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Effects of money volume (liquidity) and inflation rates on capital market development: A mathematical approach

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Abstract

The capital market is considered a subset of financial markets so the long-term financial resources required by manufacturing companies are provided from this part of the financial system. Therefore, the purpose of this study is to investigate the money supply (liquidity) and inflation rate as components of measuring macroeconomic variables on the development of the Iranian capital market with emphasis on the liberalization of justice stocks. Also, we have tried to study the relationship between macroeconomic variables (inflation and liquidity) with capital market development in the years 2005 to 2020 with quarterly data. The method used in this research is the co-integration method and error correction models and implicit reaction functions and analysis of variance. The hypotheses of this study have also been tested using the Distributed Interrupt Autoregression (ARDL) model. Research findings indicate that economic variables such as inflation, liquidity, exchange rates, etc. are stimulus and effective in changes in stock prices has been accepted as a theory. One of the characteristics of developed countries is the existence of efficient markets and financial institutions that, while playing an important role in the economy of these countries, are also the basis for the economic growth and development of these countries. Tehran Stock Exchange, as one of the main pillars of the capital market in the country, is able to accelerate the movement towards growth and development while equipping and pouring stagnant savings in the country and directing them towards production.

Keywords: Money volume (liquidity) and inflation rate, development of Iran's capital market, liberalization of justice stocks, self-regression model of distributional interruption
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1 Introduction

The term capital market generally defines a place for trading various financial instruments. These locations may include the stock market, the bond market, and the foreign exchange market. Most markets are concentrated in major financial centers, including New York, London, Singapore and Hong Kong. Capital markets are made up of suppliers and users of funds. Suppliers include the households and institutions they serve - pension funds, life insurance companies, charities and nonfinancial corporations - that generate more cash than they need to invest.

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Users of the funds include buyers of home and motor vehicles, non-financial corporations and governments that provide infrastructure investment and operating costs. Capital markets are used to sell financial products such as stocks and bonds. Equity is the ownership of shares in a company. Debt securities are like interestbearing IOU bonds. These markets fall into two categories: primary markets - where new stocks and bonds are sold to investors - and secondary markets - where existing securities are traded. Capital markets are an essential part of a modern active economy because they transfer money from those who have it to those who need it for productive use [1].

Capital markets play an important role in the development process of any nation. This is because they contribute to growth and development, which is achieved through their role in mobilizing resources, as well as attracting domestic and foreign investment to the country. A fully developed capital market puts the country on a sustainable path of growth and development through the accumulation of savings, the optimal use of investment resources and the attraction of portfolio capital. For a developing economy like Nigeria, the process of achieving growth and development requires the availability of long-term capital. No other financial institution has the capacity to perform this role like the capital market. The level of development of the capital market and macroeconomic factors affecting its performance is an important issue for policymakers and market participants. Capital markets, on the other hand, in emerging and emerging markets are often described as shallow and unstable, leading to severely sensitive stock returns to economic developments. These features emphasize the role of macroeconomic variables in the functioning of capital markets; Therefore, it is obvious that the performance of the stock market depends on the whole macroeconomy. It is often stated in the literature that stock prices and capital market performance depend on macroeconomic variables such as inflation, money supply (liquidity), GDP growth, exchange rates, interest rates and money supply.

In this research, inflation rate and money supply (liquidity) are examined. Inflation is the amount at which the cost of goods and services in an economy increases over a period of time (usually measured over a year). In the UK, this is measured using the Consumer Price Index (CPI). Modigliani and Kahn [14] hypothesized the inflationary illusion. They believe that stock market investors are exposed to the inflationary illusion. So that when inflation rises, they tend to lower their expected future earnings and dividends more sharply by using higher nominal interest rates. As a result, stock prices are less valued when they are high, and more valued when inflation decreases, leading to a negative relationship between stock returns and inflation. Studies by Ibrahim [6], Feldstein [8], Caporale & Jung [4], Graham [10], Mukherjee, and Naka [17] have acknowledged the negative relationship between inflation and stock returns of their respective countries. Another group of studies including Poitras [18], Gjerde and Saettem [9] and Chatrath, Ramchander and Song [5] in their studies did not find any significant relationship between inflation and stock price index. While some studies have found a positive relationship between price levels and stock price index. These findings can be related to different characteristics in the studied cases, such as differences in the structural characteristics of countries, the use of different methods to perform estimates and differences in the period of study [7].

Different schools of thought differ on how changes in the money supply affect real economic variables as well as the prices of goods and assets. But everyone agrees that changes in the money supply in the long run lead to changes in the prices of goods and assets, including stock prices (IJNAA-v). Keynesians and polygons do not agree on what kind of financial assets people substitute when the money supply increases. Keynesians' view of the mechanism of influence can be expressed in such a way that they usually consider fixed income assets (such as bonds and treasury) as good substitutes for money, in other words, in Keynesian approach, the return on all assets, including the same stock. And is considered risk-free. The mechanism of action is that any increase in the money supply by lowering interest rates increases the demand for financial assets, including stocks, and consequently increases their prices (IJNAA-v). Polyon, on the other hand, argues that increasing money supply will directly and indirectly affect the flow of expenditures and asset prices. The increase in money supply will upset the balance between real money balances and desirable money balances, and will result in an attempt to eliminate oversupply, oversupply in a wide range of goods and services, as well as financial assets. On the other hand, they assume that the assets that replace the cash balance are very diverse. These assets include a wide range of financial assets with different risks (such as treasury bonds, mortgages, stocks, etc.) as well as real assets (buildings and durable goods, etc.). According to Polyon theory, as demand for financial assets, including stocks, increases, their prices increase directly [15].

Regarding the need for a capital market, it can be said that, after the re-imposition of US sanctions on Iran and at a time when the Trump administration had begun its policies of maximum pressure to paralyze the country's economy, the Iranian government is implementing a strategy to reduce oil confidence. And promote domestic production using domestic capacities. The capital market was one of the major areas in which this new strategy was manifested. As part of the strategy, the government defined a comprehensive plan to encourage the country's manufacturing sector to enter the capital market and use its enormous capacity to fund development projects and boost production. The government also used the offer of shares of a large group of its foundations, investment organizations, banks and pension funds on the Tehran Stock Exchange (TSE), the country's largest stock market, to direct stray capital to a

single area for use . To maintain economic growth by offsetting revenues from oil sales or foreign trade. Following the new move by the government, the TSE attracted a whole new generation of investors. Ordinary Iranians flocked to the capital market to protect their assets from possible economic fluctuations as well as to make a profit in the meantime. This caused the main market index (dividend and price index of Tehran or TEDPIX) to start to increase significantly. In early August 2020, when major stocks around the world plummeted, TEDPIX crossed the 2 million mark. This created skepticism among investors about creating a bubble in the market, and some economists and market analysts warned about excessive government interference in the market. However, the government continues to offer more and more of its institutions in the market and encourages more and more people to invest in the market [2]. Various studies have been conducted on the effects of macro variables on inflation and money supply (liquidity).

Azimi et al. [3], in a study showed that in the Tehran securities market, dynamic and real macroeconomic variables including exchange rate, inflation rate, money supply, short-term and longterm interest rates and industrial production index have significant effects on the price index. Tehran Stock Exchange has left; So that the exchange rate, inflation rate, money supply and industrial production index have positive effects and short-term and long-term interest rates have inversely affected the market price index. Among these, the inflation rate is the main factor affecting the price index, and the industrial production index and the exchange rate are in the next important categories. Mosaei et al. [15] examined the relationship between the stock market and macroeconomic variables in Iran. The results show the existence of a long-term equilibrium relationship between the available variables. Money volume (central bank monetary policy) has had the greatest impact on stock price changes in the long and short term; Therefore, it seems that the stability of monetary policy plays an important role in reducing uncertainty in this market. Al-Imran [1] in its article entitled Stock market impact as a result of irregular growth of money supply evaluated. The results show that the growth of money supply affects the total stock market index. Hashemi Dehnavi [11] states that based on the long-term model, oil prices have a negative and significant effect and in the short term, oil prices have a significant positive effect on the stock price index. In the field of foreign studies, Maistami et al. [13], the relationship between the index of different segments of the Singapore stock market such as financial index and composite index of Singapore market with changes in short-term and long-term interest rates, industrial production, prices, exchange rates and money supply Has checked. The Singapore stock market has a valid relationship with all of these macroeconomic variables; While the financial index is related to only one of the variables.

Lee et al. [12] examine the relationship between macroeconomic variables such as exchange rates, inflation, industrial production, short-term and long-term interest rates, and money supply with the Shanghai Stock Exchange and the Shenzhen Stock Exchange from 1992 to 2001. The result shows that there is a positive relationship between stock prices and money supply and industrial production and a negative relationship between stock prices and exchange rates, inflation rates, short-term and long-term interest rates. Suleiman Mohammad et al. [16] examine the impact of macroeconomic variables in Karachi, Pakistan, and state that in the post-reform period in 1991, foreign exchange rates and foreign exchange reserves had the highest impact on stock prices. Interest and money supply have a negative effect on stock prices, and ultimately the increase in capital formation by companies and the increase in industrial production do not affect stock prices. Also, changes in macroeconomic variables are not for commercial law investors so that they can make tremendous continuous returns in the stock market. As a result, investors are not able to make a huge profit using the information available.

It can be said that the rate of recording economic progress in a country depends on its stock exchange being able to create the necessary savings for investment. In 2009, for example, Soheili and Hussein [19] argued that a well-developed capital market would lead to economic growth because it would help raise savings for investment projects. In industrial economies, financial markets are well developed. We can not say the same about developing countries. In particular, developing countries do not yet fully explore the potential and financial resources offered by the capital market, which partly explains why they are not yet developed.

Finally, given that the capital market accounts for the bulk of a country's wealth - and given the role that macroeconomic variables play in its performance. Considering the importance of studying macro variables in the capital market and the current importance of justice stocks in the present study, the researcher intends to examine the effects of inflation and money supply (liquidity) on the development of Iran's capital market with emphasis on the liberalization of justice stocks.

The research hypotheses are presented as follows:

The main hypothesis

Macroeconomic variables (money supply (liquidity) and inflation rate) affect the development of the capital market (with an emphasis on equity stocks).

Sub-hypotheses (special)

1. The amount of money (liquidity) has an effect on the development of the capital market (with an emphasis on equity stocks).
2. Inflation rates affect the development of the capital market (with an emphasis on equity stocks).

2 research method

The capital market consists of two indicators: money supply (liquidity) and inflation rate. In this regard, we define the concept of the three main variables of stock price index, money supply (liquidity) and inflation rate.

The statistical population of this research includes a 15-year period from 2005 to 1399 using quarterly macroeconomic data for the variables of liquidity volume, inflation rate and justice stock price index. Justice stock data is extracted using classified information in the organization's archives that contains daily information, this is important based on library studies and the use of classified data. It has been achieved in the software packages of the mentioned organization and the source of all information of macroeconomic variables used in this research is the statistical data of the Central Bank. The hypotheses of this study have also been tested using the Distributed Interval Autoregression (ARDL) model.

2.1 Stock Price Index

The return on equity stocks actually indicates the growth or decline of the total price index at the beginning and end of each period (season). The most common starting point for investors when buying stocks is to check for changes in stock prices. This price is influenced by two factors: first, the factors that affect a particular stock, and second, the factors that will affect the entire stock market. In this regard, stock price indices and, better, changes in these indices will reflect these effects. This index is obtained from the ratio of investment in the capital market to GDP, the volume of investment in the capital market from the database of the Exchange Organization and GDP from the time series data of the Central Bank of the Islamic Republic of Iran. Has been extracted.

2.2 Volume of liquidity

The concept of money supply:

(M) from the perspective of the US Federal Reserve,

M1: Banknotes and Coins + Visual Deposits + Transferable Remittances + Automatic Transfer Services Account + Credit Union Joint Remittance Account and Travel Checks.

M2: M1 plus savings and term accounts, redemption agreements with commercial banks known as money market deposits and balances of non-institutional money market mutual funds.

M3: M2 in addition to other substitute securities - which have less liquidity - in the UK banking system (M4) in addition to the above definitions is also known as money, which includes banknotes and coins and bank deposits of domestic banks in addition to deposits It is created by the private sector and is almost a specific definition of the British economy. In terms of money supply policy, it is influenced by the discount rate - the legal reserve rate and the central bank's open market operations. In the present study, we will examine the concept of M2 (money and quasi-money) from the perspective of the Central Bank of the Islamic Republic of Iran.

The trend of liquidity in Iran in recent decades has always been upward. The upward volume of liquidity has been due to the volume of exchanges on the one hand and the need of producers for liquidity to supply raw materials and capital equipment, wage payments and other factors on the other hand. Increasing liquidity for equity stocks to buy and sell stocks is also an important issue. But the extent to which firms have been financed requires information on their financial resources and liquidity. Corporate information requires separate research in this area.

Inflation rate (INF): Percentage of changes in the consumer price index, which is based on the information of the Central Bank of the Islamic Republic of Iran. Is extracted.

Three main assumptions in this research:

Default One: Check the meaning of the pattern variables
Macroeconomic variables often have unknown time series. In order to avoid the use of anonymous time series in time series models, three variables can be tested in the model:

A: Drawing method

B: Correlation method (the self-correlation function is plotted against a certain number of interrupts.)

A: Single root test method

In this research, the correlation method has been used.

Second Default: Johansen Co-integration Test (Determining Co-Coefficient Regression):

It is one of the tests that is used for multivariate cases and uses the maximum likelihood method to process and prepare a framework for testing the integration of autoregressive vector error correction (VAR) models. The present study focuses on the ability of this test to implement the model.
If there is a long-run equilibrium relationship between X_1 and X_2 , that is $|\rho| < 1$, assuming a simple regression of at least squares X_{1t} on X_{2t} gives a consistent estimate:

$$\left.\begin{array}{l} X_{1t} + \beta X_{2t} = U_{1t} \\ U_{1t} = U_{1,t-1} + e_{1t} \\ X_{1t} + \alpha X_{2t} = U_{2t} \\ U_{2t} = \rho U_{2t-1} + e_{2t} \end{array}\right\} X_{1t} = \frac{\alpha}{\alpha-\beta}U_{1t} - \frac{\beta}{\alpha-\beta}U_{2t}, X_{2t} = \frac{1}{\alpha-\beta}U_{1t} + \frac{1}{\alpha-\beta}U_{2t} \tag{2.1}$$

In this case α the consistent estimation of the degree $\sqrt{T}$ is also called:

$$\sqrt{T}(\hat{\alpha} - \alpha) \to N(0, T\sqrt{ar}(\hat{\alpha})) \qquad T \to \infty \tag{2.2}$$

Third Default: Error Correction Models (ECM)

In error correction models, there is less concern about structural behavior or traditional economic theories and how expectations are formed. These models specify the method of adjusting the control variable for deviation, error, or imbalance in the status variable.

If the state variable (X_t) is considered, it is affected by the control variable Y_t and exogenous shocks. Denote the desired level of the status variable by (X_t^*) and exogenous shocks. Denote the desired level of the status variable by e_t:

$$X_t^* - X_t = e_t$$

Y_t^*. Control variable in optimal condition: $X_t = X_t^*$.

The term mentioned was originally used by Phillips to indicate the unemployment curve. But in relation to the ECM relationship with integration, the Granger representation theorem is used. Because the ECM shows how to adjust the variables of the device in the short run relative to the imbalance to achieve a long-run equilibrium relationship. In fact, if there is no mechanism by which variables are adjusted for imbalance (deviation from the long-run equilibrium relationship), no longterm relationship is established between the variables, so co-integration requires error correction. In other words, the long-run equilibrium relationship between a number of variables requires an $E < M$, and this has nothing to do with economic theories.

Findings
Descriptive statistics of variables

Based on quarterly information and statistics related to quarterly macroeconomic data during the years 1385 to 1399, descriptive statistics indicators of research variables are presented according to Table 1.

The highest average change in the volume of liquidity and then inflation in Iran is in the next position of the stock price index. The most seasonal changes belong to the stock price index, in addition, the largest seasonal decline belongs to the same index. Interestingly, liquidity alone does not have a normal distribution.

In the next step, we will examine three defaults:

Default One: Check the meaning of the pattern variables

To avoid false regression estimation, the significance of the model variables should be tested. Before entering into the discussion of examining the significance of model variables, it should be acknowledged that the model

Table 1: Descriptive statistics of research variables from 2006 to 2016

SIR	$M2R$	INF	
8.12	27.30	20.50	Average
5.10	28.50	18.05	Middle
114.80	37.60	67.90	Maximum
−16.20	12.90	4.60	At least
17.82	5.60	11.01	Standard deviation
3.58	−0.42	2.06	cholagi
21.55	2.60	8.19	Elongation
1037.59	2.26	114.86	Jarque-Bera statistics
0.00	0.32	0.00	Probability of distribution is not norma
63	63	94	Observations

Source: Research Findings

studied in this study is not limited by any preconditions, so the purpose is to examine the free relationships between these macro variables without the use of limiting equations.

Analysis of autocorrelation coefficient between capital market index and inflation variables and liquidity volume.

The simple correlation coefficient between the capital market index and inflation rate and liquidity volume is -0.33 and 0.93, respectively. It is natural that the buildings in stock during the economic boom will have a favorable situation in terms of efficiency of economic activities, allocation of resources, absorption of production factors, expansion of production capacity and development plans to absorb new technology. Table 2 summarizes the results related to the autocorrelation coefficients of the principal values of the model variables:

Table 2: Autocorrelation coefficients of the main values of the model variables

	INF	$M2$	SI
INF	1.00	−0.39	−0.33
$M2$	−0.39	1.00	0.93
SI	−0.33	0.93	1.00

Source: Research Findings

Inflation has a negative effect on the stock price index. Inflation, on the one hand, causes instability in economic activities and, on the other hand, increases the stock price index. But the sum of its effects will be due to instability and uncertainty in different markets and changes in the composition of assets (housing market boom, gold and currency). In a simple analysis, estimates show that there is a negative relationship between these two variables. The volume of liquidity has also had a positive relationship with the securities index. This coefficient is 0.93. The increase in liquidity in terms of the impact on inflation, corporate financing and production boom will cause a positive correlation between this index and the securities index.

Second Default: Johansen Co-integration Tests:

The Johansen co-integration test uses the maximum likelihood method to estimate long-run equilibrium relationships. In other words, due to the limitations of using the least squares method, the maximum likelihood method is used in estimating the long-run relationship. If there is more than one long-run equilibrium relation ($r > 1$),

the least squares method fails to explain it and does not provide consistency estimates of the co-accumulating vectors.

The method of inference from Johansen's test table is as follows: First, all variables must be accumulated by the same degree. There is a unique term. If the null hypothesis is confirmed, the vector autoregression model can be easily tested by ensuring the compatibility of the model coefficients. He turned the estimation into a VAR model, in which case it is not correct to rely on the Granger parasite method to compare the results, because when the number of long-run relationships is more than one, the nonlinear method should actually be used to estimate the pattern. Shows longterm algebraic relationships between data.

Table 3: Long-term algebraic relationships between data

				Sample: 1399:2 1384:4
Included observations: 57				
Test assumption: No deterministic trend in the data				
Series: D(SIR) D(GDPR) D(EFR) D(M2R) D(INF)				
Lags interval: 1 to 4				
Hypothesized	1 Percent	5 Percent	Likelihood	
No. of CE(s)	Critical Value	Critical Value	Ratio	Eigenvalue
None**	66.52	59.46	157.2055	0.701673
At most1**	45.58	39.89	88.26019	0.483931
At most2**	29.75	24.31	50.5539	0.313985
At most3**	16.31	12.53	29.0731	0.270599
At most4**	6.51	3.84	11.08777	0.176772
∗(∗∗) denotes rejection of the hypothesis at 5(1) significance level				
L.R. test indicates 5 cointegrating equation(s) at 5 significance level				

Source: Research Findings

In the above test, the assumption that co-accumulation exists under the absence of width from the origin and trend is significant, but the number of long-run relationships is more than one. This table shows that the rank of the model in terms of having equations is also cumulative in fact under different assumptions: without structure (with width of origin and trend and without them) - with linear structure (with width of origin and trend and without They) - With nonlinear structure, the existence of cumulative equations in the model is investigated. The result of the table is that in the case of linear equations with the width of the origin and without the trend of the model rank in terms of having the same equations is accumulator 5. In other cases, with the exception of the linear mode with trend and width from the origin, it has been ranked 5th. After co-integration tests and heterogeneity variance, the results of the above table are obtained after two pauses in the model. Therefore, we select the optimal interval of the model 2 and consider the model rank 5. After ensuring the existence of cumulative equations, we proceed to the implementation of the vector autoregression model through error correction.

Third Default: Error Correction Models (ECM)
The value of the statistic F, for the condition of having width from the origin and without trend and degree of co-accumulation one (ie all variables remain after one difference). Table 4 shows a summary of the model implementation results.

From the table to determine the existence of a long-run equilibrium relationship is equal to 3.36 for 5 parameters. This value will be equal to 2.9 in the case without width from the origin and trend. As can be seen, the model for currency changes - stock index changes - changes in GDP and liquidity is significant, and a well-fitting equation can not be seen only for inflation.

The instantaneous reaction was also estimated using the error correction model, which, using a fixed sentence

Table 4: summarizes the results of the implementation of the error correction model

Vector Error Correction Estimates					
Cointegrating Eq:	CointEq1	CointEq2	CointEq3	CointEq4	
D(SIR(-1)):	1.00	0.00	0.00	0.00	
D(EFR(-1)):	0.00	1.00	0.00	0.00	
D(GDPR(-1)):	0.00	0.00	1.00	0.00	
D(M2R(-1)):	0.00	0.00	0.00	1.00	
D(INF(-1)):	−0.36	2.00	0.02	−0.07	
	0.28	0.12	0.08	0.17	
	−1.30	0.21	0.31	−0.42	
DUM	0.02	−0.01	0.02	−0.003	
C	−0.59	0.41	−0.2	−0.08	
Error Correction:	D(SIR, 2)	D(EFR,2)	D(GDPR,2)	D(M2R,2)	D(INF,2)
CointEq1	1 − 0.88	−0.026	0.164	−0.03	0.09
	−8.13	−0.17	1.15	−0.40	0.76
CointEq2	0.038	−2.33	−0.62	0.291	−0.06
	−0.24	1.76	−1.94	−7.4	0.07
CointEq3	−0.121	0.019	−3.994	−0.0052	0.06
	0.29	−0.04	−16.96	0.08	−0.32
CointEq4	−0.66	−0.50	0.37	−1.01	−0.12
	0.74	−0.91	0.66	−3.55	−0.26
D(SIR(-1),2)	0.46	0.02	−0.06	−0.01	−0.05
	2.71	0.23	−0.58	−0.11	−0.65
D(SIR(-2),2)	−0.02	−0.013	0.03	−0.04	0.13
	1.36	−0.76	0.47	−0.44	−0.38
D(EFR(-1),2)	0.04	0.84	0.47	−0.16	0.037
	0.20	−1.40	2.07	3.73	0.11
D(EFR(-2),2)	0.04	0.31	0.16	−0.05	−0.02
	0.17	2.31	1.19	−0.67	−0.15
D(GDPR(-1),2)	0.167	−0.0007	1.92	0.007	−0.05
	0.62	−0.004	11.61	0.08	−0.41
D(GDPR(-2),2)	0.001	−0.007	0.86	0.012	−0.06
	0.07	−0.079	9.34	0.27	−0.79
D(M2R(-1),2)	0.34	0.80	−0.15	−0.22	−0.08
	0.47	1.86	−0.35	−0.99	−0.23
D(M2R(-2),2)	−0.06	0.49	−0.01	−0.18	0.02
	-0.14	1.70	−0.03	−1.19	0.09
D(INF(-1),2)	−0.73	−0.20	0.015	0.052	−0.76
	−2.44	−1.12	0.08	0.55	−5.12
D(INF(-2),2)	−0.23	−0.36	−0.04	−0.04	−0.32
	−2.16	−0.41	−0.20	−2.00	−0.76
C	−8.33	0.921	−0.34	−0.22	−0.22
	−2.30	0.42	−0.15	−0.192	−0.12
DUM	0.18	−0.024	0.05	0.005	0.003
	1.94	−0.39	0.93	0.18	0.07
R-squared	0.88	0.79	0.94	0.65	0.49
Adj. R-squared	0.84	0.72	0.92	0.53	0.31
F-statistic	21.01	11.12	43.38	5.42	2.71

Source: Research Findings

and two interrupts for all variables and interpreting the subject from the meaninglessness of the F-statistic for the interrupt coefficients of their model, concluded that the Texas economy was dependent. Reduced oil and other oil price shocks can not have a devastating effect on employment in the state. In addition to this simple inference from the model in the present study, we will try to create more symmetry with the co-accumulation patterns and the model used in this research will have all the criteria of vector autoregression and the accumulator. Figure 1 shows the instantaneous reaction using the error correction model.

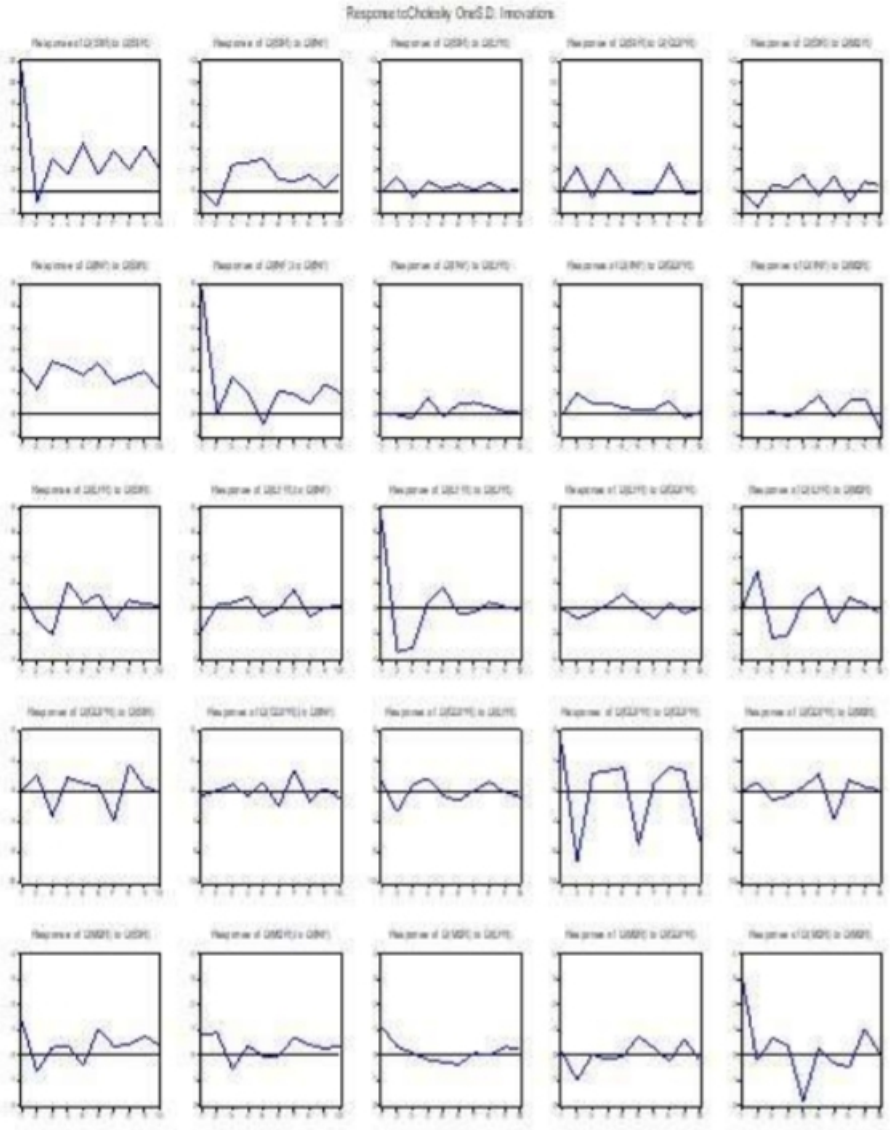

Figure 1: Instantaneous reaction using error correction model

3 Testing research hypotheses based on Granger test

In the present study, Granger causality test is estimated based on a simple linear regression model. The results are presented in Table 5.

Hypothesis zero indicates that this variable is not the causal variable of another variable, and if the probability of hypothesis zero is very low, it means confirmation of the causal cause. As a result, the causal relationship between currency and inflation and the stock price index with GDP is confirmed, but the rest of the relationships are rejected. In Table 5, Granger causality test for the first-order difference mode of variables is also performed. In this case, the best relationship is obtained by expressing cause and effect between the difference of currency changes and stock price index, for which we have no specific economic interpretation.

Table 5: Granger causality test

Results	Statistical probability level (1-p)	Possibility	Number of observations	Amara	Hypothesis Zero $H0$:
Reject the hypothesis	0.61	0.39	0.96	60	D(INF) is not the cause of D(SIR)
Reject the hypothesis	0.43	0.57	0.56	60	D(SIR) is not the cause of D(SIR)
Reject the hypothesis	0.15	0.85	0.16	60	D(M2R) is not the cause of D(SIR)
Reject the hypothesis	0.75	0.24	1.43	60	$D(M2R)$ is not the cause of $D(INF)$
Reject the hypothesis	0.82	0.18	1.79	60	D(INF) is not the cause of D(M2R)

Source: Research Findings

4 Discussion and conclusion

Over the past decades, the interaction of stock returns and macroeconomic variables has been a topic of interest to academia and professional associations. Usually in such circles the debate is whether stock prices are determined on the basis of fundamental macroeconomic variables such as GDP, money supply, exchange rates and the general level of prices (inflation). According to the literature on financial economics, investors generally believe that monetary policy and macroeconomic events have a major impact on stock price volatility. This implies that macroeconomic variables can influence individuals' investment decisions, so the study of the relationship between stock returns and macroeconomic variables has been one of the topics of interest to researchers. According to stock valuation patterns, the current stock price is equal to the present value of its future cash flows. Changes in macroeconomic conditions affect the expected future cash flows and the required rate of return on stocks, which in turn affects the current stock price.

On the other hand, it is necessary to study the general movements of the economy and its various sectors in order to evaluate the performance of the economy and economic planning. For this purpose, using various criteria such as indicators that are designed in each sector and in accordance with the macroeconomic variables, related to the goals and variables specific to that sector. Among the economic variables that play the role of a leading indicator to show the future movements of the country's economy, we can mention the total stock price index in order to express the market movement and show the average changes in the market during Two specific time periods have been designed and created. In this regard, in order to provide the necessary grounds for examining the relationship between macroeconomic variables and stock returns, in the literature chapter, the first topic is an overview of the financial system in the process of economic development. Definition and use of securities market indices, the impact of micro and macro economic variables on the stock price index.

The existence of a dynamic relationship between macroeconomic variables and stock returns has been extensively investigated using expected future cash flow discount models. Because economic variables have major effects on future cash flows and demand returns, they are expected to have a significant impact on stock prices as well.

Empirical research shows that the expected rate of inflation has a negative relationship with stock prices, while it has a positive relationship with the real activities of the economy.

An increase in interest rates increases the cost of the opportunity to hold cash, which in turn reduces the price of stocks by making the maintenance of other interest-bearing securities lighter and heavier.

Theoretically, since the expected increase in the growth rate of money, the expected increase in inflation and a decrease in stock prices occur, as a result, the money supply has a negative impact on stock prices. However, an increase in the money supply leads to an increase in the economy and corporate profits. This is likely to lead to an increase in future cash flows and stock prices, which confirms a positive relationship between money supply and stock returns.

The present study tries to examine the development of capital market (case study: equity stocks) using statistical data of two economic variables, inflation rate and money supply (liquidity). As a result, research needs a suitable

model to achieve this goal. For this purpose, the researcher has chosen his dynamic and strong vector regression model. In designing models for testing hypotheses, especially for variables with time chains (series), it is necessary to point out the pre-constructed and tested models that exist according to the subject of the research hypotheses; Note. Student research is often reluctant to design and build a new model, due to existing bottlenecks, especially in terms of funding and time available to students; Occurs. Therefore, the use of known models and their development and applicability according to the conditions and limitations of any economic or financial system are considered as the best options for students. The exact pattern used in the research was neglected by others. Because each model, in addition to the points, also has weaknesses that must be considered in the final inference of the test. Hypotheses This research has also been tested using the Distributed Interrupt Autoregression (ARDL) model.

Macroeconomic variables and stock returns have been studied extensively. The research is based on the theory that stock prices reflect the present value of the future cash flows of that stock (present value model). For this reason, both future cash flows and the expected rate of return (discount rate) are required. Thus, economic variables affect both future cash flows and expected rates of return, so they can affect stock prices.

The result was the highest correlation between the inflation rate and the stock market price index. The relationship between this price index and its previous interruption was also confirmed. On the other hand, there was no relationship between GDP and liquidity volume and exchange rate with the dependent variable. All the obtained results are consistent with the results of the vector autoregression model. Therefore, the conclusion about rejecting or accepting the research hypotheses will be similar.

If economic policymakers pursue the goal of strengthening the country's capital market, the results of this research can pave the way for many of their monetary and financial decisions. As the model showed, the return on the securities market, which is considered as a market attractiveness for attracting investors, depends on the main components of the economy such as inflation, liquidity and GDP. Thus, the following solutions are proposed: Increased inflation in the current period will lead to an increase in the price index of the securities market in the next period. But in the next 2 periods, this trend will not be continuous and the result will be reversed. Therefore, in the long run, policies that stabilize the monetary situation and inflation of the country will lead to the stabilization and prosperity of the capital market.

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