A THESIS

FOR THE DEGREE OF MASTER OF ECONOMICS

The Relationship between Stock Prices and Macroeconomic Variables: The Evidence from Mongolia and Korea

Enkhzul Mendee

Department of Economics

GRADUATE SCHOOL

JEJU NATIONALUNIVERSITY

2011. 8.

The Relationship between Stock Prices and Macroeconomic Variables: The Evidence from Mongolia and Korea

Enkhzul Mendee
(Supervised by Professor Sang Soo Park)

A dissertation submitted in partial fulfillment of the requirement for the degree of
MASTER OF ECONOMICS

2011. 8.

This dissertation has been examined and approved.

Thesis director,Su Yeon Jung, Professor, Department of Economics

Sang Soo Park, Professor, Department of Economics

Gi Choon Kang, Professor, Department of Economics

2011.08
Date

Department of Economics
GRADUATESCHOOL
JEJU NATIONAL UNIVERSITY
REPUBLIC OF KOREA

-Abstract-

The purpose of this study is to examine the relationship between the stock market movement and the macroeconomic variables in Mongolia and Korea. It is interesting and important to understand the relationship between the stock market and the macroeconomic variables of Mongolia as a just developing stock market.

Firstly, I will describe the theoretical studies of the Mongolian and Korean stock market and analyze them. The analysis is based on the Engle Granger methodology with the framework of the Vector Error Correction Model (VECM). To do this, first, the stationary of the variables is tested by performing Unit root test. For this purpose, I will use the Augmented Dickey Fuller (ADF) test and the Phillips – Perron test. Then, I will examine the cointegration analysis suggested by Johansen. Finally, the causal relations are examined through the VECM.

The data are based on the period from January, 2000 to December, 2009 in the case of Mongolia, and from January, 2002 to December, 2009 in the case of Korea. Variables include the Consumer price index (CPI), Interest rate of one year savings (IR), Money supply (M2) and Exchange rates: US dollar for both countries and Korean won for the case of Mongolia.

The study concludes that there are a long-run relationship between the stock market and macroeconomic environment, in the two countries. The unit root test results show that all variables are non-stationary at level, but they are stationary at first difference.

To see a cointegration, the Johansen cointegration test is performed. Trace test and Maximal – Eigenvalue test are used for detecting the presence of the number of cointegrating vector. The findings of Johansen cointegration test show that there is one cointegration in Mongolian data, and two cointegrations in Korean data.

From the Granger causality test results, Mongolian stock prices cause to the money supply and CPI.

In the case of Korea, there are bidirectional causality between the stock prices and the interest rate. Therefore, all macroeconomic variables cause to the stock price by unidirectional way.

To

My family

Acknowledgements

This thesis has been carried out of at the Department of Economics at Jeju National University. It is the outcome of my effort with so much support from many people.

Firstly, I am very grateful to my advisor, Professor Sang Soo Park, for the technical and professional guidance. Special thanks for Professor Gi Choon Kang, for his kind encouragement.

Secondly, I would like to thank to all professors of Jeju National University who have taught me the theoretical courses. Especially, I am very grateful to assistant of Departments of Economics, Yeong Shil Kang, and all of her help during the study period. Thank you once again professors and friends.

Thirdly, I would like to give my heartiest thanks to my family.

-Contents-

List of Tables

List of figures

I. Introduction

Financial market, especially stock markets, has grown considerably in the developed and developing countries over the last three decades. It is important for a number of reasons to have a well developed securities market, for it is the sources of debt financing within economy, offers greater investment opportunities for financial institutions, deepens markets by attracting reputable foreign financial institutions and provides alternative source of funds, which dominates the domestic financial markets in developing countries. Also, economic liberalization, privatization, and relaxation of foreign exchange control have resulted in the improvements in the size and depth of securities markets in developing countries and they are beginning to play due role. To assess the potential for stock markets in transition like Mongolia, it is important to understand what is the determinant of economy and stock market development.

Determining the effects of macroeconomic variables on stock prices has preoccupied the minds of economics in recent times. This has been necessitated by the general perception, that macroeconomic fundamentals such as inflation and interest rate influence the economic activities especially stock returns.

Also, understanding the relationship of stock prices and macroeconomic variables will help all investors for hedging and diversifying their portfolio. As for the effect of macroeconomic variables on stock prices, the efficient market hypothesis (EMH) suggests that competition among the profit – maximizing investors in an efficient market will ensure that all the relevant information currently known about changes in macroeconomic variables are fully reflected in current stock prices, so that investors will not be able to earn an abnormal profit through prediction of the future stock market movements.(Chong and Koh, 2003)

Every study involves explaining stock prices by the efficient market hypothesis. According to the EMH in the semi-strong form developed by Fama (1970), the EHM states that stock prices must contain all relevant information including the public available and past information.

Concentrating primarily on the US stock exchanges, such early studies attempted to capture the effects of economic forces in the theoretical framework, based on the Arbitrage Pricing Theory (APT), where the asset returns are explained by multiple risk factors. The APT theory was initiated

by Stephen Ross (1976). The factors can be divided into two groups: macro factors and company specific factors. Accordingly, Chen, Roll, and Ross (1986), having first illustrated that economic forces affect discount rates, the ability of firms to generate cash flows, and future payouts, provided the basis for the belief that a long-term equilibrium existed between stock prices and macroeconomic variables.

More recently, Granger (1986) and Johansen and Juselius (1990) proposed to determine the existence of long-term equilibrium among selected variables through cointegration analysis, paying the way for a preferred approach to examining the relationship of economic variables and stock market. A set of time series variables are cointegrated if they are integrated of the same order and a linear combination of them are stationary. Such linear combinations would then point to the existence of a long-term relationship between the variables. An advantage of cointegration analysis is that through building an Vector Error Correction model, the dynamic co-movement among variables and the adjustment process toward long-term equilibrium can be examined. (Maysame, Howe and Hamzah, 2004)

There are many empirical studies to disclose the relationship between stock prices and macroeconomic variables such as inflation, interest rate, exchange rate and money supply etc. But there is no enough researching paper conducted on the Mongolian stock market. Erdenetuya (2010) described the relationship between economic growth and stock market in Mongolia by using multiple regression tests. The results from multiple regression tests suggest that the stock market is insignificant and cannot contribute economic growth. Lhagvajav et al (2008) measured the bond market development in Mongolia, analyzed in some detail the stock market response to monetary policy actions. They showed that the effect of monetary policy and macroeconomic indicators on the bond market development is consistent with theory, but the effect in lagged and relatively weak.

For that reason, I want to establish the dynamic linkage between key macroeconomic indicators including Consumer price index (CPI), Exchange rate (ER), Interest rate (IR), Money supply (M2) and Stock index (Top20ind) in Mongolia.

Mongolia embarked on the transition from central planning to a market – oriented economy in the 1990, and Mongolia Stock Exchange (MSE) was founded in 1991 with the introduction of the voucher privatization program. However, for the period of 19 years since then the financial market sector in Mongolia, especially the securities market is still at a primitive stage. The securities

market in Mongolia is led by the stock market; the bond market has not yet played a big role.

The weak development of securities market might be explained by numerous factors, but the following two explanations would be suggested. Firstly, the history of the Mongolian Stock Exchange is still short and started simultaneously with the institutional and structural reforms initiated by the government. Secondly, the price level of 1990s was subject to high inflation discouraging individuals and entities to accumulate financial resources. However, the stabilization of the economy accompanied by the central bank's successful efforts to curb the inflation and to reduce the lending rate, increased public interest to make savings pave the way to the recovery of the Stock exchange. What was the effect of the macro policies on the development of the securities market? The answer to this question is important. (Lkhagvajav et al, 2008)

Notwithstanding, the Korean Stock Market has begun its operation in 1956 with 12 listed companies including banks, insurance companies, and brokerage houses. Since the establishment of the Korean Stock Exchange (KRX), the Korean securities markets have played a pivotal role in providing capital for the rapid modernization of the Korean economy. In addition to its long history of growth, the market has made tremendous strides over recent years, in terms of the securities market and infrastructure. Also, as Korean economy successfully overcame such international turmoil as the oil shocks and the Asian financial crisis to emerge as the world's 11th largest trading nation, the KRX has also shown the tremendous achievements, growing from its early unstable beginnings into the world's 10th largest stock exchanges through consistent market liberalization.

The Korean economy provides an interesting scenario for the student of finance and a solid ground of applying the theory. The dynamic conditions of the stock market, its continuous development and the availability of information facilitate the research. However, there are many studies documenting the relationship between the Korean stock market and macroeconomic environment. Thus, the topic of this study is important because it provides the empirical evidence towards the understanding of the Mongolian and Korean stock market under the macroeconomic circumstances. The topic has also a particular relevance because it shows the differences between similar results obtained for different countries in different periods of time.

This study is organized in six chapters including this introduction. Chapter 2 covers the literature review and the conclusions of previous studies. Chapter 3 briefly describes the development of the Mongolian and Korean stock markets and provides some basic statistics about

the market indices. Chapter 4 provides the theoretical background and the data, the relevant variables and the econometric model to be estimated. Chapter 5 shows the results of the tests and estimations. Finally, Chapter 6 provides general conclusions.

II. Literature review

This chapter covers the theoretical review of literature on the relationship between stock prices and macroeconomic variables, and presents the empirical evidence as outlined by previous researchers.

The serious attempts for empirical verification of the theory, although a widely accepted theory for long time, started only in the 1980s. There have been a number of studies on different stock indices and macroeconomic variables. For example, Chen, Ross and Roll (1986) tested whether the innovations in macroeconomic variables are rewarded in the stock market or not. They used the industrial production, long and short-term interest rate, risk premium and, expected and unexpected inflation. Their conclusion is that returns of stocks are related to economic variables in a systematic way and that stocks are priced according to their exposure.

Engle and Granger (1987) suggest that the validity of long term equilibrium between the variables and can be examined by using the cointegration techniques.

Maysami and Koh (2000) applied the Johansen cointegration approach and Vector Error Correction Model to examine dynamic relationship among stock prices and macroeconomic variables and reported the sensitivity of Singapore stock market to interest rate and exchange rate. Also, Maysami, Howe and Hamzah (2004) examined the long-term equilibrium relationship between the Singapore stock market index and the macroeconomic variables including short and long – term interest rate, industrial production, price levels, exchange rate and money supply. Similarly, Humpe and Macmillan (2007) examined the influence of a number of macroeconomic variables on stock prices in the US and Japan by using cointegration analysis. US stock prices were influenced positively by industrial production and negatively by inflation and the long-term interest rate. For Japan, they found that stock prices are influenced positively by industrial production and negatively by the money supply. Also, they found the industrial production to be negatively influenced by the consumer price index and a long-term interest rate.

Mukherjee and Naka (1995) examined the effect of stock prices on six macroeconomic variables such as exchange rate, inflation, money supply, real economic activity, long-term government bond rate and call money rate by using a Vector error correction model for Japanese

data. They found positive relationship between stock prices, exchange rate, money supply and industrial production.

In the case of India, Batthacharya and Mukherjee (2003) investigated a causal relationship of stock prices and macroeconomic variables such as exchange rate, foreign exchange reserves and value of trade balance. The result suggests that there is no causal linkage between stock prices and the three variables.

Kwon and Shin (1997) studied the relationship between the Korean stock market and a set of macroeconomic variables, including exchange rate, the trade balance, a production index and the money supply. They detected that there is no correlation between the KOSPI and any of the variables. However, they found a combination of the KOSPI index and all the other variables is cointegrated, indicating a long – run relationship. In other words, however, stock price indices are not a leading indicator for economic variables, which is inconsistent with the previous findings that the stock market rationally signals changes in real activities.

Mohammed et al (2009) used quarterly data on macroeconomic factors as foreign exchange rate, foreign exchange reserve, gross fixed capital formation, M2, call money rate (interest rate proxy), industrial production index and whole sales price index (proxy of inflation), and analyzed their relationship with Karachi stock market of Pakistan. The results of Autoregressive and Moving average approach shows that exchange rate and exchange reserve highly affect the stock prices, but industrial production changes does not affect stock prices. The empirical results also suggest that interest rate and M2 is significant and negatively effect to stock market returns.

Adam and Tweneboah (2008) examined the role of macroeconomic variables on stock prices movement in Ghana, using inward foreign direct investments, the Treasury bill rate (proxy of interest rate), consumer price index and exchange rate as macroeconomic variables. They analyzed both of long and short – run dynamic relationship between the stock market index and the variables. They found a cointegration between the variables and the stock prices in Ghana indicating long – run relationship. The results of FEVD test indicate inflation explains small proportion of the variation of the stock prices compared to interest rate, FDI inflow and exchange rate. Also, the results show that interest rate is the key determinant of the share price movements.

Kim, Sung Hee (2002) investigated this study in the Korea's stock market empirically. She analyzed the long-term equilibrium relationship and short-term movement of variables, using the

method of VECM. The result shows that stock price has the positive relationship with US dollar, industrial index and consumer price index. Whereas, it has negative relationship with Japanese yen, US fund rate, M2 money, domestic call rate and corporate bond yield.

Guswame and Jung (1997) analyzed the relationship between stock prices and nine macroeconomic variables from Korean economy using Vector Error Correction Model (VECM). They found that the Korean stock market is cointegrated with nine macroeconomic variables including industrial production, inflation, short-term interest rate and long-term interest rate, oil price, foreign exchange rates, money supply, and balance of trade. Also, stock prices are positively related to industrial production, inflation and short-term interest rate, and negatively related to long-term interest rate and oil prices. The foreign exchange rate changes may affect stock prices in either direction. They also showed that the VECM is generally better than Vector Autoregressive estimating procedure.

Finally, Han (2003) also investigated the impacts of business survey index and economic variables on Korean stock market. He found the long – term equilibrium relationship, using VECM through cointegration test. Time series data include Business survey index, 3 year corporate bond yields (CBY), consumer money supply (M3) and the foreign exchange rates against US dollar (FX).

III. Background of the study

3.1. The overview of Mongolian stock market

3.1.1. The brief history of the Mongolian stock market

Mongolia has made significant efforts in achieving macroeconomic stability and fundamental structural reforms since its transition to democracy and market- based system in the 1990s. During the transitional period in Mongolia, many social and economic changes were made. One of those changes was the decision of Government to establish Mongolian Stock exchange to privatize the state owned enterprises.

During the pre-transition period the Government owned almost all social wealth. However, since Mongolia has adopted the new Constitution, Civil code and other laws to allow existence of private wealth, the Government had to be directly involved in such economic relations which are arranged by stock exchange markets.

Thus, Mongolian Stock Exchange was founded on January 18th of 1991. Auctions officially began on 7th February of 1992; with the public offering of 3 large enterprises for vouchers. The primary goal of the MSE operations or the establishment of the Stock Exchange was to privatize state-owned factories, which had been inherited from the centrally planned economy.

Citizens privatized directly the property by vouchers, but they didn't become a shareholder of any shareholding company. However, they had the right to purchase stocks of any company in the next stage of the privatization. In 1994, the Parliament approved the Securities Law and established the Securities and Exchange Commission for the purpose of coordinating and monitoring the securities market. The Securities and Exchange Commission has carried out such activities as preparation and implementation of rules and regulations concerning the securities market, the adoption of the secondary stock market, the licensing and certification of brokers.

The second period of the MSE functioning was started in 1995. The government issued Decree №106 on some measures in the secondary securities market and on trading in cash which solved many issues related to the reorganization of the MSE as a non-profit entity; privatization of

brokerage firms in 1995, financial resources needed to conduct a secondary securities market, creation of conditions for effective participation of individuals in trading securities with cash, preparation of regulations on distribution of dividends, and prices of shares traded in cash. On August 28, 1996 the first trade on the secondary securities market was held. Since the first trade in the secondary securities market, the securities market has began to develop with its real meaning in Mongolia. According to the annual report of 2003, over 1.0 million securities of 409 shareholding companies were registered in the Stock Exchange and the Securities Commission. Also, the shares of over 38.8 billion MNT (32.1 million US$) have been traded in 1996-2004.

3.1.2. The general feature of the Mongolian stock exchange

The Mongolia Stock Exchange (MSE) is the major player in the security markets and it organizes trading of the securities. In accordance with the renewed Securities Law, the MSE was restructured as 100 percent state-owned profit making company in 2002. The MSE is operating with 7 main departments and 2 sub-units, 2 centers with 6 directors and over 40 staff members and specialists.

The MSE trades in a continuous and auction format. The trading of corporate bonds and companies shares is conducted in a continuous format, and the trading of the Government bonds and shares of some state – owned companies is carried out in auction format. Settlement of transactions involving shares is effected on the next business day following the day of transaction. Transactions of bonds are settled on the same day as the transaction day.

All transactions are transferred to the Securities Clearing House and Central Depository that a structural unit of department of the MSE via the network system inspects. Thus, the balance on securities and available financial resources are automatically recorded in client's account at the centralized depository via the network system on the same trading day. The SCHCD provides information on account balances only to brokerage and dealer companies. The brokerage and dealer companies verify the obtained data. In the SCHCD, the transfer officer checks completeness of submitted documents, withdraw the relevant summary from the clients' account according to the application, and makes transfer. In cases, when the clients apply to transfer their money from the account at the centralized depository to their bank account, the transaction is conducted directly in the SCHCD.

Clients may select brokerage and dealing company in order to sell or purchase stocks in the MSE. Clients should open an account at the centralized depository via chosen member brokerage and dealing company. At the MSE, the deal is made between 11 a.m. and 12 a.m. from Monday to Friday.

As shown in <Table 1> by the end of 2010, there were one Stock exchange, 253 trading sessions, 336 listed companies, and 45 broker and dealer companies on the MSE. Also, 64.5 million shares and 3 thousand Government bonds were sold with total transaction value of 92.9 billion MNT. Total market capitalization has been increasing every year. At the end of 2010, total market capitalization of the MSE reached 1 trillion 373.9 billion MNT, indicating 753.2 billion MNT is increased over 2009.

Table1. Main indicators of the Mongolian Stock Exchange

	1995	2000	2005	2009	2010
Numbers of trading days	84	255	253	253	253
Member broker and dealers company	-	42	24	45	45
Number of listed companies	475	410	392	358	336
- State company	244	69	66	53	51
- Private company	171	341	326	305	285
Total shares traded (thousand shares)	6584.0	35525.4	26323.5	89916.6	64517.3
- Stock	6584.0	35412.3		89916.6	
- Bond	-	113.1	375.3	-	3.0
Total turnover (in mln MNT)					
- Stock	811.5	14105.4	11978.6	23181.5	92873.1
- Bond	811.5	2973.3		23181.5	628131
	-	11132.1	9431.4	-	30000.0

Market capitalization (in mln MNT)	12,816.0	34,427.9	55,701.0	620,705.7	1373,946.1
Top20 Index	110.8	359.3	796.2	5551.9	10582.8

Source: Yearbooks of National Statistics office

Public issuing companies that are interested in being listed at the MSE must meet certain criteria with regard to their financial and operational conditions. Applicant companies are screened according to the relevant criteria of Securities Law and other rules regulations issued by Financial Regulatory Commission (FRC) of Mongolia. Applicant companies, who have fulfilled listing criteria and received approval from the FRC, may apply for listing at the MSE by submitting all required documents to the MSE's Listing Department. At first, companies will be registered on the Registered Companies list and are required to issue their securities to public (IPO) within one year period. Once a company issues securities or does IPO, then the entity and its shares are transferred to the MSE's Registered Securities List, and a company receives permission to trade its securities.

All listed securities on the MSE are traded through Exchange's electronic trading platform in the Trading hall. The brokers enter all orders into the computer network located in the Trading hall. The orders are automatically matched and executed. Once transactions have been completed, the results are transmitted immediately to the broker's computer systems. The MSE monitors the market and supervises transactions in the MSE Trading hall.

The securities trading at the MSE are administered using two different auction methods: continuous auction and auction. Continuous auction is where buy and sell orders interact with one another. All orders are placed by member Broker dealer companies and matched accordance with the price priority and time priority rules. Under the price priority rule, a selling (or buying) order with the lowest (or highest) price takes precedence. Under the time priority rule, an earlier order takes precedence over other at the same time. The transaction is executed at the price, when buying and selling are matched at the same price.

3.1.3. Mongolian stock market index

The MSE calculates two main indexes.

- **Top20 index** consists of securities from top 20 companies that listed at the MSE. The MSE started calculating the Top20 index since the opening of secondary market. The basket for Top20 index is renewed once in 6 months.

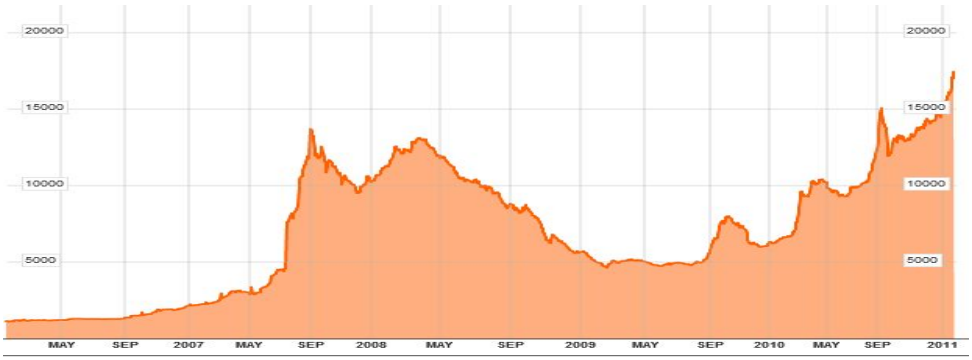
- **Composite index** consists of all companies listed at the MSE. The index is calculated according to index calculation regulation of the MSE.

The index shall be calculated by following basic formula:

$$\text{Top20Index} = \frac{\text{market capitalization of the current day}}{\text{base value unit}} * 100$$

Below <Figure 1> shows a changing of Top20Index during the past five years. The Top20Index was increasing rapidly from the end of the first half of 2007 which was constant before 2007. It was 10,256.13 points at the end 2007. But it has slowly decreased and in the middle of 2009 it has 50% decreasing. Top20 Index's highest point was 15,039.97 and lowest point was 6144.28, and average point was 10,582.80, respectively. From the beginning of 2010, Top20Index has been increasing continuously, and on September, it has reached its highest point in history, or 15,039.97 points.

Figure 1. 5 year interactive chart of Top20Index



Source: www.bloomberg.com

3.2. The overview of Korean stock market

3.2.1. Brief history of Korean stock market

The Daehan Stock Exchange, the predecessor of the KRX, was established February, 1956 with joint contributions from banks, insurance companies, and securities firms. The exchange commenced trading on the 3rd day of the following month. At the onset, three government bonds, 49 securities firms and 13 corporations were listed on the KRX.

In January 1962, the inception of the First Five Year Economic Development Plan launched rapid economic growth. The government enacted the Securities and Exchange Law to mobilize funds, through the securities market, needed to carry out its planned economic goals. In accordance with the Law, the Exchange was reorganized into a joint- stock corporation. The stock market experienced an extra ordinary trading boom immediately following it reorganization. Under the revised Securities and Exchange Law amended in April 1963 to impose stricter regulatory measures on the operation of the securities market, the Exchange was reorganized on May into a non-profit, government owned corporation and renamed the Korea Stock Exchange.

Embarking on the Second Five Year Economic Development Plan in 1968, the government enacted the Law on Fostering the Capital market, which is one of the most important measures in the development of the KSE. The major aim of this law was to increase the number of listed companies, thus stimulating a wide dispersion of share ownership and creating an investment climate which would ensure the public's participation in enterprises as well as efficient corporate financing. The Law also stipulated the establishment of the Korean Investment Corporation for the purpose of activating the primary market in 1968. Diverse improvements were made in the trading and settlement system to increase both the trading volume and the number of listed corporations. At same time, the government enacted the Capital Market Promotion Act (CMPA) which encouraged corporations to become publicly listed by providing extensive tax relief.

The sudden growth of the securities market in the 1970s brought with it the new regulatory concerns. In 1977, the Securities and Exchange Commission (SEC) and its executive body, the Securities Supervisory Board (SSB), were established. By the legal provision, the Korean securities

market experienced an unprecedented rush of public offerings. This was indicated by the increased number of listed corporations, which stood at only 66 in 1972 and jumped to 356 by the end of 1978. Also in that year, the KSE set up the Korean Securities Computer Corporation to provide computerization of the securities market. In 1979, a new trading floor was opened and the Computerized Order-routing system was put into full operation in 1983. The system enabled member firms to transmit orders directly to the trading floor. In 1988, the Stock Market Automated Trading System (SMATS), the first computerized trading system of the KSE, was introduced to expand trading volume.

During the late 1990s, the efforts were concentrated on restructuring the stock market and further development. As a consequence of the 1997 turmoil the authorities were cautious and the government established a stabilization fund for bonds. In addition, the KOSDAQ market was established in 1996. In March 2000, the OTC Bulletin Board (OTCBB), a "third market" for non-listed stocks, was launched and it was established on July 2005 and named Free Board. The Free Board is operated as a new securities market, where corporate shares not listed on the KRX may be traded. In recent, there are three stock exchange: KRX, KOSDAQ and Free Board. The Stock market is the market for the big and superior firms' shares, and KOSDAQ for small – to – medium enterprises and venture firms, while the shares not listed but designated by the KSDA are traded on the Free Board.

The regular trading hours of stock exchanges are between 9 a.m. and 15 p.m. and off-hours trading are from 7.30 a.m to 8 a.m., and from 15p.m to 18 p.m.

<Table 2> represents the key statistics of Korean stock market. The table shows that there were 66 listed companies in 1972, and it increased to 1,308 in 2000. Market capitalization amounted 2,893 billion won at the end of 1978, it increased continuously until 2007. Market capitalization amounted 1,051,776 billion won in 2007, it dropped to 623,012 billion won in 2008. In 2008, 1,799 companies and 102,880 million stocks listed in the Korean stock market. Therefore, 213,111 million shares were traded.

Table 2. Key statistics of the Korean stock market

(Unit: billion won, million shares)

Year	Number of listed companies	Capital Stock Listed	Market capitalization	Trading volume	Daily trading value
1972	66	174	246	210	-
1978	356	1,914	2,893	2,959	-
1985	342	4,665	6,570	7,955	3.620
1990	669	23,981	79,019	3,162	53,454
1995	721	38,047	141,151	7,656	142,914
2000	1,308	100,058	217,057	124,835	1,205,623
2005	1,620	93,464	725,972	265,329	1,232,635
2006	1,694	95,974	776,724	202,987	1,275,994
2007	1,767	99,879	1,051,776	240,478	1,862,254
2008	1,799	102,880	623,012	213,111	1,595,108

Note: KOSDAQ statistics have been compiled from 1997

Source: Korea Securities Dealers Association, "*Financial market in Korea*", 2009

3.2.2. Korean stock market indices

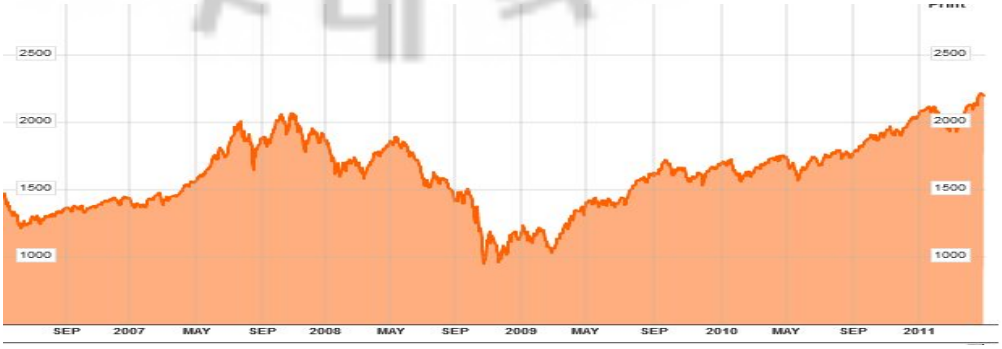
- The Korean Composite Stock Index or KOSPI is a market value weighted index, composed of all common stocks listed on the Stock market. The KOSPI was introduced in 1983, providing a comprehensive measure or trends on the Stock Market Division, and it is a price – weighted index based on the aggregate market value of all common stocks listed on the Stock market, using a base date of 4 January 1980 and a base index of 100.00.

The index is adjusted, however, to eliminate the influence of any corporate actions, reflecting only movements resulting from market activities. Therefore, the base aggregate market value is adjusted whenever the current market value undergoes variations such as capital changes, new listings, or delisting. The KOSPI is calculated as follows:

$$\text{KOSPI} = \frac{\text{Current aggregate market value}}{\text{Base aggregate market value}} * 100$$

<Figure 2> shows the past five years' interactive chart of KOSPI index. KOSPI continued below after reaching 1,078.8 points, on April 1, 1989 and it reached a new high on November 1994, when it touched 1,138. In 1999, the KOSPI surged to 1,028.07 points, up from 562.46 points at the end of 1998. Unfortunately, the Korean stock market then saw a long – term slump. It started out at 1,028.33 points in early January 2000, sank to 504.62 points the same year on repercussions due to the Daewoo debacle in 1999. Likewise, the KOSDAQ steadily declined after peaking at 283.44 points in March 2000, dropping to record low of 34.64 points in March 2003. In 2006, the Korean stock market moderated over downward pressure from a strong won, oil price hikes, a surge in property prices, and continued net selling by foreigners, although the KOSPI hit 1,434.46 points, an increase of 55.09 points, or 3.99 percent from 2005. In 2008, the KOSPI dropped to 1,124.47 points.

Figure 2 . 5 years interactive chart of KOSPI index



Source: www.bloomberg.com

- Other important index in the Korean Stock Market is the KOSDAQ, using the base date of July 1, 1996 and a base index of 1,000. The index, based on the aggregate market value, is adjusted to eliminate any influence of corporate actions.

- The KOSPI 200 index serves as the underlying index for stock index futures and was introduced in Korea in 1996. It consists of 200 listed stocks, and is calculated according to the

same market capitalization – based formula as KOSPI, using the base date of January 3, 1990 and a base index of 100.00.

- Korea Exchange 100 Index or KRX 100 is the first stock price index developed with the launch of the KRX. It consists of 100 representative stocks listed on the Korean Stock market as well as the KOSDAQ Market, reflecting the integration of both markets. Stocks on the index are chosen on the basis of various criteria such as profitability, stability, and soundness, in addition to criteria used for existing indices such as business size and liquidity.

- Another one index is the Korea Dividend Stock Price Index or KODI, which was introduced in July 2003 using 50 listed stocks. The main purpose of the index is to provide investors with a new appraisal indicator. It has a base date of July 1, 2001 with a base index of 1,000.

The KRX also provides other indices for the following industries: venture, IT composite, IT venture, manufacturing, services, construction distribution, and finance.

IV. Empirical methodology

4.1. Methodology

The relationship between the stock prices and economic variables is formally investigated through cointegration and Error correction analysis. In this context, first, the stationary of the variables is tested by performing Unit root test. For this purpose, I use the Augmented Dickey Fuller (ADF) test and Phillips – Perron test. Then, I examine the cointegration analysis suggested by Johansen (1990). If cointegration is found, the Vector Error Correction model will be used in order to analyze the Granger causality. If cointegration is not found, the Vector Autoregressive model will be used to determine the Granger causality.

4.1.1 Unit root test

The presence and absence of a unit root is important in empirical models based on the time series data. A large number of macroeconomic time series are trended and therefore in most cases are non-stationary. To estimating the Granger causality, the time series need to be stationary. Therefore, first of all, the stationary need to be tested.

A time series is said to be stationary, if displacement overtime does not alter the characteristics of a series in the sense that the probability distribution remains constant over time, or more formally:

$P(X_{t1}, \ldots, X_{tn}) = P(X_{t1+i}, \ldots, X_{tn+i})$ for all *i*. This requires that the mean, variance, and covariance of a series to remain constant over time. Thus a series is said to be stationary if its mean, variance, and covariance all are independent of time or in other words remain constant over time. Conversely, a series is non-stationery if it's mean, variance, or covariance changes over time.

The popular test for stationary (or non - stationary) is unit root. Several statistical methods are constructed to test for unit roots. There are three types of time series: stationary (I(0)), trend

stationary and non – stationary (I(1)).

But if the unit root test can not reject the null hypothesis, it means that the series are non stationary and I need to apply the difference operator to make the series stationary. The tests for unit root employ the Dickey – Fuller (DF) test, Augmented Dickey – Fuller (ADF) test and Phillip – Perron (PP) test. In this study, the familier ADF and PP tests are applied.

1) Dickey – Fuller test

The simplest and most widely used tests for unit roots were developed by Dickey-Fuller (1979). The Dickey-Fuller tests are based on the following three regressions:

$$\Delta Y_t = \beta Y_{t-1} + \varepsilon_t \quad (4.1)$$

$$\Delta Y_t = \alpha + \beta Y_{t-1} + \varepsilon_t \quad (4.2)$$

$$\Delta Y_t = \alpha + \beta Y_{t-1} + \alpha_1 t + \varepsilon_t \quad (4.3)$$

The differences among the three equations are the presence of deterministic elements α and $\alpha_1 t$. Those elements are included to consider the presence of intercept and linear trend in the regression. The first equation is a pure random walk model, the second is a random walk model with a draft and the third one adds both draft and linear trends. The main parameter is β. In every case, If $\beta=0$ the series contains a unit root and the series needs to be differentiated in order to become stationary.

2) Augmented Dickey – Fuller test

It is an augmented version of Dickey – Fuller test for a larger and more complicated set of time series models. The testing procedures for the ADF test are as follows:

$$\Delta Y_t = \alpha + \beta Y_{t-1} + \delta_1 \Delta Y_{t-1} + \ldots + \delta_\rho \Delta Y_{t-\rho} + \varepsilon_t \quad (4.4)$$

$$\Delta Y_t = \alpha + \beta Y_{t-1} + \sum_{i=1}^{p} \delta_i \Delta Y_{t-i} + \varepsilon_t \quad (4.5)$$

where Δ is the difference operator, α is constant, β and δ are coefficient on time trend and ρ is the lag order of the autoregressive process, Y is the time series variable and ε_t is error term. By including lags of the order ρ, the ADF formulation allows for higher – order autoregressive

processes. This means that the lag length ρ is to be determined when applying the test. So, the lag length selection is also important for ADF test.

The unit root test is then carried out under the null hypothesis $\beta=0$ against the alternative hypothesis of $\beta<0$.

H_0: $\beta=0$ (non-stationary)

H_0: $\beta<0$ (stationary)

If the calculated ADF are less than their critical values from Fuller's table (in Eviews program), then the null hypothesis (H_0) is accepted and the series are non-stationary of zero order.

3) Phillips – Perron test

Phillips-Perron (1988) developed a number of unit root test that have become popular in the analysis of financial time series. The PP unit root tests differ from the ADF tests mainly in how they deal with serial correlation and heteroskedasticity.

The null hypothesis for the PP test is $\delta=0$. PP test uses the following equation as the test regression:

$$\Delta Y_t = \alpha + \delta Y_{t-1} + \varepsilon_t \qquad (4.6)$$

where Δ is the first difference operator and ε_t is error term. The PP test usually gives similar results with ADF tests, but the test statistics calculations are relatively complex. Interpretation of the results is almost the same.

4.1.2 Cointegration test

In the second step, cointegration test is performed by using variables having the same order of integration. Engle and Granger (1987) pointed out that a linear combination of two or more non – stationary series may be stationary. If such a stationary linear combination exists, the non – stationary time series are to be cointegrated.

Cointegration analysis examines the long-rum equilibrium relationship between time series variables. To analyze the long-term relationship between stock returns and macroeconomic variables, the cointegraion analysis is more appropriate compared to the VAR model because the cointegration method can explore the co-movements among the variables. (Mukherjee and Naka,

1995)

There are some methods to test for the possibility of cointegrating relationship, namely Eangle – Granger cointegration test (Eangle and Granger, 1987) and the Johansen test (Johansen, 1988) etc . The Eangle – Granger method provides methods of testing for cointegration in a single-equation framework, and Johansen's (1991) method allows testing for cointegration in a system of equations.

The Engle – Granger (1987) procedure is the most widely known single equation approach. In the first step, the parameters of the cointegrating vector are estimated by running the static regression in the levels of the variables. In the second step, these are used in the error correction form.

In this study, the cointegration tests were carried by the method developed by Johansen (1991). A finding of cointegration implies the existence of a long – run relationship between the variables. If there is at least one cointegreting relationship among the variables, then the causal relationship among these variables can be determined by estimating the VECM. In the cointegration test, Johansen's maximum likelihood estimation utilizes the trace test and maximum eigenvalue test to determine the number of cointegration vectors. The hypothesis of trace test and maximum eigenvalue test are described here:

1) Trace test

$$Trace \quad = -T \sum_{i=r+1}^{k} \ln(1 - \lambda_i) \tag{4.7}$$

For conducting the trace test the, null hypothesis that there are at most r cointegrating vectors is tested against the alternative hypothesis that there exists r or more cointegrating vectors.

2) Maximum Eigenvalue test

$$MaxEigenvalue = -T \ln(1 - \lambda_{r+1}) \tag{4.8}$$

This test is to evaluate the null hypothesis of r cointegrating vector against the alternative of $r+1$ cointegrating vectors. Rejection of this hypothesis suggests the existence of the maximum r cointegrating vectors.

According to the research of Engle and Granger (1987), if a pair of variable series is cointegrated, the bivariate cointegrated system must have a causal ordering in at least one direction. In other words, the existence of a cointegrating relationship in two series implies a temporal Granger causality between the variables, but the direction of causality will be tested by applying the Granger causality test through VECM.

4.1.3 Vector Error Correction model

There are many ways to analyze relationship among the variables. One simple but useful empirical methodology to uncover and compare the relationship among variables is Vector Auto Regression (VAR) model. This is one of the most successful, flexible and easy to use models for the analysis of multivariate time series. The VAR model is used commonly for forecasting the systems of interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables.

The VAR approach sidesteps the need for structural modeling by treating every endogenous variable in the system as a function of the lagged values of all of the endogenous variables in the system. The mathematical representation of a VAR is

$$Y_t = c + A_1 Y_{t-1} + \ldots + A_p Y_{t-p} + \varepsilon_t$$

or

$$Y_t = c + A(L) Y_t + \varepsilon_t \qquad (4.9)$$

Where, Y_t is a n vector of endogenous variables, and *A(L)* is lag operator.

If the series are cointegrated, long-run relationship have to be existence between the variables and to be include in the model. The Vector Error Correction model is model that includes the long-run relationship between variables of the VAR model.

Equation (4.9) can be changed to the VECM as follows:

$$Y_t = \Gamma_1' \Delta Y_{t-1} + \ldots + \Gamma_{\rho-1}' \Delta Y_{t-\rho+1} + \Pi' Y_{t-1} + c' + \varepsilon_t \qquad (4.10)$$

where

$$\Gamma_i' \equiv -(A_{i+1} + A_{i+2} + \ldots + A_\rho)(i = 1,2,\ldots, \rho - 1),$$

$$\Pi^{'} \equiv (I_n - A_1 - \ldots - A_\rho) = A(1)$$

Consider r cointergration exist between Y_t with n time series, the Π can be write as follows:

$$\Pi = \alpha\beta^{'} \qquad (4.11)$$

where, α and β are nxr matrices, α are error correction matrices and β are r cointegration vector matrices.

The Vector error correction model (VECM) abstracts the short – run and long – run information in the modeling process. The VECM first used by Sargan and later popularized by Engle and Granger (1987) corrects the disequilibrium in the short run. Eangle and Granger (1987) show that cointegration is implied by the existence of an error correction representation of the indices involved.

In this study, the VECM will be as follows (in the case of Mongolia):

$$\Delta \mathrm{Top20}_t = \alpha_1 + \xi_{1i} e_{t-1} + \sum_{i=1}^{k} \beta_{1i} \Delta Top20_{t-i} + \sum_{i=1}^{k} \chi_{1i} \Delta CPI_{t-i} + \sum_{i=1}^{k} \delta_{1i} \Delta IR_{t-i} + \sum_{i=1}^{k} \phi_{1i} \Delta \mathrm{M2}_{t\text{-}i} + \sum_{i=1}^{k} \gamma_{1i} \Delta KRW_{t-i} + \sum_{i=1}^{k} \eta_{1i} \Delta USD_{t-i} + \varepsilon_{1t}$$

$$\Delta \mathrm{CPI}_t = \alpha_2 + \xi_{2i} e_{t-1} + \sum_{i=1}^{k} \beta_{2i} \Delta Top20_{t-i} + \sum_{i=1}^{k} \chi_{2i} \Delta CPI_{t-i} + \sum_{i=1}^{k} \delta_{2i} \Delta IR_{t-i} + \sum_{i=1}^{k} \phi_{2i} \Delta \mathrm{M2}_{t\text{-}i} + \sum_{i=1}^{k} \gamma_{2i} \Delta KRW_{t-i} + \sum_{i=1}^{k} \eta_{2i} \Delta USD_{t-i} + \varepsilon_{2t}$$

$$\Delta \mathrm{IR}_t = \alpha_3 + \xi_{3i} e_{t-1} + \sum_{i=1}^{k} \beta_{3i} \Delta Top20_{t-i} + \sum_{i=1}^{k} \chi_{3i} \Delta CPI_{t-i} + \sum_{i=1}^{k} \delta_{3i} \Delta IR_{t-i} + \sum_{i=1}^{k} \phi_{3i} \Delta \mathrm{M2}_{t\text{-}i} + \sum_{i=1}^{k} \gamma_{3i} \Delta KRW_{t-i} + \sum_{i=1}^{k} \eta_{3i} \Delta USD_{t-i} + \varepsilon_{3t}$$

$$\Delta \mathrm{M2}_t = \alpha_4 + \xi_{4i} e_{t-1} + \sum_{i=1}^{k} \beta_{4i} \Delta Top20_{t-i} + \sum_{i=1}^{k} \chi_{4i} \Delta CPI_{t-i} + \sum_{i=1}^{k} \delta_{4i} \Delta IR_{t-i} + \sum_{i=1}^{k} \phi_{4i} \Delta \mathrm{M2}_{t\text{-}i} + \sum_{i=1}^{k} \gamma_{4i} \Delta KRW_{t-i} + \sum_{i=1}^{k} \eta_{4i} \Delta USD_{t-i} + \varepsilon_{4t}$$

$$\Delta \mathrm{USD}_t = \alpha_5 + \xi_{5i} e_{t-1} + \sum_{i=1}^{k} \beta_{5i} \Delta Top20_{t-i} + \sum_{i=1}^{k} \chi_{5i} \Delta CPI_{t-i} + \sum_{i=1}^{k} \delta_{5i} \Delta IR_{t-i} + \sum_{i=1}^{k} \phi_{5i} \Delta \mathrm{M2}_{t\text{-}i} + \sum_{i=1}^{k} \gamma_{5i} \Delta KRW_{t-i} + \sum_{i=1}^{k} \eta_{5i} \Delta USD_{t-i} + \varepsilon_{5t}$$

$$\Delta KRW_t = \alpha_6 + \xi_{6i} e_{t-1} + \sum_{i=1}^{k} \beta_{6i} \Delta Top20_{t-i} + \sum_{i=1}^{k} \chi_{6i} \Delta CPI_{t-i} + \sum_{i=1}^{k} \delta_{6i} \Delta IR_{t-i} + \sum_{i=1}^{k} \phi_{6i} \Delta \mathrm{M2}_{t\text{-}i} + \sum_{i=1}^{k} \gamma_{6i} \Delta KRW_{t-i} + \sum_{i=1}^{k} \eta_{6i} \Delta USD_{t-i} + \varepsilon_{6t}$$

(4.12)

where, Δ is the difference lag operator, e_{t-1} refers to the error correction term derived from long-run cointegrating relationship via the Johansen likelihood procedure, ε_{it} is the error terms. In the case of Korea, the equations of VECM is similarly the above equations. I will use the KOSPI instead Top20Index.

The VECM has two short dynamic analyses: Impulse Response Functions (IRFs) and Variance Decompositions (VDCs).

A shock to *i*-th variable not only directly affects *i*-th variable but is also transmitted to all of the other endogenous variables through the dynamic structure of the VAR. An impulse response function traces the effect of a one – time shock to one of the innovations on current and future values of the endogenous variables. If the innovations ε_t are contemporaneously uncorrelated, the interpretation of the impulse response is straightforward. The *i*-th innovations ε_{it} is simply a shock to the *i*-th endogenous variable Y_{it}. Innovations, however, are usually correlated, and may be viewed as having a common component which cannot be associated with a specific variable. In order to interpret the impulses, it is common to apply a transformation *P* to innovations so that they become uncorrelated

$$\nu_t = P\varepsilon_t \sim (0, D) \qquad (4.13)$$

where, D is a diagonal covariance matrix. The impulse response functions can be used to produce the time path of the dependent variables in the VECM, to shocks from all the explanatory variables.

While the impulse response functions trace the effects of a shock to one endogenous variable on the other variables, the variance decomposition separates the variation in an endogenous variable into the component shocks to the VECM. Thus, the variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the VECM, over a series of time horizons. Usually own series shocks explain most of the error variance, although the shock will also affect other variables in the system. It is also important to consider the ordering of the variables when conducting these tests, as in practise the error terms of the equations in the VECM will be correlated, so the result will be dependent on the order in which the equations are estimated in the model.

4.1.4 Granger causality test

Granger causality is a statistical concept of causality that determines whether one time series is useful in forecasting another. In 1969, Granger proposed the Granger Causality to test whether one economic variable can help forecast another economic variable.

Assuming that the VAR model contains two lagged values of the endogenous variables, if the time series of variables are stationary from the unit root test, and cointegration does not exist between two variables, the Granger causality test can be applied as follows:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} \Delta Y_{t-i} + \sum_{i=1}^{k} \alpha_{2i} \Delta X_{t-i} + \varepsilon_{1t} \quad (4.14)$$

$$\Delta X_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} \Delta X_{t-i} + \sum_{i=1}^{k} \beta_{2i} \Delta Y_{t-i} + \varepsilon_{2t} \quad (4.15)$$

where Y_t and X_t endogenous variables respectively, α_0, β_0 and α_{ij}, β_{ij} are the parameters to be estimated, k is the optimum lag, and ε_{ij} are the error terms.

If null hypothesis, H_0: $\alpha_{21} = \alpha_{22} = \ldots = \alpha_{2k} = 0$, is not rejected, it means that Y does not have Granger causality for X. Similarly, H_0: $\beta_{21} = \beta_{22} = \ldots = \beta_{2k} = 0$ is not rejected, it suggests that X does not have Granger causality for Y.

If two variables Y and X are cointegrated, then the Granger causality can be expressed using the VECM. An error correction term ($e_{t-1} = Y_{t-1} - \delta X_{t-1}$) is added to the equation to test the Granger causality such that:

$$\Delta Y_t = \alpha_0 + \alpha e_{t-1} + \sum_{i=1}^{k} \alpha_{1i} \Delta Y_{t-i} + \sum_{i=1}^{k} \alpha_{2i} \Delta X_{t-i} + \varepsilon_{1t} \quad (4.16)$$

$$\Delta X_t = \beta_0 + \beta e_{t-1} + \sum_{i=1}^{k} \beta_{1i} \Delta X_{t-i} + \sum_{i=1}^{k} \beta_{2i} \Delta Y_{t-i} + \varepsilon_{2t} \quad (4.17)$$

Where e_{t-1} is an error correction term. A negative and significant coefficient indicates the presence of long-run causal relationship. If the H_0: $\alpha_{21} = \alpha_{22} = \ldots = \alpha_{2k} = 0$ and $\alpha = 0$ are not rejected, it means that Y does not have a Granger causality for X. Similarly, $\beta_{21} = \beta_{22} = \ldots = \beta_{2k} = 0$ and $\beta = 0$ are not rejected, it suggests that X does not have Granger causality for Y. (Wong, Khan and Du, 2005)

Sims, Stock and Watson (1990) show that inference based on the VAR model is valid, since the Wald test used in the Granger causality restrictions has a limiting chi-square distribution if the time series are cointegrated and the long-run relationship involves the variables that is excluded under the null hypothesis.

In this study, the null hypothesis is that:

a. X (stock prices) and Y(variables) do not have a Granger causilty in the first regression

b. X and Y do not have Granger causality in the second regression.

There are four possible outcomes of the test. First, both (a) and (b) are accepted. This implies that there is no causal relationship between the stock prices and the macroeconomic variables implying that the stock market is efficient with respect to news about variables. Second, if (a) is accepted and (b) is rejected, then causality runs unidirectional from the macroeconomic variables to the stock prices – the stock market is not efficient with respect to information contained in the variable. Third, if (a) is rejected and (b) is accepted, then causality runs unidirectional from the stock prices to the variables and the stock market is still efficient with respect to information embodied in the variables. Finally, if both are rejected, this means that both the stock prices and the corresponding variables selected exhibit bi-directional causality, implying that the stock market is not efficient with respect to news about the variables.

4.2. Data description

For the analyses of the relationship between stock prices and macroeconomic variables, the data analyses will be monthly data for the above variables: Consumer price index (CPI), Money supply in terms of M2 aggregate, and Exchange rate (US dollar and Korean won for Mongolian tugrug) and Interest rate of one year savings, and Top20 Index of the Mongolian Stock Exchange. All variables are based on monthly data from January, 2000 to December, 2009 and collected from statistical sources of Bank of Mongolia and National Statistical Office of Mongolia.

In the case of Korea, KOSPI of Korean stock market, Consumer price index, Broad money (M2), Interest rate of one year savings, and Exchange rate (US dollar for Korean won) are used. All data collected from www.kosis.kr (Korean Statistical Information Service), during the period of January 2002 and December 2009.

All macroeconomic variables employed in this study have been used in many papers, and below I will describe a short theoretical intuition why I have chosen these factors.

4.2.1 Exchange rate

In Mongolia, like most other small open economies, the foreign sector plays a major role in its economy growth. We include two exchange rates US Dollar per Mongolian tugrug and Korean won per Mongolian tugrug as representative foreign exchange rates.

Mongolia and Korea have developed friendly cooperative relationship in various field of economy since the establishment of diplomatic relations in 1990. In recent years, Korean investment and trade increased in Mongolia. Therefore, the Korean securities companies are organizing their activity in the Mongolian stock market. Then, I choose exchange rate of Korean won for Mongolian tugrug by one variable.

Foreign exchange changes can have important impact on the stock price by affecting cash flow, investment and profitability of firms. Exchange rate changes affect the firms through their impact on input and output price. When the exchange rate appreciates, exporters will lose competitiveness in international market, their profits will shrink and the stock price will decline. On the other hand, importers will gain their competitiveness in domestic market, their profit and stock prices will increase. (Aydemir and Demirhan, 2009)

Mayasami et al (2004) found the evidence of a positive relationship between exchange rates and stock prices for Singapore which is regarded as one of the most open economies in the world.

4.2.2 Interest rate

Interest rate is one of the important macroeconomic variables. Therefore, the impact of interest rate on stock provides important implications for monetary policy, financial securities valuation and risk management practices.

If the interest rate paid by banks to depositors increases, people switch their capital from share to banks. This will decrease the demand for share and the price of share. On the other way, when the interest rate paid by banks to depositors increases, the lending interest rate is increased, and

leads to decrease the investments. Also, this will decrease the price of share. So, theoretically there is an inverse relationship between interest rate and stock price.

4.2.3 Consumer price index

Consumer price index is a proxy of inflation. Inflation can affect stock prices negatively and positively. First, inflation increases cost, therefore decreases profit of firms, thus their share prices. Second, expectation of inflation is the general source of uncertainty that reduces today's value of future cash flows, thus value of the firms. (Bayaramova, 2010)

Lastly, inflation implies the rise of firms' product and revenue, and increases the stock prices.

4.2.4 Money supply

Macmillan and Humpe (2007) mentioned that monetary supply could influence stock returns in at least three mechanisms. First, money supply could be related to unanticipated increases in inflation and inflation uncertainty. Second, a money supply could positively affect economic activity, and thus the relationship with the stock prices would be positive. Finally, the portfolio theory suggests a positive effect, since a money supply increases would shift money from non – interest assets such as bank notes to financial assets such as equities.

V. Empirical results

This study has used the Vector Error Correction model to analyze the relationship between the stock prices and macroeconomic variables of Mongolia and Korea. All analyses have been done by using Eviews 5.0 software. This chapter contains the methodology and discussions on previously described empirical results.

First, I summarize the statistics of variables. After it, I apply the unit root test to determine the stationary or the order of integration of the variables, followed by estimating cointegration of the variables that are integrated of the same order so as to capture the long-run relationship. Finally, the VECM will be formulated to measure the speed of adjustment to the equilibrium in the long run. Therefore, some tools of the VECM, Impulse response and Variance Decompositions, are presented to help for the interpretation of empirical results. <Table 3> describes the variables which are used in this study.

Table3. Description of the variables

	Description	Source
Top20Index	Stock index of the Mongolian Stock Exchange	Bank of Mongolia
KOSPI	Stock index of the Korean Stock Exchange	Korean Statistical Information Service
CPI	Consumer price index of two countries	National Statistical Office of Mongolia and Korean Statistical Information Service
IR	Interest rate of one year savings	National Statistical Office of Mongolia and Korean Statistical Information Service

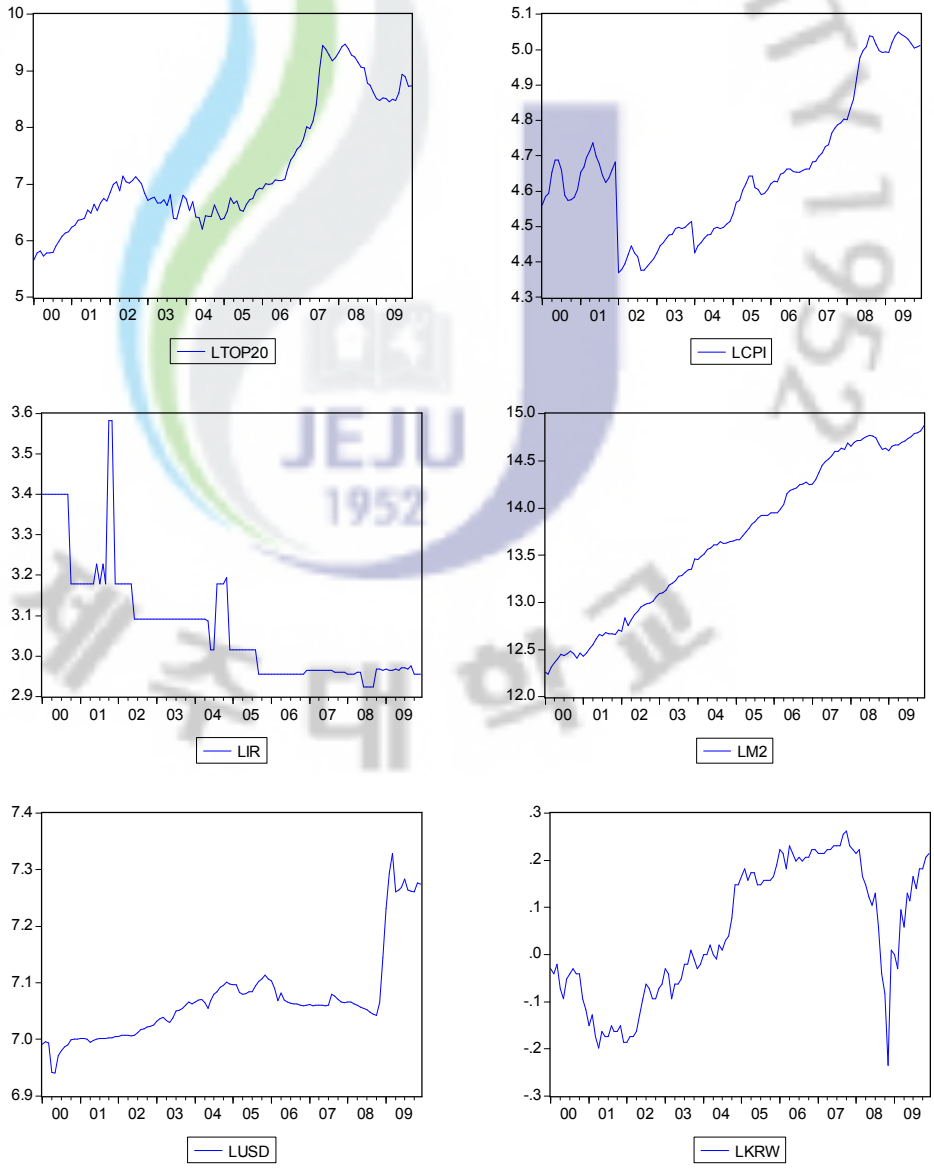
M2	Money supply	Bank of Mongolia and Korean statistical Information Service
USD	United States dollar for Korean won and Mongolian tugrug	Bank of Mongolia and Korean statistical Information Service
KRW	Korean won for Mongolian tugrug	Bank of Mongolia and Korean statistical Information Service

5.1 Summary statistics

In this section, this study will present the descriptive statistic tools in order to make easy understanding of the countries that this study considers, and the measures considered will be the ones of central tendency such as the mean, maximum and minimum values, and measures standard deviation. <Table 4> and <Table 5> represent the summary statistics, and < Figure 3> and < Figure4> represent the distribution of time series of the variables under the study.

In the case of Mongolia, <Figure 3> shows movement of the stock prices (Top20) and the macroeconomic variables. The Top20Index drops during the 2002 and 2004, and it rises sharply until 2007. The consumer price index rises temporarily from 2002, while the interest rate drops temporarily, but it is permanently low recent years. The money supply rises incessantly during the period. The US dollar rises temporarily until 2008, but it shows sharp rise in the first half of 2009. The Korean won rises until 2008, but it drops sharply in the second half of this year.

Figure 3. Distribution of time series (Mongolia)



As shown in <Table 4>, the average monthly Top20Index is 2762.004 during the study period (Jan 2000 – Dec 2009) with a high standard deviation. The average of consumer price index is 107.8 with a maximum of 155.89 and minimum of 79.0. The average interest rate is 21.88 during the period, with 3.54 percent of standard deviation. Also, the average of Korean won and US dollar

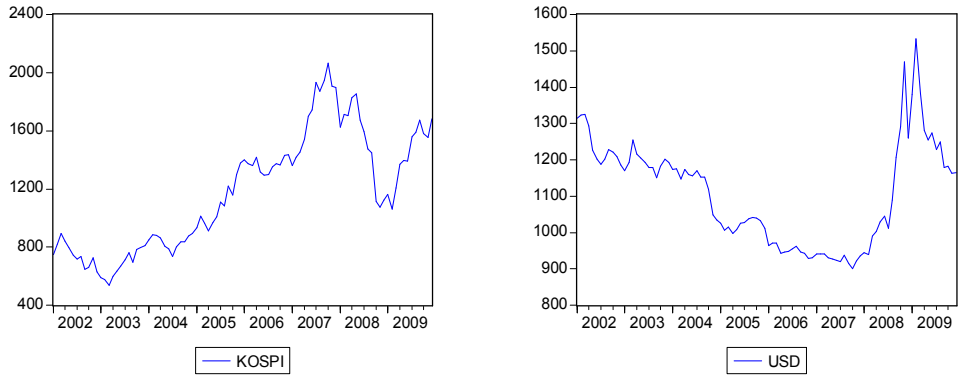
are 1.05 and 1178.4 respectively.

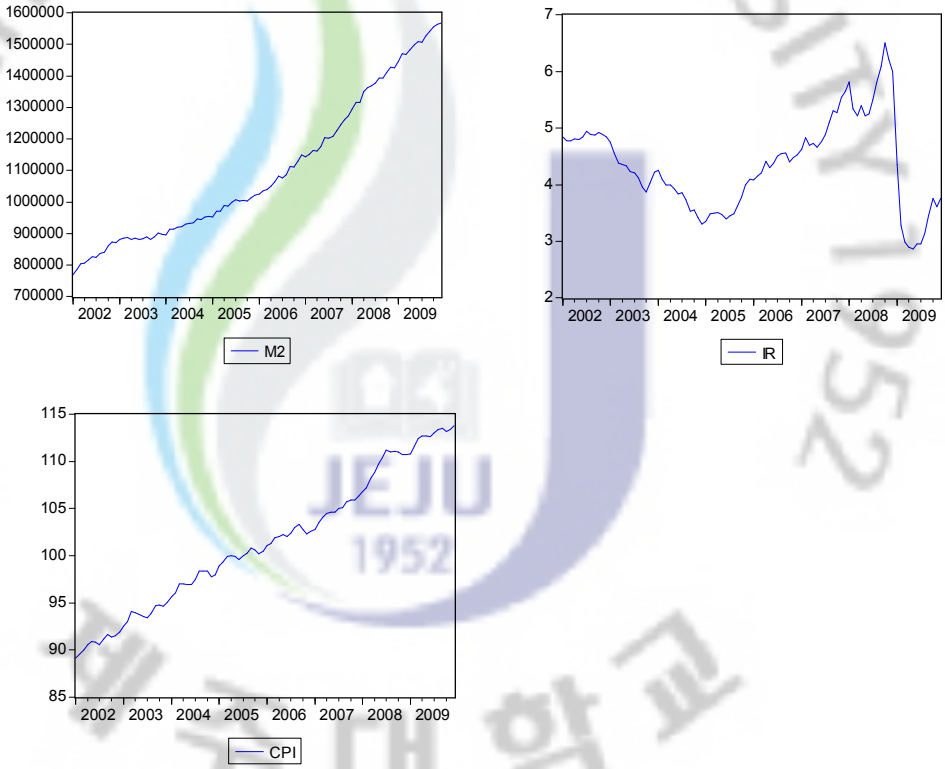
Table 4. Summary statistics(Mongolia)

Variables	Top20Ind	CPI	M2	Interest rate	US dollar	Korean won
Standard deviation	3468.683	22.33642	843321.9	3.539001	97.97237	0.147774
Mean	2762.004	107.8035	1167880.0	21.88750	1178.494	1.057833
Maximum	12966.77	155.8993	2880034.0	36.0000	1524.070	1.300000
Minimum	285.8800	79.00000	207541.8	18.60000	1032.700	0.790000

In the case of Korea, the KOSPI index hits the highest point in 2007, but it drops until 2009. The US dollar for Korean won drops temporarily until 2008 and it rises sharply during this year. The money supply rises continuously and the interest rate drops for 3.3% in 2005, and rises for 6.5% in the second half of 2008. But it drops sharply during the first half of 2009. The consumer price index rises similarly with the money supply.

Figure 4. Distribution of time series (Korea)





<Table 5> represents summary statistics of the variables of Korean economy. The average monthly KOSPI is 1176.316 with 403.4686 of standard deviation. The average of consumer price index is 101.4487 with a maximum of 113.8 and minimum of 89.109. Also, the average of US dollar is 142.2008, with 1534.0 of maximum and 900.7 of minimum.

Table 5. Summary statistics (Korea)

	KOSPI	IR	CPI	M2	USD
Standard deviation	403.4686	0.802953	7.152067	203644.8	142.2008
Mean	1176.316	4.362708	101.4487	1099881.0	1106.974
Maximum	2064.900	6.500000	113.8000	1566850.0	1534.000
Minimum	535.7000	2.860000	89.10900	770533.8	900.7000

5.2 Unit root test

As it mentioned before, this study will perform the Granger causality test. The basic requirement to apply Granger causality test is that the data should be stationary. Thus, I tested all involved time series for unit root and stationary. The Augmented Dickey – Fuller and Phillips Perron tests were applied to test the presence of unit root. I performed the unit root test of each variable in levels and first differences in the both cases of two countries.

In the case of Mongolia, as shown in <Table 6> and <Table 7>, the ADF and PP test results indicate that all variables in level contain unit roots. The tests were applied to the intercept, and the intercept and trend. The lag length was determined by the Schwartz Information minimization criteria in the ADF test and the Bartlett kernet criteria in the PP test.

In levels, the ADF and PP statistic values are lower than the critical values at 1%, 5% and 10%. For the M2, the ADF test results indicate that the null hypothesis can be reject, because statistic values are greater than critical values, but hypothesis is not rejected for other variables. So, the null hypothesis cannot be rejected. It means that the data series are non – stationary. Then, I made the ADF and PP tests by taking first difference of variables.

According to the results of ADF and PP test at first difference, the values of the all data series are greater than the critical values at 1%, 5% and 10%. It means that the null hypothesis of no unit roots of all the variables are rejected at their first difference. So it can be said that the variables are stationary.

Table 6. The ADF test results (Mongolia)

Variables	Level		1st difference	
	Constant included	Constant and trend included	Constant included	Constant and trend included
Top20Ind	-0.844302	-1.310002	-9.23003***	-9.197640***
CPI	-0.252053	-1.497865	-9.902913***	-9.978496***
IR	-2.477038	-1.743690	-11.05859***	-6.010582***
M2	-1.088592	-4.618037**	-5.981582***	-11.07305***
USD	-1.079172	-2.611658	-6.685541***	-6.721923***

KRW	-1.030513	-2.322623	-13.26773***	-13.22582***

- Mackinnon (1996) one – sided p – values
- *,**,*** denotes rejection of the hypothesis at the 1%,5% and 10% level.
- Lag length was determined by the Schwartz Information minimization criteria

Table 7. The PP test results (Mongolia)

Variables	Level		1st difference	
	Constant included	Constant and trend included	Constant included	Constant and trend included
Top20Ind	-0935221	-1.539798	-9.259842***	-9.220100***
CPI	-0.308003	-1.520393	-9.867912***	-9.951508***
IR	-2.562521	-4.429128	-19.13893***	-32.10500***
M2	-1.052975	-1.481790	-11.76419***	-11.83812***
USD	-0.442306	-1.626162	-6.136348***	-6.120623***
KRW	-1.227740	-2.187892	-13.19157***	-13.15155***

- Mackinnon (1996) one – sided p – values
- *,**, *** denotes rejection of the hypothesis at the 1%, 5% and 10% level.
- Lag length was determined by the Bartlett kernet criteria

In the case of Korea, the <Table 8> and <Table 9> show the similar results with the case of Mongolia. According to the results of the ADF and PP tests at level, statistic values are lower than the critical values at significant levels. It is clear from tables that the null hypothesis of no unit roots for all the variables are rejected at their first differences at 10% levels of significances. Thus the variables are stationary and integrated of same order.

Table 8. The ADF test results (Korea)

Variables	Level		1st difference	
	Constant included	Constant and trend included	Constant included	Constant and trend included
KOSPI	-0.910712	-1.831916	-9.212097***	-9.162170***
CPI	-0.353572	-3.727403	-7.592213***	-7.548482***
IR	-2.870276	-2.854883	-5.042137***	-5.043159***
M2	2.674266	-1.239001	-4.353674***	-4.699015***
USD	-1.770406	-1.551432	-9.755315***	-9.854052***

- Mackinnon (1996) one – sided p – values
- *,**,*** denotes rejection of the hypothesis at the 1%,5% and 10% level.
- Lag length was determined by the Schwartz Information minimization criteria

Table 9. The PP test results (Korea)

Variables	Level		1st difference	
	Constant included	Constant and trend included	Constant included	Constant and trend included
KOSPI	-1.051722	-2.122127	-9.251158***	-9.202406***
CPI	-0.838770	-2.810282	-7.435677***	-7.326856***
IR	-2.157276	-2.152189	-5.121177***	-5.093006***
M2	0.766741	-0.977315	-11.23199***	-11.41166***
USD	-1.819883	-1.548405	-9.755173***	-9.856377***

- Mackinnon (1996) one – sided p – values
- *,**, *** denotes rejection of the hypothesis at the 1%, 5% and 10% level.
- Lag length was determined by the Bartlett kernet criteria

From the above tables, the variables of two countries to test the cointegration satisfied the stationary condition, in other words, the variables of two countries do not have unit roots, so as it is possible to test the cointegration.

5.3 Cointegration test

Since the data series are stationary, so I can perform cointegration test. Cointegration test using the Johansen's methodology derives two likelihood estimators: a trace test and maximum eigenvalue test, to see whether any combinations of the variables are cointegrated.

In the case of Mongolia, <Table 10> presents the trace and max-eigenvalue statistics are larger than corresponding critical value. The null hypothesis of no cointegration can be rejected at 5% level of sighnificant. This implies the existence of one cointegrating vectors at 5% level of significant.

Table 10. Johansen cointegration test results (Mongolia)

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Max-Eigen Statistic	0.05 Critical Value
None *	138.1264	117.7082	53.77432	44.49720
At most 1	84.35212	88.80380	32.29908	38.33101
At most 2	52.05305	63.87610	22.00187	32.11832
At most 3	30.05118	42.91525	15.57368	25.82321
At most 4	14.47750	25.87211	8.530632	19.38704
At most 5	5.946869	12.51798	5.946869	12.51798

- Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
- * denotes rejection of the hypothesis at the 0.05 level.
- Mackinnon – Hang – Michelis (1999) p – values.

I also report the cointegrating coefficients in equation form normalized on stock prices (LnTop20Ind):

LTop20Ind = - 181.0280LCPI – 258.42LM2 + 250.4804LIR –85.551990LUSD

9.6119) (59.7707) (54.5443) (105.783)

+48.67898LKRW - 7.602831

(44.4271) (1.60061)

- t-statistics is shown in ().

The signs of the equation indicate that the consumer price index, money supply, and US dollar have a negative effect on the stock prices, whereas the interest rate and Korean won relate positively to the stock prices.

As shown in <Table 11> in the case of Korea, critical values for the trace statistic are 130.2043 for H_0: r=0 and 74.87479 for H_0: r≤1, and max-eigenvalue statistics are 55.32946 for H_0: r=0 and 34.05989 for H_0: r≤1 at the 5% significance level. It means that there are two cointegrating vectors at 5% level of significant.

Table 11. Johansen's cointegration test results (Korea)

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Max-Eigen Statistic	0.05 Critical Value
None *	130.2043	88.80380	55.32946	38.33101
At most 1 *	74.87479	63.87610	34.05989	32.11832
At most 2	40.81490	42.91525	21.08372	25.82321
At most 3	19.73118	25.87211	15.12013	19.38704
At most 4	4.611050	12.51798	4.611050	12.51798

- MacKinnon-Haug-Michelis (1998) p-values

- Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

- Max- eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

- * denotes rejection of the hypothesis at the 0.05 level

Cointegrating coefficients in equation form is normalized on the stock prices (LnKOSPI) as follows:

$$LKOSPI = 0.923462LIR - 5.650312LM2 + 1.251614LUSD + 0.050936$$

(0.14799) (0.89581) (0.29030) (0.00663)

$$LCPI = -0.049626LIR + 0.065379LM2 + 0.036741LUSD + 0.002879$$

(0.01134) (0.06865) (0.02225) (0.00051)

- t-statistics is shown in ().

The signs of the equation indicate that the consumer price index, interest rate and US dollar have a positive effect on the stock prices. The money supply has a negative effect. In both cases of two countries, the interest rate has a positive effect on the stock prices, whereas the money supply has a negative effect.

5.4 Vector error correction model

5.4.1 Estimation result

According to the methodology, if the series are cointegrated, I can run ECM to test the causality. Johansen cointegration test indicates the cointegration, in the both cases of two countries. In this study, the ECM is estimated including error correction (EC) terms using 11 lags in every variable, because according to AIC minimization criteria, 12 lag lengths were selected in the VAR model. The lag length order of the VECM is smaller than lag length order of the VAR model by 1 lag. <Table 12> provides the results in the case of Mongolia.

Table 12. The Error correction model results (Mongolia)

Error Correction:		TOP20	CPI	IR	M2	KRW	USD
CointEq1		-0.121246	0.044688	0.120868	0.048615	0.097955	-0.008842
		(0.12968)	(0.01919)	(0.04456)	(0.02090)	(0.03266)	(0.00847)
		[-0.93495]	[2.32854]	[2.71269]	[2.32638]	[2.99885]	[-1.04354]
TOP20	Lag 1	-0.572657	-0.028803	-0.133649	-0.024947	-0.013839	0.009434
		(0.18261)	(0.02702)	(0.06274)	(0.02943)	(0.04600)	(0.01193)
		[-3.13598]	[-1.06586]	[-2.13018]	[-0.84780]	[-0.30087]	[0.79076]
	Lag6	-0.020709	0.037455	-0.087874	0.083497	0.102828	0.013604
		(0.30149)	(0.04462)	(0.10359)	(0.04858)	(0.07594)	(0.01970)
		[-0.06869]	[0.83947]	[-0.84831]	[1.71863]	[1.35406]	[0.69060]
	Lag11	-0.062790	0.052249	-0.013510	0.010316	-0.020556	0.016237
		(0.18216)	(0.02696)	(0.06259)	(0.02935)	(0.04588)	(0.01190)
		[-0.34470]	[1.93820]	[-0.21587]	[0.35144]	[-0.44803]	[1.36428]
CPI		0.322331	-0.346205	0.479932	-0.250164	0.214251	-0.010274
	Lag1	(1.08690)	(0.16085)	(0.37344)	(0.17514)	(0.27377)	(0.07101)
		[0.29656]	[-2.15238]	[1.28517]	[-1.42833]	[0.78260]	[-0.14468]
		-1.376766	-0.080936	0.598982	-0.304778	-0.864942	-0.057111
	Lag6	(1.21736)	(0.18015)	(0.41826)	(0.19617)	(0.30663)	(0.07954)
		[-1.13094]	[-0.44926]	[1.43207]	[-1.55366]	[-2.82081]	[-0.71805]
		1.060217	-0.010763	0.409442	-0.161487	0.201988	0.027834
	Lag11	(0.69042)	(0.10217)	(0.23721)	(0.11125)	(0.17390)	(0.04511)
		[1.53562]	[-0.10535]	[1.72605]	[-1.45151]	[1.16151]	[0.61706]
IR		-2.164147	0.786292	0.957849	0.709955	1.420906	-0.135929
	Lag1	(1.76597)	(0.26134)	(0.60676)	(0.28457)	(0.44481)	(0.11538)
		[-1.22547]	[3.00868]	[1.57864]	[2.49482]	[3.19438]	[-1.17811]
		-0.127773	0.253050	0.148898	0.471465	0.617275	-0.082706
	Lag6	(1.24170)	(0.18376)	(0.42663)	(0.20009)	(0.31276)	(0.08113)
		[-0.10290]	[1.37710]	[0.34901]	[2.35626]	[1.97364]	[-1.01947]
		1.153187	-0.090180	0.393991	0.101742	0.092054	-0.058387
	Lag11	(0.54158)	(0.08015)	(0.18608)	(0.08727)	(0.13641)	(0.03538)
		[2.12932]	[-1.12519]	[2.11738]	[1.16582]	[0.67482]	[-1.65011]
M2		-0.628675	-0.828604	-1.408630	-1.294719	-1.003181	-0.043933
	Lag1	(1.67031)	(0.24718)	(0.57389)	(0.26916)	(0.42072)	(0.10913)

		[-0.37638]	[-3.35217]	[-2.45454]	[-4.81028]	[-2.38445]	[-0.40258]
	Lag6	1.827659 (1.63367) [1.11875]	-0.659204 (0.24176) [-2.72667]	-0.631519 (0.56130) [-1.12511]	-0.788820 (0.26325) [-2.99644]	-1.041876 (0.41149) [-2.53197]	0.015918 (0.10674) [0.14913]
	Lag11	0.876273 (0.86227) [1.01624]	-0.390094 (0.12761) [-3.05703]	-0.065405 (0.29626) [-0.22077]	-0.359704 (0.13895) [-2.58876]	-0.510689 (0.21719) [-2.35135]	-0.035386 (0.05634) [-0.62812]
KRW	Lag1	0.491357 (0.69084) [0.71125]	0.263880 (0.10224) [2.58111]	0.149059 (0.23736) [0.62799]	0.005534 (0.11132) [0.04971]	-1.081515 (0.17401) [-6.21531]	-0.037249 (0.04514) [-0.82528]
	Lag6	0.893863 (1.47796) [0.60480]	0.291573 (0.21872) [1.33310]	0.680229 (0.50780) [1.33956]	0.354244 (0.23816) [1.48742]	0.233565 (0.37227) [0.62741]	-0.045582 (0.09656) [-0.47204]
	Lag11	-1.173266 (1.01986) [-1.15042]	0.359499 (0.15093) [2.38196]	-0.254739 (0.35040) [-0.72699]	0.213231 (0.16434) [1.29749]	-0.100797 (0.25688) [-0.39239]	-0.034542 (0.06663) [-0.51840]
USD	Lag1	1.834748 (4.78922) [0.38310]	-1.829034 (0.70874) [-2.58067]	-3.703133 (1.64549) [-2.25048]	-0.748145 (0.77174) [-0.96942]	-2.832018 (1.20631) [-2.34767]	0.006807 (0.31290) [0.02175]
	Lag6	5.249774 (4.34114) [1.20931]	-1.736962 (0.64243) [-2.70372]	-3.605784 (1.49154) [-2.41750]	-1.201891 (0.69954) [-1.71812]	-1.979612 (1.09345) [-1.81043]	-0.108356 (0.28363) [-0.38204]
	Lag11	4.720527 (3.38253) [1.39556]	-0.946725 (0.50057) [-1.89129]	-2.286702 (1.16217) [-1.96761]	-0.221913 (0.54507) [-0.40713]	-0.779268 (0.85199) [-0.91464]	0.035185 (0.22100) [0.15921]
C		-0.005168 (0.01618) [-0.31942]	3.27E-05 (0.00239) [0.01366]	0.000497 (0.00556) [0.08932]	-0.000629 (0.00261) [-0.24118]	0.001701 (0.00408) [0.41750]	0.000464 (0.00106) [0.43913]

- Standard errors in ( ) & t-statistics in [ ]

From the above VECM results, (4.12) equation was determined following regression:

$$\Delta Top20_t = -0.005168 + (-0.572657\Delta Top20_{t-1} + \ldots - 0.02.709\Delta Top20_{t-6} + \ldots - 0.062790\Delta Top20_{t-11}) + (0.322331\Delta CPI_{t-1} + \ldots - 1.376766\Delta CPI_{t-6} + \ldots + 1.060217\Delta CPI_{t-11}) + (-2.164147\Delta IR_{t-1} + \ldots - 0.127773\Delta IR_{t-6} + \ldots + 1.1553187\Delta IR_{t-11}) + (-0.628675\Delta M2_{t-1} + \ldots + 1.827659\Delta M2_{t-6}$$

$$+\ldots+0.876273\Delta M2_{t-11}) + (0.491357\Delta KRW_{t-1}+\ldots+ 0.893863\Delta KRW_{t-6}+\ldots-1.173266\Delta KRW_{t-11}) + (1.834748\Delta USD_{t-1}+\ldots+5.249774\Delta USD_{t-6}+\ldots+4.720527\Delta USD_{t-11}) - 0.121246EC_{t-1}$$

$$\Delta CPI_t = 3.27E\text{-}05 + (-0.028803\Delta Top20_{t-1}+\ldots+0.037455\Delta Top20_{t-6}+\ldots+0.052249\Delta Top20_{t-11}) + (-0.346205\Delta CPI_{t-1}+\ldots- 0.080936\Delta CPI_{t-6}+\ldots- 0.010763\Delta CPI_{t-11}) + (0.786292\Delta IR_{t-1}+\ldots + 0.253050\Delta IR_{t-6}+\ldots-0.090180\Delta IR_{t-11}) + (-0.828604\Delta M2_{t-1}+\ldots-0.659204\Delta M2_{t-6}+\ldots- 0.390094\Delta M2_{t-11}) + (0.263880\Delta KRW_{t-1}+\ldots+ 0.291573\Delta KRW_{t-6}+\ldots+0.359499\Delta KRW_{t-11}) + (-1.829034\Delta USD_{t-1}+\ldots -1.736962\Delta USD_{t-6}+\ldots-0.946725\Delta USD_{t-11}) +0.044688EC_{t-1}$$

$$\Delta IR_t = 0.000497 + (-0.133649\Delta Top20_{t-1}+\ldots- 0.087874\Delta Top20_{t-6}+\ldots- 0.013510\Delta Top20_{t-11}) + (0.479932\Delta CPI_{t-1}+\ldots+0.598982\Delta CPI_{t-6}+\ldots+0.409442\Delta CPI_{t-11}) + (0.957849\Delta IR_{t-1}+\ldots + 0.148898\Delta IR_{t-6}+\ldots+ 0.393991\Delta IR_{t-11}) + (-1.408630\Delta M2_{t-1}+\ldots- 0.631519\Delta M2_{t-6}+\ldots - 0.065405\Delta M2_{t-11}) + (0.1490059\Delta KRW_{t-1}+\ldots+ 0.680229\Delta KRW_{t-6}+\ldots - 0.254739\Delta KRW_{t-11}) + (-3.703133\Delta USD_{t-1}+\ldots- 3.605784\Delta USD_{t-6}+\ldots- 2.286702\Delta USD_{t-11}) + 0.1208686EC_{t-1}$$

$$\Delta M2_t = -0.000629 + (-0.024947\Delta Top20_{t-1}+\ldots+ 0.083497\Delta Top20_{t-6}+\ldots+ 0.010316\Delta Top20_{t-11}) + (-0.250164\Delta CPI_{t-1}+\ldots- 0.304778\Delta CPI_{t-6}+\ldots- 0.161487\Delta CPI_{t-11}) + (0.709955\Delta IR_{t-1}+\ldots + 0.471465\Delta IR_{t-6}+\ldots+ 0.101742\Delta IR_{t-11}) + (-1.294719\Delta M2_{t-1}+\ldots- 0.788820\Delta M2_{t-6}+\ldots -0.359704\Delta M2_{t-11}) + (0.005534\Delta KRW_{t-1}+\ldots+ 0.354244\Delta KRW_{t-6}+\ldots+ 0.213231\Delta KRW_{t-11}) + (-0.78145\Delta USD_{t-1}+\ldots-1.201891\Delta USD_{t-6}+\ldots-0.221913\Delta USD_{t-11}) + 0.048615EC_{t-1}$$

$$\Delta KRW_t = 0.001701 + (-0.013839\Delta Top20_{t-1}+\ldots+ 0.102828\Delta Top20_{t-6}+\ldots- 0.020556\Delta Top20_{t-11}) + (0.214251\Delta CPI_{t-1}+\ldots- 0.864942\Delta CPI_{t-6}+\ldots+0.201988\Delta CPI_{t-11}) + (1.420906\Delta IR_{t-1}+\ldots + 0.617275\Delta IR_{t-6}+\ldots+ 0.092054\Delta IR_{t-11}) + (-1.003181\Delta M2_{t-1}+\ldots- 1.041876\Delta M2_{t-6}+\ldots -0.510689\Delta M2_{t-11}) + (-1.081515\Delta KRW_{t-1}+\ldots+ 0.233565\Delta KRW_{t-6}+\ldots - 0.034542\Delta KRW_{t-11}) + (-2.832018\Delta USD_{t-1}+\ldots- 1.979612\Delta USD_{t-6}+\ldots- 0.779268\Delta USD_{t-11}) + 0.097955EC_{t-1}$$

$$\Delta USD_t = 0.000464 + (0.009434\Delta Top20_{t-1}+\ldots+ 0.013604\Delta Top20_{t-6}+\ldots+ 0.016237\Delta Top20_{t-11}) + (-0.010274\Delta CPI_{t-1}+\ldots- 0.057111\Delta CPI_{t-6}+\ldots+0.027834\Delta CPI_{t-11}) + (-0.135929\Delta IR_{t-1}+\ldots -0.082806\Delta IR_{t-6}+\ldots- 0.058387\Delta IR_{t-11}) + (-0.043933\Delta M2_{t-1}+\ldots+0.015918\Delta M2_{t-6}+\ldots - 0.035386\Delta M2_{t-11}) + (-0.037249\Delta KRW_{t-1}+\ldots- 0.045582\Delta KRW_{t-6}+\ldots - 0.034542\Delta KRW_{t-11}) + (0.006807\Delta USD_{t-1}+\ldots- 0.108356\Delta USD_{t-6}+\ldots+0.035185\Delta USD_{t-11}) - 0.008842EC_{t-1}$$

The results indicate that the error term of the stock prices (Top20) is negative (- 0.121246) and significant at 10% level of significance, which implies that 12.1% of the deviation from the equilibrium in the previous period is adjusted in the following period. The small coefficient of the

EC implies that the deviations tend to be adjusted slowly and that disequilibrium might be persistent over short periods of time. Also, the results show that an increase of the CPI per 1% in the last months increases the Top20Ind by 32.3% and also an increase of the interest rate of 1% decreases the Top20Ind by 216.4% during the sample period. On the other hand, an increase of M2 and KRW per 1% decreases the Top20Index by 62.8% and 49.1%, while an increase of the USD per 1% increases the Top20Index by 183.5%.

Also, the results show that a change of 1% in Top20Ind adjusts the CPI by 2.8%, the interest rate by 13.3%, M2 by 2.4%, KRW by 1.3%, and the USD by 0.9%, respectively.

From the sign of equations, it can be explained that the CPI has a positive effect in the stock prices in lag 1 and lag 11(last month and 11 months ago) and negative effect in lag 6 (6 months ago). Negative relationship can be because of an increase in the rate of inflation. Interest rates also have a negative relationship with the stock prices in lag 1 and lag 6. It is because of high interest rates of banks. If the interest rates increase, the people want to deposit to the banks. It can influence the activity level of firms, which in turn influence the price. The Korean won and US dollar have a positive effect in the stock prices. It can be because of foreign investments, which is conducted in Mongolian mining sector, of past years.

<Table 13> provides results in the case of Korea. The results indicate that the first error term is negative (-0.187347) and the second one is positive (23.94347) and both of them are significant at 10% level of significance. Also, the results show that a change of 1% of last months in CPI adjusts the KOSPI by over 21.89%, the change in money supply can adjusts the Top20Index by 557.3%, whereas the changes in foreign exchange rates adjust by 602.3%. Therefore, the results show that a change of 1% in the KOSPI adjusts the CPI by 0.2%, the interest rate by 74.9%, M2 by 9.4% and the USD by 43.9%, respectively. From the sign of the equations, money supply has negative effects each lag order, and other variables have a positive relationship with the stock prices.

Table 13. Error correction models results (Korea)

Error Correction:		KOSPI	CPI	IR	M2	USD
CointEq1		1.128966	0.041220	1.432486	0.060193	-1.032131
		(0.67453)	(0.05464)	(0.42109)	(0.09660)	(0.54228)
		[1.67372]	[0.75445]	[3.40185]	[0.62312]	[-1.90331]
CointEq2		-36.96826	0.140854	-5.267720	2.880640	-3.187150
		(9.00296)	(0.72923)	(5.62034)	(1.28932)	(7.23790)
		[-4.10623]	[0.19315]	[-0.93726]	[2.23423]	[-0.44034]
KOSPI	Lag1	-2.502267	-0.047581	-1.438480	-0.000926	1.014317
		(0.75675)	(0.06130)	(0.47242)	(0.10837)	(0.60838)
		[-3.30661]	[-0.77626]	[-3.04492]	[-0.00855]	[1.66723]
	Lag6	-1.915029	-0.010982	-0.431750	0.018063	0.626943
		(0.56134)	(0.04547)	(0.35043)	(0.08039)	(0.45129)
		[-3.41153]	[-0.24154]	[-1.23205]	[0.22469]	[1.38923]
	Lag11	-0.057867	-0.006299	-0.226469	-0.026632	0.031412
		(0.13737)	(0.01113)	(0.08576)	(0.01967)	(0.11044)
		[-0.42124]	[-0.56606]	[-2.64075]	[-1.35373]	[0.28442]
CPI	Lag1	33.26697	-0.941683	2.081045	-2.209129	4.177177
		(8.94399)	(0.72445)	(5.58353)	(1.28087)	(7.19049)
		[3.71948]	[-1.29986]	[0.37271]	[-1.72470]	[0.58093]
	Lag6	12.11318	-0.861702	4.710016	-1.413343	8.807736
		(6.31856)	(0.51179)	(3.94453)	(0.90488)	(5.07978)
		[1.91708]	[-1.68369]	[1.19406]	[-1.56190]	[1.73388]
	Lag11	-0.057067	-0.587356	-1.688964	0.764493	4.444400
		(3.05160)	(0.24718)	(1.90504)	(0.43702)	(2.45332)
		[-0.01870]	[-2.37627]	[-0.88657]	[1.74933]	[1.81158]
IR	Lag1	2.479297	-0.005332	0.473416	-0.166666	-0.050738
		(0.68824)	(0.05575)	(0.42965)	(0.09856)	(0.55331)
		[3.60236]	[-0.09565]	[1.10185]	[-1.69094]	[-0.09170]
	Lag6	0.401798	0.035597	-0.296536	-0.005411	0.135030
		(0.35310)	(0.02860)	(0.22043)	(0.05057)	(0.28388)
		[1.13790]	[1.24460]	[-1.34524]	[-0.10700]	[0.47567]
		0.022893	0.024621	-0.131068	0.015089	0.108500

	Lag11	(0.28489) [0.08036]	(0.02308) [1.06696]	(0.17785) [-0.73696]	(0.04080) [0.36985]	(0.22904) [0.47372]
M2	Lag1	-8.765743 (1.96562) [-4.45952]	-0.045542 (0.15921) [-0.28605]	-3.524468 (1.22709) [-2.87221]	-0.889260 (0.28150) [-3.15903]	2.226213 (1.58026) [1.40877]
	Lag6	-14.01748 (3.75677) [-3.73126]	0.138423 (0.30429) [0.45490]	-2.444634 (2.34526) [-1.04237]	-0.128956 (0.53801) [-0.23969]	1.569550 (3.02024) [0.51968]
	Lag11	-2.781761 (1.42096) [-1.95766]	-0.035141 (0.11510) [-0.30532]	-0.679387 (0.88707) [-0.76588]	0.223767 (0.20350) [1.09961]	0.235065 (1.14238) [0.20577]
USD	Lag1	2.316489 (0.64642) [3.58355]	-0.021016 (0.05236) [-0.40138]	0.533310 (0.40355) [1.32155]	-0.244159 (0.09257) [-2.63742]	-0.583093 (0.51969) [-1.12200]
	Lag6	1.894643 (0.90970) [2.08271]	-0.042196 (0.07368) [-0.57266]	-0.085314 (0.56790) [-0.15023]	-0.348071 (0.13028) [-2.67174]	0.639886 (0.73135) [0.87494]
	Lag11	1.365487 (0.54336) [2.51303]	-0.000203 (0.04401) [-0.00461]	0.391253 (0.33921) [1.15343]	-0.193203 (0.07782) [-2.48284]	-0.189592 (0.43684) [-0.43401]
C		0.009002 (0.00600) [1.49980]	0.000129 (0.00049) [0.26511]	0.001770 (0.00375) [0.47239]	0.000417 (0.00086) [0.48520]	-0.001154 (0.00483) [-0.23904]

- Standard errors in ( ) & t-statistics in [ ]

From the above table, (4.14) equation can be determined in the case of Korea as follows:

$$\Delta KOSPI_t = 0.009002 + (-2.502267\Delta KOSPI_{t-1} + \ldots - 1.915029\Delta KOSPI_{t-6} + \ldots - 0.057867\Delta KOSPI_{t-11}) + (33.26697\Delta CPI_{t-1} + \ldots + 12.11318\Delta CPI_{t-6} + \ldots - 0.057067\Delta CPI_{t-11}) + (2.479297\Delta IR_{t-1} + \ldots + 0.401798\Delta IR_{t-6} + \ldots + 0.022893\Delta IR_{t-11}) + (-8.765743\Delta M2_{t-1} + \ldots - 14.01748\Delta M2_{t-6} + \ldots - 2.781761\Delta M2_{t-11}) + (2.316489\Delta USD_{t-1} + \ldots + 1.894643\Delta USD_{t-6} + \ldots + 1.365487\Delta USD_{t-11}) + 1.128966EC_{t-1} - 36.96826EC_{t-2}$$

$$\Delta CPI_t = 0.000129 + (-0.047581\Delta KOSPI_{t-1} + \ldots - 0.010982\Delta KOSPI_{t-6} + \ldots - 0.006299\Delta KOSPI_{t-11}) + (-0.941683\Delta CPI_{t-1} + \ldots - 0.861702\Delta CPI_{t-6} + \ldots - 0.587356\Delta CPI_{t-11}) + (-0.005332\Delta IR_{t-1} + \ldots + 0.035597\Delta IR_{t-6} + \ldots + 0.024621\Delta IR_{t-11}) + (-0.045542\Delta M2_{t-1} + \ldots + 0.138423\Delta M2_{t-6} + \ldots$$

$$- 0.035141\Delta M2_{t-11}) + (-0.021016\Delta USD_{t-1}+\ldots-0.042196\Delta USD_{t-6}+\ldots- 0.000203\Delta USD_{t-11})$$
$$+ 0.041220EC_{t-1} + 0.140854EC_{t-2}$$

$$\Delta IR_t = 0.001770 + (- 1.438480\Delta KOSPI_{t-1} +\ldots- 0.431750\Delta KOSPI_{t-6} +\ldots- 0.226469\Delta KOSPI_{t-11})$$
$$+ (2.081045\Delta CPI_{t-1}+\ldots+4.710016\Delta CPI_{t-6} +\ldots-1.688964\Delta CPI_{t-11}) + (0.473416\Delta IR_{t-1} +\ldots$$
$$-0.296536\Delta IR_{t-6}+\ldots-0.131068\Delta IR_{t-11}) + (- 3.524468\Delta M2_{t-1}+ \ldots-2.4444634\Delta M2_{t-6} +\ldots$$
$$-0.679387\Delta M2_{t-11}) + (0.533310\Delta USD_{t-1}+\ldots-0.085314\Delta USD_{t-6}+\ldots+0.391253\Delta USD_{t-11})$$
$$+ 1.432486EC_{t-1}- 5.267720EC_{t-2}$$

$$\Delta M2_t =0.000417 + (- 0.000926\Delta KOSPI_{t-1} +\ldots+0.018063\Delta KOSPI_{t-6} +\ldots- 0.026632\Delta KOSPI_{t-11})$$
$$+ (-2.209129\Delta CPI_{t-1}+\ldots-1.413323\Delta CPI_{t-6} +\ldots+0.764493\Delta CPI_{t-11}) + (-0.166666\Delta IR_{t-1} +\ldots$$
$$-0.005411\Delta IR_{t-6}+\ldots+ 0.015089\Delta IR_{t-11}) + (-0.889260\Delta M2_{t-1}+ \ldots-0.128956\Delta M2_{t-6} +\ldots$$
$$+0.223767\Delta M2_{t-11}) + (-0.244159\Delta USD_{t-1}+\ldots-0.348071\Delta USD_{t-6}+\ldots-0.193203\Delta USD_{t-11})$$
$$+ 0.060193EC_{t-1}+2.880640EC_{t-2}$$

$$\Delta USD_t =- 0.001154 + (1.014317\Delta KOSPI_{t-1} +\ldots+0.626943\Delta KOSPI_{t-6} +\ldots+0.031412\Delta KOSPI_{t-11})$$
$$+ (4.177177\Delta CPI_{t-1}+\ldots+8.807736\Delta CPI_{t-6} +\ldots+ 4.444400\Delta CPI_{t-11}) + (-0.050738\Delta IR_{t-1}$$
$$+\ldots +0.125030\Delta IR_{t-6}+\ldots+ 0.108500\Delta IR_{t-11}) + (2.226213\Delta M2_{t-1}+ \ldots+1.569550\Delta M2_{t-6} +\ldots$$
$$+0.235065\Delta M2_{t-11})+ (-0.583093\Delta USD_{t-1}+\ldots+0.639886\Delta USD_{t-6}+\ldots-0.189592\Delta USD_{t-11})$$
$$- 1.032131EC_{t-1}- 3.187150EC_{t-2}$$

5.4.2 Causality test

The results of the test on causality are presented in <Table14> and <Table15>. In the case of Mongolia, the causality is not found from the macroeconomic variables to the stock prices, but the null hypothesis from the stock prices to the CPI, and from the stock prices to the money supply are rejected at 1% and 10% level of significance, respectively. This means that there are unidirectional causality from the stock prices to CPI and M2.

Table 14. Granger Causality test results (Mongolia)

Granger cause	Chi-square statistic	p-value	Granger cause	Chi-square statistic	p-value
CPI->Top20Ind	15.72192	0.1518	Top20Ind->CPI	28.29288***	0.0029
IR->Top20Ind	14.05641	0.2299	Top20Ind->IR	12.91611	0.2988

M2->Top20Ind	13.34912	0.2711	Top20Ind->M2	17.72623*	0.0882
KRW->Top20Ind	9.286576	0.5955	Top20Ind->KRW	16.12777	0.1365
USD-> Top20Ind	10.32163	0.5017	Top20Ind->USD	7.281895	0.7758

- *,*** denotes rejection of the hypothesis at the 10% and 1% level

In the case of Korea, <Table 15> provides the Granger causality test in order to identify the direction of causality. The results show the bidirectional causality between the stock prices and the interest rate. There is the unidirectional causality from the all macroeconomic variables to the stock prices. The null hypothesis that the CPI does not have Granger causality to the stock prices, the interest rate does not have a granger causality to the stock prices, and the US dollar does not have a granger causality to the stock prices are rejected at the 1% level of significance,whereas the null hypothesis of the money supply does not have Granger causality to the stock prices is rejected 10% level of significance.

Table 15. Granger Causality test results (Korea)

Granger cause	Chi-square statistic	p-value	Granger cause	Chi-square statistic	p-value
CPI->KOSPI	46.47003***	0.0000	KOSPI->CPI	3.978578	0.9705
IR->KOSPI	37.12094***	0.0001	KOSPI->IR	21.88400**	0.0253
M2->KOSPI	31.79652*	0.0008	KOSPI->M2	12.33491	0.3390
USD-> KOSPI	47.37564***	0.0000	KOSPI->USD	11.90538	0.3708

- *, **,*** denotes rejection of the hypothesis at the 10%, 5% and1% level

5.4.3 Impulse responses

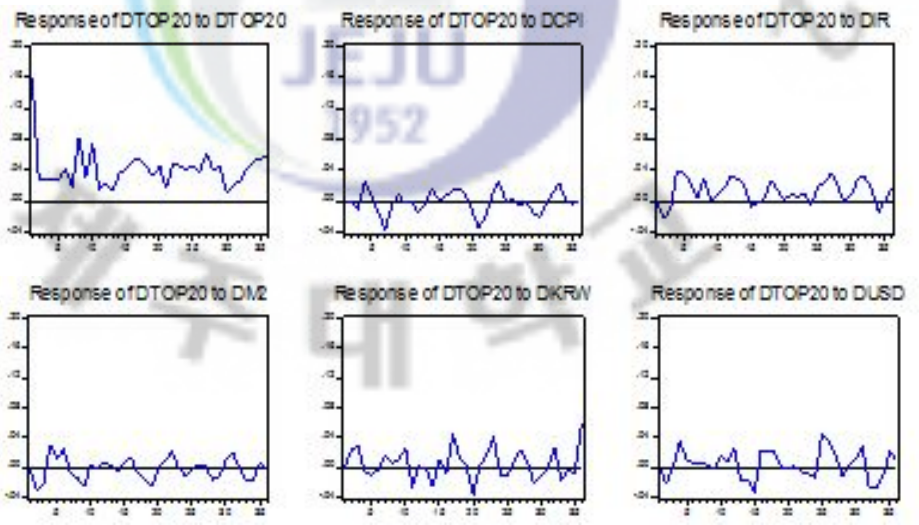
The impulse responses for the ECM, presented in < Figure 5>, illustrate 36 months response of the stock prices to the macroeconomic variables, in the case of Mongolia.

The stock prices react positively to CPI by -0.010966 changes after 3 months, but response is -0.014677 after 12 months, and -0.000435 after 3 years. The response on the interest rate is -

0.011648 after 3 months, whereas it increases 0.024467 after 6 months, 0.033701 after one year and 0.018097 after 3 years.

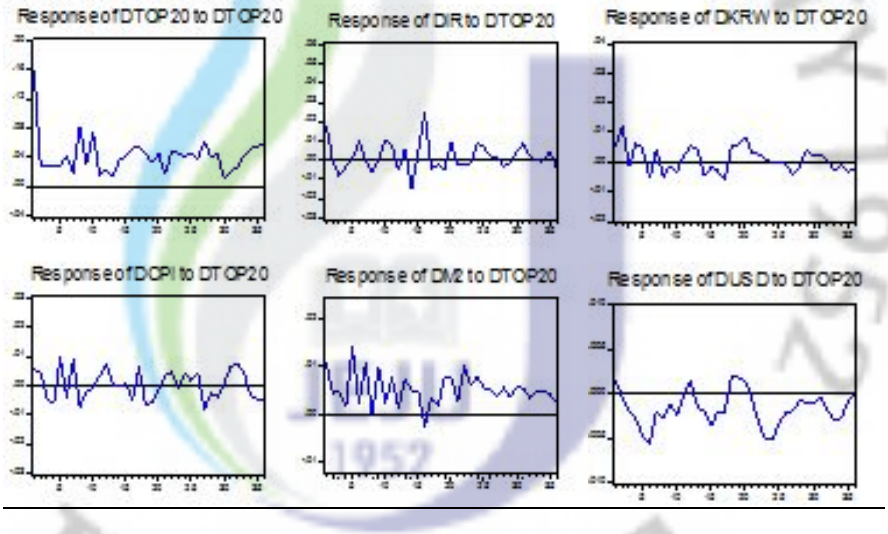
The stock prices respond negatively to M2 after 3 months, -0.024148, and positively after one year, 0.006248, but it drops for 0.005349 after 3 years. The response of the stock prices on KRW is -0.002366 after 6 months, and 0.001948 after one year, but it drops for -0.007918 after three years. The stock prices respond to the USD 0.000445 after 3 months, 0.026112 after one year, and 0.021157 after 3 years.

Figure 5. Impulse response of stock prices to macroeconomic variables (Mongolia)



<Figure6> shows the strong responses of the macroeconomic variables to the stock prices. The CPI responds to the TOP20Ind by -0.004568 after 3 months, by 0.007426 after 12 months and -0.004577 after 3 years. The interest rate responds to the TOP20Ind by 0.009559 after 6 months, -0.005357 after 12 months, and 0.004322 after 3 years, whereas the response of the Korean won is -0.001289 after 3 months and 0.005555 after 12 months, and -0.003509 after 3 years. The money supply responds to the stock prices 0.004678 after 3 months, 0.001454 after one year, and 0.004432 after 3 years. The USD responds negatively to the stock prices during the period which the response is -0.001853 after 3 months, -0.001315 after one year, and -0.001008 after 3 years.

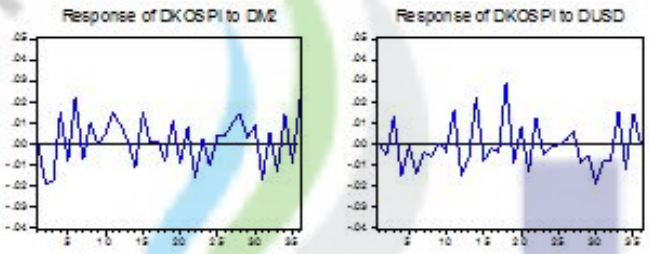
Figure 6. Impulse response of macroeconomic variables to stock prices (Mongolia)



In the case of Korea, <Figure 7> shows the response of the stock prices on the macroeconomic variables. The responses are strong on all variables during the period. The response of the KOSPI on the CPI falls until 5 months and rises during next 4 months. It is -0.001273 after 3 months, 0.015321 after one year, and 0.002773after 3 years.

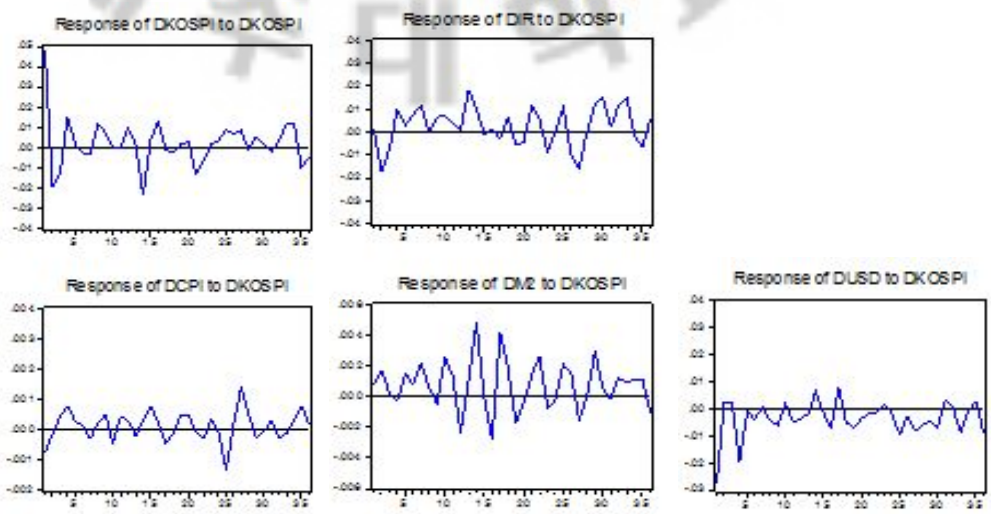
The response of the KOSPI on the interest is -0.026197 after 3 months, 0.005341after one year, and -0.011253 after 3 years. Therefore, the response on the M2 rises temporarily after 3 months. The response is -0.012053 after 3 months, 0.006018 after one year, and 0.015337 after 3 years. The last one shows that the KOSPI respond to USD. The response is 0.017210 after 3 months, -0.019415 after one year, and -0.025419 after 3 years.

Figure 7. Impulse response of stock prices to macroeconomic variables (Korea)



<Figure 8> shows the responses of the macroeconomic variables on the stock prices. The macroeconomic variables respond strongly to the stock prices during the period. The response of the CPI rises until 5 months. It is 0.000110 after 3 months, 0.000379 after one year, and 0.000920 after 3 years. On the other hand, the interest rate respond to the stock prices -0.003165 after 3 months, 0.004798 after one year, and 0.004995 after 3 years. The response of M2 is 0.000262 after 3 months, -0.002378 after one year, and -0.002515 after 3 years, while the response of the USD is 0.001795, -0.002623 and -0.012174, respectively.

Figure 8. Impulse response of macroeconomic variables to stock prices (Korea)



5.4.4 Variance decomposition

The variance decomposition measures the percentage of forecast error of variation that is explained by another variable. The results are presented in <Table16> with variance decomposition

at 3, 12, 24 and 36 months horizon.

In the case of Mongolia, I observe that variations in the stock prices are predominantly attributed to its own variations accounting for 86.86% of the stock prices forecast error variance after 3 months. Compared to the other variables in first year, the interest rate explains most of variation in the stock prices counting for 9.99%, followed by money supply by 6.42%. However, the CPI does not have a short – run impact in the variation of the stock prices, and it shows effect after one year, counting for 4.17% of the variation. After 3 years, the Korean won captures most variations in the stock prices, accounting for 10.7%, followed by the interest rate by 9.77% and US dollar by 8.82%. The results suggest that the exchange rates affect deeply to the stock prices. It can be explained that the foreign trade and investment influence have a big role in the firms. Therefore, high interest rates of banks have a impact to the stock prices.

On the other hand, the stock prices capture most variations on the money supply accounting for 25.5% after one year and 26% after 3 years, followed by the US dollar by 17.2% and the interest rate by 14.43%.

Table16. Variance decomposition results (Mongolia)

Variance Decomposition of DTOP20:							
Period	S.E.	DTOP20	DCPI	DIR	DM2	DKRW	DUSD
3	0.177063	86.86343	0.387966	2.040739	4.745972	4.413192	1.548702
12	0.253887	69.78071	4.178864	9.993679	6.425387	5.103052	4.518306
24	0.320409	63.96794	5.774496	8.732931	5.992958	9.359500	6.172172
36	0.383197	60.46007	4.948157	9.770864	5.281357	10.71470	8.824849
Variance Decomposition of DCPI:							
Period	S.E.	DTOP20	DCPI	DIR	DM2	DKRW	DUSD
3	0.030877	7.106727	72.71157	8.196094	9.531246	1.752454	0.701913
12	0.057554	12.55752	34.43579	34.80988	9.274281	6.210926	2.711605
24	0.077184	10.36367	33.77485	24.37628	11.90220	12.22451	7.358506

36	0.089013	11.50049	31.32848	21.84627	11.59657	16.11086	7.617333

Variance Decomposition of DIR:

Period	S.E.	DTOP20	DCPI	DIR	DM2	DKRW	DUSD
3	0.066154	8.872606	3.770206	73.88414	5.876902	2.240122	5.356027
12	0.079193	11.64125	11.33091	54.55224	9.791571	6.030615	6.653408
24	0.105464	16.44905	11.28750	37.65878	10.22990	10.73615	13.63861
36	0.118742	14.43787	10.49627	33.10819	9.880428	16.55118	15.52606

Variance Decomposition of DM2:

Period	S.E.	DTOP20	DCPI	DIR	DM2	DKRW	DUSD
3	0.030968	16.09215	16.46150	2.936607	50.98272	4.079794	9.447234
12	0.049900	25.53666	11.49126	14.65451	31.20263	3.437968	13.67696
24	0.062717	27.92983	8.925276	12.33857	24.66699	8.150782	17.98855
36	0.072424	26.01008	8.355073	11.65947	22.38159	12.23773	19.35606

Variance Decomposition of DKRW:

Period	S.E.	DTOP20	DCPI	DIR	DM2	DKRW	DUSD
3	0.049928	6.946033	5.357788	2.804742	3.183391	74.04577	7.662275
12	0.062681	8.938989	7.853514	7.028377	4.002797	61.37779	10.79853
24	0.079710	9.429300	11.27285	7.403255	5.738063	51.56315	14.59338
36	0.088569	8.649360	12.07070	8.719142	6.604870	48.94487	15.01106

Variance Decomposition of DUSD:

Period	S.E.	DTOP20	DCPI	DIR	DM2	DKRW	DUSD
3	0.014845	2.585830	4.423209	7.385194	5.812999	12.42733	67.36544
12	0.024280	14.99504	13.06623	8.744912	8.217063	26.00607	28.97069

24	0.031814	18.68004	11.32968	9.043908	7.714515	23.73728	29.49458
36	0.036329	17.52375	12.67860	9.942583	9.902876	23.09405	26.85813

In the case of Korea, the results for variance decomposition are presented in <Table17>. Variations in the stock prices are not predominantly attributed to its own variations accounting for 68% after 3 months and 20.5% after 3 years. In a short-run, the interest rate explains most of variation in the stock prices accounting for 16.4%, followed by the US dollar by 7.04%. But after one year, the US dollar captures most of variation in the stock prices accounting for 19.32%.

However, the CPI does not have a short-run impact in the variation of stock prices, and it shows significant effects after one year, counting for 18.42% of variation. The interest rate has significant effects during the period. All macroeconomic variables capture high variations in the stock prices after a few months.

The stock prices explain 16.7% variations on the CPI after 3 months and 22% of variations after 3 years. In short-run, the stock prices capture 6.7% and 10.7% of variations on the interest rate and money supply, but variations rise after 3 years, accounting for 15.4% and 23.2% of variations. However, the stock prices have a high short – run impact on the US dollar.

Table17. Variance decomposition results (Korea)

Variance Decomposition of DKOSPI:						
Period	S.E.	DKOSPI	DCPI	DIR	DM2	DUSD
3	0.066393	68.07472	1.486480	16.46034	6.934247	7.044218
12	0.102180	33.45828	18.42354	15.66043	13.13621	19.32154
24	0.139224	25.67822	20.88582	14.50488	12.89846	26.03263
36	0.162463	20.57411	21.05175	16.88154	15.00578	26.48682

Variance Decomposition of DCPI:

Period	S.E.	DKOSPI	DCPI	DIR	DM2	DUSD
3	0.004204	16.79385	81.76627	0.884582	0.367100	0.188197
12	0.004842	21.45235	67.59634	4.006415	2.971338	3.973558
24	0.006584	18.79243	48.60490	14.72929	5.357550	12.51582
36	0.008920	22.03512	36.70194	24.91667	4.903437	11.44283

Variance Decomposition of DIR:

Period	S.E.	DKOSPI	DCPI	DIR	DM2	DUSD
3	0.048136	6.746268	3.070274	60.49840	1.702137	27.98292
12	0.079436	11.52006	28.72555	35.29918	2.548685	21.90652
24	0.104145	15.96579	30.39600	28.21625	4.458166	20.96380
36	0.138351	15.44833	32.35789	29.93236	4.918577	17.34284

Variance Decomposition of DM2:

Period	S.E.	DKOSPI	DCPI	DIR	DM2	DUSD
3	0.008321	10.77172	24.77791	8.955622	53.69920	1.795549
12	0.012822	21.46681	16.47367	17.37392	30.15971	14.52589
24	0.021276	28.58425	10.56235	22.62333	14.85464	23.37542
36	0.028128	23.23645	15.34149	28.07632	12.16089	21.18485

Variance Decomposition of DUSD:

Period	S.E.	DKOSPI	DCPI	DIR	DM2	DUSD
3	0.043017	27.27701	1.046814	5.271153	3.718667	62.68635
12	0.060224	27.07895	9.148384	13.15146	3.634493	46.98671
24	0.079426	23.98029	14.00116	14.73805	6.407483	40.87302
36	0.093269	22.27256	13.80670	18.12046	7.273445	38.52683

VI. Conclusions

This study aims to explore whether there is any relationship between stock prices and macroeconomic variables such as consumer price index, interest rate, exchange rates and money supply in the case of Mongolia and Korea.

First of this study, I described the briefly history and development of Mongolian and Korean stock markets. During the transitional period of central planned economy to market economy in Mongolia, many social and economic changes were made. One of those changes was the Government decision to establish Mongolian Stock Exchange to privatize the state owned enterprises. Thus, in 1991, the Mongolia Stock Exchange was established. Auctions officially began on 7 February 1992; the shares of three companies were auctioned off.

Secondary trading began on 28 August 1995. From its start, the MSE permitted foreigner's investment. In 1998 the Exchange moved to electronic trading. In 2000, foreign securities investment company was allowed to register as a member of the MSE.

Mongolian Stock Exchange organizes the trading of the securities, government and corporate bonds, and provides daily news about securities prices. There are only 2 classification of securities traded on the MSE; stock and bond

By the end of 2010, there were one Stock exchange, 336 registered companies and 45 broker and dealer companies on the MSE. Also, 136 companies' 64.5 million shares and 3 thousand Government bonds were sold with total transaction value of 92.9 billion MNT. Total market capitalization has been increasing every year. At the end of 2010, total market capitalization of the MSE reached 1 trillion 373.9 billion MNT, indicating 753.2 billion MNT increased over 2009.

Since the establishment of the Korean Stock Exchange (KRX) in March 1956, the Korean capital market became an organized market, and the legal basis for its operations was provided by the Securities and Exchange Act. The KRX has begun its operations with 12 listed companies and joint contributions from banks, insurance companies, and securities firms. The trading activity consisted mainly of government bonds. However, since mid 1960s, with the economic development plans, the Korean stock market started growing rapidly with the help of government actions aimed to develop a capital market. The Securities and Exchange Act was introduced to reorganize the

KRX into a government – owned entity, in 1962. The upcoming of the Second Development Plan led to the Capital Market Promotion Act in 1968, with the main purpose of increasing the number of listed companies. In accordance with the Korean Securities Exchange, KOSDAQ and the Korea Futures Exchange, which were previously operated separately, were integrated into the Korea Exchange from January, 2005. The Korean Exchange also wants domestic companies to be listed on a greater number of foreign exchanges. The stock market may soon be listing exchange prices from around the world in an effort at greater relations between international financial institutions.

Second, I examined the relationship between stock prices and macroeconomic variables, using Granger causality test with framework Error Correction model. I used time series data for Mongolia from January, 2000 to December, 2009, and for Korea from January 2002, to December, 2009. Macroeconomic variables included Consumer price index, Money supply, Interest rate and Exchange rates.

First, to see the stationary, the ADF and PP tests were performed. The results showed that all variables are non-stationary at level, but they are stationary at first difference. This implies the possibility of cointegration relationship among the variables.

To see cointegration, the Johansen cointegration test was performed. Trace test and Maximal – Eigenvalue test were used for detecting the presence of the number of cointegrating vector. The findings of Johansen cointegration test showed that there is one cointegration in the variables of Mongolia and there are two cointegrations in the variables of Korea. In the case of Mongolia, the signs of the equation indicate that Consumer price index, money supply, and US dollar have a negative effect on the stock prices, whereas the interest rate and Korean won relate positively to the stock prices.

In the case of Korea, consumer price index, interest rate and US dollar have a positive effect on the stock prices. The money supply has a negative effect.

Finally, the Vector Error Correction model and Granger causality test were employed. I found long-run relationship between the stock prices and macroeconomic variables, in the both cases of two countries.

In the case of Mongolia, the stock prices run one way from the stock prices to the consumer price index and money supply, and not the other way.

In the case of Korea, there is bidirectional causality between the stock prices and the interest

rate. Also, there are unidirectional causalities from the all macroeconomic variables to the stock prices. The null hypothesis that the CPI does not have a Granger causality to the stock prices, the interest rate does not have a Granger causality to the stock prices, and the US dollar does not have a Granger causality to the stock prices are rejected at the 1% level of significance. On the other hand, the null hypothesis of the money supply does not have a Granger causality to the stock prices is rejected 10% level of significance.

Finally, from the results of the Granger causality test, I concluded that the Mongolian stock market is just developing and it cannot impact to Mongolian economy. Korean stock market is a developing and open market. Therefore, it works self consistent with the Korean economy and the macroeconomic variables movement is important to the stock prices.

Comparing the number of listed companies, market capitalization and trading volume of stock market and bond market of two countries, recent level of Mongolia seems to be almost equal to that of Korea in 1970s. The market capitalization of Mongolia is smaller than market capitalization of Korea.

There are some problems in the Mongolian stock market. The Mongolian stock market has a short history, very young experience, poor risk management and unfavorable legislation condition. Specific needs for improved institutional capabilities of the MSE:

- Enhancing the knowledge and skills of employees

- Increasing the number of listed companies

- Organizing public education on stock market

- Increasing requirement for stock issuers.

Also, the Mongolian stock market is limited in its size. It needs to attract foreign investors. To attract foreign investors, it seems to need legal and institutional improvements.

For above reasons, Mongolia can select some provisions of Securities and Exchange Act, Public Corporation Inducement Law and Capital Market Promotion Act of Korea. The major aims of those laws were to increase the number of listed companies, thus stimulating a wide dispersion of share ownership and creating an investment climate which would ensure the public's participation in enterprises as well as efficient corporate financing.

- References –

1. Aydemir, O. and Demirhan, E., " The Relationship between stock prices and exchange rates : Evidence from Turkey" , *International Research Journal of Finance and Economics* , N23 , 2009 , pp.207-215.
2. Adam, A. and Tweneboah, G. , 2008, "Foreign direct investment and Stock market development: Ghana evidence", MPRA paper, No.11261 , 2008.
3. Bank of Mongolia, Annual reports 1999 - 2008.
4. Bhattarcharya, B. and Mukherjee, J. "Causal Relationship between Stock Market and Exchange Rate. Foreign Exchange Reserves and Value of Trade Balance: A Case Study for India", abstracted at the *Fifth Annual Conference on Money and Finance in the Indian Economy*, January 2003.
5. Bayramova, B. and Ojagverdiyeva, S,. "Empirical test on macroeconomic factors and stock market analysis: Case of Kazakhstan stock market", Lund University, Master thesis, 2010.
6. Chen,N.F., Roll, R and Ross,S., "Economic forces and the stock market", *Journal of Business*, 59(3), 1986, pp.83-403.
7. Chong, C.S. and Goh, K.L., "Linkages of economic activity, stock prices and monetary policy: the case of Malaysia", 2003.
8. Engle, R. F. and Granger, C. W.J. , "Co-integration and Error Correction: Representation, Estimation and Testing", *Econometrica*, Vol.55, No.2,1987, pp.251-276.
9. Erdenetuya, Ch., "Economic growth in Mongolia: the Role of Stock market", Inha University, Master thesis, 2010.
10. Fama, E., "Efficient capital markets: a review of theory and empirical work", *Journal of Finance*, Vol.25, 1970, pp.383-417.
11. Granger, C.W.J., "Investigating Causal Relations by Econometric Models and Cross-spectral Methods", *Econometrica*, 37, 1969, pp.428-438.
12. Granger, C.W.J, "Developments in the study of cointegrated economic variables", *Oxford Bulletin of Economics and Statistics*, Vol.48, 1986, pp.213-228.

13. Gusmwami, G. and Jung, S.C., "Stock market and economic forces: Evidence from Korea", abstracted in the *Proceedings of Global Finance Conference* , May 1998.
14. Han, S. M. "A study on effects of Business Survey Index and Key economic variables on Stock market prices" Yonsei University, Department of Economics, Master thesis, 2003.
15. Johansen, S. and Juselius, K. "maximum likelihood estimation and inference on cointegration with application to the demand for money", *Oxford Bulletin of Economics and Statistics*, Vol52, 1990, pp.169-210.
16. Kim, S.H. "The relationship between Stock price and Macroeconomic variables: Analysis based on cointegration and Vector autoregressive model", Ehwa Women's University, Department of Economics, Master thesis, 2002.
17. Kwon, C.C. and Shin, T. S., "Co-integration and causality between macroeconomic indicators and stock exchange prices", *Global Finance Journal*, No.10(1), 1997, pp.71-81.
18. Lhagvajav, B. , Gan-Ochir, D. and Batnyam, D. , "Monetary policy and Bond market development : A case of Mongolia " , Research paper of the *Bank of Mongolia* , 2008.
19. Macmillan, P. and Hump, A., "Can macroeconomic variables explain long term stock market movements? A comparison of the US and Japan", Centre for Dynamic Macroeconomic Analysis, Working paper series CDMA 07/20, 2007.
20. Maysami, R. C., Howe, L.Ch. and Hamzah, M. A., "Relationship between macroeconomic variables and stock market indices: Cointegration evidence from stock exchange of Singapore's All-S Sector Indices", *Jurnal Pengurusan*, 2004, Vol.24, pp.47-77.
21. Maysami, R. C. and Koh, T. S., "A Vector Error Correction Model of the Singapore Stock Market, *International Review of Economics and Finance* 9, 2000, pp.79 – 96.
22. Mohammed,S.D. , Hussain, A., Anvar Jalil.M. and Ali, A., "Impact of macroeconomics variables on Stock prices:Empirical evidence in case of KSE", European Journal of Scientific Resaerch, Vol.38, No.1, 2009, pp.96-103.
23. Mongolian Stock market, *Factbook*, 2010.
24. Mukherjee, T. and A, Naka., "Dynasmic linkage between macroeconomic variables and the Japanese stock market; An application of a Vector error correction model", *Journal of Financial Research* 18, 1995, pp.223-37.

25. Phillips , P.C.B and Perron,P., “Testing for a Unit root in time series regression”, Biometrica, 75, 1988, pp. 335-346.
26. Ross,S.A., “The arbitrage theory of capital asset pricing ”, *Journal of Economics theory*, Vol.13, 1976, pp. 341-360.
27. Soe, J.H, “Review over the history of the Korean securities market”, Duksung Women’s University Journal, Vol.32, 2003.
28. Wong,W.K., Khan, H. and Du, J., “Money, Interest rate and stock prices: New evidence from Singapore and the United States”, U21Global working paper, 2005, No.007.
29. Yearbooks of National Statistical Office of Mongolia , 1999-2009.
30. 강기춘, “*계량경제학 이론과 실습*”, 온누리, 2010.
31. 남준우 , 이한식, “ *계량경제학 : 이론과 EViews, Excel 활용*”, 弘文社 , 2005.
32. 양재욱, “주가와 거시경제 변구에 관한 실증적 연구”,동국대학교, 경영학과, 석사논문, 2000.
33. 이동은,”거시경제변수가 주가에 미치는 영양에 대한 분석”, 연세대학교, 경제학과, 석사논문,2000.
34. 한국은행, “*우리나라의 금융시장*”, 2000 – 2009.