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Cointegrated Relations between Foreign Ownership and Business Conditions in the Level of Korean Capital Market

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〈abstract〉

This paper examines the results of survey that the foreign ownership is cointegrated with capital market conditions in Korea using Vector Error Correction Model (VECM) and how the mechanism of innovations and dynamics among the foreign ownership and capital market proxies in the VECM was described. Specifically, we find that the foreign ownership and capital market proxies follow I (1) process and there are cointegrated relations between the foreign ownership and capital market proxies. Adopting the impulse response function and variance decomposition in the VECM, we suggest, in turn, the default risk premia, liquidity of market and the rate of interest in long term business cycle take on a special function on the KSE and KOSDAQ. Finally, we also offer evidences of which there are differences of the mechanism of dynamics and innovations between on the KSE and on the KOSDAQ.

Keywords : Cointegrated Relation, Foreign Ownership, Financial Market Variables, VECM, Impulse Response Function, Variance Decomposition

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Ⅰ. Introduction

After 1980, the magnitude of capital flows across country has increased rapidly, especially, capital flows to emerging capital markets have shown the eye-opening growth from 1990. It appears likely that stock market liberalization already has been accomplished perfectly in Korea and the weight of foreign investment was over 40% in 2005. The weight of foreign investment in Korean capital market is higher than other emerging capital markets, so the importance of foreign investment may be seen as representing huge in Korea capital market.

In recent years, therefore, numerous studies have attempted to find and explore capital market liberalization. In the case of countries impossible to invest internationally, domestic investors are only allowed to invest stocks listed on the local market, so there may exists small investment opportunity set compared to global investors who are permitted to invest internationally. All this considered, diversified investment opportunity would be small, so domestic investors would require higher returns more than global investors in terms of compensating for risk. This stands for propositions concerning that cost of capital required by domestic investors is higher than global investors. The results from Henry (2000a) have been consistent with evidence of which stock market liberalization may reduce the liberalizing country's cost of equity capital by allowing for risk sharing between domestic and foreign agents with international asset pricing models. Stulz (1999) has provided the clue of which with the resulting global diversification of investor portfolios, companies with access to global markets experience a reduction in market risk premiums and hence a lower cost of capital. Bae (1995) has suggested that relaxing barriers which government imposed is associated with a reduction in equity premiums, meaning that the liberalization process reduces the cost of capital for local firms in Korean market. Some scholars have empirically argued the expected gains from international diversification for a U.S. investor average 2.11 percent per year and have not significantly declined over the last two decades (Desantis and Gerard (1997)).

In general, stock market liberalization causes the diminution of cost of capital, so this is able to expand firm's object-investment. There has been a publication which is for the official liberalization and capital flow increase in the investment to GDP ratio, re-

spectively, by 75 and 66 basis points significant at the 5 percent level (Bekaert and Harvey (2000)). According to Bekaert, Havey, and Lundblad (2002), integration is also associated with a lower cost of capital, a real exchange rate appreciation, and increased real economic growth. Henry (200b) has demonstrated that after liberalizing stock markets, the developing countries show abnormal 22% growth rates of private investment. Bakaert, Harvey and Lundblad (2001) have suggested that financial market liberalizations are related with higher real growth ranging in the time-series component of growth as well as the cross-sectional relation. Bekaert, Harvey, and Lundblad (2005) have offered clues that equity market liberalization leads to increase approximate 1% real per capita GDP growth annually.

Information efficiency of financial market plays a leading part regarding economic development and the nourishment of capital market. In efficiently informative market, a lot of investors can invest productive firms, so this triggers increments of firm value and economy development possible. In other words, information efficiency of financial market is necessary condition dealing with efficiency of asset allocation. It could be mentioned that stock market liberalization can increase with information efficiency. Increased liberalization is related with increases in firm-specific information, analyst coverage, and analyst added value, and decreases in earnings management (Bae, Bailey, Mao (2006)). Bae, Ozouguz and Tan (2007) have argued that financial liberalization in the form of greater investibility guarantees more informationally efficient stock prices in emerging markets. Findings of Lang, Lins and Miller (2003) have supported the clue that the firm value around cross listing is correlated with analyst following and forecast accuracy, suggesting that cross listing enhances firm value through its effect on the firm's information environment. Since foreign investors have access to superior information rather than domestic investors, they significantly outperform individual and institutional investors and still show a statistically significant positive abnormal return at a 5% level (Ko and Kim (2004)). Kim and Cheon (2004) have found a significant information advantage on the side of foreign investors relative to domestic investors. Namely, through net purchases, they may have the ability to search for future winning stocks based on another information or better trading strategy. Oh and Hahn (2008) have provided that, compared to domestic investors, foreign investors enjoy more in-

formational advantages related with asset allocation strategies.

Relatively little attention, nevertheless, was paid to determinants of foreign investment at the level of capital market in previous literatures. The majority of previous articles depicted the effect of stock market liberalization to a certain capital market. Recently, as financial globalization has been expended, the amount of foreign investment has increased sharply and the capital world market has been integrated internationally. Consequently, it seems obviously that there might be possibility that when foreign investors invest internationally, they reckon with states and circumstances of the corresponding domestic market as well as other information. Curiously, despite the rise of studies regarding stock market globalization, few have attempted to address *instant relations* between the foreign ownership and capital market. In this work, we take into account capital market proxies decomposing Korean capital market conditions intimately. Moreover, these capital market proxies are sort of macroeconomic variables, so it is essential to apply sophisticated econometric model. As far as we know, there has been not clear consensus in literatures of whether the foreign ownership has the cointegrated relation with capital market conditions.

Subsequently, in order to estimate the dependence of increasingly integrated capital market better, we adopt the VECM providing better forecasts of cointegrated relations between the foreign ownership and capital market conditions than other models for both short-term and long-term predictions. Numerous studies have attempted to find and explore evidences which provide the VECM is superior to estimate cointegrated relation among macroeconomic variables. At the level of the macro-economy, the VECM is charged with conduction to examine cointerated relations. Ambler (1989) has investigated the properties of a set of Canadian and U.S. economic time series and used the data to address the question of the importance of monetary variables in Canadian business cycle fluctuations. They have offered that a multivariate vector error correction model is estimated well. In relations between spot and forward exchange rates, dynamic out-of-sample forecasts up to one year ahead indicate that the VECM is strikingly superior to a range of alternative forecasts (Clarid and Taylor (1997)). Ghatak (1998) has presented that growth of real per-capita income has been aided by income, investment and export growth, as well as government spending and exchange rate policies in Korea.

They have demonstrated that the VECM provide better forecasts of growth than do the VAR and BVAR models for both short-term and long-term predictions. Eltony and Al-Awadi (2001) have reported that VECM is superior to the VAR approach in examining the impact of oil price fluctuations on seven key economic variables for the Kuwaiti economy. Finally, Fanelli and Massocchi (2002) have highlighted some of the advantage s of using the VECM, including the possibility of testing the cointegration rank of the system and the (weak and strong) exogeneity of prices and expenditure within a well specified statistical model.

The main aim of this study, therefore, is to provide an overview of whether the foreign ownership is cointegrated with capital market conditions and how the mechanism of innovations and dynamics in the VECM was described. We stress on the existence, the trend and nature of innovations, and dynamics of the equilibrium relation between the foreign ownership and capital market proxies. To our knowledge, this study is the first one to examine, based on Vector Error Correction Model (VECM), cointegrated relations and mechanism of innovations and dynamics between the foreign ownership and capital market proxies.

In this paper, it would be important to select which capital market proxies are used to estimate 'direct relations' between the foreign ownership and capital market proxies because capital market proxies included in this paper have to be adequate in order to reflect capital market exactly. Such an exercise is, by nature, somewhat arbitrary. According to Pontiff and Schall (1998) and Chordia and Shivakumar (2006), we use representative and well-known capital market proxies such as (i) the yield on the one-year Monetary Stabilization Bonds (TBI), (ii) the return of the market portfolio (MKT), (iii) the term spread (TERM), (iv) the default spread (DEF), and (v) the dividend yield on the market (DIV). We assume that there are differences of the intergrated relation across the market, for example, the KSE and the KOSDAQ in Korea, so after categorizing the Korean stock market into the KSE and the KOSDAQ, we estimate the cointegrated relation in this paper.

In order to check the first condition as for cointegration, that is to see if each time series is I (1) process, we apply the augmented Dick-Fuller (ADF) unit root tests and Phillips-Perron (PP) unit root tests. We can find that each element is viewed as I (1)

process. In order to determine the number of cointegrating vectors, we apply the λ_{max} test and trace test statistics, suggested by Johansen (1991) and Pesaran, Shin, and Smith (2000). There is the long-run equilibrium relationship *in toto*.

Investigating the long-run cointegrated relationship between the foreign ownerships and capital market variables, we focus on dynamics into the structure of the foreign ownership and capital market variables. We estimate the impulse response function and variance decomposition using the foreign ownership and capital market variables. From results of the mechanism of innovations driven by impulse response function and variance decomposition function, we can confirm the dominance of default risk and the yield on Monetary Stabilization Bonds, in turn, in the VECM system on the KSE and the KOSDAQ. We also provide there are differences of the mechanism of innovations between on the KSE and on the KOSDAQ.

The remainder of the study is organized as follows : Section 2 provides the data and sample selection and Section 3 develops the methodology. Section 4 describes the preliminary evidence that there are cointegrated relations between the foreign ownership and conditions of Korean capital market (the KSE and the KOSDAQ) and describes the mechanism of innovations and dynamics in VECM using impulse response function and variance decomposition on the KSE and KOSDAQ practically, Section 5 shows conclusions.

Ⅱ. Data Description

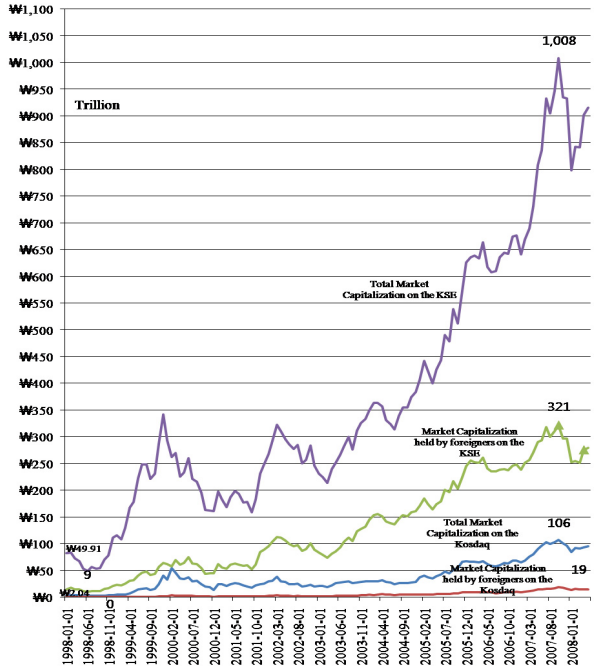
Data in this paper include all Korean firms listed from January 2000 to December 2007. Since the effect of the Asian Crisis in 1997 has been existed economically in many parts in Korea until 2000, we assume that the sample period from 2000 through 2007 would be adequate in order to be lost to the Asian Crisis in 1997. What is more, resting on [Figure 2], the weight of foreign ownership in the KSE and KOSDAQ has been multiplied apparently (i.e. over 20%) after 2000, so it seems meaningful to establish the sample period from 2000 to 2007. The market capitalization held by foreigners and total market capitalization, needed to calculate the foreign ownership, and capital market proxies are obtained from the Fn-guide dataset during the period from 1998 through 2007.

We require these available for full sample period of data in the Fn-guide dataset and most KSE and KOSDAQ firms are included in the sample. We also imagine that there are differences of cointegrated relations between on the KSE and on the KOSDAQ, so we exploit the VECM based on dataset distinguished by the KSE and KOSDAQ respectively.

In [Figure 1] and [Figure 2], monthly dataset include all firms listed on Korean market from 1998 to 2008. These figures imply the market capitalization of the KSE (KOSDAQ) and the market size obtained by foreigner on the KSE (KOSDAQ) at the end of each month. In [Figure 1], during the sample period from 1998 to 2008, the market capitalization expressed by the Korean won on the KSE (KOSDAQ) has varied between 49.91 trillion won on June 30 in 1998 (2.04 trillion won on October 31in 1998) and 1,008.40 trillion

[Figure 1] The Plots of Market Capitalization in the Korean Market

The figure shows the total market capitalization on the KSE (KOSDAQ) and the market capitalization held by foreigners on monthly basis over the period from 1998 to 2008. The top line depicts the total market capitalization on the KSE and the second line shows the market capitalization held by foreigners on the KSE and the third line presents the total market capitalization on the KOSDAQ and the fourth line shows the market capitalization held by foreigners on the KOSDAQ. These are expressed in terms of trillion won.

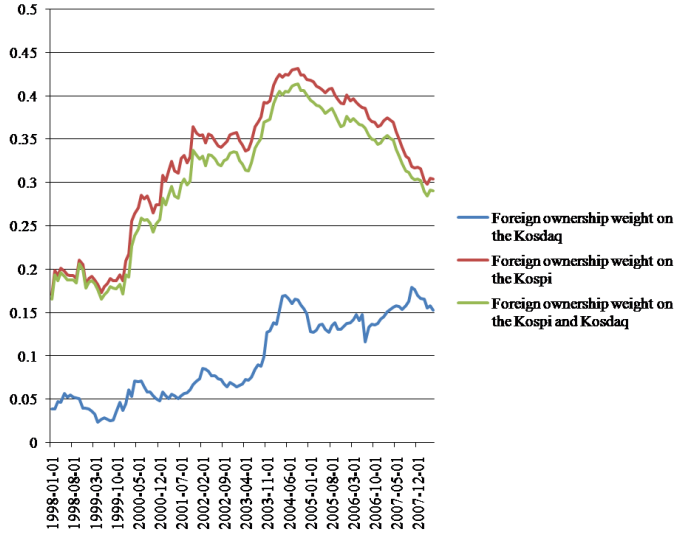


won on October 31 in 2007 (106.43 trillion won on October 31 in 2007). In [Figure 1], during the time period from 1998 to 2008, the market capitalization (held by foreigners) expressed by Korean won on the KSE (KOSDAQ) has ranged between 9.50 trillion won on June 30 in 1998 (0.10 trillion won on October 31 in 1998) and 321.21 trillion won on October 31 in 2007 (19.02 trillion won October 31 in 2007). During the sample period, market capitalization on the KSE (KOSDAQ) increased more than 20 (51) times and the market capitalization, held by foreigners, on the KSE (KOSDAQ) increased more than 35 (190) times at most.

The foreign ownership on the KSE (KOSDAQ) had increased from 17.03% on January 31 in 1998 (2.30% on April 30 in 1999) to 43.18% on April 30 in 2004 (17.86% on October 31 in 2007) at most. During sample period from 1998 through 2008, the portion held by foreigners on the KSE (KOSDAQ) increased more than 2 (7) times. The increased foreign ownership, reflecting [Figure 1] and [Figure 2], is partly due to regulatory changes during the sample period. Before 1998, most Korean firms had two classes, i.e., restricted and unrestricted shares when foreign investors hold stocks. Only the latter

[Figure 2] The Plots of Foreign ownership in the Korean Market

The figure shows the foreign ownership in Korean Market on monthly basis over the period from 1998 to 2008. The top line shows the foreign ownership on the KSE and the second line shows the foreign ownership on the KSE plus KOSDAQ and the third line shows the foreign ownership on the KOSDAQ. These are expressed in terms of trillion won.



could be held by foreigners. Actually, in order to stabilize the Asian Crisis of 1997, the restrictions have been formally abolished from January 1998, under the IMF in Korea.

To calculate the foreign ownership, we scale the market capitalization (held by foreigners) by the total market capitalization, on the KSE (PFO) and KOSDAQ (DFO), respectively at the end of each month. We predict determinants of foreign ownership using capital market proxies and test whether capital market proxies are attributable to the predicted foreign ownership. That is, we estimate determinants of the foreign ownership in Korea using the capital market proxies to predict market returns. These variables which serve as a proxy of the state variables are (i) the yield on the one-year Monetary Stabilization Bonds (TBI), (ii) the return of the market portfolio (MKT) defined as the rate of returns of the value-weighted market portfolio index, (iii) the term spread (TERM) defined as the difference between the yield of 10 years Korean government bonds and the yield of the one-year Monetary Stabilization Bonds (TBI), (iv) the default spread (DEF) defined as the difference between the yield of BAA rated bonds and the yield of AAA rated bonds, and (v) the dividend yield on the market (DIV) defined as the total dividend yield of the value-weighted market portfolio index.

In this paper, we exploited the return of Korea Composite Price Index (KOSPI) as (ii) the return of the market portfolio (MKT), since KOSPI has an equivalent of the Korean value-weighted market portfolio index. Fama (1981) and Fama and Schwer (1977) have presented that the yield on the three-month T-bill is associated with future stock market returns and that is served as a proxy for future economic activity. Approached from Korean data, we adopted TBI ((Kim and Shin (2006)) instead of the yield on the three-month T-bill based on the findings from Fama (1981) and Fama and Schwer (1977). Contrary to development countries which have issued government bonds (for example, T-bill) and government guaranteed bonds as way of the open market operation in order to support monetary policy, in the case of Korea, the monetary stabilization bonds activate manipulating function of open market system and promote efficiency in controlling money supply. Monetary stabilization bonds are the principal method to redeem currencies and to promote development of bonds market. The monetary stabilization bonds issued with maturity dates 364 days are adopted mainly in Korea.

According to the results from Fama and French (1988), the default premia tracks

long-term business cycle conditions and the term spread (TERM) is related to short-term business cycles. In previous Korean literatures, the yield of 5 years Korean government bonds is often manipulated as that of long term Korean government bonds due to liquidity in Korean market. Even though fluidity of 5 years Korean government bonds is higher than that of 10 years Korean government bonds, the observations of the latter are guaranteed from 2000 and, in calculating the term spread which is consistent with evidence of spreads of long-over-short-term interest rates, it seems theoretically reasonable to use 10 years Korea government bonds rather than using 5 years Korean government bonds.

<Table 1> The Summary Statistics of Economic Variables and Foreign Ownership

This table shows the summary statistics of economic variables and the foreign ownership. Five variables represent the capital market conditions. They are (i) the yield on the one-year Monetary Stabilization Bonds (TBI), (ii) the return of the market portfolio (MKT) defined as the rate of returns of the value-weighted market portfolio index, (iii) the term spread (TERM) defined as the difference between the yield of 10 years Korean government bonds and the yield of the one-year Monetary Stabilization Bonds (TBI), (iv) the default spread (DEF) defined as the difference between the yield of BAA rated bonds and the yield of AAA rated bonds, and (v) the dividend yield on the market (DIV) defined as the total dividend yield of the value-weighted market portfolio index. In order to calculate the foreign ownership, we scale the market capitalization held by foreigners by the total market capitalization, the KSE (PFO) and KOSDAQ (DFO), respectively at the end of each month. The sample period is from 2000 through 2007.

	TBI	MKT	TERM	DEF	DIV	PFO	DFO
Mean	0.047	0.016	0.008	0.037	0.019	0.370	0.114
Median	0.047	0.020	0.008	0.039	0.019	0.370	0.130
Std. Dev.	0.007	0.071	0.005	0.007	0.004	0.040	0.040
Maximum	0.062	0.203	0.021	0.049	0.028	0.430	0.179
Minimum	0.033	-0.144	0.001	0.026	0.013	0.300	0.050

Keim and Stambaugh (1986), Campbell and Shiller (1988) and Fama and French (1988) have offered the evidence of which the dividend yield on the market (DIV) is related with slow mean reversion in stock returns across numerous economic cycle. Moreover, they have argued that the dividend yield on the market is included as a proxy for time variation in the risk premia. The default spread (DEF) is involved to capture the effect of default premia. According to findings of Fama and French (1989), we infer that DEF

and DIV track elements of long term business simultaneously, when business is persistently poor and low.

<Table 2> Optimal Lag of Capital Market Variables

<Table 2> reports the optimal lags among capital market variables. Information crieterion is the Schwarz criterion. Five variables represent the capital market conditions. They are (i) the yield on the one-year Monetary Stabilization Bonds (TBI), (ii) the return of the market portfolio (MKT) defined, (iii) the term spread (TERM) defined, (iv) the default spread (DEF), and (v) the dividend yield on the market (DIV). The bold numbers stand for optimal lag. The sample period is from 2000 through 2007.

Schwarz Crieterion	Including PFO	Including DFO
Lag 1	**-48.552**	**-48.531**
Lag 2	-48.188	-48.013
Lag 3	-45.472	-46.574
Lag 4	-45.056	-45.101
Lag 5	-44.060	-44.532

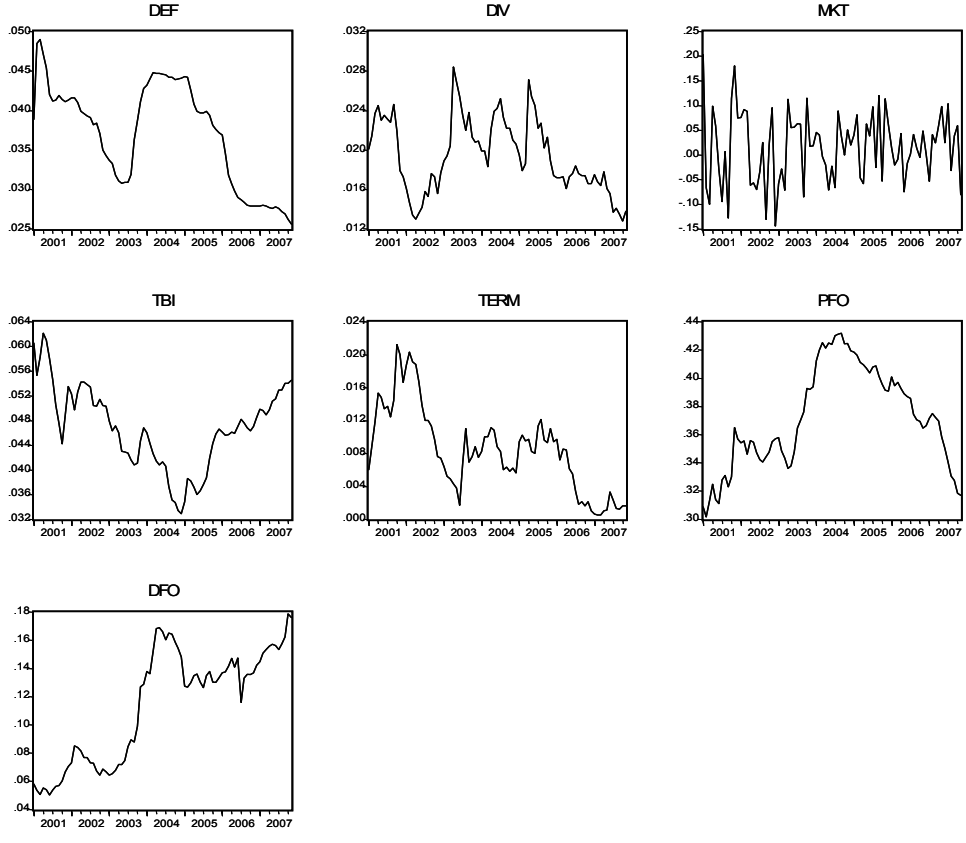
Chordia and Shivakumar (2006) use standard macroeconomic variables known to predict market returns. These are dividend yield, default spread, yield on three-month T-bills and term structure spread. Pontiff and Schall (1998) and Chordia and Shivakumar (2006) did not include the market portfolio return as we did in this paper. Excluding the market portfolio return greatly reduces the R-square of the regressions, but does not change our results. This is interesting to test whether the foreign ownership in Korea is explained by time-series variability of capital market proxies using VECM.

<Table 1> presents the summary statistics of five capital market proxies, such as (i) the yield on the one-year Monetary Stabilization Bonds (TBI), (ii) the return of the market portfolio (MKT), (iii) the term spread (TERM), (iv) the default spread (DEF), and (v) the dividend yield on the market (DIV) and (vi) the foreign ownership on the KSE (PFO) and (vii) the foreign ownership on the KOSDAQ (DFO). <Table 2> shows optimal lag of capital market proxies. In the VECM, in order to find out optimal lag, we need to check information crieterion out among capital market proxies. Accordingly, based on <Table 2>, since the value of Schwarz information crieterion at lag 1 is the smallest, we provide that the optimal lag in VECM is one.

[Figure 3] suggests plots of economic variables, such as (i) the yield on the one-year Monetary Stabilization Bonds (TBI), (ii) the return of the market portfolio (MKT), (iii) the term spread (TERM), (iv) the default spread (DEF), and (v) the dividend yield on the market (DIV), (vi) the foreign ownership on the KSE (PFO) and (vii) the foreign ownership on the KOSDAQ. The default spread, a spread of lower-over high-grade

[Figure 3] Plots of Capital Market Variables and Foreign Ownership

Theses tables plot capital market values and the foreign ownership. Five variables represent the capital market conditions. They are (i) the yield on the one-year Monetary Stabilization Bonds (TBI), (ii) the return of the market portfolio (MKT) defined as the rate of returns of the value-weighted market portfolio index, (iii) the term spread (TERM) defined as the difference between the yield of 10 years Korean government bonds and the yield of the one-year Monetary Stabilization Bonds (TBI), (iv) the default spread (DEF) defined as the difference between the yield of BAA rated bonds and the yield of AAA rated bonds, and (v) the dividend yield on the market (DIV) defined as the total dividend yield of the value-weighted market portfolio index. There is the foreign ownership on the KSE (PFO) and foreign ownership on the KOSDAQ (DFO). The sample period is from 2000 through 2007.



bond yields, is a measure of business conditions. [Figure 3] shows that the DEF takes highest values in the late years of IMF, after 2000 the DEF had been decreased sharply, but there are upward blips during the less serious recessions after Asian crisis. It seems likely that the 2000s is a period of general economic uncertainty. [Figure 3] also offers that the variation of TERM is more closely related to business cycles. The TERM tends to be low near business-cycle peaks and high near troughs. From [Figure 3], it seems likely that the Korean government had attempted to boost the financial market in the early 2000s because TBI had tended downward mostly from 2000 to 2004. We assume that the capital market conditions have became better in the early and late 2000s since the DEF and TERM had drifted downward largely in the early and late 2000s. The DIV pretends to have the seasonality in the end of each year. The PFO and DFO had exhibited the strong upward trends together until the end of 2003, but there have been a different trend between PFO and the DFO from 2004 through 2007. The standard deviation of MKT have decreased totally gradually for total sample period, this implies that the returns of the Korean stock market have became lower volatile. The foreign ownership and capital market proxies which I mentioned above stand for non-stationary except for the MKT, because the latter is defined as the rate of returns of the value-weighted market portfolio index. Resting on the results of [Figure 3], it is needed to examine unit root test whether these variables are statistically stationary or not.

Ⅲ. Methodology

In this section, we describe the model to analyze cointegrated relations between the foreign ownership and five representative capital market proxies and suggest equilibrium innovations and dynamics in VECM. Even though each variable is not stationary, there could be stationary linear combinations in long term-equilibrium set. This is known as cointegration. To see cointegration, that is to check if each variable follows I (1) process, we adopt the augmented Dick-Fuller (ADF) unit root tests as well as Phillips-Perron (PP) unit root test to each variable. Moreover, in order to examine the existence of the equilibrium relationship between capital market proxies and the foreign ownership, we examine cointegration analysis such as the λ_{max} test and trace test sta-

tistics (Johansen (1991) and Pesaran, Shin, and Smith (2000)). Given the existence of cointegration and the deviations from the long-run equilibrium which are consisted of foreign ownership and capital market proxies, the equilibrium system will respond to a shock to foreign ownership and capital market proxies. By impulse response functions and the variance decompositions, we identify this phenomenon in the cointegrated systems and measure the direct effect of innovations over the horizon (Sims (1980) and Lutkepohl and Reimers (1992)).

Drawing on the cointeration analysis, we test the presence of long-run equilibrium relations between the foreign ownership and capital market proxies. Generally, if each y_t is I (1) process and there are at one non-zero $p \times 1$ vector β, a $p \times 1$ vector Y_t is depicted to be cointegrated. In this paper, approaches are dwelled on five capital market proxies and the foreign ownership.

$$Y_t = [\ I_t\ (1)\ \cdots\ I_t\ (6)\ ]' = [\ y_{t,1}\ \cdots\ y_{t,6}\ ]', \tag{1}$$

The unit root test was done by Dickey and Fuller (Fuller, 1976 and Dickey and Fuller, 1979). The basic aim of the test is to investigate the null hypothesis that $\phi = 1$ in against the alternative $\phi < 1$.

$$Y_t = \phi y_{t-1} + \mu_t \tag{2}$$

Thus, there are two hypotheses which contains a unit root (H_0) and series is stationary (H_1).

$$\Delta y_t = \Psi y_{t-1} + \mu_t \tag{3}$$

For detecting the number of cointegrating vectors, we exploit the maximum likelihood approach for the analysis, the λ_{max} test and trace test statistics (Johansen (1991) and Pesaran, Shin, and Smith (2000)). The cointegrating relations supply how the foreign ownership and capital market proxies are related together in the long-run equilibrium.

Stock and Watson (1989) have referred to the problem as over-differencing. Therefore,

we apply the VECM (Engle and Granger (1987) and Johansen (1991)) for cointegrated relations between the foreign ownership and capital market proxies. For instances, providing that $Y_t = [y_{t1}, \cdots, y_{t6}]'$ stands for the j + 1 = $n \times 1$ vector of the system's variables, the VECM can be written as follows

$$\Delta y_t = \mu + \Gamma_1 \Delta y_{t-1} + \cdots + \Gamma_{k-1} \Delta y_{t-k+1} + \Pi y_{t-1} + \varepsilon_t \quad (4)$$

where Δ = the first-difference operator,

μ = a $p \times 1$ constant vector,

$\Pi = \alpha\beta'$ (i.e. α and β are $p \times r$ matrices of full rank r),

Γ_j = a $p \times p$ matrix of dynamics coefficients,

ε_t = a $p \times 1$ vector of innovations (i.e. $p = 6$).

The positive β stands for the being of conitigrated relation among y_t and equation (4) becomes the vector error correction model (VECM). The VECM reduces to the vector autoregression (VAR) - if the matrix Π is of full rank. It can be part of the product of two $p \times r$ matrices α and β - if matrix Π is of reduced rank. The difference of VECM from VAR is equal to existence of long-run equilibrium relationships among a system's variables.

$$\Pi = \alpha\beta' \quad (5)$$

where β' = the $p \times r$ matrix of the system's r cointegrating vectors,

Π = the $p \times r$ matrix of r adjustment coefficients for each of the system's 6 equations.

The parameters in α matrix detect the rate at which each of the system's variables adjusts in response to lagged deviations from the r cointegrated relationships. Stock and Watson (1988) have suggested that the long-run dynamics of a system of n variables which r is less than p is governed by $p-r$ common stochastic trends. Thus, a test for the cointegration rank r is also a test for the number of common trends.

From equation (4), we obtain an equivalent vector autoregressive representation of the form as follows :

$$Y_t = C_1 Y_{t-1} + \cdots + C_p Y_{t-p} + a_t \quad (6)$$

where C_i = the coefficient matrices,

a_t = a vector of Gaussian white noises with a variance-covariance matrix Σ.

Impulse responses track the responsiveness of the dependent variables in the VECM to shocks to each of the variables. If unit shock is applied to the error across equations, and the effects in the VECM system are noted over time. It is easy to see what the effects of shocks to the variables will be in VECM. From equation (6), we gain the impulse response functions that illuminate the effect of shocks to variables in the co-integrated system. They are defined as following.

$$\Psi_n = (\Psi_{ik,n}) = \sum_{j=1}^{n} \Psi_{n-j} C_j, \tag{7}$$

where $\Psi_0 = I$, $C_j = 0$ if $j > p$,

$\Psi_{ik,n}$ = the response of foreign ownership to an impulse or shock to capital market proxies (by one standard error).

Variance decompositions provide a slightly different method for examining VECM system dynamics. They offer the proportion of the movements in the dependent variables that are due to their own shocks, versus shocks to the other variables. Variance decompositions settle how much of the step-ahead forecast error variance of a given variable is interpreted by innovations to each explanatory variable. We exploit the triangular Choleski decomposition of Σ, i.e., Σ = P P' , ($\Theta_n = (\Theta_{ik,n}) = \Psi_n$ P). We have the forecast error variance decompositions.

$$\sigma_{kj,h} = \sum_{n=0}^{h-1} \theta_{kj,n}^2 / FE_k(h) \tag{8}$$

where $\Theta_{kj,n}$ = the (k, j) - th element of Θn,

FEk (h) = the k_{th} diagonal element of the mean squared error matrix of the h-step ahead forecast of the process.

The variance of the forecast error of foreign ownership and capital market proxies is decomposed to analyze what part of foreign ownership and capital market proxies

is described by innovations in themselves and others in the system (Choi, Eun and Lee (2007)).

Ⅳ. Empirical Results

1. Unit root test

In order to check the first condition for cointegration, that is to see if each of the elements in foreign ownership and capital market proxies is I (1) process, we present the augmented Dick-Fuller (ADF) unit root tests and the Phillips-Perron (PP) unit root tests. In <Table 3>, we conduct the unit root test for each capital market proxy and foreign ownership, using intercept model (Panel A), trend and intercept model (Panel

<Table 3> The Unit Test (ADF) of Capital Market Variables and Foreign Ownership

This table reports the augmented Dickey-Fuller (ADF) statistics for five capital market variables and the foreign ownership, using intercept, trend and intercept, and none model. This table reports correlations among economic variables. Five variables represent the capital market conditions. They are (i) the yield on the one-year Monetary Stabilization Bonds (TBI), (ii) the return of the market portfolio (MKT), (iii) the term spread (TERM), (iv) the default spread (DEF), (v) the dividend yield on the market (DIV). In order to calculate the foreign ownership, we scale the market capitalization held by foreigners by the total market capitalization, the KSE (PFO) and KOSDAQ (DFO), respectively at the end of each month. Bold numbers mean that numbers are statistically significant at 1 percent level. Figures in parenthesis refer to results of PP unit root test. The sample period is from 2000 through 2007.

Panel A : Intercept								
		DEF	DIV	MKT	TBI	TERM	PFO	DFO
Level variable	T-statistic	-1.94 (-0.79)	-2.09 (-2.17)	**-9.10 (-9.09)**	-2.35 (-2.05)	-1.40 (-1.44)	-1.60 (-1.40)	-0.71 (-0.79)
	Prob	0.31 (0.81)	0.24 (0.21)	**0.00 (0.00)**	0.15 (0.26)	0.57 (0.55)	0.47 (0.57)	0.83 (0.81)
1st difference	T-statistic	**-9.64 (-8.66)**	**-8.84 (-8.84)**	**-11.91 (-23.95)**	**-7.18 (-6.42)**	**-8.19 (-8.18)**	**-7.38 (-7.42)**	**-8.65 (-8.66)**
	Prob	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**
2st difference	T-statistic	**-12.28 (-29.34)**	**-8.76 (-56.90)**	**-8.64 (-37.00)**	**-11.20 (-27.89)**	**-13.39 (-29.88)**	**-13.10 (-36.54)**	**-8.13 (-45.31)**
	Prob	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**

Panel B : Trend and intercept								
		DEF	DIV	MKT	TBI	TERM	PFO	DFO
Level variable	T-statistic	-1.90 (-1.89)	-2.38 (-2.50)	**-9.13 (-9.12)**	-1.37 (-1.34)	-3.17 (-3.26)	-0.42 (-0.02)	-1.65 (-1.83)
	Prob	0.64 (0.65)	0.39 (0.32)	**0.00 (0.00)**	0.86 (0.86)	0.10 (0.07)	0.99 (0.99)	0.76 (0.67)
1st difference	T-statistic	**-9.44 (-8.53)**	**-8.80 (-8.79)**	**-11.83 (-23.73)**	**-7.79 (-6.48)**	**-8.17 (-8.17)**	**-8.23 (-8.23)**	**-8.59 (-8.60)**
	Prob	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**
2st difference	T-statistic	**-12.05 (-28.96)**	**-8.70 (-67.99)**	**-8.58 (-37.03)**	**-11.13 (-33.19)**	**-13.36 (-30.88)**	**-13.00 (-35.83)**	**-8.07 (-44.80)**
	Prob	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**
Panel C : None								
		DEF	DIV	MKT	TBI	TERM	PFO	DFO
Level variable	T-statistic	-2.54 (-0.87)	-0.74 (-0.74)	**-8.83 (-8.85)**	-0.61 (-0.57)	-0.95 (-0.98)	0.04 (-0.03)	-1.39 (1.25)
	Prob	0.11 (0.33)	0.39 (0.39)	**0.00 (0.00)**	0.44 (0.46)	0.30 (0.28)	0.69 (0.66)	0.95 (0.94)
1st difference	T-statistic	**-9.23 (-8.45)**	**-8.87 (-8.87)**	**-11.99 (-24.17)**	**-7.21 (-6.48)**	**-8.22 (-8.22)**	**-7.42 (-7.46)**	**-8.37 (-8.42)**
	Prob	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**
2st difference	T-statistic	**-12.41 (-29.82)**	**-8.83 (-54.33)**	**-8.87 (-37.41)**	**-11.27 (-27.62)**	**-13.46 (-29.65)**	**-13.18 (-33.38)**	**-8.18 (-45.00)**
	Prob	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**	**0.00 (0.00)**

B), and none model (Panel C). In the intercept model (Panel A), trend and intercept model (Panel B), and none model (Panel C), we cannot reject the unit root hypothesis in all cases at the 5 percent significance level in the level variable rows, except for MKT. In the 1st difference row and 2st difference row, we can find that all time-series have no unit root because they are rejected by the unit root hypothesis (i.e. ADF test and PP test). Hence, it could be interpreted that foreign ownership and each element in capital market proxy follows I (1) process.

2. Cointegration Test

<Table 4> offers the evidence of the cointegration test of capital market proxies and the foreign ownership on the KSE. The λ_{max} and trace statistics provide the number of cointegrating vectors. In Panel A, the trace statistics have statistically one significant eigenvalues, at most, at 5 percent level. This could be construed in such a way that the null of r = 0, r = 1 are rejected, but the null of r = 2 cannot be rejected for each time-series. In Panel B, the λ_{max} statistics is statistically significant at the 5% level at most. This poses that the null of r = 0, r = 1 are rejected, but the null of r = 2 cannot be rejected for each time-series. By dwelling upon results of the cointegration test in <Table 4>, we can conclude that there are two cointegrating vectors. Virtually, the result of <Table 4> is analogous to that of <Table 5> titled to the conintegration test of capital market proxies and the foreign ownership on the KOSDAQ. To sum up, we find that, using cointegration tests, there is the long-run equilibrium relationship for variables.

<Table 4> The Cointegration Test of Economic Variables and Foreign Ownership on the KSE

This table reports the number of cointegrating vectors using the maximum likelihood approach for the analysis, the λmax test and trace test statistics, suggested by Johansen (1991) and Pesaran, Shin, and Smith (2000). The cointegrating relations provide whether the time-series are related to each other in the long-run equilibrium. Bold numbers mean that numbers are statistically significant at 5 percent level. The sample period is from 2000 through 2007.

Panel A : Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	**0.495**	**142.305**	**95.754**	**0.000**
At most 1*	**0.399**	**86.959**	**69.819**	**0.001**
At most 2	0.227	45.667	47.856	0.079
At most 3	0.188	24.837	29.797	0.167
At most 4	0.093	7.941	15.495	0.472
At most 5	0.000	0.000	3.841	0.985

Panel B : Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None*	**0.495**	**55.346**	**40.078**	**0.001**
At most 1*	**0.399**	**41.292**	**33.877**	**0.005**
At most 2*	0.227	20.830	27.584	0.287
At most 3	0.188	16.896	21.132	0.177
At most 4	0.093	7.941	14.265	0.385
At most 5	0.000	0.000	3.841	0.985

<Table 5> The Cointegration Test of Economic Variables and Foreign Ownership on the KOSDAQ

This table reports the number of cointegrating vectors using the maximum likelihood approach for the analysis, the λmax test and trace test statistics, suggested by Johansen (1991) and Pesaran, Shin, and Smith (2000). The cointegrating relations provides whether the time-series are related to each other in the long-run equilibrium. Bold numbers mean that numbers are statistically significant at 5 percent level. The sample period is from 2000 through 2007.

Panel A : Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None*	**0.512**	**131.59**	**95.753**	**0.000**
At most 1*	**0.394**	**73.543**	**69.819**	**0.024**
At most 2	0.183	32.853	47.856	0.564
At most 3	0.157	16.447	29.797	0.680
At most 4	0.030	2.563	15.494	0.983
At most 5	0.000	0.015	3.841	0.902

Panel B : Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.
None*	**0.512**	**58.046**	**40.078**	**0.000**
At most 1*	**0.395**	**40.691**	**33.877**	**0.007**
At most 2	0.183	16.406	27.584	0.631
At most 3	0.158	13.884	21.132	0.375
At most 4	0.031	2.549	14.265	0.972
At most 5	0.000	0.015	3.841	0.902

3. Granger Causality Tests

In order to check whether given variables are dependent or independent each other, we conduct Granger causality test. Granger causality test described by Granger (1969) and a slight variant due to Sims (1972) seek to answer the argument that if y_1 causes y_2, lags of y1 should be significant in the equation for y_2. If this is the case and not vice versa, it would be said that y_1 'Granger-causes' y_2 or there exists unidirectional causality from y_1 to y_2. On the other hand, if y_2 causes y_1, lags of y_2 should be significant in the equation for y_1. If y_1 is found to Granger-cause y_2, but not vice versa, it would be said that variable y_1 is strongly exogenous. If neither set of lags are statistically significant in the equation for the other variable, it would be said that y_1 and y_2 are independent (Brooks (2002)).

<Table 6> Granger Causality Tests

Granger causality sets described by Granger (1969) and Sims (1972) seek to answer the argument that if y1 causes y2, lags of y1 should be significant in the equation for y2. If this is the case and not vice versa, it would be said that y1 'Granger-causes' y2 or that there exists unidirectional causality from y1 to y2. Panel A reports results of Granger Causality Tests including the foreign ownership on the KSE (PFO). Panel B offers results of Granger Causality Tests including the foreign ownership on the KOSDAQ (DFO). Bold numbers mean that numbers are statistically significant at 1, 5 and 10 percent level. The sample period is from 2000 through 2007.

Panel A : including PFO		
Null Hypothesis :	Lag1 F-statistic	Lag1 Probability
DIV does not Granger Cause DEF	1.95634	0.16582
DEF does not Granger Cause DIV	1.14507	0.28784
MKT does not Granger Cause DEF	**7.51803**	**0.00755**
DEF does not Granger Cause MKT	0.05666	0.81248
PFO does not Granger Cause DEF	0.10991	0.74112
DEF does not Granger Cause PFO	**5.58189**	**0.02061**
TBI does not Granger Cause DEF	0.07233	0.78868
DEF does not Granger Cause TBI	0.75974	0.38605
TERM does not Granger Cause DEF	1.18321	0.28001
DEF does not Granger Cause TERM	**8.52833**	**0.00456**
MKT does not Granger Cause DIV	2.95153	0.08971
DIV does not Granger Cause MKT	**5.80067**	**0.01835**

PFO does not Granger Cause DIV	0.01061	0.91823
DIV does not Granger Cause PFO	**11.9441**	**0.00089**
TBI does not Granger Cause DIV	0.00017	0.98951
DIV does not Granger Cause TBI	**8.13009**	**0.00555**
TERM does not Granger Cause DIV	**5.28377**	**0.09573**
DIV does not Granger Cause TERM	**4.79967**	**0.03141**
PFO does not Granger Cause MKT	0.5172	0.47416
MKT does not Granger Cause PFO	0.77274	0.38204
TBI does not Granger Cause MKT	**2.95286**	**0.08964**
MKT does not Granger Cause TBI	1.44289	0.23326
TERM does not Granger Cause MKT	0.00515	0.94296
MKT does not Granger Cause TERM	0.0069	0.93399
TBI does not Granger Cause PFO	**8.52003**	**0.00457**
PFO does not Granger Cause TBI	0.99198	0.3223
TERM does not Granger Cause PFO	2.57329	0.11267
PFO does not Granger Cause TERM	1.7473	0.19003
TERM does not Granger Cause TBI	0.5015	0.48093
TBI does not Granger Cause TERM	8.20E-06	0.99772

Panel B : including DFO

Null Hypothesis :	Lag1 F-statistic	Lag1 Probability
DIV does not Granger Cause DEF	**2.73423**	**0.04974**
DEF does not Granger Cause DIV	1.32087	0.27416
MKT does not Granger Cause DEF	0.74183	0.53054
DEF does not Granger Cause MKT	1.65813	0.18352
TBI does not Granger Cause DEF	**4.49914**	**0.02195**
DEF does not Granger Cause TBI	**4.05962**	**0.01003**
TERM does not Granger Cause DEF	2.09525	0.10823
DEF does not Granger Cause TERM	**4.33611**	**0.00721**
DFO does not Granger Cause DEF	0.66228	0.57791
DEF does not Granger Cause DFO	**3.76357**	**0.0143**
MKT does not Granger Cause DIV	**4.69951**	**0.07462**
DIV does not Granger Cause MKT	**2.6165**	**0.05741**
TBI does not Granger Cause DIV	0.26391	0.85118
DIV does not Granger Cause TBI	**5.56976**	**0.0017**
TERM does not Granger Cause DIV	0.6298	0.5981
DIV does not Granger Cause TERM	**5.34439**	**0.0022**

DFO does not Granger Cause DIV	0.81354	0.49048
DIV does not Granger Cause DFO	0.30804	0.8195
TBI does not Granger Cause MKT	1.42659	0.24195
MKT does not Granger Cause TBI	2.0709	0.11148
TERM does not Granger Cause MKT	2.07953	0.11031
MKT does not Granger Cause TERM	1.05931	0.37175
DFO does not Granger Cause MKT	0.31503	0.81446
MKT does not Granger Cause DFO	1.01514	0.39103
TERM does not Granger Cause TBI	**2.234**	**0.09144**
TBI does not Granger Cause TERM	1.14372	0.33724
DFO does not Granger Cause TBI	0.47682	0.69939
TBI does not Granger Cause DFO	0.09252	0.96394
DFO does not Granger Cause TERM	0.58695	0.62549
TERM does not Granger Cause DFO	0.76611	0.5167

For calculating impulse responses and variance decompositions, the ordering of the variables is important. The impulse responses refer to a unit shock to the errors of one VECM equation alone. This implies that the error terms of all other equations in the VECM system are held constant. Nevertheless, this is not realistic since the error terms are likely to be correlated across equations to some extent. Thus, assuming that they are completely independent would lead to a misrepresentation of the system dynamics. In practice, the errors will have a common component that cannot be associated with a single variable alone. The results of Granger causality tests are reported in <Table 6>. Drawing on <Table 6>, we order variables such as (i) MKT, (ii) DEF, (iii) TERM, (iv) DIV, (v) TBI, (vi) PFO on the KSE and (i) MKT, (ii) DIV, (iii) TERM, (iv) TBI, (v) DEF, (vi) DFO on the KOSDAQ.

4. Impulse Responses Function

In this section, having investigated the long-run cointegrated relationship between the foreign ownership and capital market variables, we focus on dynamics into the structure of foreign ownership and capital market variables. We estimate the impulse response function which analyzes examining responses of system (the foreign ownership and capital market variables) to a shock introduced to the corresponding capital market

variables. The analysis is performed separately for the KSE and KOSDAQ. We examine the pattern of dynamic responses of PFO and DFO respectively to a shock introduced to the corresponding each variable and repeat analysis for each variable. We focus on the responses of PFO and DFO respectively to shocks introduced to five capital market variables. <Table 7> suggests impulse responses of the PFO and the DFO, respectively, to a unit shock introduced to each of capital market variables. Resting on <Table 7>, in [Figure 4] and [Figure 5], we plot impulse responses to the PFO and the DFO originated by each capital market variable shock respectively in order to understand better.

According to [Figure 4], [Figure 5], the PFO (DFO) reacts strongly to the DEF shock and this response of the PFO (DFO) shows the upward trend until 10(4)-month horizon and then become flat and persistent after 10(4)-month horizon. This can be constructed in such a way that foreign investors are sensitive to unexpected changes in long-term business conditions. It is appealing that they try to capture expected business-variation related to components of business-conditions risks of assets. Moreover, a shock to the TBI causes the strong and negative responses to the PFO (DFO). This is conceived of implications that foreign investors are attentive to liquidity of market and the rate of interest.

It is the surprised result which is that shock to the MKT prompts practically no responses of the PFO in opposition to the general concept that the return on market portfolio has a relation with foreign investment. Interestingly, rather than response of the PFO to the MKT in [Figure 4], the response of the DFO from a shock of the MKT in [Figure 5] is stronger. This is interpreted that when foreign investors consider holding stocks listed on KSE, they show strategies which are less sensitive to MKT rather than the KOSDAQ. Accordingly, the degree of responses of foreign ownership introduced by a DEF shock on the KOSDAQ is smaller than on the KSE. In [Figure 4], the response of the PFO by a DIV shock seems negative and weak and is transmitted after 8 month. Nevertheless, in [Figure 5], the response of the DFO by a DIV shock is positive and weak until 2 month, but changes negatively and then is not transmitted from 4 month. This is read in the context of facts that responses of KSE or KOSDAQ aroused by foreign investment take on a different aspect of dynamics and innovations in equilibrium set in the level of capital market.

<Table 7> Impulse Responses of foreign ownership to Cholesky one S.D Innovations

This table shows results of the impulse response function which analysis examining responses of system (the foreign ownership with capital market variables) to a shock introduced to the corresponding capital market variables. Five variables represent the capital markets conditions. They are (i) the yield on the one-year Monetary Stabilization Bonds (TBI), (ii) the return of the market portfolio (MKT), (iii) the term spread (TERM), (iv) the default spread (DEF), (v) the dividend yield on the market (DIV). In order to calculate the foreign ownership, we scale the market capitalization held by foreigners by the total market capitalization, on the KSE (PFO) and KOSDAQ (DFO), respectively at the end of each month. Panel A reports results of the impulse response function including the foreign ownership on the KSE (PFO). Panel B reports results of the impulse response function including the foreign ownership on the KOSDAQ (DFO). The sample period is from 2000 through 2007.

Panel A : including PFO						
Period	DEF	DIV	MKT	TBI	TERM	PFO
1	0.000372	0.001053	0.001383	-0.001900	-0.000845	0.007259
2	-0.000033	0.001651	0.001786	-0.001916	-0.002045	0.008172
3	-0.000046	0.002950	0.001787	-0.001159	-0.002640	0.007870
4	0.000302	0.003684	0.001272	-0.000944	-0.002582	0.008544
5	0.000530	0.004020	0.000886	-0.000827	-0.002394	0.009343
6	0.000570	0.004283	0.001012	-0.000473	-0.002291	0.009551
7	0.000567	0.004553	0.001191	-0.000205	-0.002260	0.009450
8	0.000578	0.004887	0.001178	-0.000162	-0.002288	0.009471
9	0.000552	0.005217	0.001150	-0.000169	-0.002348	0.009630
10	0.000508	0.005433	0.001179	-0.000148	-0.002412	0.009768
11	0.000486	0.005546	0.001198	-0.000141	-0.002461	0.009848
12	0.000484	0.005616	0.001190	-0.000149	-0.002487	0.009908
13	0.000486	0.005660	0.001183	-0.000150	-0.002498	0.009954
14	0.000489	0.005685	0.001183	-0.000141	-0.002501	0.009978
15	0.000493	0.005700	0.001183	-0.000133	-0.002500	0.009988
16	0.000495	0.005714	0.001182	-0.000127	-0.002500	0.009994
17	0.000496	0.005726	0.001182	-0.000122	-0.002500	0.009999
18	0.000495	0.005736	0.001183	-0.000119	-0.002501	0.010004
19	0.000495	0.005744	0.001183	-0.000118	-0.002503	0.010007
20	0.000494	0.005750	0.001183	-0.000118	-0.002504	0.010010
21	0.000494	0.005754	0.001183	-0.000117	-0.002505	0.010013
22	0.000494	0.005756	0.001183	-0.000117	-0.002506	0.010015
23	0.000494	0.005758	0.001183	-0.000117	-0.002506	0.010016
24	0.000494	0.005759	0.001183	-0.000117	-0.002507	0.010017

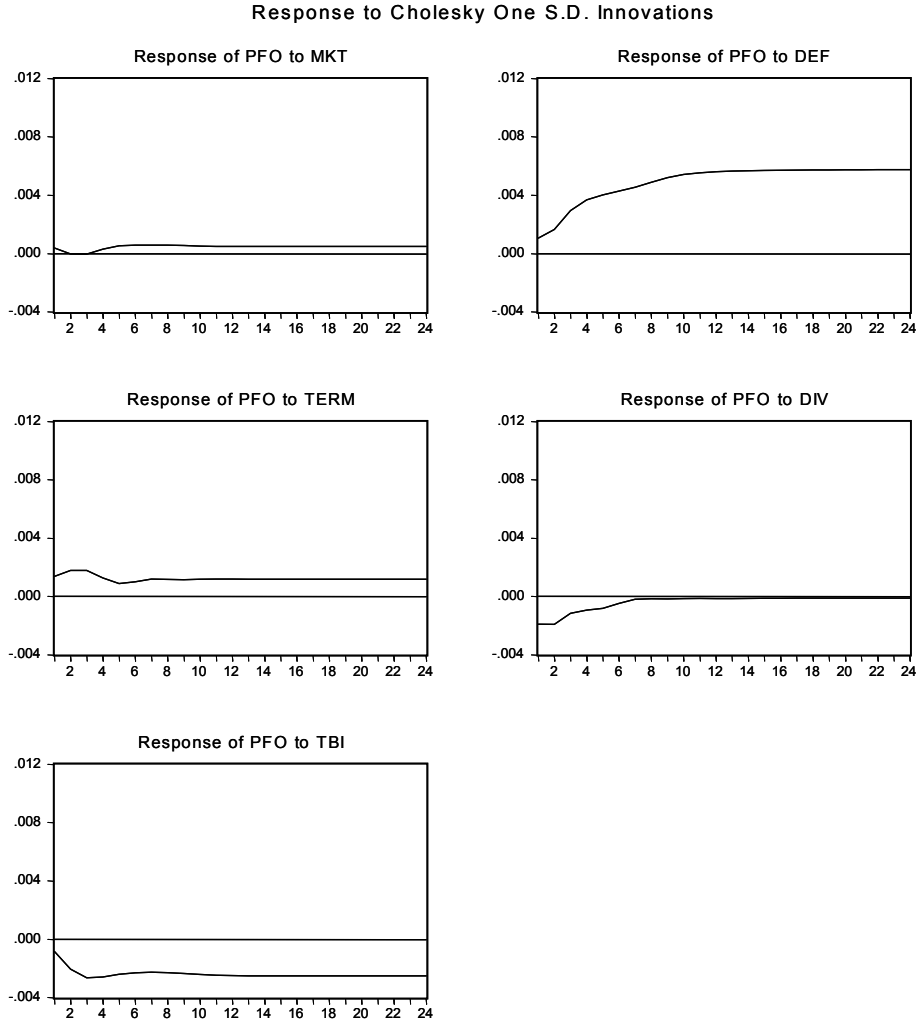
Panel B : including DFO						
Period	MKT	DIV	TERM	TBI	DEF	DFO
1	0.001647	0.000407	0.000518	-0.001179	0.000788	0.007384
2	0.001999	-8.03E-05	0.000717	-0.001013	0.001537	0.007459
3	0.00152	-0.000316	0.000985	-0.000961	0.001906	0.007493
4	0.001391	-0.000478	0.000962	-0.001135	0.002081	0.007576
5	0.001358	-0.000484	0.00093	-0.001236	0.002115	0.0076
6	0.001314	-0.000463	0.000911	-0.001277	0.002104	0.007611
7	0.001305	-0.000449	0.000892	-0.001298	0.002087	0.007617
8	0.001306	-0.000438	0.000883	-0.001303	0.002074	0.007617
9	0.001308	-0.000432	0.000879	-0.001302	0.002067	0.007617
10	0.001309	-0.00043	0.000879	-0.0013	0.002063	0.007616
11	0.001311	-0.000429	0.000879	-0.001299	0.002062	0.007615
12	0.001311	-0.00043	0.000879	-0.001298	0.002062	0.007615
13	0.001311	-0.00043	0.000879	-0.001298	0.002062	0.007615
14	0.001311	-0.00043	0.000879	-0.001297	0.002063	0.007615
15	0.001311	-0.00043	0.000879	-0.001297	0.002063	0.007615
16	0.001311	-0.00043	0.000879	-0.001297	0.002063	0.007615
17	0.001311	-0.00043	0.000879	-0.001297	0.002063	0.007615
18	0.001311	-0.00043	0.000879	-0.001298	0.002063	0.007615
19	0.001311	-0.00043	0.000879	-0.001298	0.002063	0.007615
20	0.001311	-0.00043	0.000879	-0.001298	0.002063	0.007615
21	0.001311	-0.00043	0.000879	-0.001298	0.002063	0.007615
22	0.001311	-0.00043	0.000879	-0.001298	0.002063	0.007615
23	0.001311	-0.00043	0.000879	-0.001298	0.002063	0.007615
24	0.001311	-0.00043	0.000879	-0.001298	0.002063	0.007615

The response of the PFO (DFO) introduced by a shock to the TERM has a trend to be weak and positive. This clue provides an interpretation of which is that foreign investment seems unable to associate with compensations for a term or maturity premium in expected returns and exposure to discount-rate shocks in short-term business cycles.

To put it bluntly, dwelling on results of impulse response function, we can confirm the dominance of the DEF and TBI, in turn, in VECM system on the KSE and KOSDAQ. These findings can be rendered that Korean government and domestic investors require managing default risk and monetary stabilization in long term business cycle in the cause of defending disadvantages against foreign investment.

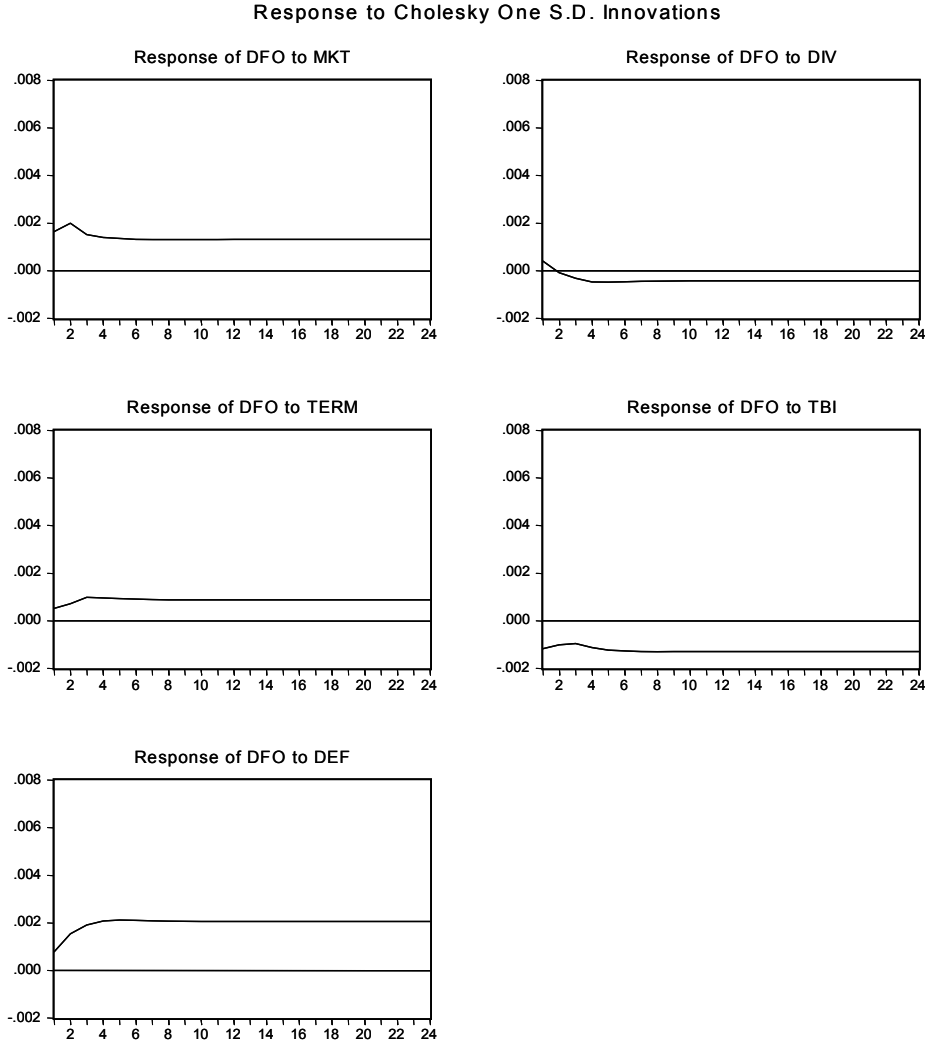
[Figure 4] Impulse Responses of foreign ownership on the KSE (PFO) to Cholesky one S.D Innovations

This table plots results of impulse responses function in Panel A of the <Table 6> in order to recognize results easily. Five variables represent the capital markets conditions. They are (i) the yield on the one-year Monetary Stabilization Bonds (TBI), (ii) the return of the market portfolio (MKT), (iii) the term spread (TERM), (iv) the default spread (DEF), (v) the dividend yield on the market (DIV). In order to calculate the foreign ownership, we scale the market capitalization held by foreigners by the total market capitalization, on the KSE (PFO), at the end of each month. The sample period is from 2000 through 2007.



[Figure 5] Impulse Responses of Foreign ownership on the KOSDAQ (DFO) to Cholesky one S.D Innovations

This table plots results of impulse responses function in Panel B of the <Table 6> in order to recognize results easily. Five variables represent the capital markets conditions. They are (i) the yield on the one-year Monetary Stabilization Bonds (TBI), (ii) the return of the market portfolio (MKT), (iii) the term spread (TERM), (iv) the default spread (DEF), (v) the dividend yield on the market (DIV). In order to calculate the foreign ownership, we scale the market capitalization held by foreigners by the total market capitalization, on the KOSDAQ (DFO), at the end of each month. The sample period is from 2000 through 2007.



5. Variance Decomposition

In this section, having investigated the long-run cointegrated relationship between the foreign ownership and capital market proxies, especially, we underline in dynamics into the structure of foreign ownership and capital market proxies. We give the following portrait of the variance decomposition which is a way to account for capital market innovations. We offer the variance decomposition built on the estimated VECM for each variable and present these results in <Table 8>. Drawing on the results of <Table 8>, in order to understand better, we plot, respectively, variance decomposition in [Figure 6] and [Figure 7]. The patterns of the forecast error variance decompositions provided by [Figure 6] and [Figure 7] are totally consistent with the results from impulse responses in [Figure 4] and [Figure 5]. <Table 8> portrays the forecast error variance decompositions of foreign ownership on the KSE and KOSDAQ, respectively, into the fractions for 24 months. Panel A (B) of <Table 8> provides the forecast error variance decompositions of the foreign ownership on the KSE (KOSDAQ). According to <Table 8>, it is likely clear that the intensity and pattern of dynamics differ greatly across variables.

In the Panel A of <Table 8>, the DEF innovations intensively account for the fraction (from 1.84% at 1-month horizon to 20.56% at 24-month horizon) of the PFO variance. In the Panel B, the DEF (from 1.039% at 1-month horizon to 6.09% at 24-month horizon) account for the DFO innovations powerfully, but the DEF on the KOSDAQ cannot affect to the DFO innovations as much as the PFO on the KSE. The DEF which is representative capital market conditions is confined to lead the PFO and the DFO in variance decomposition function of the VECM system. In other words, the relative importance of the DEF in cointegrated relations may be attributable to the leading role which affects to the flow of foreign investment.

Panel A of <Table 8> and [Figure 6] suggest that the TBI innovations (from 1.18% at 1-month horizon to 5.815% at 4-month horizon) and TERM (from 3.17% at 1-month horizon to 1.22% at 24-month horizon) and the DIV (from 5.99 % at 1-month horizon to 0.358% at 24-month horizon) substantially attributed to the PFO variance. In Panel B of <Table 8> and [Figure 7], the DIV innovations are found to be the most passive

of the DFO variance. The TBI (the average is 2.3%), TERM (the average is 1.15%), in turn, are influential to the DFO innovations. It seems likely that these consequences *ipso facto* support implications described in section 4.4.

The TBI in panel B of <Table 8> and [Figure 7] attribute to the DFO innovations half more than the TBI in the panel A and [Figure 6]. These may be due to reasons why, by nature, characteristics of dynamics and innovations are different across the KSE and the KOSDAQ. The fraction of the PFO (DFO) variance is attributable to the MKT innovations in Panel A (B) of <Table 8> and [Figure 6 (7)], being susceptible least, ranging from 0.063% (2.864%) at 3 (24) -month horizon to 0.197% (4.547%) at 10 (1) -month horizon. This implies that the volatility of foreign investment is more related with shock-return of stocks listed on the KOSDAQ compared to that of the KSE. That is to say that high volatility of KOSDAQ likely affects inflow of foreign investment.

<Table 8> Variance Decomposition

This table shows results of the variance decomposition which is a way to account for innovations of the financial market equilibrium set. The analysis is performed separately for the KSE and KOSDAQ, respectively. Five variables represent the capital markets conditions. They are (i) the yield on the one-year Monetary Stabilization Bonds (TBI), (ii) the return of the market portfolio (MKT), (iii) the term spread (TERM), (iv) the default spread (DEF), (v) the dividend yield on the market (DIV). In order to calculate the foreign ownership, we scale the market capitalization held by foreigners by the total market capitalization, on the KSE (PFO) and KOSDAQ (DFO), respectively at the end of each month. Panel A reports results of the variance decomposition including the foreign ownership on the KSE (PFO). Panel B reports results of the variance decomposition including the foreign ownership on the KOSDAQ (DFO). The sample period is from 2000 through 2007.

Panel A : Including PFO

Period	S.E.	MKT	DEF	TERM	DIV	TBI	PFO
1	0.067733	0.230176	1.842657	3.177125	5.999364	1.185577	87.5651
2	0.073424	0.09919	2.724007	3.624105	5.175122	3.477548	84.90003
3	0.080678	0.063581	5.623528	3.720271	3.86989	5.323823	81.39891
4	0.085835	0.072996	8.190216	3.108969	2.985823	5.815128	79.82687
5	0.089326	0.119512	9.836911	2.488826	2.374206	5.648002	79.53254
6	0.093028	0.153497	11.09908	2.145825	1.909125	5.405107	79.28736
7	0.096479	0.174992	12.26888	1.981296	1.57871	5.222465	78.77366
8	0.099713	0.190632	13.42867	1.85366	1.339144	5.0869	78.10099
9	0.103044	0.197506	14.54263	1.740206	1.155333	4.981915	77.38241

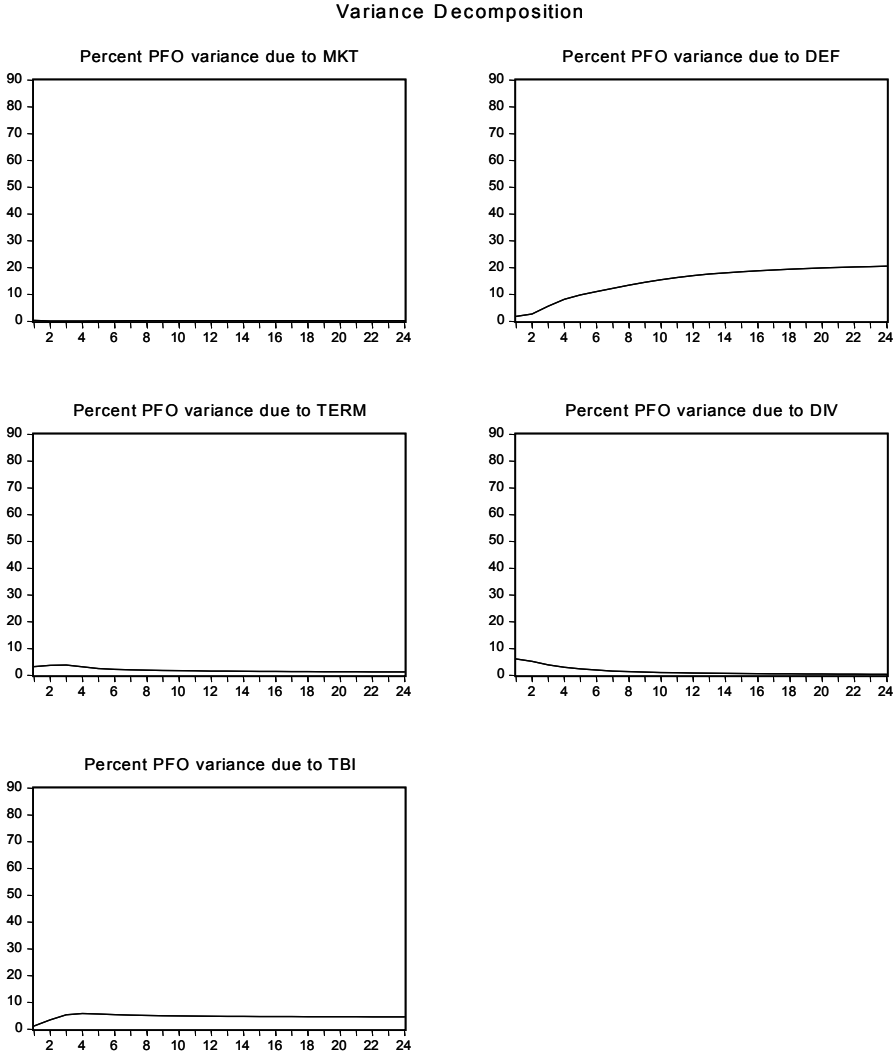
10	0.106175	0.197132	15.52617	1.652583	1.010764	4.90716	76.70619
11	0.109236	0.194545	16.35088	1.584298	0.896251	4.856808	76.11722
12	0.112235	0.192005	17.03787	1.526349	0.804263	4.819152	75.62036
13	0.11512	0.189888	17.61203	1.476745	0.728966	4.787532	75.20484
14	0.117938	0.188268	18.09452	1.435069	0.666326	4.76004	74.85578
15	0.120691	0.187073	18.50525	1.399802	0.613515	4.735856	74.55851
16	0.123377	0.186148	18.8602	1.369459	0.568431	4.714437	74.30132
17	0.126008	0.185356	19.17049	1.343165	0.52951	4.695496	74.07598
18	0.128586	0.184627	19.44385	1.320261	0.495586	4.678836	73.87684
19	0.131114	0.183944	19.68612	1.300128	0.465773	4.664209	73.69982
20	0.133594	0.183308	19.90199	1.282271	0.439379	4.651306	73.54175
21	0.136029	0.182719	20.09519	1.266327	0.415856	4.639841	73.40006
22	0.138421	0.182182	20.26888	1.252009	0.394763	4.629577	73.27259
23	0.140772	0.181695	20.42572	1.239082	0.375745	4.620321	73.15743
24	0.143085	0.181254	20.568	1.227358	0.358513	4.611923	73.05295

Panel B : Including DFO

Period	S.E.	MKT	DIV	TERM	TBI	DEF	DFO
1	0.062659	4.547545	0.2775	0.44915	2.32905	1.03962	91.35713
2	0.067452	5.446696	0.13963	0.634609	1.960086	2.419802	89.39918
3	0.067969	4.816449	0.145303	0.935221	1.782814	3.531951	88.78826
4	0.068597	4.323994	0.197522	1.05664	1.82613	4.318956	88.27676
5	0.069599	3.998899	0.229652	1.106864	1.923033	4.816906	87.92465
6	0.070693	3.7551	0.245453	1.130418	2.012538	5.130059	87.72643
7	0.071831	3.57759	0.253843	1.139366	2.087498	5.335609	87.60609
8	0.072963	3.446919	0.258197	1.142987	2.14612	5.478473	87.5273
9	0.074064	3.346796	0.260696	1.144982	2.191178	5.584066	87.47228
10	0.075139	3.267936	0.26242	1.146367	2.226482	5.666306	87.43049
11	0.076193	3.204187	0.263762	1.147538	2.254799	5.732832	87.39688
12	0.077228	3.151427	0.264881	1.148595	2.278055	5.788071	87.36897
13	0.078248	3.106968	0.265847	1.149542	2.297569	5.834777	87.3453
14	0.079255	3.068959	0.266688	1.150379	2.31422	5.874799	87.32496
15	0.080249	3.036076	0.267424	1.151114	2.328617	5.909463	87.30731
16	0.081231	3.007345	0.26807	1.151761	2.341195	5.939765	87.29186
17	0.082201	2.982027	0.268641	1.15233	2.352281	5.96647	87.27825
18	0.08316	2.959548	0.269147	1.152835	2.362125	5.990179	87.26617
19	0.084109	2.939459	0.2696	1.153286	2.370924	6.011366	87.25537
20	0.085046	2.921397	0.270006	1.153691	2.378835	6.030414	87.24566
21	0.085974	2.905071	0.270374	1.154057	2.385986	6.047632	87.23688
22	0.086891	2.890241	0.270708	1.154389	2.392482	6.06327	87.22891
23	0.087799	2.876712	0.271012	1.154692	2.398408	6.077537	87.22164
24	0.088698	2.864319	0.271291	1.15497	2.403836	6.090606	87.21498

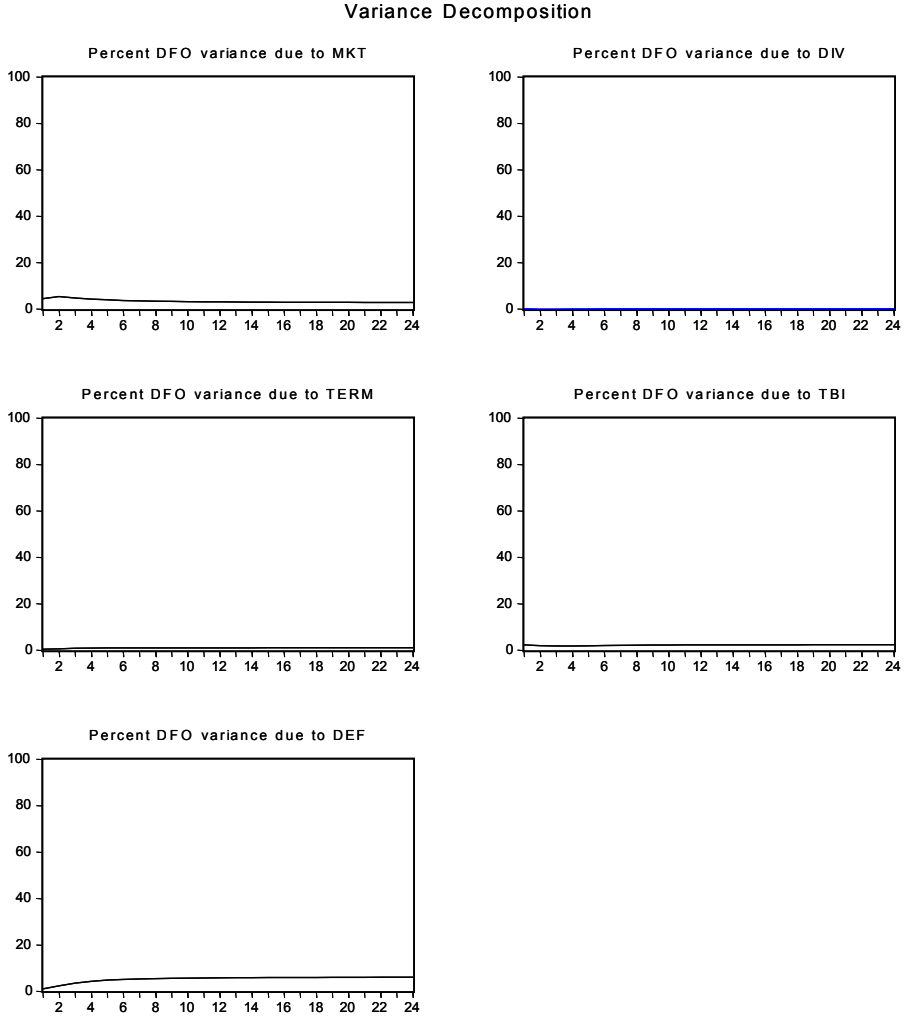
[Figure 6] Variance Decomposition on the KSE

This table plots results of variance decomposition in Panel A of the <Table 6> in order to recognize results easily. Five variables represent the capital markets conditions. They are (i) the yield on the one-year Monetary Stabilization Bonds (TBI), (ii) the return of the market portfolio (MKT), (iii) the term spread (TERM), (iv) the default spread (DEF), (v) the dividend yield on the market (DIV). In order to calculate the foreign ownership, we scale the market capitalization held by foreigners by the total market capitalization, on the KSE (PFO), at the end of each month. The sample period is from 2000 through 2007.



[Figure 7] Variance Decomposition on the KOSDAQ

This table plots results of variance decompostion in Panel B of the <Table 6> in order to recognize results easily. Five variables represent the capital markets conditions. They are (i) the yield on the one-year Monetary Stabilization Bonds (TBI), (ii) the return of the market portfolio (MKT), (iii) the term spread (TERM), (iv) the default spread (DEF), (v) the dividend yield on the market (DIV). In order to calculate the foreign ownership, we scale the market capitalization held by foreigners by the total market capitalization, on the KOSDAQ (DFO), at the end of each month. The sample period is from 2000 through 2007.



Ⅴ. Conclusion

This article has attempted to establish whether there are the cointegrated relation between the foreign ownership and capital market proxies and whether dependences exits between the foreign ownership and capital market proxies adopting VECM system. Furthermore, we have placed emphasis on long-run equilibrium relationship and innovations and dynamics between the foreign ownership and capital market proxies in this paper.

Proceeding from what has been said above, it should be concluded that this paper provides new insights which the foreign ownership is cointegrated to capital market proxies. To sum up, the following kinds of research materials were used : (1) each time series follows I (1) process, (2) there are cointegrating vectors between the foreign ownership and capital market proxies. One discussion we draw from these two conclusions is that the foreign ownership is cointegrated with capital market proxies, it can be stated that the flow of foreign investment may be generated by capital market conditions, (3) there exist the dominance of, in turn, default risk premia and Monetary Stabilization on the KSE and KOSDAQ in the VECM system from results of the mechanism of innovations driven by impulse response function and variance decomposition function. So far, we have been discussing Korean government and domestic investors are material to control for default risk, liquidity of market and the rate of interest in long term business cycle in the cause of defending disadvantages against foreign investment.

Despite these findings, there remain some basic limitations inherent in this paper. First, given the paucity of capital market proxies before 2000, this paper will be limited to discuss the cointegrated relations from 21st century after the IMF in Korea. Second, there is another argument that global market variables could affect to Korean market variables and the foreign ownership simultaneously. Certainly, the present paper was limited in scope. Further studies on different large-scale assessments are needed.

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