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MACROECONOMIC VARIABLES AND STOCK PRICES IN CHINA

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Abstract

This article examines the equilibrium relationships between selected macroeconomic variables and stock returns in China stock market during the period 2002 to September, 2024. Empirical results show that long run equilibrium relationship exists between inflation, consumer price index (CPI), exchange rate, annual growth rate of money supply and interest rate and the stock prices in China stock market. Besides, the long-term impacts of annual growth rate of money supply and interest rate on SSEC index are positive. The effect of CPI and exchange rate on SSEC index is negative.

Keywords: Consumer Price Index, CPI, Stock Returns, Inflation, Exchange Rate, Money Supply, Interest Rate

INTRODUCTION

It is widely accepted that the stock returns are partially predictable by using publicly available information about macroeconomic fundamentals. Although the precise cause and effect relationship between macroeconomic variables and stock prices is not known, they are believed to be related. The existing empirical evidence on the long term relationship between economic variables and stock returns is mixed because of the different data sets and testing methods used (see for example, Cutler et al., 1989; Cochrane, 1991; Frennberg and Hansson, 1993; Chappel, 1997). Furthermore, evidence of stock return predictability using macro-economic variables for emerging markets is rather scarce while such evidence is extensively available for the developed economies. Moreover, the predictability of returns by using macro-economic information could be regarded as evidence of market inefficiency.

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. By investigating the long term relationship between macro-economic variables and stock returns, conclusions regarding the efficiency of the stock market can be derived and relevant policy regulations to improve stock market conditions can be assessed.

LITERATURE REVIEW

Fama (1991) suggests that stock prices reflect earnings, dividends and interest rate expectations as well as information about future economic activity. Moreover, stock returns affect the wealth of investors which in turn affects the level of consumption and investment. The development of cointegration technique by Granger (1986) and Engle and Granger (1987) has motivated research on short term and long term relationships between variables of interest. Further, the development of the Error Correction Model (ECM) has facilitated examination of dynamic co-movements and the adjustment process towards the long-term equilibrium amongst the variables.

The aim of this study is to investigate the long term equilibrium relationship between macroeconomic variables and stock returns for China stock market. Specifically, using Cointegration techniques and the Error-Correction model, the study investigates whether a set of economic variables i.e., the inflation, money supply, exchange rate and interest rate could be used in predicting stock returns in China stock market.

Macroeconomic variables such as inflation, money supply, exchange rates, etc. have been identified as some of the major determinants of stock prices (see for example, Fama, 1981; Chen et al., 1986; Smith and Sims, 1993; Flannery and Protopapadakis, 2002, etc.). Hence, it is important to understand how these variables relate to the stock market and specifically their potential impact on stock price formation. It is suggested that money supply changes affect stock prices directly through portfolio changes and indirectly through their effects on real activity variables (see for example, Darrat, 1990; Dhakal et al., 1993). Specifically, under the assumption of the liquidity preference hypothesis, an increase in money supply is expected to lower the interest rate thus raising the stock prices. Similarly, the relationship between inflation and stock returns has been a matter of considerable interest since Fisher (1930) suggested that common stocks are considered a good hedge against inflation since they represent a claim on real assets whose value is assumed to be independent of the inflation rate. The empirical evidence however, suggests that high and variable inflation rates increase inflation uncertainty and thus lower share value. Specifically, high levels of inflation generate greater uncertainty which, in turn, increases the risk premium demanded by investors for holding equity, hence decreasing the stock prices (Malkiel, 1979). Further research also supports the hypothesis that stock returns are

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negatively related to both expected and unexpected inflation rate. However, Caporale and Jung (1997) reject the hypothesis that stock returns and inflation are negatively correlated while Chatrath et al. (1997) and Adrangi et al. (1999) only partially support this hypothesis in the developing stock markets of India, Peru and Chile respectively. Further, Joo (2000) examines whether monetary policy accounts for the negative relationship between real stock returns and inflation. His evidence suggests that that about 30% of the observed negative relationship is attributed to monetary innovations. In more a recent study, Choudhry (2001) shows that past rates of inflation influence the current stock returns. In contrast to evidence of negative relationship reported by previous research, Choudhry finds a positive relationship between inflation and stock prices in high inflation economies of Argentina, Chile, Mexico and Venezuela.

Another macroeconomic variable is the exchange rate since currency movements expose firms to substantial financial risks. There are numerous studies investigated the relationship between exchange rate movements and stock returns using data from developed markets. In the case of developing countries, Abdalla and Murinde (1997) investigate the interactions between exchange rates and stock prices in the emerging financial markets of India, Korea, Pakistan and Philippines. Using the cointegration and Granger tests, they report unidirectional causality from exchange rates to stock prices in all the countries, except the Philippines. They also find evidence of a long-run relationship between exchange rates and stock returns for India and Pakistan. More recently, Granger, Huang and Yang (2000) using a BVAR model, examine the relationship between stock prices and exchange rates for nine Asian countries and find mixed results. While their findings suggest no relationship between the stock and the exchange rate for Japan and Indonesia, they find that exchange rates lead stock prices in Korea, whereas stock prices lead exchange rates in Hong Kong, Malaysia, Thailand and Taiwan. Grambovas (2003) examines the interaction between exchange rate fluctuations and equity prices. Using data from three European emerging financial markets including Greece, Czech Republic and Hungary, Grambovas finds a strong link between foreign exchange and capital markets in Greece and Hungary.

Hatemi (2002) provides evidence on the Korean stock market suggesting that it is efficient with respect to incorporating information regarding monetary policy changes. More recently, Ibrahim et al. (2003) has examined the dynamic linkages between stock prices and four macroeconomic variables for the case of Malaysia using cointegration and vector autoregression. Their results suggest presence of a long-run relationship between these variables and the stock prices and substantial short-run interactions among them.

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RESEARCH METHODOLOGY

The sample period of this study starts from 2002 and ends in September, 2024. The data used in this study consists of monthly closing prices of the Shanghai Stock Exchange Composite Index (here after as SSEC), Annual growth rate of Money Supply (M2), Annual growth rate of Consumer Price Index (CPI), Exchange Rate (domestic currency per US dollar) (EX), and Overnight lending rate (I).

Study applied both descriptive and inferential statistics were applied. When analyzing non-stationary data, Unit root tests are used to detect the presence and form of non-stationarity. Firstly, we employed Augmented Dicker-Fuller (ADF) unit test to test if the macroeconomic variables are stable. After confirming the I(1) process of each variable and the I(0) process of all the combinations among variables of this study, we begin to determine if the cointegration model are existed. Second, we test for multivariate cointegration test employing the Johansen Cointegration Tests. Third, once the long-run relationship is confirmed, we carry on the test of Vector Error Correction Models.

FINDINGS

Figure 1 displays the monthly volatility of the five variables in this study. Table 1 reports the descriptive statistics of the variables. In Table 2 shows the coefficient of correlation matrix for these five variables.

Table 1. Descriptive statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
SSEC	2656.01	2842.21	5954.77	1060.74	863.83	0.2976	3.6210
M2	15.50	15.32	30.52	4.85	5.27	0.5539	3.1608
CPI	2.18	1.90	8.70	-1.80	1.94	0.7747	3.9075
EX	7.03	6.83	8.28	6.05	0.71	0.6606	2.1244
I	2.13	2.06	6.43	0.81	0.68	1.3026	8.4926

Table 2. Coefficient of Correlation Matrix

	SSEC	M2	CPI	EX	I
SSEC	1	-0.4274	0.2074	-0.5085	-0.0258
M2	-	1	-0.0504	0.2130	-0.1302
CPI	-	-	1	-0.1085	0.3712
EX	-	-	-	1	-0.3217
I	-	-	-	-	1

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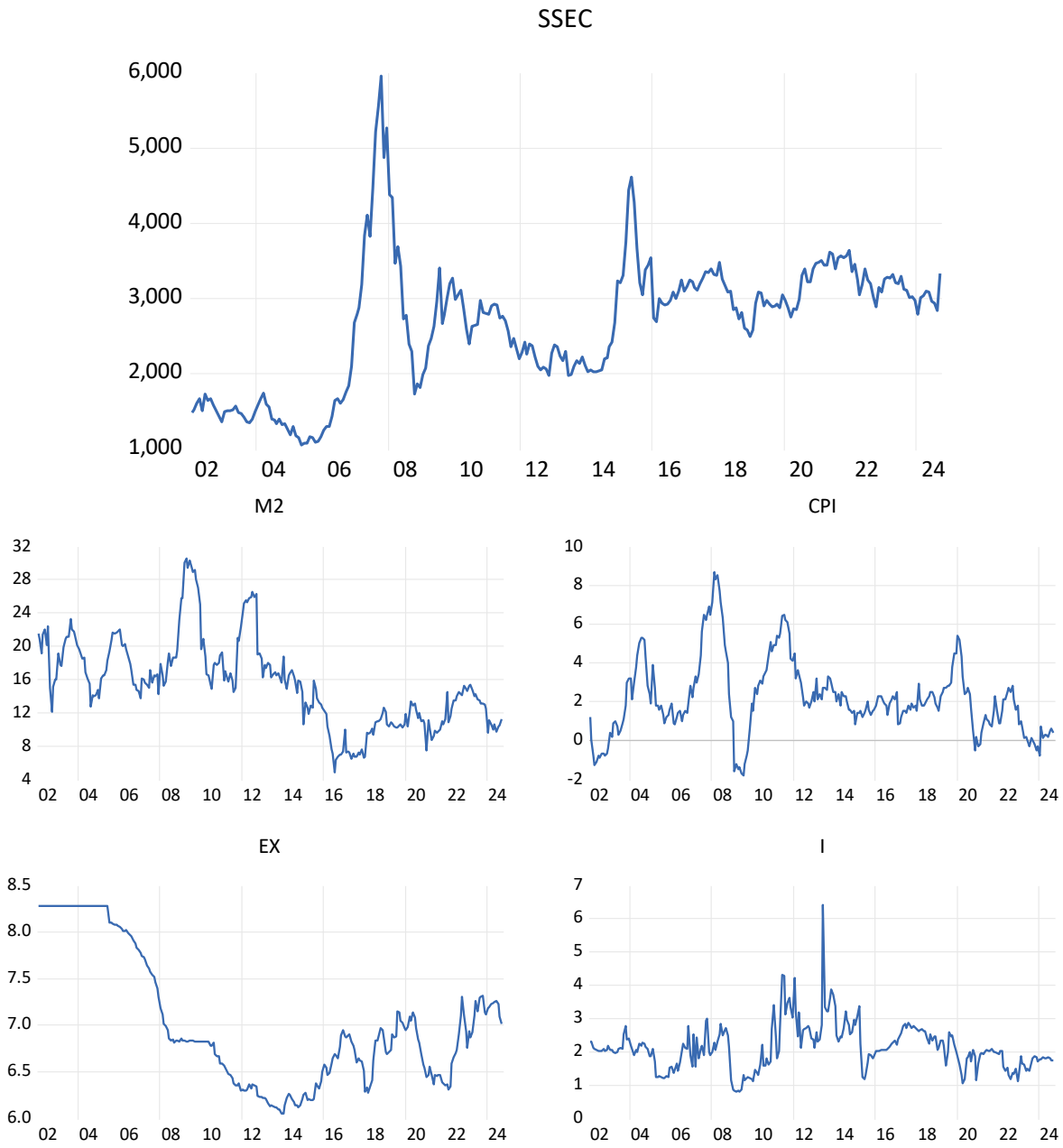

Figure 1. Monthly volatility for all five variables in this study

Unit Root Tests

A nonstationary time series is called integrated if it can be transformed by first differencing once or a very few times into a stationary process. The order of integration is the minimum number of times the series needs to be first differenced to yield a stationary series. An integrated of order 1 time series is denoted by I(1). A stationary time series is said to be integrated of order zero, I(0). The statistics of Augmented Dicker-Fuller (ADF) unit test are reported in Table 3.

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Table 3. The ADF Unit Root Tests Results

Variable	Unit root test in levels (With constant and trend)	Unit root test in first differences (With constant and trend)
LOG(SSEC)	-1.9507	-14.9125**
M2	-2.1080	-7.6634**
CPI	-3.5060*	-7.3363**
EX	-1.1660	-11.6070**
I	-5.7526**	-7.6131**

Note: *Significant at 5%, **Significant at 1%

In Table 3, we obtain that variable LOG(SSEC), M2, and EX are I(1). They should be first differenced to become stable. The diagrams after first differenced of these series are shown in figure 2. We will employ the stable variable D(LOG(SSEC)) as the dependent variable, D(M2), CPI, D(EX) and I to be the independent variables.

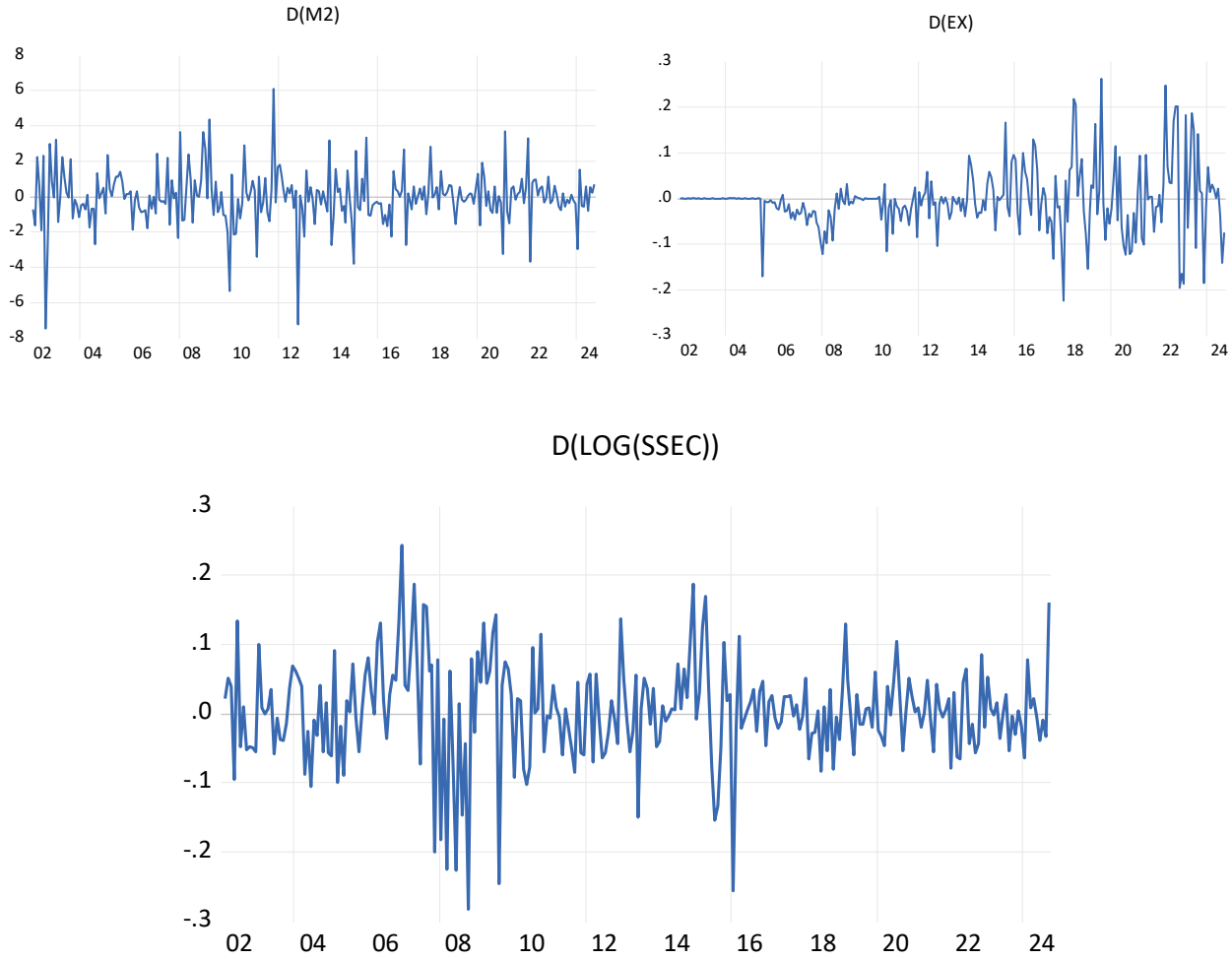

Figure 2. Monthly volatility for LOG(SSEC), M2, and EX

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Multivariate Cointegration Test

There are various approaches to test for cointegration in multivariate models. The Engle and Granger (1987) and the Johansen method (Johansen, 1988; Johansen-Juselius, 1990) are two common approaches used to estimate cointegration equations. This study employs the full information Johansen Maximum Likelihood (JML) procedure.

Table 4. Johansen Cointegration Tests Results

H_0	Trace Test	Maximum Eigenvalue Test
$r = 0$	169.8419**	56.7993**
$r \leq 1$	113.0426**	50.7038**
$r \leq 2$	62.3388**	36.6933**
$r \leq 3$	25.6455**	14.8365
$r \leq 4$	10.8090*	10.8090*

Notes: *Significant at 5% and **Significant at 1% level

Tables 4 shows the Johansen cointegration test findings based on the trace statistics and maximum eigenvalues. In both the maximum eigenvalue test and trace test indicate that D(LOG(SSEC)) and D(M2), CPI, D(EX), I, have long-run relationship and are moving together in the long-run :

D(LOG(SSEC))=0.0382**D(M2)-0.0117**CPI-0.3942**D(EX)+0.0041I+0.0188

Based on the cointegration results in the above equation, the long-term impacts of M2 and I on SSEC index are positive (but I is not significant). However, the effect of CPI and EX on SSEC index is significantly negative.

This positive long-term relationship between money supply (M2) and the stock market could be due to strong pro-cyclical monetary policies implemented in China. This is also consistent with Du's (2006) findings.

Vector Error Correction Models (VECM)

To find the short run correlation between macroeconomic variables and stock market indices in China, this study employs the vector error correction model (VECM) test. VECM is a restricted VAR that has cointegration restrictions built into the specification, so that it is designed for use with nonstationary series that are known to be cointegrated. The VECM specification restricts the long-run behavior of the endogenous variables to converge to their cointegrating

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relationships while allowing a wide range of short-run dynamics. The error correction model is based on the following equation:

Vector error correction models are very similar to VAR models and can have the following form:

$$Dx_t = \prod x_{t-1} + \sum_{i=1}^{p-1} \Gamma_i Dx_{t-i} + Cd_t + \varepsilon_t$$

Where,

Dx is the first difference of the variables in vector *x*, $\prod$ is a coefficient matrix of cointegrating relationships, Γ is a coefficient matrix of the lags of differenced variables of *x*, *d* is a vector of deterministic terms and *C* its corresponding coefficient matrix. *p* is the lag order of the model in its VAR form and ε is an error term with zero mean and variance-covariance matrix Σ.

We employ the E-views 12.0 software to test the Vector Error Correction in this study, the results are reported in Table 5.

Table 5. Vector Error Correction Estimates

D(LOG(SSEC))	coefficient	t statistics
$D(LOG(SSEC))_{t-1}$,	-0.2486	-3.1263**
$D(LOG(SSEC))_{t-2}$	-0.0788	-1.2753**
$D(M2)_{t-1}$	-0.0144	-4.3126**
$D(M2)_{t-2}$	-0.0096	-3.6175**
CPI_{t-1}	0.0081	0.9707**
CPI_{t-2}	0.0179	2.1486**
$D(EX)_{t-1}$	0.0835	1.3121**
$D(EX)_{t-2}$	0.0485	0.9737**
I_{t-1}	0.0005	0.0499*
I_{t-2}	-0.0017	-1.6667
C	0.0005	0.1067**

Notes: *Significant at 5% and **Significant at 1% level

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CONCLUSION

This study investigates the long run equilibrium relationship between a set of macro-economic variables and stock prices using monthly data for the period 2002 to September, 2024 from China stock market. The economic variables include inflation, money supply, the exchange rate and interest rate. The empirical evidence obtained from the cointegration tests and the error correction model. The results suggest that in the long run, there are equilibrium relationship from CPI, exchange rate, money supply and interest rate to the stock price return in China stock exchange. Besides, the long-term impacts of annual growth rate of money supply (M2) and I on SSEC index are positive. The effect of CPI and EX on SSEC index is negative.

Overall, the results of this research are consistent with the theoretical arguments and practical developments that occurred in the China stock markets during the sample period. The results also imply that the SSEC Index is informationally inefficient because publicly available information on macroeconomic variables and trading volumes can be potentially used in predicting stock prices. The scope for further studies may employ more microeconomic variables or more capital markets into discuss to see the results and make comparison.

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