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Economic Development and the Development of the Securities Market: A Study of China's CSI 300 Index

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Abstract: The Chinese securities market has experienced over two decades of development and has emerged as a significant global investment market. However, compared to other developed securities markets, it still faces issues such as an inadequate institutional framework, irrational investor behavior, and imperfect mechanisms. To explore the relationship between China's economic development and its securities market, this paper employs Eviews time series analysis and VAR modeling for empirical research, aiming to uncover the relationship and operational mechanisms between the two. The findings indicate a certain correlation between economic development and securities market development in China. The variance decomposition reveals that the contribution of economic development to the securities market is relatively low, highlighting a major issue within the Chinese securities market. Consequently, this paper proposes reform suggestions from various perspectives, including institutional, investor, and listed company aspects, to guide the healthy growth of the Chinese securities market and create a favorable environment for economic development.

Keywords: Securities market, Broad money supply, Time series, VAR model.

1. Introduction

The securities markets in developed European and American countries began earlier, with the establishment of the world's first stock exchange in the early 17th century in the Netherlands, the founding of the London Stock Exchange in the 1870s, and the creation of the New York Stock Exchange in the 1920s. In contrast, China's securities market started later, launching pilot operations in the 1990s with the establishment of the Shenzhen Stock Exchange and the Shanghai Stock Exchange. Despite its relatively short history of just over thirty years, it has achieved remarkable milestones.

According to statistics from the China Securities Depository and Clearing Corporation, by February 2021, the number of investors in China reached 180 million. As of March 2021, the total market capitalization of stocks on the Shanghai and Shenzhen exchanges exceeded 78 trillion yuan, with a circulating market value exceeding 64 trillion yuan, and a total of 4,248 listed companies, indicating strong financing capabilities. The achievements of the Chinese securities market place it in a leading position globally. In 1991, the initial market capitalization was only 10.919 billion yuan, but it has attracted attention from global investors over the past thirty years.

Analysis of the investor composition in the Chinese securities market reveals a yearly increase in the proportion of foreign and institutional investors, indicating a trend toward more rational investor behavior focused on value investment, with a growing internationalization of the investor base. The market is gradually maturing, with the issuance system transitioning from an approval-based to an approval-in-principle system, and the gradual advancement toward a registration system. However, it is undeniable that due to its late start, the Chinese securities market still lags behind its developed Western counterparts, facing challenges such as the singular function of securities firms, a relatively small scale of the securities industry, insufficient capital market functionality, and imperfect regulations.

The relationship between the securities market and economic development is a popular research topic among economists both domestically and internationally. In developed economies with mature securities markets, the relationship between the two has not yet reached a unified conclusion, and the situation is even less clear in China.

Therefore, there is a pressing need to study the relationship between the emerging Chinese securities market and economic development. Researching whether a correlation exists and analyzing the mechanisms of influence can facilitate improvements in the Chinese securities market and promote the functioning of the macroeconomy. Ultimately, this research aims to provide a theoretical foundation for China's future economic development.

2. Literature Review

Mukherjee T.K. et al. (1995) conducted a co-integration analysis of the Tokyo Stock Exchange index with macroeconomic data such as GDP and CPI, concluding that there exists a correlation between Japan's macroeconomy and its stock market, indicating that stock market fluctuations can partially explain macroeconomic operations. Adamopoulos Antonios (2010) studied the relationship between the German stock market and economic development from 1986 to 2007, using Johansen co-integration analysis, which revealed a one-way causal relationship where stock market development Granger-causes German economic growth. Sheilla Nyasha and N.M. Odhiambo (2015) explored the causal relationship between financial development and economic growth in both developed and developing countries, finding that the nature of the causality varies significantly across nations. Overall, the varying levels of economic development in different countries influence the degree of stock market maturity; in developed economies, the stock market effectively reflects macroeconomic performance, whereas in less developed regions, the relatively recent establishment of stock markets

limits their economic impact.

Tan Ruyong (1999) investigated the relationship between financial development and economic growth in China, using data from 1993 to 1998 to analyze the regression of stock market capitalization on GDP and transaction volumes, concluding that there is a significant positive correlation between the development of financial intermediaries and economic growth, while the relationship between stock market growth and economic growth is negative but not significant. Shi Zhiheng and Wang Yating (2004) addressed the divergence between the Chinese stock market and economic growth, attributing this to the costs associated with market transformation and regulatory adjustments, suggesting a return to normal growth levels post-adjustment. Wang Zhijun (2012) empirically examined the relationship between the Shanghai Composite Index and China's macroeconomy, finding low contribution rates from various factors affecting the index, including a reverse impact of CPI on the index. Cao Shuyuan (2015) explored the relationship between stock index fluctuations and GDP through a VAR time-series approach, concluding that there is a long-term equilibrium relationship, with the stock market serving as a barometer for economic development. Zhang Xin (2017) identified a long-term equilibrium relationship between the stock market and macroeconomic development in China, noting that while economic factors positively influence the stock market, external variables may play a more significant role. Jin Fang (2017) examined whether the stock market serves as a barometer for the macroeconomy in China and the U.S., finding that while the U.S. stock market effectively reflects economic conditions, the effect remains less pronounced in China due to its underdeveloped market. Thus, domestic scholars present divergent views: some affirm a long-term equilibrium relationship where economic growth promotes stock market prosperity, while others argue that the correlation is weak and the stock market does not serve as an economic barometer.

3. The Relationship Between the Securities Market and Macroeconomic Variables

3.1. Selection of Variables

3.1.1. Selection of Securities Market Indicators

China's securities trading venues include the Shenzhen Stock Exchange and the Shanghai Stock Exchange, each with its representative indices. For instance, the Shanghai Stock Exchange features the SSE 50 index, while a composite index like the CSI 300 encompasses multiple exchanges. In this study, the CSI 300 is selected as the key variable representing the Chinese securities market, as it includes high-quality companies from both major exchanges, providing a comprehensive cross-market index that reflects the overall market situation in China. The CSI 300 consists of a combination of companies from the Shanghai and Shenzhen exchanges, selected based on liquidity, scale, and their ability to represent overall market fluctuations.

3.1.2. Selection of Macroeconomic Indicators

Many indicators reflect economic development in China. After considering the relevance and availability of variables in relation to the securities market, GDP (Gross Domestic Product) is chosen as the primary representative. Additionally, to enhance data richness, M2 (broad money supply) and the interbank lending rate are included as supplementary indicators. GDP represents the total economic output of China, indicating its productive capacity. Cao Shuyuan (2015) also utilized GDP in his research during his master's studies. The money supply supports trading volumes in the securities market; adequate monetary supply provides the necessary funds for market growth, as noted by Wang Zhijun (2012) in his study of the relationship between the SSE index and macroeconomics. The interbank lending rate serves as a representative interest rate in the Chinese financial market, reflecting short-term supply and demand dynamics, and was similarly used by Wang Zhijun (2012) in his analysis of the economic relationship with the stock market.

Definitions of Selected Indicators:

Gross Domestic Product (GDP): The final result of production activities in a region (China) over a specific period (one year), encompassing final goods and services.

Broad Money Supply (M2): This encompasses all forms of money that indicate purchasing power, including circulating cash, demand deposits, time deposits, individual savings, and other deposits.

Interbank Lending Rate: The short-term borrowing rate between financial institutions, representing the cost of funds in the lending market (Table 1).

Table 1. Selected Indicators and Their Corresponding Symbols

Indicators	Hu-Shen 300 Index	Gross Domestic Product	(Broad Money Supply	Interbank Lending Rate
Symbols	HS300	GDP	M2	R

3.2. The Impact of Macroeconomic Variables on Securities Market Development

Gross Domestic Product (GDP) is a key indicator of China's macroeconomic performance, representing the overall level of economic development. During economic upturns, consumer demand for products increases, prompting producers to enhance supply, expand their workforce, and stimulate both production and employment. This strong supply-demand dynamic leads to improved living standards, positive corporate performance, and heightened investor sentiment, attracting more capital into the securities market. This influx results in rising stock prices, encouraging small and medium-sized enterprises to seek financing through the market. Conversely, during economic downturns, weak market demand can lead to oversupply, causing operational difficulties for listed companies. When enterprises lack investment value, investors are likely to exit the market.

The broad money supply (M2) is an important indicator of money supply in China, encompassing all forms of money that can be converted into actual purchasing power. When the money supply increases, investor expectations regarding future returns may decline, leading both individual and institutional investors to allocate funds to the securities market in search of higher value investments, which drives stock prices up. Additionally, an increase in the overall money supply indicates more liquid funds in the market, and the time value of money incentivizes investors to seek higher returns in the securities market, further elevating stock prices. Conversely, a decrease in M2 results in reduced liquidity, leading to higher returns on risk-free investments and prompting investors to opt for safer, more stable assets rather than equities. This decline in investment volume can consequently result in falling stock prices.

The interbank lending rate represents the important settlement price for short-term borrowing among financial institutions, reflecting the cost of borrowed funds. This basic borrowing cost is ultimately passed on to clients who engage in securities transactions. When the cost of borrowing rises, the efficiency of fund utilization significantly decreases, leading to reduced liquidity in the securities market and impacting stock market returns. Conversely, a decrease in the interbank lending rate lowers borrowing costs among institutions, enabling clients to access funds at reduced rates, thus encouraging more capital to flow into the securities market in pursuit of higher returns and enhancing overall market liquidity.

3.3. The Impact of the Securities Market on Macroeconomic Variables

The securities market influences China's macroeconomic landscape primarily through financing. Its primary function is to raise capital by facilitating indirect financing through the issuance of stocks during public offerings. Compared to direct financing, the securities market offers lower transaction costs and can mobilize large amounts of capital in a short time. According to Tobin's Q theory, when the securities market is thriving, stock prices exceed their fundamental values, motivating both individual and corporate investors to establish new enterprises for greater returns rather than pursuing acquisitions of existing firms at a premium. As the number of firms in the market increases and competition intensifies, capital allocation becomes more efficient, flowing into high-quality enterprises and stimulating rapid economic growth.

The securities market also impacts the macroeconomy through the wealth effect. According to Modigliani's life-cycle hypothesis, current expenditure levels are not solely determined by present income but are influenced by anticipated future income. When the securities market performs well, the wealth effect becomes apparent as investors experience significant gains in their asset values. This positive sentiment can enhance future income expectations, resulting in increased personal consumption levels and quality, which stimulates overall societal demand and bolsters the consumption component of macroeconomic activity.

Furthermore, the securities market improves capital allocation efficiency. The Chinese securities market is characterized by good liquidity, enabling investors to adjust their capital portfolios flexibly, thereby mitigating risk while maximizing returns and fostering economic growth. Additionally, the market plays a crucial role in resource allocation. Professional investment teams, such as fund managers, identify undervalued assets for investment, ensuring that funds flow into enterprises that genuinely need them. This alleviates financing challenges and optimizes the utilization of capital, thereby enhancing economic efficiency.

Lastly, the securities market influences China's macroeconomy by standardizing corporate governance practices. The stringent regulations imposed on listed companies enhance their reputation and governance structures. Improved corporate credibility is reflected in stock price levels, thereby increasing the value of the assets available for lending, expanding the scale of loanable funds, and enhancing overall societal credit levels. This funding can then be directed toward social investment and enterprise development, contributing to an increase in total social output.

4. Empirical Analysis Results

4.1. Variable Selection

In this study, the explained variable, the CSI 300 Index, is denoted as HS300. The explanatory variables include Gross Domestic Product (GDP), represented as GDP; the broad money supply (M2), denoted as M2; and the interbank lending rate, represented as R. Additionally, the data is organized chronologically on a quarterly basis, with time recorded as TIME.

4.2. Data and Basic Processing

4.2.1. Data and Sources (Table 2)

Table 2. Study data presentation.

Time	Quarterly GDP (trillion)	M2 (trillion)	CSI 300 Index (points)	Interbank Lending Rate (%)
Q1 2011	10.447	75.813088	3223.29	1.93
Q2 2011	11.8894	78.082085	3044.09	4.56
Q3 2011	12.6562	78.74062	2581.35	3.74
Q4 2011	13.8012	85.15909	2345.74	3.33
Q1 2012	11.7358	89.55655	2454.9	2.58
Q2 2012	13.132	92.49912	2461.61	2.72
Q3 2012	13.809	94.368875	2293.11	2.93
Q4 2012	15.1812	97.415946	2522.95	2.61
Q1 2013	12.945	103.585837	2495.08	2.47
Q2 2013	14.3518	105.440369	2200.64	6.58
Q3 2013	15.2223	107.737916	2409.04	3.47
Q4 2013	16.7772	110.652498	2330.03	4.16
Q1 2014	14.076	116.068738	2146.3	2.49
Q2 2014	15.649	120.95872	2165.12	2.85
Q3 2014	16.5484	120.205141	2450.99	2.97
Q4 2014	18.0829	122.837481	3533.7	3.49
Q1 2015	15.1138	127.533278	4051.2	3.69
Q2 2015	16.855	133.337536	4473	1.44
Q3 2015	17.6597	135.982406	3202.95	2.05
Q4 2015	19.2573	139.227811	3731	1.97
Q1 2016	16.241	144.619803	3218.09	2.09
Q2 2016	18.1408	149.049183	3153.92	2.14
Q3 2016	19.1011	151.63605	3253.28	2.25
Q4 2016	21.1566	155.006667	3310.08	2.33
Q1 2017	18.1868	159.960957	3456.05	2.62
Q2 2017	20.195	163.128253	3666.8	2.94
Q3 2017	21.2789	165.566207	3836.5	2.92
Q4 2017	23.5429	167.676854	4030.85	2.91
Q1 2018	20.2036	173.985948	3898.5	2.74
Q2 2018	22.3962	177.017837	3510.98	2.73
Q3 2018	23.4474	180.166558	3438.86	2.59
Q4 2018	25.8809	182.674422	3010.65	2.57
Q1 2019	21.7168	188.941214	3872.34	2.42
Q2 2019	24.1503	192.136019	3825.59	1.7
Q3 2019	25.1046	195.225049	3814.53	2.55
Q4 2019	27.6498	198.648882	4096.58	2.09
Q1 2020	20.5727	208.092341	3686.16	1.4
Q2 2020	24.8985	213.494866	4163.96	1.85
Q3 2020	26.4976	216.40848	4587.4	1.8
Q4 2020	29.6298	218.679589	5211.29	1.3

4.2.2. Data Preprocessing

Based on the data compiled in Table 2, it can be observed that there are significant disparities among the datasets. The units for Gross Domestic Product (GDP) and broad money supply are in trillion yuan, while the units for the CSI 300 index are in points, and the interbank lending rate is expressed in basis points.

Since both the GDP and broad money supply data are nominal, to enhance the empirical authenticity, this study incorporates the quarterly real GDP figures from the National Bureau of Statistics as the actual GDP data, as well as the real money supply as actual M2.

To minimize absolute differences in the data and reduce empirical errors arising from differing units, while balancing the sensitivity of different datasets, this paper applies a logarithmic transformation to the CSI 300, quarterly real GDP, and quarterly real M2 data. The interbank lending rate in China, which is already expressed as a percentage, will not undergo logarithmic transformation. The selected logarithmic data will contribute to a more stable model structure, thereby improving collinearity and stability. Table 3 presents the results of the logarithmic transformation applied to the selected data.

Table 3. Data Processing and Logarithmic Transformation

Time	Quarterly GDP (trillion)	M2 (trillion)	CSI 300 Index (points)	Interbank Lending Rate (%)
Q1 2011	8.08	2.35	4.33	0.66
Q2 2011	8.02	2.48	4.36	1.52
Q3 2011	7.86	2.54	4.37	1.32
Q4 2011	7.76	2.62	4.44	1.20
Q1 2012	7.81	2.46	4.49	0.95
Q2 2012	7.81	2.58	4.53	1.00
Q3 2012	7.74	2.63	4.55	1.08
Q4 2012	7.83	2.72	4.58	0.96
Q1 2013	7.82	2.56	4.64	0.90
Q2 2013	7.70	2.66	4.66	1.88
Q3 2013	7.79	2.72	4.68	1.24
Q4 2013	7.75	2.82	4.71	1.43
Q1 2014	7.67	2.64	4.75	0.91
Q2 2014	7.68	2.75	4.80	1.05
Q3 2014	7.80	2.81	4.79	1.09
Q4 2014	8.17	2.89	4.81	1.25
Q1 2015	8.31	2.72	4.85	1.31
Q2 2015	8.41	2.82	4.89	0.36
Q3 2015	8.07	2.87	4.91	0.72
Q4 2015	8.22	2.96	4.92	0.68
Q1 2016	8.08	2.79	4.97	0.74
Q2 2016	8.06	2.90	5.00	0.76
Q3 2016	8.09	2.95	5.02	0.81
Q4 2016	8.10	3.05	5.04	0.85
Q1 2017	8.15	2.90	5.07	0.96
Q2 2017	8.21	3.01	5.09	1.08
Q3 2017	8.25	3.06	5.11	1.07
Q4 2017	8.30	3.16	5.12	1.07
Q1 2018	8.27	3.01	5.16	1.01
Q2 2018	8.16	3.11	5.18	1.00
Q3 2018	8.14	3.15	5.19	0.95
Q4 2018	8.01	3.25	5.21	0.94
Q1 2019	8.26	3.08	5.24	0.88
Q2 2019	8.25	3.18	5.26	0.53
Q3 2019	8.25	3.22	5.27	0.94
Q4 2019	8.32	3.32	5.29	0.74
Q1 2020	8.21	3.02	5.34	0.34
Q2 2020	8.33	3.21	5.36	0.62
Q3 2020	8.43	3.28	5.38	0.59
Q4 2020	8.56	3.39	5.39	0.26

4.2.3. Basic Data Analysis

Based on the results obtained from the basic processing of the data, the trend chart for Gross Domestic Product (GDP), broad money supply (M2), CSI 300 (HS300), and interbank lending rate (R) from quarterly data (2011 to 2020) is presented below:

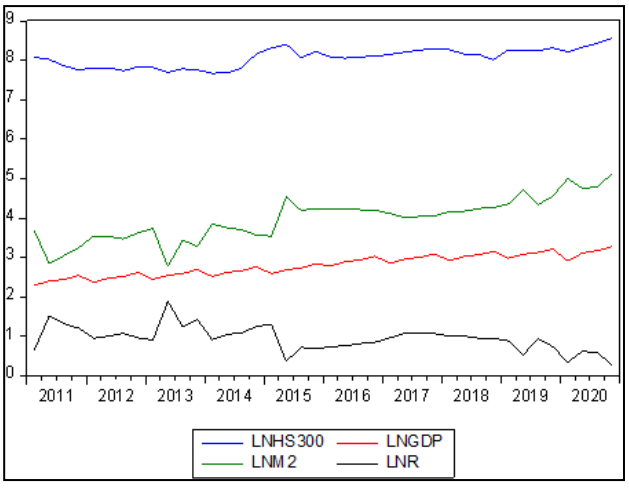

Figure 1. Trend Chart of LNGDP, LNM2, LNHS300, and LNR by QUARTERLY

From the above chart, it can be observed that within the

selected time frame (2011-2020), the data for GDP, M2, and HS300 generally exhibit an upward trend year by year, while the selected data for R shows a declining trend. From an economic perspective, China's interbank lending rate represents the borrowing rate for short-term funds in the financial market, which indirectly influences the choice of China's deposit and loan interest rates. A long-term downward fluctuation in the interbank lending rate indicates a reduction in the cost of capital market financing, which is conducive to the upward growth of China's money supply, GDP, and the stock market.

Table 4. Descriptive Statistics.

	LnHS300	LnGDP	LnM2	LnR
Mean	8.0681	2.7979	3.9782	0.9409
Median	8.0961	2.8079	4.0828	0.9497
Maximum	8.5586	3.2722	5.1253	1.8840
Minimum	7.6715	2.2915	2.7738	0.2624
Std.Dev.	0.2377	0.2681	0.5562	0.3206
Observations	40	40	40	40

Table 5. Correlation analysis table between explanatory and interpreted variables

Correlation	LnHS300	LnGDP	LnM2	LnR
LnHS300	1			
LnGDP	0.7253	1		
LnM2	0.7509	0.7946	1	
LnR	-0.5737	-0.4509	-0.8791	1

Through covariance analysis, the correlation coefficients of LnHS300 with LnGDP, LnM2, and LnR are found to be 0.7253, 0.7509, and -0.5737, respectively. This indicates a positive correlation between the CSI 300 and both GDP and broad money supply, while a negative correlation exists with the interbank lending rate.

4.2.4. Model Construction

The logarithmic transformation of the data facilitates the reduction of variable scales, helping to alleviate the impact of heteroscedasticity. Thus, the following logarithmic model is constructed,

$$LnHS300_t = C + \beta_1 LnGDP_t + \beta_2 LnM2_t + \beta_3 LnR_t + \delta$$

Where β_1, β_2 and β_3 the parameters to be estimated, δ represents the residual term.

4.3. Empirical Analysis

4.3.1. Unit Root Test

The empirical analysis method selected for this study combines time series analysis and the VAR model. Time series analysis has several assumptions, such as the stationarity of the series. However, many series in reality are non-stationary, leading to adverse empirical outcomes, such as spurious regression. Therefore, it is essential to test the stationarity of each series before proceeding with time series analysis.

This study employs the ADF test to assess the stationarity of the time series. In the test formulation, C represents the constant term, T represents the trend term, and K represents the lag period. The choice of intercept in the test equation is based on the minimum values of AIC, SC, and HQ. If the P-value determined by the minimum value is still greater than 0.05, the series is considered non-stationary. If the dependent variable LnHS300 is non-stationary, then the other explanatory variables are also deemed ineffective. Consequently, first-order differencing will be used for empirical analysis, with D1 indicating first-order differencing and D2 indicating second-order differencing.

Table 6. ADF Test

Variable	Test Form	ADF Test Value	Critical Value (5%)	Critical Value (10%)	P-value	Test Result
LnHS300	(C, T, 9)	-3.0305	-3.5297	-3.1964	0.1373	Non-stationary
LnGDP	(C, T, 9)	-1.8212	-3.5443	-3.2047	0.6728	Non-stationary
LnM2	(C, T, 9)	-5.2542	-3.5297	-3.1964	0.0006	Stationary (Rejected)
LnR	(C, T, 9)	-5.3041	-3.5298	-3.1964	0.0005	Stationary (Rejected)
D (LnHS300, 1)	(0, 0, 9)	-6.1178	-1.9499	-1.6115	0.0000	Stationary
D (LnGDP, 1)	(C, 0, 9)	-2.3625	-2.9484	-2.6129	0.1593	Non-stationary
D (LnM2, 1)	(C, T, 9)	-9.8206	-3.5331	-3.1983	0.0000	Stationary
D (LnR, 1)	(C, T, 9)	-10.0362	-3.5330	-3.1982	0.0000	Stationary
D (LnHS300, 2)	(0, 0, 9)	-11.5548	-1.9501	-1.6113	0.0000	Stationary (5%)
D (LnGDP, 2)	(0, 0, 9)	29.8903	-1.9507	-1.6111	0.0000	Stationary (5%)
D (LnM2, 2)	(0, 0, 9)	-4.8157	-1.9517	-1.6106	0.0000	Stationary (5%)
D (LnR, 2)	(0, 0, 9)	-4.8527	-1.9517	-1.6105	0.0000	Stationary (5%)

From the results of the ADF test in the above table, it is evident that only the dependent variable for broad money supply and the interbank lending rate show stationarity in the original series, while the original series for HS300 is non-stationary. In first-order differencing, HS300, broad money supply, and the interbank lending rate show stationarity at the 5% significance level, while GDP remains non-stationary. In second-order differencing, all variables exhibit stationarity at the 5% significance level. Next, a cointegration test will be conducted on the second-order differenced series.

4.3.2. Cointegration Test

Cointegration refers to establishing a model for non-stationary time series to test the long-term equilibrium relationship between variables. This study will employ the E-G two-step method to test the residual series.

In the first step, a simple linear regression is performed on all variables, yielding the results shown in figure 2. All regression results indicate t-values greater than 0, signifying significance, thus no variables need to be excluded. The following is the simple linear regression result for second-order integration:

$$D2LnHS300_t = 6.3958 + 0.3090 D2LnGDP_t + 0.2029 D2LnM2_t + 0.0005 D2LnR_t + e_t$$

Dependent Variable: LNHS300
Method: Least Squares
Date: 04/21/21 Time: 20:41
Sample: 2011Q1 2020Q4
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDP	0.309008	0.294204	1.050319	0.3006
LNM2	0.202928	0.265655	0.763876	0.4499
LNR	0.000504	0.313524	0.001606	0.9987
C	6.395785	0.661272	9.671937	0.0000

R-squared	0.608778	Mean dependent var	8.068140
Adjusted R-squared	0.576176	S.D. dependent var	0.237785
S.E. of regression	0.154802	Akaike info criterion	-0.798701
Sum squared resid	0.862691	Schwarz criterion	-0.629813
Log likelihood	19.97402	Hannan-Quinn criter.	-0.737637
F-statistic	18.67313	Durbin-Watson stat	0.722345
Prob(F-statistic)	0.000000		

Figure 2. OLS regression model.

In the second step, a unit root test is conducted on the residual series, choosing the unit root test "without drift and trend," with the following results (Figure 3).

Null Hypothesis: D(ECM,2) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.662404	0.0000
Test critical values:	1% level	-2.628961	
	5% level	-1.950117	
	10% level	-1.611339	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ECM,3)
Method: Least Squares
Date: 04/21/21 Time: 20:48
Sample (adjusted): 2011Q4 2020Q4
Included observations: 37 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ECM(-1),2)	-1.405341	0.145444	-9.662404	0.0000

R-squared	0.721557	Mean dependent var	0.006924
Adjusted R-squared	0.721557	S.D. dependent var	0.298063
S.E. of regression	0.157281	Akaike info criterion	-0.834912
Sum squared resid	0.890542	Schwarz criterion	-0.791374
Log likelihood	16.44588	Hannan-Quinn criter.	-0.819563
Durbin-Watson stat	2.226354		

Figure 3. Unit Root Test of Residuals

The results show that P-value = 0 < 0.05, leading to the rejection of the null hypothesis. This indicates that the residual series does not contain a unit root and is stationary. Therefore, there exists a cointegration relationship between HS300 and GDP, M2, and R, with the cointegration equation as follows:

$$D2LnHS300_t = 6.3958 + 0.3090 D2LnGDP_t + 0.2029 D2LnM2_t + 0.0005 D2LnR_t + e_t$$

4.3.3. Granger Causality Test

Through the cointegration test, it can be concluded that there is a causal relationship between the explanatory variables and the dependent variable, meaning that the lag of one variable impacts the current value of another. Thus, a Granger causality test will be conducted to examine the relationship between HS300 and broad money supply, GDP, and the interbank lending rate. The results will be based on the P-values, with smaller P-values indicating more significant Granger causality.

Figure 4 displays the bidirectional Granger causality test results between HS300 and GDP, broad money supply, and the interbank lending rate.

In the first step, the optimal lag period for the Granger causality test is determined by establishing a VAR model, yielding the lag information values shown in Figure 4. First, the AIC and SC values for the lag order are compared, observing values of 4 and 8, respectively. Finally, by considering HQ and LR values, the optimal lag order (indicated by an asterisk) is confirmed to be 4 periods.

VAR Lag Order Selection Criteria
Endogenous variables: DLNHS300 DLNGDP
Exogenous variables: C
Date: 04/21/21 Time: 22:41
Sample: 2011Q1 2020Q4
Included observations: 31

Lag	LogL	LR	FPE	AIC	SC	HQ
0	42.21356	NA	0.000256	-2.594423	-2.501908	-2.564265
1	47.33836	9.257707	0.000238	-2.666991	-2.389445	-2.576518
2	49.09067	2.939360	0.000277	-2.521979	-2.059402	-2.371190
3	71.38269	34.51668	8.59e-05	-3.702109	-3.054502	-3.491006
4	83.30770	16.92581*	5.25e-05	-4.213400	-3.380762*	-3.941981
5	87.38484	5.260828	5.38e-05	-4.218377	-3.200708	-3.886642
6	94.70475	8.500539	4.55e-05	-4.432564	-3.229865	-4.040515
7	100.0435	5.511002	4.46e-05*	-4.518937*	-3.131208	-4.066572*
8	103.1006	2.761204	5.21e-05	-4.458102	-2.885342	-3.945421

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Figure 4. Optimal Lag Period Determination

In the second step, since the regression model did not determine a balance relationship between LnGDP, LnM2, and LnHS300, the causality test is conducted here. Setting the lag period to 4 in Eviews, if the accompanying probability is greater than 0.10, the null hypothesis is accepted, indicating no causal relationship. Conversely, the null hypothesis is rejected.

Table 7. Granger Causality Test

Original Hypothesis	Lag Order	F-Statistic	Probability
DLnGDP does not Granger-cause DLnHS300	4	0.6965	0.6013
DLnHS300 does not Granger-cause DLnGDP	4	1.4146	0.2507
DLnM2 does not Granger-cause DLnHS300	4	0.6118	0.6578
DLnHS300 does not Granger-cause DLnM2	4	2.2909	0.0866
DLnR does not Granger-cause DLnHS300	4	0.6795	0.6124
DLnHS300 does not Granger-cause DLnR	4	2.1806	0.0992

It can be observed that DLnHS300 is a Granger cause of DLnM2, and DlnHS300 is a Granger cause of DLnR. However, DLnGDP and DLnHS300 do not exhibit Granger causality towards each other. Therefore, the GDP variable is deemed insignificant, and the variable for GDP will be excluded from further empirical research.

4.4. Establishing the VAR Model

The VAR model, also known as the Vector Autoregression model, involves constructing multiple regression equations and linking them to form a system of equations. The dependent variables in each equation are the endogenous variables, while the explanatory variables are the endogenous lagged terms of these dependent variables.

In the first step, the lag order for the VAR model is selected based on AIC and SC information criteria, with smaller values indicating a better fit for the optimal lag order. From the previous Granger causality test, the optimal lag order was determined to be 4, so this study selects 4 as the lag order.

In the second step, the CSI 300, interbank lending rate, and broad money supply are all treated as endogenous variables, and the VAR model is established using Eviews software with a lag order of 4. The stability analysis results are shown in figure 5, where all points for lag 4 fall within the unit circle, indicating a stable model.

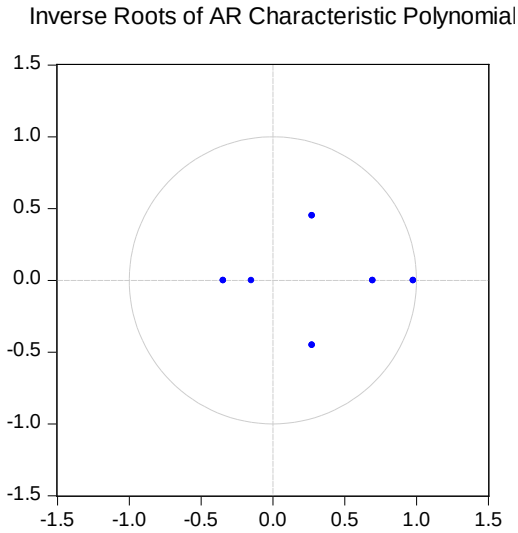

Figure 5. VAR stability analysis

Once the lag order is determined, the constant term is treated as an exogenous variable, yielding the VAR estimation results as shown in Figure 6.

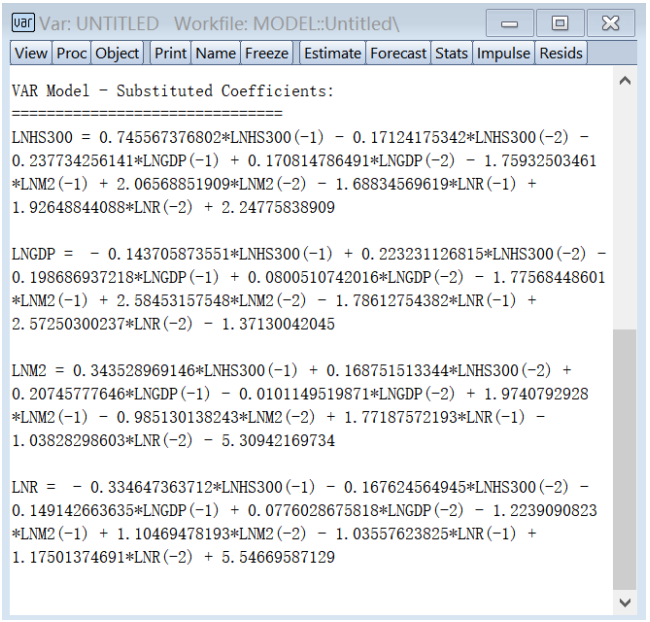

Figure 6. VAR Parameter Estimation Results

In the third step, impulse response analysis and variance decomposition are conducted on the VAR model. Impulse response measures the degree of response of the dependent variable to an impulse in the error term of the time series. The horizontal axis of the impulse response chart represents the lag periods (1-10), indicating the number of lagged quarters, while the vertical axis represents the rate of change of the dependent variable, with the upper side indicating positive correlation and the lower side negative correlation. The solid line represents the impulse response function, illustrating the response of the dependent variable to the impulse from the explanatory variable, while the dashed lines indicate the bands of deviation of two standard deviations (Figure 7).

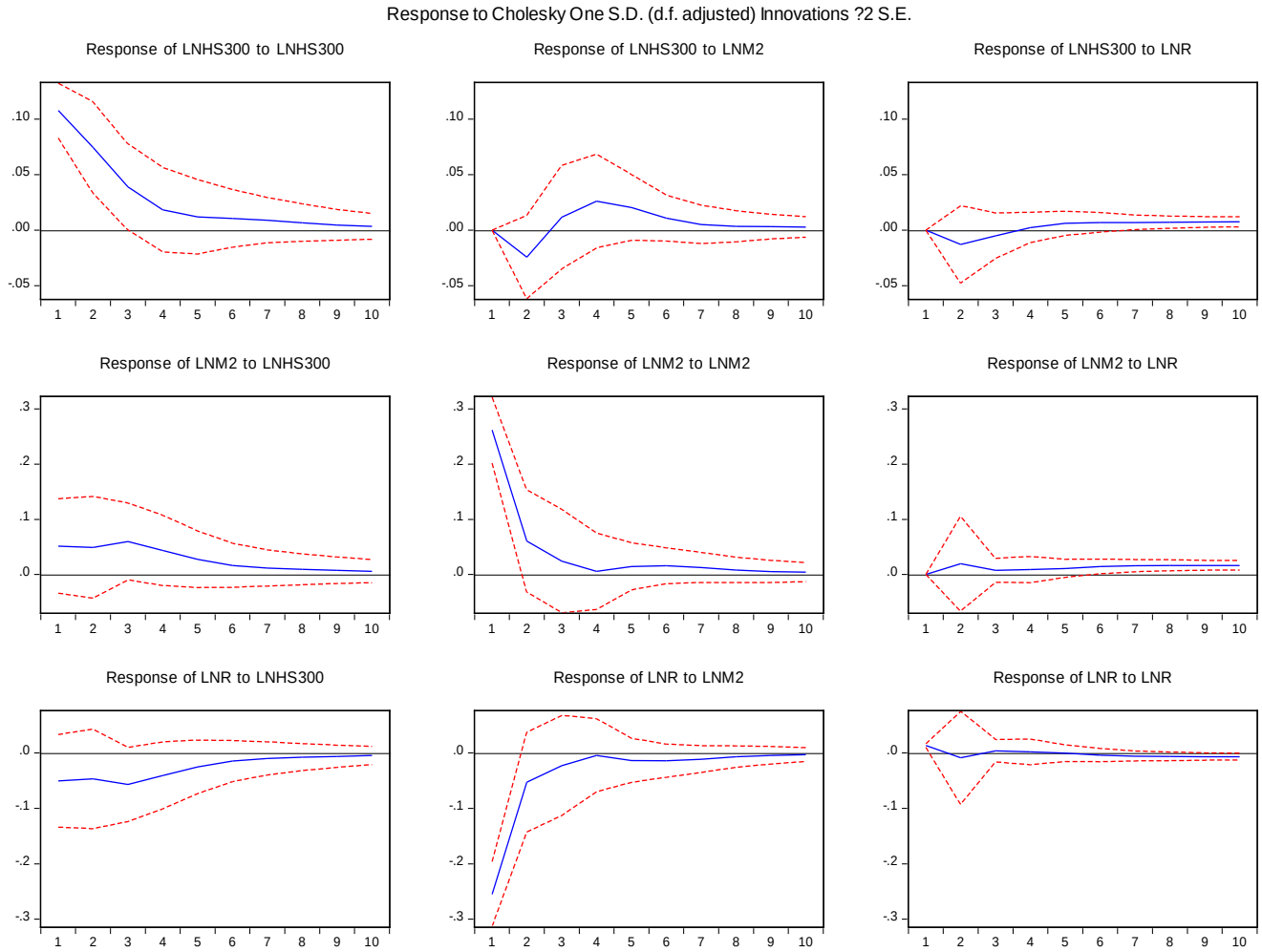

Figure 7. Impulse Response Results

The first row shows the dynamic effects of the CSI 300 (LnHS300) receiving a one standard deviation impulse on the VAR model over 10 periods. The impact of LnHS300 is positive, gradually stabilizing and diminishing over the first 5 quarters, and approaching negligible influence after the fifth quarter. The impulse from the broad money supply (LnM2) has a significant effect only in the first two quarters, gradually weakening from the fifth quarter onward. The impact of the interbank lending rate (LnR) peaks slightly in the second quarter, then declines from the third quarter until it is fully absorbed. Overall, the CSI 300 does not influence China's interbank lending rate; its increase leads to a rise in broad money supply that lasts for 7 quarters before returning to its original state.

The second row illustrates the dynamic effects of a one standard deviation impulse from broad money supply (LnM2) on the VAR model over 10 periods. The impact on the CSI 300 (LnHS300) reaches its peak in the first three quarters, with subsequent shocks gradually being absorbed; the influence of LnM2 is significant in the first three quarters, tapering off by the fourth quarter; the interbank lending rate (LnR) shows minimal impact throughout. Thus, the increase in broad money supply results in a rise in the CSI 300 for 6 quarters, while only a slight increase in the interbank lending rate occurs in the first two quarters.

The third row depicts the dynamic effects of a one standard deviation impulse from the interbank lending rate (LnR) on the VAR model over 10 periods. The CSI 300 (LnHS300) experiences the greatest impact in the first three quarters, predominantly negative, gradually dissipating to negligible effect by the fourth quarter. The influence of LnM2 remains negative for the first four quarters before being absorbed to a lower level; the impact on LnR is nearly negligible throughout the period. Therefore, a decline in the interbank lending rate corresponds to a rise in the CSI 300 for 3 quarters and an increase in broad money supply for 4 quarters, both returning to negligible impact thereafter.

Variance decomposition refers to the attribution of variance in the dependent variable.

Table 8. Variance Decomposition Results for LnHS300

Period	Standard Deviation	CSI 300	Broad Money Supply	Interbank Offered Rate
1	0.1078	100.00	0.0000	0.0000
2	0.1339	95.7840	3.2926	0.9233
3	0.1401	95.3188	3.7025	0.9787
4	0.1437	92.2293	6.8153	0.9554
5	0.1457	90.3226	8.5734	1.1041
6	0.1467	89.6898	9.0006	1.3096
7	0.1472	89.4257	9.0565	1.5178
8	0.1475	89.1993	9.0658	1.7350
9	0.1478	88.9540	9.0751	1.9710
10	0.1481	88.6989	9.0759	2.2216

According to the above table, aside from considering the contribution of the CSI 300 to itself, the broad money supply has the highest contribution to the CSI 300, peaking at 9.0759% in the 10th period, indicating significant potential for increased contribution in the later stages. Conversely, the

impact of the interbank lending rate on the CSI 300 shows a slow upward trend, reaching a peak of 2.2216% in the 10th period. Overall, as time progresses, the contributions of explanatory variables to the dependent variable will become increasingly significant.

5. Conclusion and Recommendations

(1) Research Conclusions

This study examined the relationship between the representative indices of the securities market and economic development in China from January 2011 to December 2020 using Eviews econometric models. The empirical results indicate a long-term equilibrium relationship between the Chinese securities market and economic development, leading to the following conclusions:

The CSI 300 and broad money supply exhibit a unidirectional causal relationship, where the CSI 300 is the Granger cause of the broad money supply. The impulse response indicates a positive correlation from the broad money supply to the CSI 300, maintaining this positive effect after seven periods. Conversely, the CSI 300 also shows a long-term positive response to changes in the broad money supply. Variance decomposition reveals that fluctuations in the broad money supply significantly contribute to changes in the CSI 300, with increasing contributions over time. Correlation analysis confirms a positive relationship: when broad money supply grows, it contributes to an upward trend in the securities market.

There is also a unidirectional causal relationship between the CSI 300 and the interbank lending rate, with the CSI 300 being the Granger cause of the interbank lending rate. The impulse response shows a negative impact from the interbank lending rate on the CSI 300 in the first four periods, followed by a slight positive response after the fifth period, warranting further exploration. In contrast, the CSI 300's response to the interbank lending rate remains predominantly negative over the long term. Variance decomposition shows that changes in the interbank lending rate also have a certain contribution to the CSI 300, increasing yearly. Correlation analysis indicates a negative relationship: as the cost of interbank lending rises, financing costs in the securities market increase, leading to a decline in market performance.

The empirical analysis shows no causal relationship between GDP and the CSI 300, leading to the exclusion of GDP from the study. Despite China's economy maintaining positive growth over the past decade, the stock market has experienced significant fluctuations, reflecting a large disparity between the two. Thus, GDP was excluded from the analysis.

In conclusion, while there exists a Granger causality between economic development and securities market development, the contribution attributed to economic development through variance decomposition is relatively low, with the broad money supply having the highest contribution, which did not exceed 10% by the 10th period. The CSI 300's own contribution remains significant, highlighting issues within the Chinese securities market.

Research Recommendations

Based on the empirical findings and the current state of China's economic development and securities market, this paper proposes the following strategies for reforming the securities market and promoting macroeconomic development in China:

A. Accelerate the Implementation of the Registration System for Stock Issuance: Listed companies serve as a crucial bridge between China's securities market and economic development. However, some companies pursue listing primarily for profit rather than effective management, leading to issues such as financial fraud, inadequate profitability, and significant stock sales by management, which harm small investors. These behaviors are considered black swan events in the securities market. To reduce their occurrence, a stricter approval system for company listings is necessary to prevent fraud. Additionally, implementing a registration system for stock issuance will provide the securities market with more vibrant, high-quality companies, enhancing the market and economic development.

B. Enhance Legal Regulations in Financial and Securities Markets and Ensure Strict Enforcement: The late development of China's securities market has resulted in an immature legal and regulatory framework, compounded by various factors causing market volatility and instability. Issues such as insider trading, price manipulation, financial fraud, and the spread of false information threaten the healthy development of the stock market. Therefore, it is essential to focus on improving legal regulations, imposing strict penalties for actions that disrupt financial order, and guiding investors toward value investing to promote healthy market growth.

C. Reform State-Owned Enterprises (SOEs) to Integrate Them into a Market Economy: The current state of Chinese SOEs often relies on government support in times of profit or loss, creating an unequal competitive environment compared to small and private enterprises. It is vital to foster a competitive environment by encouraging financial institutions to lend more to small and innovative, environmentally-friendly enterprises. This approach will promote entrepreneurship and innovation, adding new momentum to China’s market economy.

D. Strengthen Education for Retail Investors and Encourage the Establishment of Financial Investment Institutions**: Investors are a vital component of China’s securities market, yet most lack the expertise necessary for professional investing, often leading to subjective decision-making and difficulty in identifying investment risks. This situation makes them vulnerable to exploitation by institutional investors. Thus, enhancing investor education is crucial to protect the legal rights of shareholders. On the other hand, supporting the development of institutional investors can help by entrusting specialized tasks to professional teams, improving the overall quality of investors in China's stock market. Over time, this will guide both individual and institutional investors toward value investing, fostering healthy development in the Chinese stock market.

References

[1] Mukherjee T K, Naka A. Dynamic relations between macroeconomic variables and the Japanese stock market: an application of a vector error correction model [J]. Journal of Financial Research, 1995, 18(2): 233-237

[2] Adamopoulos Antonios. Stock Market And Economic Growth: An Empirical Analysis For Germany [J]. Economic Thought and Practice, 2010.

[3] Sheilla Nyasha, N. M. Odhiambo. Economic growth and market-based financial systems: a review [J]. Stydies in Economics and Finance, 2015, 32(2): 235-255

[4] BROWN J R, MARTINSSONG, PETERSENBC. Stock market, credit markets, and technology-led growth [J]. Journal of Financial Intermediation, 2016, 11(4): 1-15.

[5] Tan, R. Y. (1999). An empirical study on the relationship between financial development and economic growth in China. Economic Research, (10), 53-61.

[6] Shi, Z. H., Wang, Y. T., & Wang, Y. (2004). An analysis of the divergence between the Chinese stock market and macroeconomy. Journal of Northwest A&F University (Social Science Edition), (01), 69-72.

[7] Wang, Z. J. (2012). An empirical study on the relationship between the Shanghai Composite Index and China's macroeconomy. Shanxi University of Finance and Economics.

[8] Cao, S. Y. (2015). An empirical study on the relationship between stock index fluctuations and GDP in China. Yunnan University of Finance and Economics.

[9] Gu, Y. F. (2016). A study on the "sunshine and rain" effect of the Chinese stock market under a time-varying framework. University of Science and Technology of China.

[10] Jin, F. (2017). Is the Chinese stock market a barometer of the national macroeconomy? Shanxi University of Finance and Economics.

[11] Zhang, X. (2017). An empirical analysis of the relationship between the Chinese stock market and macroeconomic operations. University of Chinese Academy of Sciences (Wuhan Institute of Physics and Mathematics).