change model is the probability of all or some parameters changing, based on the Markov process in different states or regimes, where different states are represented by unobservable variables. The logic of this type of modeling is combination of different distributions with different characteristics and extracting the current value of the variables according to the more probable situation determined by the observations. In this research, by using the Markov switching approach and defining two regimes of recession and expansion, assuming that systematic variables as exogenous variables cause stock market cycles and these cycles are affected by the behavior of macroeconomic variables; we will examine some important features of stock market cycles in Iran economy. As it was determined from the long-term coefficient estimation results in (Table 5); money demand volume (M2), government spending, net capital stock and bank interest rate have had long-term and significant effects on the behavior of the entire stock market index. The estimation results of the Markov switching approach using the four effective and significant variables are given in Table 7.

***Table 7. Markov switching results for systematic variables***

| Variable | (C1)average expansion cycle | (C2)average recession cycle | LOG (Sigma) | DW |
|---|---|---|---|---|
| Coefficient | 2.35 | -2.94 | -1.39 | 1.96 |
| t-stat. | 4.04 | -5.28 | -19.42 | * |

***Source**: Research finding*

According to the results of Table 8, the average expansion and recession cycles in the stock market were 2.35 and -2.94 respectively. According to the results, recession cycles have been more intense impact compared to expansion cycles. But the results of transition probability (CMTP[1]) from one regime to another are calculated in Table 8.

***Table 8. The probability of regime transition in the Markov switching approach***

| Transition prob. | Expansion Occurrence prob. | Recession Occurrence prob. |
|---|---|---|
| During Expansion period | 0.91 | 0.08 |
| During Recession Period | 0.05 | 0.94 |

***Source**: Research finding*

The results of Table 8 confirm that the probability of occurrence expansion during an expansion period and the probability of occurrence a recession during a recession period is more than 91 and 94 percent, respectively. On the other hand, the probability of occurrence recession, while the current period is expansion, is about 8%, and the probability of occurrence expansion, while the current period

[1] Constant Markov Transition Probabilities

is recession, is estimated about 5%. Therefore, according to the results above, the average period of remaining in recession and expansion will be calculated as follows:

Average Remaining time in Expansion Period: $\frac{1}{1-0.91} = 11.11$ (5)

Average Remaining time in Recession Period: $\frac{1}{1-0.94} = 16.66$ (6)

As a result, expansion cycles last for more than 11 periods and recession cycles last for more than 16 periods. Therefore, according to the results of tables 7 and 8; in Iran stock market during the studied years (1991-2023); recession periods, in Comparing to expansion periods, were more intense and lasted for longer periods.

### 3.9 Identifying the main driver of stock market cycles

The way to identify the facts revealed in the examination of cycles is to detrend the time series using one of the methods at first. Then Co-movement, variability and stability for detrended variables should be analyzed, and the direction of the movements of variables and related time is classified into cycles. Then revealed results are obtained in cycles (Machado, 2001).

#### 3.9.1 Co-movement

In the researches which were conducted to estimate the intensity of co-movement, the index of Cross Correlation Coefficient were used; that shows the intensity of co-movement between the variables and the total stock market index. The positive coefficient indicates the co-moving relationship of the same direction between two variables and the negative coefficient indicates the relationship of opposite movement between the two variables. The cross-correlation coefficient is estimated from the following equation:

$$\rho_{xy} = \frac{c_{xy}(\ell)}{\sqrt{c_{xx}(0)c_{yy}(0)}} \quad \ell = 0, \pm1, \pm2, \dots, \pm n \qquad (7)$$

Where $\ell$ represents the lag; $c_{xx}$ indicates the variance of the variable and $c_{xy}$ indicates the covariance of two variables. The critical value of the coefficient at the level of 5% is calculated by the relation $\sqrt{T}/\pm1.96$. For Iranian economy data with T = 46, its value is about 0.3. Also, the intensity and direction of correlation between variables are shown according to the following rules:

1) The economic variable x has a high correlation with the total stock market index if $|\rho_{xy}(0)| \geq 0.4$ and a low correlation if $0.3 \leq |\rho_{xy}(0)| \leq 0.4$ . There is no correlation when $|\rho_{xy}(0)| \leq 0.3$, which is called acyclic mode.

2) If the correlation coefficient has the highest value for the values before the lag ($\ell$=0), that variable is considered as the leading variable, and if it takes the highest value for the values after the lag ($\ell$=0), that variable is considered as the latter one. Also, if the maximum coefficient is in the interval, the simultaneous variable is detected (Hadian & Hashempour, 2003).

### 3.9.2 Variability

In order to estimate the relative variability of the variables, the standard deviation will be estimated with respect to the standard deviation of total stock market index($\frac{\sigma_x}{\sigma_y}$). The high variability of a variable compared to the main variable (total stock market index) and its leading feature is a criterion for choosing the cause of the emergence of market cycles. According to Kamil & Lorenzo (1998), a variable that has a relative variability higher than 2 is called a variable with high changes. If the relative changes are between 1 and 1.99, it indicates mild changes and less than 1 indicates low changes.

### 3.9.3 Stability

Stability means how long the fluctuations of a variable tend to persist before reverting to the long-term trend. The stability index, $\boldsymbol{\rho_1}$ is the first-order autocorrelation coefficient, which measures the degree of stickiness or circulation of the investigated variable (McGough, 1995).

According to the results calculated from Table 9 and the identification of variables with long-term effects with the total capital market index (M2, G, K, INT), the mentioned indices are being estimated.

***Table 9. Identifying the cause of the cyclical behavior of the total stock market index***

| Variable | Persistence | Variability | Co-Movement | | |
|---|---|---|---|---|---|
| | | | T-1 | T | T+1 |
| CP | 0.18 | 1 | * | * | * |
| M2 | 0.85 | 1.05 | 0.70 | 0.79 | 0.37 |
| G | 0.82 | 0.91 | 0.68 | 0.78 | 0.36 |
| K | 0.55 | 0.90 | 0.62 | 0.89 | 0.38 |
| INT | 0.02 | 0.11 | 0.62 | 0.46 | 0.40 |

***Source**: Research finding*

There are two conditions for introducing a variable as the main driver of a cycle. The variable should have the highest Cross Correlation Coefficient and variability with the cycles of the main variable (i.e. total stock market index).

The relative variability shows the variable's ability to produce cycles and the Cross Correlation Coefficient also expresses the relationship between two variables. The results of Table 10 show that the Persistence of the variables of total stock market index and the bank interest rate is significantly lower than other variables. That is, the tendency of these two variables to continue the trend in the short-run is very low, before returning to their long-run trend. M2 has a higher level of variability than the others. According to the estimation, this variable has shown mild changes. The results of the Co-movement index show that the variable of net capital stock (K) has the highest level of Cross Correlation Coefficient with the total stock market index. Therefore, net capital stock cannot be the driver of stock market cycles. Considering that the variability of government expenses is less than M2 and the Co-movement index before the lag (t-1) related to M2 is

higher than other variables, therefore M2 is distinguished as the main driver of Iranian stock market cycles during the period (1991-2023).

### 3.10 Collinearity Diagnostics Test

Finally, the assumption of collinearity of the independent variables of the model has been examined using the *Variance Inflation Factors* (VIF) test. The results of the VIF collinearity test in Table 11 shows that the average value of the VIF statistic for the independent variables of the model is less than 10; therefore, there is no acute collinearity problem between the independent variables.

***Table 10. Collinearity Diagnostics Test***

| Variables | Value |
|---|---|
| M2 | 2.485 |
| GDP | 1.911 |
| EX | 1.608 |
| G | 1.712 |
| K | 2.918 |
| INF | 1.511 |
| INT | 2.702 |
| Average VIF | 2.121 |

***Source**: Research finding*

### 3.11 The results of classical assumption test, model stability

Based on the results of the Breusch-Godfrey Serial Correlation LM Test estimated for the model, the null hypothesis of the absence of autocorrelation was not rejected due to the value of F-statistic is more than 0.05, and as a result, the model does not have autocorrelation.

***Table 11. Autocorrelation test***

| Breusch-Godfrey Test | Value |
|---|---|
| F-statistic | 3.25 |
| Prob. F | 0.0576 |

***Source**: Research finding*

The normality test was done to ensure that the residuals have a normal distribution. For this purpose, the Jarque-Bera Test was done, and the null hypothesis of this test means that the distribution of it, is normal. The results of this test show the normality of the residual sentences in the models. White's test is done in order to make sure that there is no Heteroscedasticity in the Residuals, the null hypothesis of the test, which indicates the absence of Heteroscedasticity, is not rejected in model. Therefore, according to the results of the classical assumption tests, there are no problems of serial correlation, dependent form (model specification), and normal distribution of residual sentences. In order to check the stability of the coefficients on the models, Cumulative Sum of Recursive Residuals and Cumulative Sum of Squares of Recursive Residuals tests are done as follows:

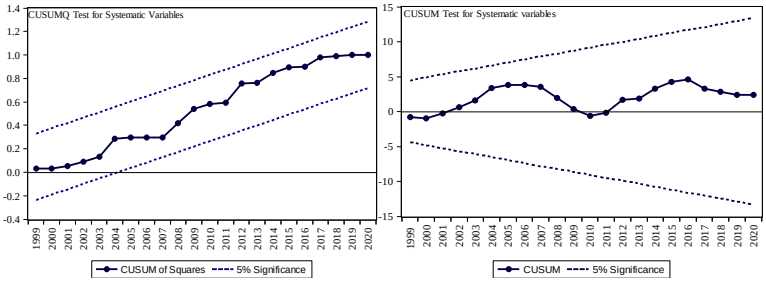


***Figure 3. CUSUM & CUSUMQ Tests for coefficients stability of Models***
***Source**: Research finding*

These tests show the stability of the parameters at a significant level of 5%. According to the results of these tests, the statistics of this test should be inside the straight lines, which means the stability of the coefficients.

## 4. Summary, Conclusion and Policy Implications

First, In order to identify how systematic factors affect the cyclical behavior of the stock market index in short and long run, we use ARDL model. According to the short-run coefficients, the most considerable effects on total stock market index belong to (LK) net capital stock (+5.57) and GDP (-5.52), both with a lag. The significant Long-run coefficients on total stock market index indicate that the demand for money, government expenditures and bank interest rate have negative effects and net capital stock has positive effect. Then according to ECM method the speed of approaching to the long-term equilibrium value is measured by imputing the residuals from a long-term relationship. The error correction coefficient indicates that systematic variables will eliminate 89% of short-term deviations in each period. The Markov switching approach is applied to calculate the average expansion and recession cycles. As shown in Table 7, the average expansion and recession cycles in the stock market were 2.35 and 2.94 and also the results of transition probability from one regime to another are calculated subsequently. The probability of occurrence expansion during an expansion period and the probability of occurrence a recession during a recession period is more than 91 and 94 percent, respectively. On the other hand, the probability of occurrence recession, while the current period is expansion, is about 8%, and the probability of occurrence expansion, while the current period is recession, is estimated about 5%. Therefore the average period of remaining in recession is 16.66 and the average period of remaining in expansion is 11.11.

Finally, in an innovative attempt the main driver of Iranian stock market cyclical behavior identified by calculating Co-movement, Stability and Variability indices. The demand for money (M2) is distinguished as the cause of creating cycles in the stock market and the total stock price index in the Iranian economy during the period (1991-2023).

Considering the monetary nature of stock market cycles in Iran economy, if the issue of strengthening the stock market and supporting domestic production is important to monetary authorities, they should consider the cyclical position of the stock market before making any decision.

As we know in the short term, the money demand at the level (M2) has a positive effect and the bank interest rate has a negative effect on the total stock market index. Therefore, it is recommended that when there is a recession in the stock market, the central bank should reduce the bank interest rate.

Practically, what is observed in Iranian economy confirms that there is no independent monetary policy and liquidity follow changes in the budget and the government's fiscal behavior. As a result, there is no effective monetary policy due to the institutional and structural problems of the economy. This claim is evidenced by the existence of the duality of liquidity in the country, while we are facing the growth of liquidity, but firms are suffering from a lack of liquidity, which means that these resources are not transferred to the production sectors and their entry into unproductive sectors, which has led to the institutionalization of structural and hidden inflation in the economy. This fact is an evidence of the lack of development of the country's stock market, because one of the tasks and functions of the stock market is to attract liquidity and control inflation.

Therefore considering the problems mentioned above and the lack of financial independence of the Central Bank in Iran, it is recommended that during recession in the stock market, brokerages, after obtaining legal licenses, provide facilities and loans from their internal resources to investors by paying amounts to investors' accounts in brokerages and not allowing withdrawal of loan funds until the recession period ends.This is how to prevent increasing inflation caused by liquidity injections while reducing the depth and severity of recessionary cycles.

In a situation where government spending in the long term has a significant effect on the decline of the entire stock market index, therefore, the existence of this market plays a vital role in financing and covering a large part of government spending.

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In all stages of writing the article, including Conceptualization, methodology, validation, formal analysis, preparation of original draft, review and editing, All authors have read and agreed to the published version of the manuscript.

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## Conflicts of Interest

The authors declare no conflict of interest.

## Data Availability Statement

Data can be made available upon request.

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