Idiosyncratic risk and foreign investors: Empirical evidence from the Korean stock market

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Abstract

This paper examines the effect of foreign ownership on idiosyncratic risk of individual stock in Korean stock market. We find that foreign ownership is negatively related to idiosyncratic risk. This result is robust to multiple idiosyncratic risk measures and regression methods. We find two underlying channels through which foreign ownership reduces the idiosyncratic risk: through influencing price informativeness and enhancing monitoring effect. Our results support that foreign investors reduce the idiosyncratic risk by enhancing monitoring, while the informativeness channel has weaker explanatory power.

1. Introduction

Since the influential paper by Campbell, Lettau, Malkiel, and Xu (2001), many studies have investigated to find the uncover determinants of idiosyncratic risk. According to prior studies, idiosyncratic risk is affected by the price informativeness, informed trading, growth option, and ownership structure (Roll (1988), Morck, Yeung, and Yu (2000), Jin and Myers (2006), Cao, Simin, and Zhao (2006), and Panousi and Papanikolau (2012)).

Brandt, Brav, Graham, and Kumar (2010) argue that idiosyncratic risk is induced by trading of retail investors. They provide the evidence that the increasing time trend of idiosyncratic risk is particularly acute in stocks with low prices and concentration of retail investors. Their findings imply that idiosyncratic risk can be related to the features of investor types.

Motivated by Brandt et al. (2010), this paper investigates whether foreign investors,

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one of the main investor types, affect idiosyncratic risk. Foreign investors possess the unique features that are different from those of domestic investors. Prior studies document that their market participation leads to various changes in emerging market, such as investment boom, market and economic development, and reducing cost of capital (Henry (2000, 2003) and Bekaert, Harvey, and Lundblad (2005)). Therefore, we expect that if features of foreign investors affect the idiosyncratic risk, foreign holdings, may influence the degree of idiosyncratic risk in individual stocks.

Understanding the relationship between foreign investors and idiosyncratic risk is valuable. Idiosyncratic risk is important factor that draws considerable attention from both outside and inside investors. Furthermore, it involves various implications for investment decision, quality of private information, corporate policy, and portfolio diversification. Given the significance of idiosyncratic risk, the understanding this relationship can provide additional implication about role of foreign investors.

To measure the idiosyncratic risk, we employ the approach of Ang et al. (2006), which is given by residuals in regression of each stock's return on the factors defined by Fama and French (1993). In order to ensure the robustness of test, we also examine using alternative idiosyncratic risk measures, such as four factor model (Carhart (1997)) and expected idiosyncratic risk (Fu (2009)). With measure of Ang et al. (2006) as our main measure, we evaluate the Korean stock market from January 2002 to December 2017.

We have three key findings from this study. First, foreign ownership is negatively related to idiosyncratic risk in the next month. This negative relationship is statistically significant at the 5% level. This result is robust to idiosyncratic risk that estimated by four factor model and multiple regression methods. We use one month lagged explanatory variables to reduce the potential reverse causality concerns. The lagged explanatory variables can be interpreted as instrument variables for the current values

(Boehmer and Kelley (2009)). We also confirm that this negative relation between foreign ownership and idiosyncratic risk holds using current regressors.

Second, we find the evidence of the direction of causality from the foreign ownership to idiosyncratic risk. In the paper, we are interested in whether foreign ownership affects idiosyncratic risk. However, it is also possible for idiosyncratic risk to determine foreign ownership.

According to previous literature, foreign investors prefer to hold stocks with large capitalization, internationally well-known, high liquidity and low leverage (Gompers and Metrick (2001), and Chan, Covrig, and Ng (2005)). In particular, Kang and Stulz (1997) report that foreign investors in Japan stock market have disproportionately in high holdings of stocks in low idiosyncratic risk relative to weights of Japanese market portfolio. Therefore, the degree of foreign holdings can be determined by degree of idiosyncratic risk if they have certain preference on idiosyncratic risk.

To address the reverse causality concern, we perform the Granger-type causality test. As a result, increase in foreign ownership is negatively related to idiosyncratic risk in next month, but the opposite direction is statistically insignificant.

Third, we explore two possible explanations that may be driving the relation between foreign investor and idiosyncratic risk: information and monitoring. Using equity mispricing and analyst coverage, we test whether foreign investors affect the idiosyncratic risk through the information channel.

As a result, information channel have weaker explanatory power. Specifically, using three different proxies for mispricing, we confirm that all interaction variables between foreign ownership and mispricing have negative sign of regression coefficient, but statistical robustness is weak. Furthermore, the effect through the analyst coverage is also marginal.

On the other hand, our result supports the monitoring based explanation. Using degree of corporate governance and block-holding announcement event, we examine whether effect of foreign ownership on idiosyncratic risk is driven by monitoring.

As a result, the effect of foreign ownership on future idiosyncratic risk differs across degree of corporate governance. The stocks with poor governance have higher idiosyncratic risk in next month and the negative effect of foreign ownership on future idiosyncratic risk is stronger for stocks with poor governance. In particular, the significance of regression coefficient for foreign ownership disappears after adding interaction variable between foreign ownership and idiosyncratic risk, suggesting that the negative relation between foreign ownership and idiosyncratic risk is largely explained by governance channel. Furthermore, the result of event study also supports the monitoring explanation.

The present paper contributes to the literature in following two ways. First, this paper provides additional finding the role of foreign investors in individual stocks of emerging stock market. In particular, we show that foreign investors reduce the firm specific risk by monitoring. This result helps additional understand about ongoing debate on whether foreign participation is beneficial to local stock market.

Second, our finding can provide additional implication for portfolio diversification. Prior studies document that market participations fail to construct well-diversified portfolio in manner (Barber and Odean (2000) and Campbell et al. (2001)). Since foreign holdings reduce the idiosyncratic risk, it can improve the diversification effect of portfolio by adding stocks with high foreign ownership. In section 6, we show that foreign holdings amplify the portfolio diversification effect. Therefore, our result can be applied as the way to reduce the cost of constructing diversified portfolio.

The remainder of this paper is organized as follows. Section 2 develops the research

hypotheses. Section 3 describes sample data and explains how we measure the idiosyncratic risk and specifies empirical models. Section 4 evaluates our main regression and causality. Section 5 examines the possible explanations. Section 6 describes the implication of our finding in portfolio diversification. Section 7 reports the result of robustness check. The final section concludes the paper.

2. Hypothesis development

2.1 Research Background

In this paper, we hypothesize that foreign investors affect idiosyncratic risk of individual stocks. Why should foreign investors affect idiosyncratic risk? Our conjecture is motivated by the study of Brandt et al. (2010). The study of Brandt et al. provides the evidence that trading behavior of retail investors affect the time trend of idiosyncratic risk, suggesting that the feature of investor types can determine the idiosyncratic risk.

Foreign investors also possess the unique features that are different from those of domestic investors. More specifically, we expect that foreign investors can affect the idiosyncratic risk in following two ways.

First, foreign investors can affect idiosyncratic risk by influencing price informativenss. Many prior studies argue that idiosyncratic risk is closely related to private information. Roll (1988), for example, shows that only small portion of return variation can be explained by market wide or public information. He suggests that this evidence may imply that idiosyncratic risk mainly reflects private information being incorporated into stock price through informed trading rather than public information.

Follow up studies support above argument by showing that idiosyncratic risk is determined by certain variable that can capture the degree of accessibility to private

information. For example, Morck et al. (2000) argue that strong protection rights can lead to informed trading by provide more firm specific information and document the significant relation between investor's protection rights and idiosyncratic risk. Jin and Myers (2006) provide that a low accounting information transparency and investor protection result in low idiosyncratic risk because stock prices fail to reflect in timely firm specific information.

Given this information based interpretation of idiosyncratic risk, foreign investors can be related in two ways. First, foreign investors affect idiosyncratic risk through influencing price informativeness due to their superior trading skill and expertise. For example, Grinblatt and Keloharju (2000), Seasholes (2000), and Froot and Ramadorai (2008) suggest the evidence that foreign investors are sophisticated informed investors since they are equipped lots of investment experience and expertise at the advance level. Furthermore, Bae, Ozojuz, Tan, and Wirijanto (2012) show that foreign trading reduces the price delay to global information and facilitates the incorporate of information moving prices in the direction to fundamental values.

On the other hand, several studies report the empirical evidence that foreign investors face to difficulty in accessibility of firm specific information due to their geographical distance, linguistic and cultural difference (Brennan and Cao (1997), Hau (2001), and Choe et al. (2005)). Combined these two arguments, we conjecture that foreign investors affect idiosyncratic risk by influencing price informativeness since they possess unique features in accessing and gathering firm specific information.

Second, increasing participation of foreign investors may affect idiosyncratic risk by improving information environment. According to Bae et al. (2006), foreign participation can apply entire local economy to adopt the better information disclosure standard or higher legal and regulation.

Improving information environment can decrease noise trading or alleviate impediment to informed trading by providing sufficient firm specific information. Therefore, foreign investors affect idiosyncratic risk if they improve information environment.

Another possible channel through which foreign investors affect idiosyncratic risk is monitoring. John, Litov, and Yeung (2008) argue that the risk choice of manager is determined not only by the managers' ownership and compensation structures, but also by the private benefits that they can capture, including the corporate cash flows that they plan to diver to themselves.

Such desire to pursuit of self-interest determines the risk taking behavior of manager, but it is also limited by monitoring of shareholder. According to Kempf et al. (2016), managers tend to implement corporate actions that motivated by their private benefits, such as opportunistically timed equity grants, when shareholder's monitoring is loosen. In addition, John et al. (2008), King and Wen (2011) show that the degree of corporate governance affects the risk taking behavior. Specifically, John et al. (2008) find that better governance leads firm to undertake riskier but value enhancing project.

Such managerial risk which is driven by manager's pursuit of private benefits can impact the firm's future cash flow, stock return, competitive position in industry or uncertainty of future perspective, but it does not affect the market or industry wide. Therefore, such managerial risk may be closely related to firm specific risk. According to Ferreira and Laux (2007), the degree of corporate governance is significantly related to idiosyncratic risk. Using anti-takeover provision as a measure of governance, they show that firms with fewer anti-takeover provision have higher degree of idiosyncratic risk

In view of investor monitoring, foreign investors are generally known to play a positive role. Gillan and Stark (2003) argue that foreign investors are effective and active

monitors because they are credited with their independence from local management. Furthermore, Ferreira and Matos (2008) and Aggarwal, Erel, Ferreira, and Matos (2011) find that foreign investors engage in monitoring investee firms which results in higher value and operating performance. Combined with above arguments, we expect that foreign investors affect idiosyncratic risk by influencing management as a monitor.

2.2 Testable hypothesis

Our main research question is whether participation of foreign investors affects idiosyncratic risk. Referring to previous literature, the direction of effect of foreign investors on idiosyncratic risk is ambiguous. Therefore, we first assume that foreign investors are active monitor or enhance the stock informativeness. If our assumption is correct, idiosyncratic risk is negative related to foreign investors. To measure the participation of foreign investors, we use the percentage of foreign ownership at the last day of each calendar month. Testable hypothesis is as follows.

Hypothesis 1: If foreign ownership is increase, idiosyncratic risk will decrease, ceteris paribus.

We propose two plausible explanations that may be driving the relation between foreign investors and idiosyncratic risk: information and monitoring. The information based explanation about the relation between idiosyncratic risk and foreign investors is based on the two essential ideas.

First, given the linkage between idiosyncratic risk and private information, foreign investors play a significant role by influencing informativeness of individual stocks. As introduced previously, Morck et al. (2000) interpret idiosyncratic risk as an indicator of informed trading. Under this interpretation, high idiosyncratic risk implies that the price

of stock is tracking its fundamental value closely.

Foreign investors can affect price informativeness, but the direction is ambiguous. If foreign investors are sophisticated informed traders, increase in their participation affects the idiosyncratic risk by stimulate informed trading. On the other hand, if foreign investors behave as noise traders due to their informational disadvantage, their participation affect the idiosyncratic risk by impeding informed trading.

In this paper, we use the degree of stock mispricing to examine the information based explanation. Stock mispricing is widely used in prior studies as a measure of informed trading or price informativeness (Stambaugh et al. (2015) and Aabo et al. (2017)). We hypothesize that if foreign investors affect idiosyncratic risk by influencing stock informativeness, the effect of foreign ownership on idiosyncratic risk will differ across degree of stock mispricing. Testable hypothesis is as follows.

Hypothesis 2: The effect of foreign ownership on idiosyncratic risk will differ across degree of mispricing

Alternatively, foreign investors can affect the idiosyncratic risk by improving information environment. The participation of foreign investors from developed countries can apply pressure local economy to adopt the higher regulatory and transparent information disclosure standards. Improving information environment can affect idiosyncratic risk by alleviate impediment to informed trading.

Using analyst coverage as a proxy for information environment, we examine the relation between foreign ownership, idiosyncratic risk, and information environment. Testable hypothesis is as follows.

Hypothesis 3: The effect of foreign ownership on idiosyncratic risk will differ across degree of information environment

The second possible explanation is monitoring. In order to capture the monitoring effect of foreign investor, we employ two measures: degree of corporate governance and announcement event of foreign block-holding.

First, the corporate governance is widely used in prior literature to examine the monitoring effect. For example, Li et al. (2011) argue that foreign investor reduces the total return volatility through monitoring by comparing magnitude of coefficients of foreign ownership on total risk between better and poor governance groups. Motivated by prior literature, we examine the monitoring effect of foreign investor on idiosyncratic risk using corporate governance dummy variable. The testing hypothesis is as follow.

Hypothesis 4: The effect of foreign ownership on idiosyncratic risk will differ across degree of corporate governance.

Although many related studies have employed corporate governance as a measure of monitoring, in a strict sense the degree of corporate governance indicates that the environment which can provide the support for monitoring activity, does not imply monitoring activity directly.

For instance, if the benefits from monitoring are smaller or more costly than benefits from sell off stocks, investor does not actively monitor the manager, even if that firm has better governance structure. Therefore, the analysis using governance dummy must be careful in interpreting because it cannot be ruled out the possibility that magnitude of monitoring effect is not always positively associated with monitoring environment.

To capture the monitoring effect of foreign investor directly, we perform the event study using block holding announcement of foreign monitor (detail explanation is presented in Chapter 5-2). In Korean stock market, any investors who acquire the shares of 5% or more the stocks listed in KSE must report the Financial Supervisory Service

(FSS) within 5 or 10 days depending on their investment purpose. In particular, information about investment purpose allows us to identify the investors who acquire the shares to influence the management. We define these foreign investors as active foreign monitor and hypothesize that idiosyncratic risk will decrease after buying announcement of foreign activist if they affect idiosyncratic risk by enhancing monitoring. The testing hypothesis is as follows.

Hypothesis 5: If foreign investor affects idiosyncratic risk through influencing monitoring, then idiosyncratic risk will significantly change after block holding announcement of active foreign monitor.

3. Data and variable construction

3.1 Data and idiosyncratic risk

Our sample contains all common stocks traded on the Korean Stock Exchange (KSE) between from January 2002 to December 2017. We obtain the daily and monthly stock return, ownership by investor type, trading volume, firm's accounting information, and number of analyst from Data-Guide database. Data-Guide database provides quantitative information for all firms listed on the Korean stock market. We include delisting stocks to control for survivorship bias.

The measure of idiosyncratic risk we use has been considered by Ang, Hodrick, Xing, and Zhang (2006). They use residuals in a regression of each stock's daily return on the three factors defined by Fama and French (1993). Following Ang et al. (2006), we estimate idiosyncratic risk using Fama and French three factors. We also consider momentum factor of Carhart (1997) to assess the robustness of test.

$$R_{i,t}^{e} = \alpha_i + \beta_i^{MKT}(R_{m,t} - R_{f,t}) + \beta_i^{SMB}SMB_t + \beta_i^{HML}HML_t + \varepsilon_{i,t} \quad (1)$$

$$R_{i,t}^{e} = \alpha_i + \beta_i^{MKT}(R_{m,t} - R_{f,t}) + \beta_i^{SMB}SMB_t + \beta_i^{HML}HML_t + \beta_i^{UMD}UMD_t + \varepsilon_{i,t} \quad (2)$$

where subscripts t denotes date t. R_i^e is the excess daily return of stock i, R_m is the return on the KSE value-weighted index. R_f is the risk free rate which is measured by interest rate of 3 years Korea Treasury Bond. SMB, and HML represent the size factor and the value factor, respectively. UMD is the momentum factor of Carhart (1997). We define the idiosyncratic risk as the standard deviation of residuals for the month, or $\sqrt{\mathrm{Var}(\varepsilon_{i,t})}$.

3.2 Control variable

Foreign investor who trades equities in KSE must report their specific information to the Financial Services Commission (FSC) and obtain identification before begin trading stock. Through this identification, FSC can count and disclose the foreign trading volume and amount of their shareholdings on a daily basis. This feature allows us to categorize shareholder ownership into foreign and domestic investors. For each end of calendar month, we collect the percentage of foreign ownership of total shares outstanding as a measure of foreign holdings.

Pastor and Veronesi (2003) employ the several firm characteristics to explain the idiosyncratic risk of individual stocks in cross section, such as firm size, leverage, book market ratio, firm age, dividend, and return on equity. Following Pastor and Veronesi (2003), we consider above firm characteristics as a control variable. Firm size is calculated by the common logarithm of market capitalization at the last day of each calendar month. Book to market equity ratio is computed by comparing the book value of equity to market capitalization at the end of calendar month. To adjust the scale of

variable, book to market ratio is multiplied by 10^{-1}. Firm age is the common logarithm of period of listed on the exchange. Leverage (Lev) is computed by comparing the total debt to sum of total debt and market capitalization. Return on equity (ROE) is the monthly current return of equity. Div is the dividend dummy variable that is equal to 1 if the firm paid the dividend in the current year and zero otherwise.

3.3 Summary statistics and idiosyncratic risk

Table 1 presents the summary statistics. The total sample stocks are 946. The value of summary statistics is computed by time-series average of monthly cross section. The average value of idiosyncratic risk and standard deviation is 2% and 1%, respectively.

Ownership of foreign investors is averagely 11%, but median is 4%, suggesting that foreign ownership is concentrated for certain stocks. The average value of firm and BM, leverage is 5.23, 1.92, and 0.57 respectively. Firm age of sample stocks is averagely 1.39.

Insert Table 1 about here

In order to check whether foreign ownership affects idiosyncratic risk, we sort the stocks into quintile portfolios based on foreign ownership and compute the average value of idiosyncratic risk. As shown Panel B of Table 1, average value of idiosyncratic risk declines monotonically from 0.027 for the low foreign ownership portfolio to 0.019 for high foreign ownership portfolio. This pattern is similar when idiosyncratic risk is estimated by four factor model. Although this result is uni-variate analysis, it suggests our hypothesis that foreign ownership affects idiosyncratic risk. Specifically, as foreign ownership increased, idiosyncratic risk declines.

4. Empirical analysis

4.1 Effect of foreign ownership on idiosyncratic risk

Refer to Table 1, we find that idiosyncratic risk monotonically decrease from the high foreign ownership quintile portfolio to the low foreign ownership quintile. It is premature to conclude that the idiosyncratic risk has been reduced by foreign ownership due to potential connections between idiosyncratic risk and other factors.

In this section, we examine a general relationship between foreign ownership and idiosyncratic risk. We use one month lagged explanatory variables to reduce the potential reverse causality concerns. The lagged explanatory variables can be interpreted as instrument variables for the current values. We perform that the Fama and MacBeth regression and panel regression with fixed effect model. The general specific is as follows:

$$\begin{aligned} IV_{i,t} = {} & \alpha_i + \beta_1 FO_{i,t-1} + \beta_2 Size_{i,t-1} + \beta_3 BM_{i,t-1} + \beta_4 Age_{i,t-1} + \beta_5 Lev_{i,t-1} \\ & + \beta_6 ROE_{i,t-1} + \beta_7 Dividend_{i,t-1} + \varepsilon_{i,t} \end{aligned} \tag{3}$$

where subscripts t denotes month t. FO_i is the ratio between foreign ownership at the last day of each calendar month. $Size_i$ and BM_i are firm size, which is computed by common logarithm of market capitalization at the last day of each calendar month and book to market ratio, computed by comparing the book value of equity to market capitalization at the last day of each calendar month, respectively. Age indicates the firm age which is computed by common logarithm of the period of listed on the stock exchange. Lev_i is the firm leverage, which computed by comparing the total debt to sum of total debt and market capitalization at the last day of each month. Div is the dividend variable that is equal to 1 if the firm paid the dividend in the current year and zero otherwise.

Insert Table 2 about here

The results are reported in Table 2, with Panel A focusing on the results using the idiosyncratic risk estimated by three factor model of Fama and French (1993) and Panel B focusing on the idiosyncratic risk estimated by four factor model of Carhart (1997). For first two columns, we report the regression coefficients using Fama and Macbeth regression method. In third column, we re-estimate the regression using panel regression with fixed effect model.

As shown by Panel A, foreign ownership is negatively related to idiosyncratic risk in the next month. The coefficient of foreign ownership is -0.002 and statistically significant at the 5% level. The negative relationship still holds and statistically significant even with adding various control variables. The control variables such as firm size, book to market ratio, leverage, and dividend dummy have significant and negative regression coefficient. On the other hand, the return on equity is significantly positive, 0.013. The regression coefficient of firm age is small and statistically insignificant.

The result is also robust to panel regression with fixed effect model. In column (3) of Panel A, we confirm that the foreign ownership has negative and statistically significant regression coefficient. We also perform the regression using idiosyncratic risk, estimated by four factor model (Carhart (1997)). As shown by Panel B of Table 2, the negative relation between foreign ownership and idiosyncratic risk still holds and statistically significant.

Furthermore, we also find that the negative relation between foreign ownership and idiosyncratic risk remain unchanged using current regressors and samples with except for no foreign ownership (but do not report).

Overall, these results support our notion that foreign ownership affects idiosyncratic

risk. Increase ownership of foreign investors mitigates idiosyncratic risk of individual stocks even after controlling for various control variables.

4.2 Reverse causality

We find the strong negative effect of foreign ownership on idiosyncratic risk in Korean stock market. The relation is robust across multiple idiosyncratic risk measures and regression methods. However, one potential issue here is that this negative relationship is driven by reverse causality effect.

According to prior studies, foreign investors prefer to hold stocks with large capitalization, internationally well-known, high liquidity and low leverage (Gompers and Metrick (2001), and Chan, Covrig, and Ng (2005)). In particular, Kang and Stulz (1997) document that foreign investors in Japan stock market have disproportionately in high holdings of stocks in low unsystematic risk relative to weights of Japanese market portfolio. The finding of Kang and Stulz (1997) suggests that the foreign holdings can be determined by degree of idiosyncratic risk of individual stocks if they have certain preference on idiosyncratic risk.

To address reverse causality issue, we use the Granger-type causality test. Boehmer and Kelley (2009) address the potential reverse causality concern between independent variable and dependent variable using granger type causality test. Following Boehmer and Kelley (2009), we address the potential reverse causality concern between foreign ownership and idiosyncratic risk. The detailed methodology is as follows. First, we run the time series regression for each stocks which having monthly observations over the past five years, at least. After that, we compute the average value of coefficients and standard t-test whether the value is different from zero. We use vector autoregressive model and all variables are first order differentiated to satisfy the stationary condition.

Insert Table 3 about here

In Panel A of Table 3, we regress the changes in idiosyncratic risk on lagged changes in foreign ownership, firm size, book to market ratio, leverage, return on equity. As a result, increase in foreign ownership is negatively related to idiosyncratic risk and statistically significant. On the other hand, as shown by Panel B of Table 4, the changes in idiosyncratic risk has negative affect foreign ownership but statistically insignificant.

One should be careful in interpreting above results because it is not easy to fully address reverse causality problem. Our findings may also a possibility driven by unobserved variables that is related to both idiosyncratic risk and foreign ownership. Nevertheless, as the results of first difference regression and granger causality test are consistent, the causal direction of foreign ownership and idiosyncratic risk seem to be persuasive.

5. Possible explanations

5.1 Information based explanation

Roll (1988) argues that idiosyncratic risk reflects private information which being incorporated informed trading than public information. Morck et al. (2000) suggest the supporting evidence that level of idiosyncratic risk is determined by degree of impediments of informed trading.

Given this linkage between idiosyncratic risk and private information, foreign investors can be related in two ways. First, foreign investors affect idiosyncratic risk by influencing price informativeness. According to Grinblatt and Keloharju (2000), Seasholes (2000), and Froot and Ramadorai (2008), foreign investors are sophisticated

informed investors since they are equipped lots of investment experience and expertise at the advance level. Furthermore, Bae, Ozojuz, Tan, and Wirijanto (2012) show that foreign trading reduces the price delay to global information and facilitate the incorporate of information moving prices in the direction to fundamental values. Therefore, it is natural hypothesis that foreign investor affects idiosyncratic risk if they stimulate informed trading.

On the other hand, several studies have documented that foreign investors are disadvantageous in accessibility to information due to their geographical distance, linguistic and cultural difference (Brennan and Cao (1997), Hau (2001), and Choe et al. (2005)). Hence, if foreign investors have difficulty to find the fundamental stock value, their participation can affect idiosyncratic risk by leading noise trading. We named this hypothesis as informed trading hypothesis.

Our hypothesis is based on idea that informational advantage is related to informed trading or price informativeness. This idea is motivated by the argument of Coval and Moskowitz (2001). They argue that location of investors can be useful in identifying informed trading because investor who located near potential investment has better ability to select the stocks. As an empirical evidence, they document that fund manager earn substantial abnormal returns in nearby investment. Therefore, we expect that the features of foreign investors on information accessibility can be useful in identifying informed trading or price informativeness.

Second, foreign investors may affect idiosyncratic risk by improving information environment. Participation of foreign investors from developed countries can apply pressure individual stocks to adopt the better information disclosure standard, higher legal of regulation. According to Bae et al. (2006), participation of foreign investors improves the information quality in local stock market.

Improving information environment can decrease noise trading or alleviate impediment to informed trading by providing firm specific information. Therefore, foreign investors affect idiosyncratic risk if they improve quality of firm specific information. We named this hypothesis as information environment hypothesis.

To examine the informed trading hypothesis, we use the equity mispricing. Mispricing is widely used in prior studies as a proxy for degree of informed trading or price informativeness (Stambaugh et al. (2015) and Aabo et al. (2017)). This paper constructs three measures of equity mispricing. First approach is based on the comparison with same industry peers. Doukas, Kim, and Pantzalis (2010) argue that since investors have imperfect information about future cash flows, they recognize information about cash flows and expected returns referring information of industry performance. Therefore, by comparison with performance information in same industry peers, it is possible to figure out whether the individual stocks are undervalued. Measure of Doukas et al. (2010) is estimated by natural logarithm of the ratio of the individual stock's actual value to its industry based imputed value. Actual value is the total capital. Imputed value is estimated by as a ratio of firm sales, multiplied by its industry peers median capital to sales ratio.

We also consider mispricing measure of Rhodes-Kropf, Robinson, and Viswanathan (2005). They develop the decomposition that breaks market to book value into two sources: a measure of fundamental to book value and a measure of price to fundamental value. If markets accurately price the value of stocks, market to book value is exactly equal to first component. If there is mispricing, then measure of price to fundamentals would not be equal to zero. According to Rhodes-Kropf et al. (2005), source of mispricing can be categorized into firm specific, time series sector, and industry sector error. In this paper, we consider the firm specific error as a measure of mispricing and estimates using following regression equation.

$$\mathrm{Ln}(\mathrm{Market}_{i,t}) = \alpha_i + \beta_1\ \mathrm{Ln}(\mathrm{Book})_{i,t} + \beta_2\ \mathrm{Ln}(\mathrm{Net\ Income}_{i,t}) + \beta_3\ I_{(<0)}\ \mathrm{Ln}(\mathrm{abs}(\mathrm{Net\ Income}_{i,t})) + \varepsilon_{i,t} \quad (4)$$

$$\mathrm{Ln}(\mathrm{Market}_{i,t}) = \alpha_{i,} + \beta_1\ \mathrm{Ln}(\mathrm{Book})_{i,t} + \beta_2\ \mathrm{Ln}(\mathrm{Net\ Income}_{i,t}) + \beta_3\ I_{(<0)}\ \mathrm{Ln}(\mathrm{abs}(\mathrm{Net\ Income}_{i,t})) + \beta_4\ \mathrm{Ln}(\mathrm{Lev}_{i,t})\ + \varepsilon_{i,t} \quad (5)$$

where Market and Book is the total capitalization and book value at the end of each calendar month, respectively. $\mathrm{abs}(\mathrm{Net\ income})$ is the absolute value of net income. To consider stocks with negative net income, we include the dummy variable which taking 1 if there is negative net income and 0 otherwise. Lev is the leverage. Using above two regressions (4) and (5), we construct mispricing 2 and 3, respectively.

The regression is estimated in each month. After that we can calculate the firm specific error using fitted value. In case of regression (5), Firm specific error is defined as $\mathrm{Ln}(\mathrm{Market}_{i,t}) - (\alpha_i + \sum_{i=1}^{4} \beta_i)$. The degree of mispricing is computed by time series average value of cross sectional firm specific error.

We perform the regression of foreign ownership on future idiosyncratic risk, including interaction variable between foreign ownership and mispricing. We expect that regression coefficient of interaction variable is statistically significant if the effect of foreign ownership on idiosyncratic risk is driven the impact of informativeness. We report the regression results from first to third column of Table 4.

As a result, all regression coefficients of interaction variable between foreign ownership and mispricing have negative sign. In column third, the interaction variable between foreign ownership and mispricing, which is estimated by regression (5), has significantly negative. However, the results of using another mispricing estimated are negative but statistically significant at 10% level.

Insert Table 4 about here

We next examine the information environment hypothesis. To measure the information environment, we use the analyst coverage. Analyst report is the common way to acquire the firm specific information. According to prior studies, foreign investors have positively related to analyst coverage (Lang et al. (2003), Bae et al. (2006)). We measure the intensity of analyst coverage as the number of analyst who issued earnings forecasts for a stock during the given calendar year. To adjust the scale of variable, we take the logarithm of one plus number of analyst. We predict that the regression coefficient of interaction variable between foreign ownership and the number of analyst to have negative sign if foreign investors reduce the idiosyncratic risk by improving information environment.

The column (4) of Table 4 shows the regression estimation using analyst coverage. Contrary to our expectation, the coefficient of number of analyst and interaction variable are significantly positive. This result suggests that the stocks being analyzed by many analysts have higher idiosyncratic risk and foreign investors have positive effect in such stocks. However, the coefficient of foreign ownership is still negative and statistically significant, suggesting that the influence through analyst coverage is marginal. Overall, the information based explanation has weaker explanatory power in foreign ownership and idiosyncratic risk relation.

5.2 Monitoring based explanation

Another possible channel through which foreign investors affect idiosyncratic risk is monitoring. Executive of firm does not always have same interest with their shareholders. Therefore, the agency problem is associated with corporate actions. Kempf et al. (2016)

show that managers tend to implement corporate actions that motivated by their private benefits when shareholder's monitoring is loosened. John et al. (2008) also show that better investor protection leads to undertake more risky and value enhancing projects by mitigating the taking of manager's private benefits.

Such managerial risk which is driven by manager's pursuit of self-interest can affect the firm's future cash flow, stock return, operating performance, investment, competitive position in industry or uncertainty of future perspective. However, it does not affect the market or industry wide. Therefore, such managerial risk may be related to idiosyncratic risk.

Foreign investors are generally known as active monitor in emerging market. Gillan and Stark (2003) argue that foreign investors are effective and active monitors because they are credited with their independent from local management. Ferreira and Matos (2008) and Aggarwal et al. (2011) also show that foreign investors have positive role in monitoring. Furthermore, Loung, Moshirian, Nguyen, Tian, and Zhang (2017) show that foreign investors enhance firm innovation by playing active monitoring role. Li et al. (2011) find that stocks with large foreign ownership have lower return volatility and this relationship is strong for stocks with better governance.

In order to examine whether monitoring of foreign investor induces the foreign ownership and idiosyncratic risk relation, we employ two measures: corporate governance and announcement event of block holding.

The corporate governance is widely used in prior literature to examine the monitoring effect. For example, Li et al. (2011) argue that foreign investor reduces the total return volatility through monitoring by comparing magnitude of coefficients of foreign ownership on total risk between better and poor governance groups. Following intuition of Li et al. (2011), we examine the monitoring effect of foreign investors on idiosyncratic

risk using corporate governance dummy variable and subsample analysis.

As a measure of governance, we use the corporate evaluate scores from Korea Corporate Governance Service (KCGS). KCGS score is widely used in prior studies on the governance of Korean stock market (Park and Yon (2009), Black, Kim, Jang, and Park (2015), and Cho and Chung (2016)). The corporate evaluate scores are calculated by reflecting degree of shareholder protection, activity of board of directors, corporate disclosure, audit systems, and profit sharing. We assign the stocks with grade B or higher as a high group. We report the regression coefficients in Table 5.

Insert Table 5 about here

Panel A shows that average value and standard deviation of foreign ownership in high and low governance groups. The average value of foreign ownership in high corporate governance groups is 12.7%, the average value of foreign ownership in low governance groups is 6.5%, and the difference (6.2%) in foreign ownership between two groups is statistically significant at the 1% level. Average value of idiosyncratic risk in next month is higher for low governance groups, 2.2% then high governance groups, 1.8%.

In Panel B, we report the regression coefficient of foreign ownership on future idiosyncratic risk. Specifically, we first include the governance dummy variable (GOV), which takes 1 if stock i belongs to poor governance groups and zero otherwise and the interaction variable between governance dummy and foreign ownership.

The result is reported in first column of Panel B. The regression coefficient of governance dummy variable is significantly positive. The interaction variable between foreign ownership and governance dummy variable ($FO_{i,t} * Gov$) is negative, -0.004 and statistically significant at 5% level. In particular, the significance of regression coefficient for foreign ownership disappears after adding governance dummy and interaction

variable. The result of subsample analysis is also consistent with result of analysis using governance dummy variable. As shown by last two columns from Panel B, the regression coefficient of foreign ownership is strongly negative in stocks with poor governance group.

Overall, the results of Table 5 support the monitoring explanation. The negative effect of foreign ownership on idiosyncratic risk is largely explained by effect of foreign ownership on corporate governance.

Although many related studies have employed corporate governance as a measure of monitoring, in a strict sense the degree of corporate governance indicates that the environment which can provide the support for monitoring activity, does not imply monitoring activity directly.

For instance, if the benefits from monitoring are smaller or more costly than benefits from sell off stocks, investor does not actively monitor the manager, even if that firm has better governance structure. Therefore, the analysis using governance dummy must be careful in interpreting because it cannot be ruled out the possibility that magnitude of monitoring effect is not always positively associated with monitoring environment.

To capture the monitoring effect directly, we perform the event study using block holding announcement of foreign monitor. The KSE provide detailed information on investment purpose of investors, including whether investor intends to influence management. Any investors who acquire the shares of 5% or more the stocks listed in KSE must report the Financial Supervisory Service (FSS) within 5 or 10 days depending on their investment purpose. More specifically, if investor acquires the shares to influence management, they must disclosure their detail intentions by creating related items within 5 days. If they do not intend to influence management, they have to report an abridged short form within 10 days.

Within this information, we can distinguish foreign investors who are likely to be actively monitoring the firm. It can be seen as intention to active monitor by holding a stakes of more than 5%, which have to disclosure their detail ownership information and declaring to actively participate in management. In this article, we use foreign investor who has declared their block holdings for management participation as an event that they actively participate in management as a monitor, and examine how idiosyncratic risk response to these foreign investor's block holding announcement.

This event approach is used in prior literature as an identification strategy about impact of foreign investor activism. Using event of announcement of foreign block holding, Kim, Sung, and Wei (2017) defined the foreign activist and show that there is significant impact of shareholder activism on stock price and corporate actions.

We hypothesize that if foreign investor reduces the idiosyncratic risk through the monitoring channel, then idiosyncratic risk will decrease in stock bought by activist foreigner. Following Kim et al. (2017), we manually collect all announcement reports of foreign activist from Data Analysis and Retrieval Transfer (DART) in FSS from January 2005 to December 2015. We also categorize block holding announcement of foreigner into block buying and selling announcement. The model is specified as follows:

$$IVOL_{i,t} = \alpha_i + \sum_{n=0}^{6} \gamma_n \delta_{n,i,t} + \sum_{t=1}^{12} \lambda_t + \sum_{q=1}^{Q} \eta_t + \varepsilon_{i,t} \quad (6)$$

where δ_0 is a binary variable taking a value 1 if the time t is announcement month. δ_1 is a binary variable that takes a value 1 if the time t is one month later a foreign activist's block holding announcement. We set n up to 6, considering the event period up to 6 month later. The coefficient γ captures that effect on idiosyncratic risk. To consider time effect, we include the calendar month dummy variable, λ which taking a value of 1 for month t. η is the industry dummy taking 1 for industry q, and zero otherwise. We use 11

industries from the two-digit Korea SIC code. The coefficients are estimated using standard errors clustered at firm level. We report the regression coefficient in Table 6.

Insert Table 6 about here

Interestingly, the idiosyncratic risk response is only significantly decreases in 4 to 6 month after buying announcement. Within 3 month, there is no significant reaction. On the contrary, for the selling announcement, idiosyncratic risk immediately increases. The only γ_0 is significantly positive, 0.0024, but other coefficients are statistically insignificant.

To address potential selection bias, we re-estimate the equation (6) using propensity score match method. The matched stocks have similar firm characteristics such as firm size, book to market ratio, degree of liquidity, return of equity, and leverage, but are not targeted foreign active monitors. We report the regression results in Panel B of Table 6.

Unlike previous result, the matched stocks do not appear any significant idiosyncratic risk response after buying announcement or selling announcement. The result suggests that response of idiosyncratic risk to block-holding announcement does not attributable to self-selection in bias.

Overall, we interpret the result of Table 6 that foreign stock holding reduces the idiosyncratic risk by enhancing monitoring. In particular, the effect from foreign participation does not immediately reflect idiosyncratic risk because the effect from change in corporate governance or participation in management may take some time to be revealed.

Immediately response idiosyncratic risk in selling announcement could be interpreted in two ways. One interpretation is that, in contrast with buying announcement, the market immediately reflects the sell-off of foreigner in idiosyncratic risk. Another interpretation

is that irrelevant with monitoring effect of foreign investor, it is driven by sell-off trading of foreign investor because the enhanced monitoring system does not easily change. Overall, we argue that the monitoring of foreign investor is channel through foreign ownership reduces the idiosyncratic risk.

One must be careful in interpreting these findings. This event study is relatively long run event approach based on monthly data. Therefore, it is hard to consider the impact of market participant on idiosyncratic risk that may occur after the block holding announcement. Furthermore, it is also possible that such effect of block holding announcement may immediately reflect in stock price if the market is efficient.

However, like various corporate events, which affect stock return and volatility in long term, if we consider that investor who can independently monitor the management becomes a shareholder as a corporate event, the change in idiosyncratic risk after foreign participation can provide meaningful implication, even if this change is observed relatively long run.

Furthermore, in the internal aspect of firm, the change in corporate governance does not proceed in a short period, so a relatively long term view of change in idiosyncratic risk after the event can support the argument about monitoring effect of foreign investor.

6. Portfolio implication

In this article, we find that increase in foreign ownership reduces the idiosyncratic risk in next month. This negative relationship may have implications for portfolio diversification. For instance, since foreign holdings reduce the idiosyncratic risk, it can improve the portfolio diversification by adding stocks with high foreign ownership. If so, this could be a way to easily save the cost of constructing a well-diversified portfolio.

We compare the diversification effect of high foreign ownership stocks with those of low foreign ownership stocks. As a measure of diversification effect, we use the excess standard deviation. The excess standard deviation is calculated by the difference between the standard deviation of individual stocks and the standard deviation of value weighted market index. We compute the standard deviation each month from daily data within month and use the Korea composite stock price index (KOSPI) as a market index.

In Panel A of Table 7, we report the time series average of excess standard deviation for each quintile group that sorted by foreign ownership. The excess standard deviation increases from 0.119 for stocks in the high foreign ownership quintile portfolio to 0.186 for stocks in the low foreign ownership quintile portfolio. This result suggests that stocks with high foreign ownership have relatively lower risk and high diversification effect than stocks with low foreign ownership.

In Panel B, we compare the excess standard deviations of portfolios containing different numbers of randomly selected stocks and degree of foreign ownership. As shown in Panel B, excess standard deviation across all foreign ownership groups decrease from 2 stocks portfolio to 30 stocks portfolio.

This pattern appears clearly in high foreign ownership portfolio. In the case of portfolio consisting of stocks with foreign ownership stakes of at least 10% of issued shares, the excess standard deviation significantly decreased as the number of stocks increased. However, the case of portfolio consisting of stocks with foreign ownership less than 5% and 1%, the excess standard deviation decrease, but statistically insignificant.

Overall, these results suggest that foreign holdings amplify the portfolio diversification effect. Therefore, it could be a way to easily reduce the cost of constructing a diversified portfolio.

7. Robustness check

In this section, in order to assess the robustness of test, we examine the effect of foreign ownership on idiosyncratic risk using alternative idiosyncratic risk measures. We first use the conditional expected idiosyncratic risk. Fu (2009) argues that the lagged idiosyncratic risk may not be an appropriate measure since volatility is time varying. He uses the exponential generalized autoregressive conditional heteroskedasticity (EGARCH) models to capture the time varying property of idiosyncratic risk.

Following Fu (2009), we choose the EGARCH (1, 1) models and include sample stocks that have at least 60 months of observations. In order to consider the time when the foreign investors have participated in Korean stock market, we start to estimate the expected idiosyncratic risk from January 2000.

Insert Table 8 about here

As shown by column (1) of Table 8, foreign ownership has negatively related to expected idiosyncratic risk. Consistent with result from previous section, the regression coefficient for foreign ownership is -1.871 and statistically significant at 5% level.

Second, we consider the idiosyncratic risk, estimated by synchronous movement of a stock's return with the market returns. Morck et al. (2000) and Fernandes and Ferreira (2008) estimate idiosyncratic risk using regression's R-squared value of individual stock returns on market index or risk factor. More specifically, they compute the logistic transformation of idiosyncratic risk as the ratio of idiosyncratic risk to total risk, $\log(\frac{(1-R^2)}{R^2})$. Using this measure, we re-estimate regression (3) and report the results in column (2) of Table 8.

As a result, the regression coefficient for foreign ownership is statistically significant

and positive. This result appears to be opposite to those reported in prior sections. However, the implication from analysis used Morck's idiosyncratic risk measure is not contradictory with prior results, because this measure captures different aspects of the spectrum of idiosyncratic risk.

Li, Rajgopal, and Venkatachalam (2014) compare between idiosyncratic risk using R square value and residual from market model and document that these two measures can yield diametrically opposite inferences. Specifically, they show that idiosyncratic risk using R square and residual from market model have similar inferences if and only if the correlation between the independent variable of interest and systematic risk is zero.

Therefore, the appropriate interpretation about results from Table 8 is that idiosyncratic risk measures from R square and residual from pricing model provide different implication rather than contradictory results.

The issue of which measures are a more appropriate proxy for idiosyncratic risk is largely controversial. In this paper, we posit the results that foreign ownership negatively affects idiosyncratic risk, which is robust to three, four factor model and expected conditional idiosyncratic risk, rather than arguing which measures are appropriate proxy for idiosyncratic risk.

8. Conclusion

This study examines whether and how foreign investors affect idiosyncratic risk of individual stocks. We find the strong and negative effect of foreign ownership on idiosyncratic risk. The relation is robust to multiple idiosyncratic risk measures and regression methods. Furthermore, we also confirm that the direction of causality goes from foreign ownership to idiosyncratic risk.

This study further explores the underlying channels through which foreign ownership

negatively affects idiosyncratic risk. Our result supports the monitoring explanation while the information based explanation has weaker explanatory power.

The negative relation between foreign ownership and idiosyncratic risk can provide additional implication for portfolio diversification. Since foreign holdings reduce the idiosyncratic risk, it can improve the diversification effect of portfolio by adding stocks with high foreign ownership. We show that foreign holdings amplify the portfolio diversification effect. Therefore, our findings can be applied as the way to reduce the cost of constructing well-diversified portfolio.

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