Spring 2002

Institutional Investors and ADRs: Three Essays

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Master of Finance, July 1998, Jinan University,

A Dissertation submitted to the Faculty of Old Dominion University in Partial Fulfillment

of the Requirement for the Degree of

DOCTOR OF PHILOSOPHY

FINANCE

OLD DOMINION UNIVERSITY

May 2002

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ABSTRACT

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Old Dominion University, 2002

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The three essays which constitute this research study the effects of institutional investors in the ADRs' market.

Essay one studies the herding and feedback trading by institutional investors in the ADRs market. The empirical results find that there is a strong positive relation between changes in the ADRs institutional ownership and returns measured over the same period—the herding year (t= month 0 to 11). The ADR portfolios experiencing the largest increase in institutional ownership outperform those experiencing the largest decrease by 15.33 percent per year over the herding year. In addition, return continuation exists for the two years following the herding year (t= month 12 to 23 and t= month 24 to 35). Further research on the post-herding year return of ADRs (t= month 12 to 23) finds that both the past year performance (t= month 0 to 11) and the change in institutional ownership (t= month 0 to 11) play a role in predicting returns of ADRs (t= month 12 to 23). It is also found that ADR institutional investors' herding is positively related to lagged returns, which indicates positive feedback trading by institutional investors of ADRs. The results also confirm that institutional investors participate in momentum strategies, but they do not always herd to past winners and herd away from past losers. The results imply that information is a very important factor in determining institutional herding in the ADRs market.

Essay two tests the hypothesis that private information of institutional investors contributes to serial correlations in ADRs daily returns. The results demonstrate that ADR individual security and portfolio daily return autocorrelations are positively related to ADRs' institutional ownership. The results show that ADR portfolios with high institutional ownerships exhibit greater daily return autocorrelations, and the returns on these portfolios lead the returns on ADR portfolios with low institutional ownerships. Thus institutional trading of ADR increases the speed with which information is reflected in prices. The empirical results show that other explanations, such as nonsynchronous trading, bid-ask spread and volatility of ADRs, cannot explain the positive relation between daily return autocorrelations and institutional ownership of ADRs.

Essay three examines the effects of noise in the ADR market. The empirical results show that ADR return is affected by investor sentiment. ADR return increases (decreases) when investors are irrationally optimistic (pessimistic). We also find that in the low-noise period, ADRs with high institutional ownership exhibit autocorrelation similar to ADRs with low institutional ownership. However, in the high-noise period, ADRs with high institutional ownership exhibit significant higher autocorrelation than ADRs with low institutional ownership. The result implies institutional investors may have engaged in stealth trading to exploit a noisy market. Through a Granger causality

regression, we find that returns on ADR portfolios with high institutional ownership lead the returns of those with low institutional ownership in the low-noise period, confirming that institutional trades reflect market information that is ultimately incorporated into other securities. Finally, we find that institutional investors help reduce volatilities of European ADRs returns. However, for ADRs from Asia and South America, the magnitude of the stabilizing arbitrage positions taken by rational investors is insignificant.

Co-chairs of Advisory Committee: Dr. Mohannad Najand

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ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to my dissertation chairman, professor Kenneth Yung for his invaluable guidance and support in carrying out this research, as well as for his time in taking care of me during my doctoral program. His encouragements and concerns will always be cherished.

I am greatly indebted to Professor Mohammad Najand and professor Vinod Agarwal for their invaluable suggestions and guidance in making the completion of this dissertation possible and in improving the quality of this research.

Finally, I am thankful to my parents, my husband Dr. Tian Fei, my friend Michael D. Mead, Dr. Quansheng Shu, Tan dun, Cheng Guangfeng, Shi Genming and Zhao Yang, for their continued support to me.

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INSTITUTIONAL INVESTORS AND ADRS

INTRODUCTION

American Depository Receipts (ADRs) have generated increasing institutional and individual investors' interest in recent years. The demand by investors for ADRs has been growing between 30 to 40 percent annually. This increasing demand for ADRs is driven by the desire of institutional and individual investors to diversify their portfolios, reduce risk and invest internationally. These investors recognize the obstacles when investing directly in local trading markets such as costly currency conversions, inefficient trade settlements, uncertain custody services and unfamiliar market practices. ADRs overcome many of the inherent operational and custodial hurdles of international investing. For US investors, buying ADRs is the practical and convenient way to acquire foreign stocks. ADRs provide an alternative to the direct purchase of ordinary shares in an overseas stock exchange. US investors can achieve the benefits of global diversification and realize cost benefits and conveniences by buying ADRs. In many cases, ADR investment can save an investor up to 10 to 40 basis points each year compared to all of the expenses associated with trading and holding ordinary shares outside the US.[1] Moreover, ADRs offer many advantages to foreign companies. For example, foreign companies can develop a larger shareholder base, obtain more publicity, and obtain easier access to the US capital markets. Thus it is not surprising that ADRs have become popular in the US market. According to Kim, Szakmary, and Mathur (2000), the dollar volume of ADRs traded on major US securities exchanges has grown dramatically in recent years. By the end of 1996, more than 1000 ADRs were available in

US market, up 14% from the previous year. At the end of July 1997, the volume of ADRs was $221 billion and represented a 27% increase over the previous year.[2]

ADRs were first introduced in 1927 by a predecessor of the Morgan Guaranty Trust Company, which began the function of acting as transfer agent, notifying investors of dividends, and distributing the dividend in dollars. Currently, the depositary bank keeps ADRs holders apprised of subscription rights, recapitalization, exchange offers, and annual meeting notes through its overseas branch or custodian. US depositary bank issues ADRs of a particular company when there is a demand for such securities and the company has no objection. Typically, when investors decide to buy foreign stocks, they contact their brokers and these brokers purchase the underlying ordinary shares and request the shares be deposited to the depository bank's custodian in the home country. The custodian bank notifies the depository bank and the depository bank then issues ADRs denominated in dollars. The brokers can also purchase existing ADRs that are not a new issuance through an intra-market transaction. When investors want to sell ADRs, they contact their brokers and the brokers can either sell in the US security market through an intra-market transaction or sell ADRs overseas by converting into the underlying shares. The depository bank will cancel ADRs and instruct the custodian bank to deliver the underlying shares to the local buyers. Since the continuous trading of ADRs tends to keep the price difference between the home country market and US market to a minimum, most trading is done through an intra-market transaction and does not involve the issuance and cancellation of ADRs.

There are two types of ADRs: sponsored and unsponsored. Unsponsored ADRs are issued by one or more depositaries in response to sufficient market demand, and there

is no formal agreement with the company. Sponsored ADRs are issued by one depositary bank in different levels available in various trading markets. Sponsored level I ADRs are traded in the US over-the-counter (OTC) market, and these ADRs are issued for foreign companies that do not need to change its current reporting process and do not need to provide full Securities and Exchange Commission (SEC) disclosure. Sponsored level II and III ADRs are listed on a US stock exchange (NYSE, AMEX, and NASDAQ). They involve foreign companies that have fully registered with SEC. The difference between sponsored level II and sponsored level III is that Sponsored level III involve raising new capital.

In sum, American Depositary Receipt (ADR) is a negotiable certificate that represents ownership of the underlying shares of a foreign corporation. The ADR is quoted and traded in US dollars and is treated in the same manner as other US securities for settlement, transfer, clearance, and ownership purposes.

Although ADRs have been traded in US for a long time, there are not many studies that examine the behavior of ADRs. Rosenthal (1983) tests the weak form efficiency for a group of 54 ADRs between 1974 and 1978 using weekly, biweekly and monthly rates of return and finds serial correlation for weekly returns but not for monthly returns. Officer and Hoffmeister (1987) show that a significant portfolio advantage exists when even a small number of ADRs are combined into portfolios with US securities. The combination of ADRs and domestic stocks can reduce the risk exposure without any reduction in expected returns and provide a realistic and useful alternative for US investors. Doukas and Yung (1993) suggest that when ADRs are randomly combined with domestic stocks, their risk-return results are not better than those of domestic stocks.

But when ADRs from such countries as Japan and South Africa are mixed with domestic stocks, the risk-return results are better than those of domestic portfolios. Wahab and Khandwala (1993) show that ADRs potentially provide better risk reduction benefits than the respective underlying shares though ADRs may provide similar expected returns. The results imply that for US investors who want to diversify their portfolios, ADRs are worth a closer look as a viable international diversification vehicle. Kato, Linn, and Schallheim (1991) find that there are no significant differences between prices of ADRs and the underlying foreign securities, and thus no arbitrage opportunities exist. Wahad, Lashgari, and Cohn (1992) examine whether profitable arbitrage opportunities exist in the ADRs market and reject the null hypothesis of no arbitrage. They find that annualized arbitrage returns between 1.23% and 4.44% were possible for some of the identified arbitrage portfolios. Park and Tavakkol (1994) find that exchange rate adjusted returns on Japanese ADRs are not significantly different from the returns on their underlying securities. Regarding the risk, ADRs are more volatile than the underlying stocks due to the variability of the currency returns and covariance between stock and currency market returns. Kim, Szakmary, and Mathur (2000) consider three pricing factors for ADRs. They show that the price of the underlying shares is the most important, but exchange rates and US market also have an impact on ADR prices. Moreover, they find that ADRs initially overreact to changes in US market and underreact to changes in the exchange rate and underlying security. Patro (2000) finds that the returns on ADRs have significant risk exposures to the returns on the respective home market portfolios and world market portfolios, but ADRs do not have significant risk exposures to changes in exchange rate. Jayaraman, Shastri, and Tandon (1993) find that the listing of ADRs is associated with

positive abnormal return to the underlying stocks on the listing day and increases the return volatilities of the underlying stocks. Miller (1999) shows that dual listing can mitigate barriers to capital flows, resulting in a lower cost of capital and higher share price. In addition, the stock price reaction is related to choice of exchange, geographical location and avenues for raising capital. Musarella and Vetsuypens (1996) study splits of ADRs that are motivated by a desire to enhance ADRS' liquidity and are not associated with splits in their home country security. The results show that improved liquidity could explain the stock split announcement effects.

In summary, existing literature studies mainly the benefits of using ADRs as a vehicle of international diversification, the price and return of ADRs, and the effect of ADRs listing on the underlying stocks.

In the ADRs market, level II and level III ADRs are used by issuers who wish to have their securities listed on NYSE, AMEX or NASDAQ. They require greater disclosure requirements and must adhere to requirements of US Generally Accepted Accounting Principles (GAAP). Thus, the listing of ADRs could supply some information to US investors. This information, however, is not enough for US investors. Patro (2000) finds that the corresponding home market information is also important for ADRs. Unfortunately, the home country information of ADRs is not easy to get. So to some extent there is a lack of information on ADRs.

Given this lack of information, the role of institutional investors is exceptionally important in the ADRs market. Many researchers have argued that institutional investors are likely to be more informed than individual investors (e.g., Arbel and Strebel, 1983). When institutional investors herd to underpriced stocks and away from overpriced stocks,

they make share prices closer to their fundamental values. When institutional investors trade on their private information in ADR market, they induce return autocorrelation. The impact of institutional trading, however, is likely affected by noise. As a result, the followings briefly describe the intention of this study.

First, due to the information advantage of institutional investors, we expect institutional herding to be readily observable in the ADRs market. Moreover, studying the ADRs market may shed light on whether institutional herding in this market is information driven or merely a momentum play.

Second, institutional investors have information advantage and may spread their private information over time to conceal information to get higher profit. This stealth trading will cause positive return autocorrelation for the individual security. According to Euromoney (Feb 1988, page SS6), institutional investors own about 80% of the ADRs in U.S. If return autocorrelation is due to institutions' trading on their private information, ADRs represent an almost perfect sample for investigation since the effect of individual investors will be less prevalent in the ADRs market. Moreover, there is no existing study examining the relationship between ADR returns and the effect of institutional ownership.

Third, given the difficulty in getting accurate information from foreign countries, institutional investors in ADRs market are therefore subject to the risk of noise. Despite ADRs are primarily owned by institutions, the effect of noise trading due to the sentiment of individual investors may still be significant.

In the literature, few papers have studied herding, return autocorrelation or noise trading in the ADRs market. The lack of attention to these three topics in the ADRs

market has left a void in the literature. This research addresses this oversight and supplies some empirical results that, while certainly not filling the abyss, render a contribution toward reducing it.

Note:

[1]See Bank of New York web page (adrbny.com) on ADR. Nov 2001.

[2] See Bank of New York web page (bankofny.com/adr), Nov 2001.

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ESSAY I:

HERDING AND FEEDBACK TRADING BY INSTITUTIOANL INVESTORS IN THE ADRS MARKET

I. INTRODUCTION

In the literature, herding refers to buying or selling the same stock over a period of time. The extant studies mainly take two paths. One path studies individual investors herding and the other path studies institutional investors herding.

A common theme in the individual investors herding is that individual investors trade on sentiment. They may herd when they follow the same signals or place too much focus on recent news and then overreact. For example, Lakonishok, Shleifer , and Vishny (1994) suggest that individual investors tend to herd to stocks that have done very well in the past and extrapolate past earnings growth too far into the future.

Herding may be more prevalent among institutional investors than among individual investors because of the former group's access to more information. Hirshleifer, Subrahmanyam, and Titman (1994) suggest that the herding can only occur when a group of traders possess superior information. Froot, Scharfstein, and Stein (1992), on the other hand, suggest a positive information spillover model in which the more investors study a given piece of information, the more the information is impounded into the market. In equilibrium, investors acquire too much of some types of information and too little of others. In the FSS (1992) model, herding occurs when

investors flock to profit on those assets with more impounded information. Bikhchandani, Hirshleifer, and Welch (1992) build a model based on "information cascades". They argue that an information cascade can occur when someone feels that it is optimal to follow the behavior of the preceding investors and disregard his own information after he observed the behavior of those ahead of him.

Some other studies show that behavior of the institutional investors may not be related to information. These studies focus on the agency context of institutional investors. For example, Lakonishok, Shleifer , and Vishny (1994) suggest that agency problems encourage institutions herd to glamour stocks. Institutional investors herd to glamour stocks so that they appear as "prudent" investors and therefore acceptable by sponsors. From a career concerns, the institutional investors will avoid value stocks when they fear getting fired before the value strategy pay off. Scharfstein and Stein (1990) also suggest that institutional investors have an incentive to hold the same stocks as others to avoid falling behind a peer group. In addition, some studies suggest that institutional investors may herd because some stocks have desired characteristics. For example, Falkenstein (1996) suggests that mutual funds herd to stocks with high visibility and low transaction costs and herd away from stocks with low idiosyncratic volatility. Del Guercio (1996) also suggests that institutions significantly herd to stocks that are viewed by courts as prudent. Finally, Friedman (1984) suggests that institutional investors are not less subject to socially determined fads and fashions and they may be even more so. Therefore, institutional herding may result from fads and fashions and cause short-term price bubbles.

One major issue concerning institutional investments is whether herding destabilizes stock prices. Herding and positive-feedback are commonly a part of the argument that institutional investors destabilize price. When institutional investors buy or sell a given stock at the same time, the effect on price can be huge and herding destabilizes price when the stock price move away from its fundamental value. In addition, positive feedback means buying past winners and selling past losers. If the positive feedback leads institutional investors to buy overpriced stocks and sell underpriced stocks, then stock price will be more away from fundamental values. On the other hand, Lakonishok, Shleifer, and Vishny (1992) suggest that herding and positive-feedback trading do not necessarily destabilize stock prices. According to them, institutional investors may herd if they all react to the same fundamental information in a timely manner and speed up the adjustments of price to new information. In this case, herding does not necessarily destabilize stock prices. They also suggest that positive-feedback does not necessarily destabilize price if the stocks underreact to news and therefore prices are closers to fundamentals.

Nofsinger and Sias (1999) have studied the herding behavior by institutional investors for all US firms listed on the NYSE. This study, however, examines institutional herding in the ADRs market. ADRs are negotiable certificates that represent shares of foreign corporations. They provide US investors an alternative to the direct purchase of ordinary shares in an overseas stock exchange. ADRs are traded in the same manner as other US securities in the US stock markets. It has been well documented that ADRs provide benefits of international portfolio diversification. Patro (2000), however, shows that the returns on ADRs have significant risk exposures to the returns on the

respective home market portfolios. The finding implies that even for cross-listed securities such as ADRs, national market factors continue to dominate ADRs return in spite of the globalization of the world capital market. For US investors, however, information about the home market of ADRs is not so easy to obtain. Hence, the role of institutional investors in ADRs market would be more prominent given their significant advantage in information gathering. As such, we expect institutional herding to be readily observable in the ADRs market. In addition, studying the ADRs market may shed light on whether institutional herding in this market is information driven or merely a momentum play.

The rest of the paper is organized as follows: Section two is data and methodology. Section three presents empirical results on five investigations: herding, post-herding returns, further tests of post-herding returns, institutional feedback trading, and institutional feedback trading and return momentum. Section four is summary and conclusions.

II. DATA AND METHODOLOGY

This study examines institutional herding among ADRs from 1985 to 1998. Daily ADR returns and prices are obtained from the Center for Research in Security Prices (CRSP). The daily returns are compounded into monthly returns. The number of shares held by institutional investors and the number of shares outstanding are gathered from the January issue of the Standard and Poors' *Security owners' Stock Guides.* According to Nofsinger and Sias (1999), data in January issue reflect third-quarter institutional ownerships. The annual ADR return is calculated from the beginning of each October to the end of each September. Fractional institutional ownership is the ratio of the number of shares held by institutional investors to the number of shares outstanding. The market capitalization is obtained by multiplying the price and the number of shares outstanding. Firms with complete data (institutional ownership at the beginning and end of the October through September, returns for October through September, and capitalization at the beginning of October) are included in the sample. Following is the sample description:

ADR distribution

Year	number of ADRs
85	62
86	67
87	77
88	84

89	96
90	107
91	111
92	121
93	137
94	180
95	210
96	247
97	278
98	279

Portfolios of ADRs are constructed for investigating institutional herding behavior. Since the absolute value of changes in institutional ownership tends to be larger for firms with high levels of initial ownership, a big change of institutional ownership is more likely to occur among portfolios with larger initial institutional ownership; therefore, portfolios are stratified by their initial ownership levels. At the beginning of each October, all ADRs are sorted into 3 portfolios (high ownership, medium ownership, low ownership) based on the fraction of shares held by institutional investors. Firms within each initial institutional-ownership-sorted portfolio are further sorted into 3 portfolios (large increase, medium change, large decrease) based on the changes in the fraction of shares held by institutional investors over the following year, the herding year.

For example, in the first year, the change in ownership is measured as the fraction of shares held by institutional investors on October 1, 1986 less the fraction on October 1, 1985. Thus, each year a 3*3 initial institutional ownership, changes in institutional-ownership-sorted portfolios are formed. ADRs with the largest increase in institutional ownership in each initial ownership group are then reaggregated across the 3 initial-ownership-sorted groups to form an initial institutional ownership stratified portfolio that shows the largest increase in institutional ownership. Similarly, ADRs within each of the other two ownership change groups are reaggregated in the same manner.

A buy and hold strategy is assumed when computing the raw and excess returns of ADRs. According to Ikenberry, Lakonishok and Vermaclen (1995), results calculated with CAR approach should be regarded as descriptive in nature since they do not represent a realistic investment strategy. Under a buy and hold approach, the portfolio is rebalanced annually. For each ADR, the annual raw return is calculated as:

$$R_{j(1\text{to}12)} = \prod_{t=1}^{12}(1+R_{jt}) - 1$$

Where $R_{j(1\text{to}12)}$ is the annual raw return for ADR *j* from the beginning of each October to the end of next September. The time period t =1 represents October each year and t =12 represents September of the next year. R_{jt} is the raw return for ADR *j* in month t. The annual average raw returns of the ADR portfolios from the beginning of each October to the end of next September are then:

$$\overline{R} = \frac{1}{N}\sum_{j=1}^{N} R_{j(1\text{to}12)}$$

N is the number of the firm in the portfolio. $\overline{R}$ is the annual average raw return of the ADR portfolios from the beginning of each October to the end of next September. The

annual average raw returns of the ADR portfolios are calculated each year from 1985 to 1998. The time-series average of the annual cross-sectional mean raw returns and the associated Fama-MacBeth (1973) t- statistics are then calculated. The Fama-MacBeth t-statistic is for testing the hypothesis that the time-series average of the annual cross-sectional mean raw return $\bar{\hat{\gamma}}_{j0}$ is equal to 0. The t-statistic is computed as:

$$t(\bar{\hat{\gamma}}_{j0}) = \frac{\bar{\hat{\gamma}}_{j0}}{s(\hat{\gamma}_{j0})/\sqrt{n}}$$

where n is the number of estimates $\hat{\gamma}_{jt}$ used to compute $\bar{\hat{\gamma}}_{j0}$ and $s(\hat{\gamma}_{j0})$.

For each ADR, the excess return is also calculated. The excess return of each ADR is defined as the geometrically compounded return on the stock minus the geometrically compounded return on the ADR home country's market index:

$$ER_{j(1to12)} = \prod_{t=1}^{12}(1+R_{jt}) - \prod_{t=1}^{12}(1+MR_t)$$

Where $ER_{j\ (1\ to\ 12)}$ is the excess return for ADR j from the beginning of each October to the end of next September. The time period t =1 represents October each year and t =12 represents September of the next year. R_{jt} is the raw return for ADR j in month t. MR_t is the return on the ADR home country's market index in month t. The annual average excess returns of the ADR portfolios from the beginning of each October to the end of next September are then:

$$\overline{ER} = \frac{1}{N}\sum_{j=1}^{N} ER_j$$

The annual average excess returns of the ADR portfolios are also calculated each year from 1985 to 1998. The time-series average of the annual cross-sectional mean excess

return and the associated Fama-MacBeth (1973) t-statistic are then calculated. The Fama-MacBeth t-statistic is for testing the hypothesis that the time-series average of the annual cross-sectional mean excess return $\bar{\hat{\gamma}}_{j1}$ is equal to 0. The t-statistic is computed as:

$$t(\bar{\hat{\gamma}}_{j1}) = \frac{\bar{\hat{\gamma}}_{j1}}{s(\hat{\gamma}_{j1})/\sqrt{n}}$$

where n is the number of estimates $\hat{\gamma}_{jt}$ used to compute $\bar{\hat{\gamma}}_{j1}$ and $s(\hat{\gamma}_{j1})$.

III. EMPIRICAL RESULTS

A: HERDING

Empirical investigations usually evaluate herding by studying changes in institutional ownership. For example, when institutional investors herd to a stock, institutional ownership of the stock will arise. The relative importance of ADRs herding is defined by the relation between the changes in ADRs' institutional ownership and returns measured over the herding interval. The reason for this is either because institutional investors have positive-feedback trading or because institutional investors' herding has significant impact on the ADRs' stock prices. On one hand, if institutional investors engage in intrayear positive-feedback trading to a greater extent than individual investors, then a positive relationship between changes in institutional ownership and returns over the same interval may arise. On the other hand, if institutional investors' herding impacts prices to a greater extent than individual investors' herding, then the increased institutional ownership is accompanied with a stock price increase and a positive relationship between annual changes in institutional investor ownership and annual returns measured over the same period may also arise.

Panel A of Table I reports the time-series average of the cross-sectional mean annual raw returns over the herding year (month t=0 to 11). The t-statistics are based on the Fama-MacBech (1973) standard errors. The results show a strong monotonic relationship between changes in institutional ownership and raw returns.

<Insert Table I here>

With the raw returns, firms in the group experiencing the largest decrease in institutional ownership have an average return of 0.55 percent. Firms in the group experiencing medium change in institutional ownership have an average raw return of 7.17 percent, but firms in the group experiencing the largest increase in institutional ownership have an average raw return of 15.88 percent. Thus, firms in the group experiencing the largest increase in institutional ownership outperform the group experiencing the largest decrease by 15.33 percent per year in the herding year. The F-value is 17.10 and significant at the 1% level. We can strongly reject the null hypothesis that the time-series averages of cross-sectional means do not differ across the three ownership change portfolios.

Panel B of Table I reports the time-series average of the cross-sectional mean annual excess returns over the herding year (month t=0 to 11). Firms in the group experiencing the largest decrease and the ones experiencing the largest increase in institutional ownership experience an average excess returns of –10.03 and 6.28 percent respectively. Firms in the group experiencing the medium change in institutional ownership have an average excess return of 1.23 percent. The F-value is 12.51 and it is also significant at the 1 percent level.

Panel A and Panel B present similar results that there exists a strong positive relationship between changes in institutional ownership and returns measured over the herding interval. This positive relationship is either because institutional investors have

intrayear positive-feedback trading or because institutional investors' herding impacts prices to a greater extent than individual investors' herding.

B: POST-HERDING RETURNS

In finance literature, some studies show that institutional investors do not perform better than other investors. If this is the case, then the notion that institutional investors have more information than individual investors is questionable. For example, Jensen (1968) shows that mutual funds were on average not able to predict security prices well enough to outperform a buy-the-market-and-hold policy, and suggests that mutual funds managers do not on average perform better than other investors. Gruber (1996) indicates that mutual funds underperform an appropriately weighted average of the indices by about 65 basis points per year and mutual funds charge investors more than the value active managers add. However, we expect institutional investors to outperform individual investors in the ADRs market given the advantage of institutional investors in gathering information from the home countries of ADRs. To see whether institutional investors are better informed in the ADRs market, we need to study the post-herding returns of ADRs. If ADRs that institutional investors buy outperform those they sell, then it is consistent with the hypothesis that institutional investors are better informed than other investors at the margin in the ADRs market. It may also indicate that momentum is not as important as information in the ADRs market.

The post-herding return patterns may also show us whether institutional herding destabilizes asset prices.

<Insert Table II here>

Panel A of Table II presents the time-series average of the cross-sectional mean annual raw returns for firms within each ownership change portfolio over the first (month t=12 to 23) and second years (months t=24 to 35) following the herding year.

In the first year following the herding year (month t=12 to 23), firms in the group experiencing the largest decrease in institutional ownership have an average raw returns of 3.83 percent, but firms in the group experiencing the largest increase in institutional ownership have an average raw return of 13.08 percent. Thus, on average, the group experiencing the largest increase in institutional ownership outperforms the group experiencing the largest decrease by 9.25 percent per year in the first year following the herding year. The F-value is 5.46 and it is significant at the 1% level. It means that we can reject the null hypothesis that the time-series averages of cross-sectional means of the raw returns in the first year following the herding year do not differ across the 3 ownership change portfolios at the 1% level.

In the second year following the herding year (month t=24 to 35), firms in the group experiencing the largest decrease in institutional ownership have an average raw return of 5.80 percent, but the firms experiencing the largest increase in institutional ownership have an average raw return of 12.98 percent. On average, the group experiencing the largest increase in institutional ownership outperforms the group experiencing the largest decrease by 7.18 percent per year in the second year following

the herding year (month t=24 to 35). The F-value is 2.73 and it is significant at the 5% level.

Panel B of Table II presents the time-series average of the cross-sectional mean annual excess returns for firms within each ownership change portfolio over the first and second years following the herding year.

In the first year following the herding year, firms in the group experiencing the largest decrease and the ones experiencing the largest increase in institutional ownership have average excess returns of –6.21 and 7.18 percent respectively. On average, firms in the group experiencing the largest increase in institutional ownership outperform the group experiencing the largest decrease by 13.39 percent per year in the first year following the herding year.

In the second year following the herding year, firms in the group experiencing the largest decrease in institutional ownership suffer an average excess return of –1.43 percent, but the firms experiencing the largest increase in institutional ownership have an average excess return of 6.66 percent.

Thus, the results in Table II show that ADRs institutional investors buy outperform those they sell. The results are consistent with the hypothesis that institutional investors are better informed than other investors. That is, institutional herding in the ADRs market may be information based. A related issue of institutional herding is its impact on market fundamentals. If institutional investors are better informed than other investors, institutional investors would purchase undervalued equities and sell over-valued ones. This could make ADR prices move closer to their fundamental values. If institutional investors continue to buy on good information and sell on bad information,

continuation of the return pattern after the herding year is the expected result of this rational behavior that is based on information. The results in Table I show that in the herding year institutional herding is associated with a big price change. It is also possible that the institutional herding may drive ADR prices away from their fundamental values. If this price bubble persists for more than two years, then the ADR's return continuation in the two years following the herding interval may also be compatible with the hypothesis that institutional herding destabilizes asset prices. But if the price bubble is short-lived and lasts for less than two years, yet ADR returns continue for two years following the herding interval, then the hypothesis that institutional herding destabilizes asset prices may not be supported. Thus, the ADRs return continuation in the two years following the herding interval may be consistent with both the rational pricing and the destabilization arguments.

C: FURTHER TESTS OF POST-HERDING RETURNS

Another explanation of herding behavior is that institutional investors herd to past winners and away from past losers, and this may reflect the momentum strategies documented by Jegadeesh and Titman (1993). To examine this in detail, the relationship among past raw returns (t=0 to 11), changes in institutional ownership (t=0 to 11), and returns over the following 12 months (t=12 to 23) are evaluated. ADRs are first sorted into three groups based on their raw returns over the herding year (t=0 to 11), then the ADRs are also independently sorted into 3 groups based on the change in institutional

ownership (t=0 to 11). Thus, a three by three matrix of portfolios independently sorted on raw returns and changes in institutional ownership are formed. This two-pass sorting procedure allows variation in one variable while holding the other variable approximately constant. Panel A of Table III reports the time-series average of the cross-sectional mean annual raw returns for ADRs in each of the 9 portfolios in the year following formation (t=12 to 23).

<Insert Table III here>

In panel A of Table III, the second to last row reports an F- statistic based on the null hypothesis that the time-series averages of cross-sectional mean post-herding year raw returns (months t=12 to 23) are equal across the herding year performance groups within each institutional ownership change group. The F-value across the three herding year performance groups within the large decrease institutional ownership group is 8.58; it is significant at the 1% level. Thus, we can reject the hypothesis that the herding year performance sorted portfolios have the same post-herding raw returns within the large decrease institutional ownership group. For the other two institutional ownership change groups, the medium change ownership group and largest increase ownership group, the F-values across the three herding year performance groups are 1.25 and 1.26 respectively. Thus, we cannot reject the hypothesis that the herding year performance sorted portfolios have the same post-herding raw returns within those two institutional ownership change groups. These results imply that for the large decrease institutional ownership group, the

herding year raw returns (months t=0 to 11) play a significant role in forecasting the post-herding year raw returns (months t=12 to 23).

The last row in Table III shows a paired t-test based on the null hypothesis that the return difference between the winners and losers portfolios, within each institutional ownership change group, do not differ from zero. For the large decrease institutional ownership group, the return difference between the losers and the winners is 11.88 percent. The paired t-statistic is 2.86, and it is significant at the 5% level. For the large increase institutional ownership group, the return difference between the losers and the winners is 7.99 percent. The paired t- statistic is 1.81, and it is significant at 10% level. For the medium change institutional ownership group, the paired t- statistics are 1.19 and it is not significant. In sum, these results in Panel A of Table III imply that post-herding year raw returns are related to both institutional herding and market momentums in the previous year.

In order to delineate the impacts of herding from those of market momentums, the second to last column in Panel A of Table III reports an F- statistic based on the null hypothesis that the time-series averages of cross-sectional mean post-herding year raw returns (months t=12 to 23) are equal across the change in ownership portfolios within each herding year performance group. For the losers group, the F-value is 5.83 and it is significant at the 1% level. For the medium herding year performance group, the F-value is 3.99 and it is significant at the 5% level. For the winners group, the F-value is 3.57 and it is significant at the 5% level. Thus, we can reject the null hypothesis in all the three cases. These results show that changes in institutional ownership in the herding year (t=0 to 11) play an important role in predicting the post-herding year raw returns (months t=12

to 23) for all the three herding year performance groups. That is, post-herding year performance is related to institutional herding in the previous year after controlling for market momentums.

The last column in Panel A of Table III shows a paired t-test based on the null hypothesis that the return difference between the large increase ownership portfolios and the large decrease portfolios, within each lag performance group, do not differ from zero. For the losers group, the raw return difference between the large decrease institutional ownership group and large increase institutional ownership group is 16.09 percent. The paired t-statistic is 3.13 and it is significant at the 1% level. For the winners group, the difference is 12.20 percent with a significant paired t-statistic of 2.57. For the medium performance group, the difference is 7.56 percent, the paired t-statistic is 1.85 and it is significant at the 10% level. Thus, for all the three groups, we can reject the null hypothesis that the raw return differences between the large increase institutional ownership portfolios and the large decrease portfolios do not differ from zero.

Panel B of Table III reports the time-series average of the cross-sectional mean annual excess returns for ADRs in each of the 9 portfolios in the year following formation (months t=12 to 23). The results are similar to those shown in Panel A.

The results shown in Table III suggest that both past year performance (months t=0 to 11) and change in institutional ownership (months t=0 to 11) play a role in forecasting returns (months t=12 to 23). The results also imply that post-herding performance is related to previous year herding even when market momentums are controlled for.

It has been well documented that stock returns are related to firm size, for example, Jegadeesh and Titman (1993) document that returns from momentum strategies are related to firm size. The post-herding returns of ADRs therefore may also be related to firm size. To see this in detail, each year each of the 3 ownership change portfolios used in Table I are divided into two groups based on the beginning-of-herding year capitalization. Each year, firms in each of these 3 portfolios are sorted into large (above the median firm capitalization) and small (below median firm capitalization) firms. The post-herding year returns for small and large ADRs are examined and reported in Table IV. The F-statistics is based on the null hypothesis that the time-series averages of cross-sectional means do not differ across the ownership change portfolios.

<Insert Table IV>

Panel A of Table IV report the post-herding raw returns for small and large ADRs. For large firms, the large decrease ownership change portfolios have a raw return of 9.37 percent and a t-statistic of 4.21; the medium ownership change portfolios have a raw return of 14.63 percent and a t-statistic of 5.71; and the large increase ownership change portfolios have a raw return of 17.72 percent and a t-statistic of 7.40. All three t-statistics are significant at the 1% level. The F-value is 3.08 for large firms, and it means that we can reject the null hypothesis that the time-series averages of cross-sectional means do not differ across the 3 ownership change portfolios at the 5% level. That is, after controlling for firm size, institutional herding still remains a significant factor in determining post-herding ADRs returns.

For the small firms, the large decrease ownership change portfolios have a raw return of 2.16 percent and an insignificant t-statistic of 0.84; the medium ownership change portfolios have a raw return of 9.74 percent and a t-statistic of 3.17; and the large increase ownership change portfolios have a raw return of 22.94 percent and a t-statistic of 6.38. The F-value is 11.27 and it is significant at the 1% level.

Panel B of Table IV report the post-herding excess returns for small and large ADRs. The results are similar to those shown in Panel A.

These results in Table IV show that institutional herding plays an important role in determining ADRs returns even after controlling for the size of the firm. Consistent with earlier results, ADRs with large increase in institutional ownership outperform that with large decrease in institutional ownership in the post-herding period.

D: INSTITUTIONAL FEEDBACK TRADING

In Table III, we show that post-herding year performance is related to both institutional herding and market momentums in the herding year. However, we need to determine if institutional investors have actually engaged in positive feedback trading in the ADRs market. Long, Shleifer, Summers, and Waldmann (1990) summarize some of the experimental and survey evidence, which suggest that positive feedback trading especially of the extrapolative expectations variety (or trend chasing) is common. When rational investors receive good news and trade on the news, they expect that the initial price increase will stimulate future buying by positive feedback traders. These rational

investors then buy more today and drive today's price higher. Their purchase makes the positive feedback traders more excited and tomorrow the positive feedback traders will buy to respond to today's price increase. Here, positive feedback investors buy securities when past prices rise and sell when past prices fall. They buy or sell according to the change of the past price. Balduzzi, Bertola, and Foresi (1995) show that positive-feedback strategies increase the volatility of stock return and negative-feedback strategies decrease the volatility of stock return. The negative-feedback traders sell stocks when their prices are increasing and buy stocks when their prices are falling. To determine whether institutional investors of ADRs have engaged in positive feedback trading, we need to confirm that the lagged excess returns of ADRs and the institutional ownership changes are indeed correlated.

Panel A of Table V reports the time-series average of the annual cross-sectional mean raw returns in the three (t=-1 to –3) and twelve (t=-1 to –12) months prior to the herding year for the three ownership change portfolios of ADRs.

<Insert Table V here>

Panel A show that in the three (t=-1 to –3) months prior to the herding year, the large decrease ownership change portfolios have a raw return of 1.54 percent and a t-statistic of 2.18; the medium ownership change portfolios have a raw return of 3.72 percent and a t-statistic of 5.16(significant at the 1% level); and the large increase ownership change portfolios have a raw return of 5.71 percent and a t-statistic of 7.41. The F-value is 8.10 and it means that we can reject the null hypothesis that the time-

series averages of cross-sectional means (t=-1 to –3) do not differ across the three ownership change portfolios at the 1% level.

Similar results are obtained when the 12 months raw returns prior to the herding year are examined. Thus, changes in institutional ownership are also positively related to the lagged returns in the twelve (t=-1 to –12) months prior to the herding year.

Panel B of Table V reports the time-series average of the annual cross-sectional mean excess returns in the three and twelve months prior to the herding year for the three ownership change portfolios of ADRs. The results are similar to those shown in Panel A.

The results in Table V show that changes in institutional ownership are positively related to lagged returns. Institutional investors buy ADRs when their past prices rise and sell ADRs when their past prices fall. Thus, the results confirm that institutional investors indeed have engaged in positive feedback trading in the ADRs market.

E: FEEDBACK TRADING AND ADRS RETURNS MOMENTUM

The results in Table V show that institutional investors indeed herd to ADRs with higher lagged returns and away from ADRs with lower lagged returns. We need then to show if this positive feedback trading of institutional investors in the ADRs market contributes to the return from market momentum strategies. To do this, 3 momentum portfolios of ADRs are formed. At the beginning of each October (1985-1998), ADRs are sorted into 3 portfolios based on their raw performance over the previous six months (t=-1 to -6). That is, ADRs are sorted by the raw returns each April through September. The change in the fraction of shares held by institutional investors over the subsequent 12

months (t=0 to 11), raw returns over the subsequent 12 months (t=0 to 11), and excess returns over the subsequent 12 months are then examined.

<Insert Table VI>

The first row of Table VI shows that the formation period raw return (t=-1 to –6) is -12.28 percent for losers, 8.71 percent for the medium performance group, and 33.28 percent for winners. The second row in Table VI shows that the institutional ownership change (t=0 to 11) is –0.37 percent for the losers, 0.06 percent for the medium performance group and 0.45 percent for the winners. The t-statistic is –2.06 for losers and it is significant at the 5% level. The t-statistic is 2.11 for the winners and it is significant at the 5% level. The F-value is 5.31 and it means that we can reject the null hypothesis that the three momentum portfolios have the same change in institutional ownership at the 1% level. The results show that changes in institutional ownership are positively related to the lagged performance (t=-1 to –6) for the three momentum portfolios, which suggest that institutional investors buy past winners and sell past losers and engage in positive feedback trading. The subsequent raw return (t=0 to 11) is 0.85 percent for losers, 7.43 percent for the medium performance group, and 11.07 percent for winners. The winners have a 10.22 percent higher subsequent return (t=0 to 11) than the losers. The t-statistics are 0.46 for losers (it is not significant), 4.09 for the medium performance group, and 5.26 for the winners. The F-value is 7.22 and it means that we can reject the null hypothesis that the three momentum portfolios have the same subsequent raw returns. The subsequent excess returns (t=0 to 11) show similar results. The losers suffer

an excess return of –8.31 over the subsequent 12 months, and the winners have an excess return of 4.71 over the subsequent 12 months. Thus, institutional positive feedback trading contributes to the returns of winners and losers.

In Table VII, we examine the impact of institutional feedback in greater details. ADRs are sorted into winners and losers based on the raw returns six months prior to the herding year (t=-1 to –6). The winners and the losers are further sorted into 3 portfolios each based on the change in institutional ownership over the herding year (t=0 to 11).

<Insert Table VII>

Table VII presents interesting results. Institutional investors do not herd to all winners, and also do not herd away from all losers. Some winners actually suffer a decline in institutional ownership in the subsequent period. Some losers gain in institutional ownership later on. Panel A of Table VII reports the time-series mean of the annual cross-sectional average of subsequent changes in institutional ownership, the raw returns in the herding year, and the excess returns in the herding year (the subsequent year) for winners. Winners are sorted into three groups based on the subsequent change in institutional ownership during the herding year. For winners, the subsequent changes in institutional ownership of the three groups are -2.27 percent, -0.04 percent, and 2.77 percent respectively. The F-value is very significant.

The subsequent raw returns (t=0 to 11) are –0.20 percent for the group with the largest decrease in institutional ownership, 6.61 percent for the group with the medium change in institutional ownership, and 19.08 percent for the group with the largest

increase in institutional ownership. The t- statistics are -0.08 (it is not significant), 2.94 (significant at the 1% level), and 6.16 (significant at the 1% level) respectively. The winners (in time t=-1 and –6) that experience the largest decline in institutional ownership (in time t=0 to 11) exhibit return reversals with an average return of –0.20 percent over the herding year. The winners (t=-1 and –6) that experience the largest increase in institutional ownership (t=0 to 11) exhibit 19.28 percent raw return and therefore exhibit strong return momentum.

The subsequent excess returns are –10.10 percent and 8.39 percent for winners with the largest decrease in institutional ownership and winners with the largest increase in institutional ownership respectively. The winners that experience the largest decline in institutional ownership exhibit return reversals (average excess return –10.10 percent) over the herding year.

The results show that the subsequent returns and subsequent change in institutional ownership are positively related. The results further suggest that institutional investors' herding may not necessarily be purely momentum plays. This is consistent with our earlier conjecture that institutional herding in the ADRs market may be information based.

Panel B of Table VII reports the results for losers. For the losers, the subsequent changes in institutional ownership of the three groups are -2.65 percent, 1.05E-04 percent and 2.43 percent respectively. The F-value is very significant. The subsequent raw returns (t=0 to 11) are –2.28 percent for the group with the largest decrease in institutional ownership, 1.76 percent for group with the medium change in institutional ownership, and 9.48 percent for the group with the largest increase in institutional

ownership. The losers (t=-1 and –6) that experience the largest increase in institutional ownership (t=0 to 11) exhibit 11.76 percent higher raw return than the losers that experience the largest decrease in institutional ownership over the herding year. The t-statistics are –0.91 (not significant), 0.70 (not significant), and 3.53 (significant at the 1% level) respectively. The F-statistic is 5.46 and it means that we can reject the null hypothesis that the time-series averages of cross-sectional means (t=0 to 11) do not differ across the three portfolios for losers.

The subsequent excess returns are –14.33 percent and 1.15 percent for losers with the largest decrease in institutional ownership and losers with the largest increase in institutional ownership respectively. The F-statistic is 7.21 and it is significant at the 1% level.

Results in Panel B are consistent with those in Panel A. That is institutional herding in ADRs may not be a pure momentum strategy in that not all losers are dumped and not all winners are embraced. It appears that information plays a significant role in the ADRs market.

IV. SUMMARY AND CONCLUSIONS

In the literature, herding and feedback research mainly take two paths: Individual herding and institutional herding. Few papers have studied herding and feedback trading in ADRs market. This paper examines herding and feedback trading in the ADRs market and attempts to infer the relative importance of institutional investors in the ADRs market. The empirical results find that there is a strong positive relation between changes in the ADRs institutional ownership and returns measured over the same period. This relation suggests that institutional investors engage in positive feedback trading, that is, they are more likely to buy past winners and sell past losers. In addition, return continuation exists for the two years following the herding period. The results show that the ADRs institutional investors buy subsequently outperform those they sell. Thus, institutional investors of ADRs are better informed than individual investors. Detail research on the post-herding year return of ADRs (t=12 to 23) finds that both the past year performance (t=0 to 11) and the change in institutional ownership (t=0 to 11) play a role in predicting returns of ADRs (t=12 to 23). The results also show that ADRs experiencing the largest increase in institutional ownership (t=0 to 11) also have much higher returns than those experiencing the largest decrease in institutional ownership over the 3 or 12 months prior to the herding year (t=-1 to –3 and t=-1 to –12). Changes in ADRs institutional ownership are positively related to lagged returns. Further analysis confirms that institutional investors participate in momentum strategies, but they do not always herd to past winners and herd away from past losers. The results imply that

information is a very important factor in determining institutional herding in the ADRs market.

Table I

Each October (1985-1998), ADRs are sorted into 3 portfolios based on the ratio of shares held by institutional investors. The ADR firms in each initial institutional ownership group are then further sorted into 3 portfolios based on the change in the ratio of shares held by institutional investors over the following year (for a total of 9 initial institutional ownership, change in institutional-ownership -sorted portfolios). ADR firms are then reaggregated based on their change in ownership group rank resulting in 3 initial ownership stratified, ownership change portfolios. Following are the time-series average of the annual cross-sectional mean raw returns and excess returns and the associated Fama-MacBeth (1973) t-statistic in parentheses for each portfolio. Both raw returns and excess returns are computed by buy and hold returns. The period t=0 to 11 indicates the 12 months during the herding year. The F-statistic is based on the null hypothesis that the time-series averages of cross-sectional means do not differ across the ownership change portfolios. All ADRs included have institutional ownership data at the beginning (t=0) and end (t=11) of the herding year and capitalization data at the beginning of the herding year.

Panel A: Herding year raw returns

	Large Decrease	Medium Ownership change	Large increase	F-statistic
t=0 to 11	0.0055	0.0717	0.1588	17.10[a]
	(0.31)	(4.01)[a]	(7.81)[a]	

Panel B: Herding year excess returns

	Large Decrease	Medium Ownership change	Large increase	F-statistic
t=0 to 11	-01003	0.0123	0.0628	12.51[a]
	(-8.12)[a]	(3.11)[a]	(6.93)[a]	

[a] statistically significant at the 1% level.

[b] statistically significant at the 5% level.

[c] statistically significant at the 10% level.

Table II

Each October (1985-1998), ADRs are sorted into 3 portfolios based on the ratio of shares held by institutional investors. The ADR firms in each initial institutional ownership group are then further sorted into 3 portfolios based on the change in the ratio of shares held by institutional investors over the following year (for a total of 9 initial institutional ownership, change in institutional-ownership -sorted portfolios). ADR firms are then reaggregated based on their change in ownership group rank resulting in 3 initial ownership stratified, ownership change portfolios. Following are the time-series average of the annual cross-sectional mean raw returns and excess returns and the associated Fama-MacBeth (1973) t-statistic in parentheses for each portfolio. Both raw returns and excess returns are computed by buy and hold returns. The period t=12 to 23 indicates the first year following the herding year and t= 24 to 35 indicates the second year following the herding year. The F-statistic is based on the null hypothesis that the time-series averages of cross-sectional means do not differ across the ownership change portfolios. All ADRs included have institutional ownership data at the beginning (t=0) and end (t=11) of the herding year and capitalization data at the beginning of the herding year.

Panel A: Post- herding year raw returns

	Large Decrease	Medium Ownership change	Large increase	F-statistic
t=12 to 23	0.0383	0.0646	0.1308	5.46[a]
	(1.99)[c]	(3.19)[a]	(5.98)[a]	
t=24 to 35	0.0580	0.0791	0.1298	2.73[b]
	(2.69)[b]	(3.42)[a]	(5.80)[a]	

Panel B: Post- herding year excess returns

	Large Decrease	Medium Ownership change	Large increase	F-statistic
t=12 to 23	-0.0621	-0.0055	0.0718	5.99[a]
	(-3.01)[a]	(-0.27)	(5.55)[a]	
t=24 to 35	-0.0143	0.0188	0.0666	3.23[b]
	(-2.47)[b]	(4.22)[a]	(6.33)[a]	

[a] statistically significant at the 1% level.

[b] statistically significant at the 5% level.

[c] statistically significant at the 10% level.

Table III

In Table 3, ADRs are sorted (each October) into three groups based on their raw return over the herding year (months t=0 to 11). The ADRs are also independently sorted into three groups based on changes in the ratio of shares held by institutional investors over the herding year (month t=0 to 11). Firms are then sorted into 9 portfolios based on their herding year return and their change in ownership. The time-series averages of the annual cross-sectional mean raw returns and excess returns over the following 12 months (months t=12 to 23) are reported for each portfolio. Both raw return and excess return for each firm is computed by buy and hold approach. The second to last column reports an F- statistic based on the null hypothesis that the time-series averages of cross-sectional mean post-herding year returns are equal across the change in ownership portfolios within each herding year performance group. The second to last row reports an F-statistic based on the null hypothesis that the time-series averages of cross-sectional mean post-herding year returns are equal across the herding year performance groups within each institutional ownership change group. The last column shows a paired t-test based on the null hypothesis that the return difference between the large increase institutional ownership portfolios and the large decrease portfolios, within each lag performance group, do not different from zero. The last row shows a paired t-test based on the null hypothesis that the return difference between the winners and losers portfolios, within each institutional ownership change group, do not different from zero.

Panel A: Raw returns:

Post-Herding Raw Returns for Stocks Sorted on Herding Year Return and Changes in Institutional Ownership

Herding year Performance	Large decrease	Medium ownership change	Large increase	F-statistics	Inc.-Dec. t-statistic
Losers	-0.0141	0.1230	0.1468	5.83[a]	0.1609
					(3.13)[a]
Medium Return	0.1402	0.1111	0.2158	3.99[b]	0.0756
					(1.85)[c]
Winners	0.1047	0.1883	0.2267	3.57[b]	0.1220
					(2.57)[a]
F-statistics	8.58[a]	1.25	1.26		
Win-Los.	0.1188	0.0653	0.0799		
t-statistic	(2.86)[b]	(1.19)	(1.81)[c]		

[a] indicate statistical significance at the 1% level.

[b] indicate statistical significance at the 5% level.

[c] indicate statistical significance at the 10% level.

Panel B: Excess returns:

Post-Herding Excess Returns for Stocks Sorted on Herding Year Return and Changes in Institutional Ownership

Herding year Performance	Large decrease	Medium ownership change	Large increase	F-statistics	Inc.-Dec. t-statistic
Losers	-0.1321	0.0239	0.0531	7.11[a]	0.1852
					(2.78)[a]
Medium Return	0.0411	0.0016	0.1197	4.37[b]	0.0786
					(2.01)[b]
Winners	0.0488	0.0468	0.1325	5.16[a]	0.0837
					(3.15)[a]
F-statistics	6.86[a]	0.37	1.58		
Win-Los.	0.1808	0.0229	0.0794		
t-statistic	(3.06)[b]	(0.77)	(1.69)[c]		

[a] indicate statistical significance at the 1% level.

[b] indicate statistical significance at the 5% level.

[c] indicate statistical significance at the 10% level.

Table IV

In Table IV, ADRs are sorted (each October) into 3 portfolios based on the fraction of shares held by institutional investors. The firms in each initial institutional ownership are further sorted into 3 portfolios based on the change in the fraction of shares held by institutional investors over the following year (for a total of 9 initial institutional ownership, change in institutional ownership sorted portfolios). Firms are then reaggregated based on their change in ownership group rank resulting in 3 initial ownership stratified, ownership change portfolios. Each year firms in each of these 3 portfolios are then further sorted into large (above the median firm capitalization) and small (below median firm capitalization) firms. Table IV reports the time-series average of the annual cross-sectional mean raw returns and excess returns in the year following the change in ownership and the associated Fama-MacBeth (1973) t-statistic for small and large firms within each ownership change portfolio. Both raw return and excess return for each firm are computed by buy and hold returns. The F-statistics is based on the null hypothesis that the time-series averages of cross-sectional means do not differ across the ownership change portfolios.

Panel A: Post-herding raw returns by firm size for months 12-23

	Large decrease	Medium group	Large increase	F-statistics
Large firm	0.0937	0.1463	0.1772	3.08[b]
(cap>median)	(4.21)[a]	(5.71)[a]	(7.40)[a]	
Small firms	0.0216	0.0974	0.2294	11.27[a]
(cap<median)	(0.84)	(3.17)[b]	(6.38)[a]	

Panel B: Post-herding excess returns by firm size for months 12-23

	Large decrease	Medium group	Large increase	F-statistics
Large firm	-0.0513	0.0421	0.0828	5.66[a]
(cap>median)	(-3.83)[a]	(4.33)[a]	(6.31)[a]	
Small firms	-0.1036	-0.0153	0.1155	7.92[a]
(cap<median)	(-3.65)[a]	(-1.18)	(5.21)[a]	

[a] indicate statistical significance at the 1% level.

[b] indicate statistical significance at the 5% level.

[c] indicate statistical significance at the 10% level.

Table V

Each October (1985-1998), ADRs are sorted into 3 portfolios based on the ratio of shares held by institutional investors. The ADR firms in each initial institutional ownership group are then further sorted into 3 portfolios based on the change in the ratio of shares held by institutional investors over the following year (for a total of 9 initial institutional ownership, change in institutional-ownership -sorted portfolios). ADR firms are then reaggregated based on their change in ownership group rank resulting in 3 initial ownership stratified, ownership change portfolios. Following are the time-series average of the annual cross-sectional mean raw returns and excess returns and the associated Fama-MacBeth (1973) t-statistic in parentheses for each portfolio. Both raw return and excess return are computed by buy and hold returns. The period t=-1 to -3 indicates 3 month returns just prior to the herding year, and t=-1 to -12 indicates 12 month returns just prior to the herding year. The F-statistic is based on the null hypothesis that the time-series averages of cross-sectional means do not differ across the ownership change portfolios. All ADRs included have institutional ownership data at the beginning (t=0) and end (t=11) of the herding year and capitalization data at the beginning of the herding year.

Panel A: Pre-herding year raw returns

	Large Decrease	Medium Ownership change	Large increase	F-statistic
t=-1 to -3	0.0154	0.0372	0.0571	8.10[a]
	(2.18)	(5.16)[a]	(7.41)[a]	
t=-1 to -12	0.0978	0.1365	0.2018	8.63[a]
	(5.77)[a]	(8.70)[a]	(9.77)[a]	

Panel B: Pre-herding year excess returns

	Large Decrease	Medium Ownership change	Large increase	F-statistic
t=-1 to -3	-0.0533	-0.0337	0.0108	7.30[a]
	(-4.23)[b]	(-4.30)[a]	(6.01)[a]	
t=-1 to -12	-0.1066	0.0422	0.1246	6.26[a]
	(-7.14)[a]	(5.59)[a]	(8.11)[a]	

[a] means statistically significant at the 1% level.

[b] means statistically significant at the 5% level.

[c] means statistically significant at the 10% level.

Table VI
Momentum Portfolios and Subsequent Changes in Institutional Ownership

At the beginning of each October (1985-1998), ADRs are sorted into 3 portfolios based on their raw performance over the previous six months (t=-1 to -6). Table VI reports the time-series average of the annual cross-sectional mean raw returns for the formation period (t=-1 to -6), the change in the fraction of shares held by institutional investors over the subsequent 12 months (t=0 to 11), and raw returns and excess returns over the subsequent 12 months (t=0 to 11). Both raw return and excess return are computed by buy and hold method.

Returns and Changes in Institutional Ownership: Sorted by Six-month Prior Performance

	Losers	Medium group	Winners	F-statistics
Formation period raw Return (t=-1 to -6)	-0.1228	0.0871	0.3328	71.01[a]
ΔInstitutional	-0.0037	0.0006	0.0045	5.31[a]
(t=0 to 11)	(-2.06)[b]	(0.49)	(2.11)[b]	
Subsequent raw	0.0085	0.0743	0.1107	7.22[a]
Return (t=0 to 11)	(0.46)	(4.09)[a]	(5.26)[a]	
Subsequent excess	-0.0831	-0.0211	0.0471	6.88[a]
Return (t=0 to 11)	(-7.08)[a]	(-1.79)[c]	(6.33)[a]	
0				

[a] means statistically significant at the 1% level.

[b] means statistically significant at the 5% level.

[c] means statistically significant at the 10% level.

Table VII

Winners and Losers Sorted by Subsequent Changes in Institutional Ownership

Panel A reports the time-series mean of the annual cross-sectional average subsequent changes in fractional institutional ownership (month t=0 to 11) and raw returns and excess returns over the following year (month t=0 to 11) for winners sorted by subsequent change in institutional ownership. Both raw return and excess return are computed by buy and hold approach. The F-statistic is based on the null hypothesis that the time-series averages of cross-sectional means do not differ across the portfolios. The t-statistic (in parentheses) is calculated from time-series standard errors of annual cross-sectional averages. Panel B reports the results for losers.

	Subsequent Decline in Ownership	Subsequent medium change in ownership	Subsequent Increase in Ownership	F-statistics
	Panel A: Winners Sorted by Subsequent Changes in Institutional Ownership			
ΔInstitutional (t=0 to 11)	-0.0227	-4.3E-04	0.0277	111.73[a]
Subsequent raw	-0.0020	0.0661	0.1908	13.85[a]
Return (t=0 to 11)	(-0.08)	(2.94)[a]	(6.16)[a]	
Subsequent excess	-0.1010	-0.0311	0.0839	9.79[a]
Return (t=0 to 11)	(-4.45)	(-3.47)[b]	(5.11)[a]	
	Panel B: Losers Sorted by Subsequent Changes in Institutional Ownership			
ΔInstitutional (t=0 to 11)	-0.0265	1.05E-06	0.0243	133.68[a]
Subsequent raw	-0.0228	0.0176	0.0948	5.46[a]
Return (t=0 to 11)	(-0.91)	(0.70)	(3.53)[a]	
Subsequent excess	-0.1433	-0.0915	0.0115	7.21[a]
Return (t=0 to 11)	(-7.11)[a]	(-5.15)[a]	(4.25)[a]	

[a] indicate statistical significance at the 1% level.

[b] indicate statistical significance at the 5% level.

[c] indicate statistical significance at the 10% level.

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ESSAY II:

RETURN AUTOCORRELATION AND INSTITUTIONAL INVESTORS IN THE ADRS MARKET

I. INTRODUCTION

The prevailing evidence in finance literature is that individual stock returns over short intervals are in general consistent with market efficiency. The positive serial correlation in the daily returns of equity portfolios, on the other hand, remains an anomaly. Cross-autocorrelations among stock returns are in general considered the primary reason of the positive autocorrelations in stock portfolios. However, the source of cross-autocorrelation among stock returns has yet to be clearly understood. The most common explanation is that nonsynchronous trading induces cross-autocorrelation among returns of stock portfolios. Lo and Mackinlay (1990) suggest that though some of the cross-autocorrelations may be due to nonsynchronous trading, claiming all of them would demand the existence of a stock market that is unrealistically thin. Atchison, Butler, and Simonds (1987) also suggest that the level of the autocorrelation predicted from nonsynchronous trading effects is well below that observed and other factors appear to be playing the major role in generating return autocorrelations. Mech (1993) presents evidence that portfolio return autocorrelation is not caused by time-varying expected returns, nontrading, stale limit orders or market maker trading strategies. His results support the hypothesis that transaction costs cause portfolio autocorrelation by slowing price adjustment. However, Mech fails to find complete empirical proof for his

hypothesis. In a total departure from microstructure related explanations, Kyle(1985) focuses on information and argues that profit-maximizing informed investors attempt to camouflage their information by spreading trades over time. Barclay and Warner (1993) support the stealth trading hypothesis and show that stock price movements are due mainly to informed traders' private information. Such 'stealth trading' would induce autocorrelation in individual security returns. Moreover, if investor's private information contains a marketwide component, then portfolios composed of securities with more informed trading will have higher return autocorrelation.

As of today, evidence of private information induced stock return autocorrelation is still very limited. Sias and Starks (1997) present a direct test of the effect of private information on stock return autocorrelation. By assuming that institutional investors are better informed than most individual investors, Sias and Starks (1997) examine the relationship between institutional ownership and the return autocorrelation among individual security and stock portfolios. In their study, they examine all the NYSE firms between 1977 and 1991. However, descriptive statistics of their study show that institutional ownership of the sample firms ranged from a low of 2.6 percent to a high of 27.6 percent only. As such, the sample is less than perfect for providing the evidence that private information induces stock return autocorrelation. The influence of individual investors is still considerable.

In this study, in order to provide stronger and better evidence that private information induces stock return autocorrelation, we examine American Depository Receipts (ADRs). ADRs are ownership certificates of foreign companies that trade on US stock market. ADRs present a low-cost way to diversify investment portfolios while

avoiding the problems of buying foreign stocks on overseas market. Moreover, ADRs are attractive for institutions that are prevented from buying foreign stocks from overseas markets by their charters. According to Euromoney, institutional investors own about 80% of the ADRs in U.S. That is, if return autocorrelation is due to institutions' trading on their private information, ADRs represent an almost perfect sample for investigation since the effect of individual investors will be less prevalent. In addition, Patro (2000) find the home country information an important determinant of ADRs returns. The difficulty in obtaining foreign country information by small investors makes the private information of institutional investors in the ADRs market more significant and influential. As such, ADRs definitely present a better sample to investigate whether return autocorrelation is information based. Moreover, there is no existing study examining the relationship between ADR returns and the effect of institutional ownership.

Our empirical results show that there is a positive relationship between the activities of institutional investors and the daily return autocorrelation of ADR individual security or ADR portfolios. Using Granger causality regressions, the results also show that ADR portfolios with high institutional ownerships have a better ability to predict the returns of ADR portfolios with low institutional ownerships than the ability of the latter to predict the former. Thus, the returns on ADR portfolios with high institutional ownerships lead the returns on ADR portfolios with low institutional ownerships. It implies that institutional trading of ADR increases the speed with which information is reflected in prices.

The paper also examines whether the positive relation between institutional ownership and daily return autocorrelation of ADR portfolios can be explained by other factors such as nonsynchronous trading, bid-ask spread and volatility of ADRs. The empirical results show that none of them can explain the relation between ADR return autocorrelation and institutional ownership.

The rest of the paper is organized as follows. Section two is data and methodology. In section three we examine the relationship between institutional investors and individual ADR daily return autocorrelation. In section four we examine the relationship between institutional investors and daily return autocorrelation of ADR portfolios. In section five we investigate whether institutional investors reflect information and increase the speed with which prices reflect marketwide information using Granger causality regressions. In section six other explanations for the relationship between ADR return autocorrelation and institutional investors are examined. Section seven is summary and conclusions.

II. DATA AND METHODOLOGY

The sample analyzed in this study contains all the ADRs from 1984 to 1998. To avoid survivorship bias, we keep also the ADRs that are later delisted. The daily returns and daily prices of ADRs are obtained from the Center for Research in Security Prices (CRSP) database. The numbers of shares held by institutional investors and ADR's shares outstanding are obtained from the January issue of *Standard and Poor's Security Owners' Stock Guide.* The annual market equity capitalization is determined by multiplying price with outstanding shares of ADR. The yearly sample size ranges from 59 ADRs in 1984 to 279 ADRs in 1998.

The daily return autocorrelation of each individual ADR in each year is calculated according to the following formula:

$$R_{jt} = \alpha + \beta R_{j,t-1} + \varepsilon_t$$

Where Rjt is the daily return for firm j at time t, and $R_{j,t-1}$ is the daily return for firm j at time t-1.

In the literature, it is found that capitalization may also affect return autocorrelation. For example, Loeb (1983) shows that small firms have larger bid-ask spreads. Foerster and Keim (1993) show that small firms have high level of nontrading. Hasbrouck (1991) also finds that small firms tend to have less market depth. All these may slow down the response of stock price to information. To take into consideration the capitalization effect on return autocorrelation, we sort ADRs annually into three groups based on market equity capitalization. Within each capitalization group, ADRs are further sorted into three groups based on the fraction of shares held by institutional investors.

Thus, each ADR is assigned to one of the 9 groups. The portfolio daily return is the average daily returns across all ADRs in each of the 9 groups. Group membership is rebalanced each year.

Table 1 reports the average institutional ownerships for ADRs with low, medium, and high institutional ownerships within each capitalization group. Table 1 also reports the mean capitalization for the low, medium and high institutional ownership groups within each capitalization group. To see whether the results change over time, subperiod results of 84-91 and 92-98 are also supplied. Dividing into subperiods is desirable because the ADR market was less active in the 1980s.

<Insert Table 1>

For the entire period between 1984 and 1998, Table 1 shows that the mean institutional ownerships is larger for smaller ADR firms across all the three institutional ownership portfolios. Portfolios with high institutional ownership have the lowest mean capitalization compared with portfolios with medium and low institutional ownership in each capitalization group. The results are inconsistent with the common belief that firm capitalization and institutional ownership have positive correlation. The possible reason is that U.S institutions may have restrictions regarding their exposures to foreign securities. It appears from the numbers in Table 1 that U.S institutions have a limit regarding the dollar amount of their ADR investments. ADRs represent ownership of shares of foreign companies. This may explain why our results of ADRs are not consistent with common belief. Nevertheless, the negative relationship between

capitalization and institutional ownership implies that there is a need to control for firm size in our study of ADRs.

III. INDIVIDUAL ADR SECURITY RETURN AUTOCORRELATION AND INSTITUTIONAL INVESTORS

We now examine whether the return autocorrelation of ADR individual security is positively related to the institutional ownership of ADR. Each year, Each ADR's return autocorrelation is estimated. The cross-sectional time–series mean daily return autocorrelation in each of the nine groups is reported in Table 2. The F-statistic is calculated to test the null hypothesis that the mean individual ADR return autocorrelations between high and low (or high and medium, medium and low) institutional ownership portfolios in each capitalization group are equal.

<Insert Table 2>

Table 2 shows that for small capitalization ADRs, the mean daily autocorrelations for individual ADR returns with low, medium and high institutional ownership are –0.0280, 0.0063 and 0.0853, respectively. The t-statistics are –2.51, 0.56 and 5.41 respectively. For average capitalization ADRs, the mean daily autocorrelations for individual ADR returns with low, medium and high institutional ownership are –0.0039, 0.0493 and 0.0793 respectively. The t-statistics are –0.55, 6.76 and 7.40 respectively. For large capitalization ADRs, the mean daily autocorrelations for individual ADR returns with low, medium and high institutional ownership are 0.0061, 0.0309, and 0.0589 respectively. The t-statistics are 0.62, 2.91 and 5.35 respectively. In all the three capitalization groups, the individual ADRs with high institutional ownerships have

significant positive return autocorrelation. In addition, on average, ADR securities with high institutional ownerships exhibit return autocorrelation of 0.0745 versus -0.0086 for ADR securities with low institutional ownerships. The F-statistics calculated to test the null hypothesis that the mean individual ADR return autocorrelations with high and low institutional ownerships are equal in each capitalization group are 12.81, 41.66 and 34.36 respectively and all of them are significant at the 1% level. The F-statistics indicate that we can strongly reject the null hypothesis that individual ADRs with high and low institutional ownerships have the same security return autocorrelation. The F-statistics calculated to test the null hypothesis that the ADRs with low and medium institutional ownerships have the same autocorrelation in each of the capitalization group are 3.34, 5.35, and 16.64 respectively. The F-statistics calculated to test the null hypothesis that the ADRs with high and medium institutional ownerships have the same autocorrelation in each of the capitalization group are 2.93, 26.90, and 4.71 respectively. All these F-statistics are significant at the 5% or 10% level. The results of subperiod (1984-1991) and subperiod (1992-1998) are shown in Table 2a and Table 2b. The subperiod results are similar to the results of the entire period and imply that the results are robust over time. In conclusion, results in Table 2, 2a and 2b show that individual ADR return autocorrelation is positively related to the institutional ownership of the ADR.

As shown in Table 1, firm size is related to institutional ownership of ADRs. Moreover, it has been documented that market friction such as bid-ask spread is also responsible for portfolio return autocorrelation since market friction delays adjustment of stock price to information. Despite Roll (1984) suggests that bid-ask spread will not affect return autocorrelation, Sias and Starks (1997) show that a larger spread will induce

a greater negative bias in stock return autocorrelation. In order to control for these confounding effects on return autocorrelation, each year, individual ADR's daily return autocorrelations are regressed on the institutional ownership, the natural log of firm capitalization, and the average share price. Following Stoll (1978), the average price is a proxy for the bid-ask spread. Results are reported in Table 3.

<Insert Table 3>

As expected, the daily return autocorrelation is positively associated with institutional ownership in all the 15 years from 1984 to 1998. Almost all the coefficients of the institutional ownership ratio are positive and significant within 5% level even after controlling for price and firm size. The coefficient of the capitalization is positive and significant at about 10% level in only 2 of the 15 years, but for the other 13 years, the sign is indeterminate and not significant. The coefficient of share price is positive and significant in only 4 of the 15 years, and it is insignificant in the other years.

IV. EVIDENCE ON PORTFOLIO RETURN AUTOCORRELATIONS

We next examine return autocorrelations of ADR portfolios. According to French (1980) and Smirlock and Starks (1986), there are differences in mean daily returns. To account for the impact on stock return, dummy variables are used to allow the intercept to vary across the days of the week when the first-order return autocorrelations of the ADR portfolios sorted by capitalization and institutional ownerships are estimated. The estimation equation is:

$$R_t = a_0 + a_1 b_1 + a_2 b_2 + a_3 b_3 + a_4 b_4 + \beta R_{t-1} + \varepsilon_t$$

where R_t and R_{t-1} are the contemporaneous and lagged portfolio returns. b1, b2, b3 and b4 are dummy variables. Monday through Thursday is assigned to b1 through b4 respectively. Each day, the respective dummy variable is assigned the value 1 and the rest of the dummy variables are assigned the value 0. The results in Table 4 show that for the entire period from 1984 to 1998 all the return autocorrelations are positive. In all but two cases, these return autocorrelations are significantly different from zero (at the 1% level). Of the small capitalization portfolios, the return autocorrelation is 0.0395 for the low institutional ownership portfolios, 0.0864 for the medium institutional ownership portfolios, and 0.1645 for the high institutional ownership portfolios. The t-statistics are 2.38, 4.97, and 10.02 respectively. Of the medium capitalization portfolios, the return autocorrelation is 0.0643 for the low institutional ownership portfolios, 0.1108 for the medium institutional ownership portfolios, and 0.1406 for the high institutional ownership portfolios. The t-statistics are 3.77, 6.71, and 7.99 respectively. Of the large capitalization portfolios, the return autocorrelation is 0.0182 for the low institutional

ownership portfolios, 0.0641 for the medium institutional ownership portfolios, and 0.0917 for the high institutional ownership portfolios. The t-statistics are 1.40, 4.15 and 5.25 respectively. The F-statistics are calculated to test the null hypothesis that the portfolios with high vs. low, high vs. medium, and medium vs. low institutional ownerships have the same return autocorrelations. In each capitalization group, the average return autocorrelation for the low institutional ownership portfolios is less than the autocorrelation for the high institutional ownership portfolios, and the differences are statistically significant at the 1% level for all the three capitalization groups. On average, the return autocorrelation difference between portfolios with high institutional ownership and portfolios with low institutional ownership is 0.0916.

To examine whether the results are robust over time, the results of the subperiod (1984-1991) and subperiod (1992-1998) are shown in Table 4a and Table 4b. Another reason to divide the entire period into two subperiods is that non-trading is higher in the 1980s (1984-1991), and non-trading may cause portfolio return autocorrelation according to finance literature. The subperiod results shown in Table 4a and 4b are similar to the results of the whole sample period and mean that the results are robust over time. That is, non-trading does not have an important impact on ADR portfolio return autocorrelation.

<Insert table 4>

When we compare ADR portfolio return autocorrelations across capitalization groups, Table 4, 4a and 4b suggest that the relationship between capitalization and portfolio return autocorrelation is not monotonic. Both capitalization and institutional

ownership may have played a role in explaining the portfolio return autocorrelation. To evaluate the relative importance of capitalization and institutional ownership, portfolio return autocorrelation is regressed on these two variables. Each year, the daily portfolio return autocorrelations for the low, medium, and high institutional ownerships portfolios within each capitalization group are calculated. The results from a pooled regression of all 15 years are shown in Table 5. The results indicate that institutional ownership plays an important role in determining portfolio return autocorrelation and it is significant at the 1% level. The coefficient of capitalization is negative but not significant. 25.40% of the variance of the portfolio return autocorrelations can be explained by the two independent variables. The relation between autocorrelations and institutional ownership is not substantially changed if capitalization is excluded from the regression. The subperiods 1984-1991 and 1992-1998 show similar results.

<Insert Table 5>

V. CROSS-PREDICTABILITY OF PORTFOLIO RETURNS

So far, the results show that daily return autocorrelations of both individual ADR and ADR portfolio have a positive relationship with institutional ownership. It is possible that the correlated trading by institutional investors contributes to daily return autocorrelations of both individual securities and portfolios. That is, due to the trading strategy of institutions (See Barclay and Warner (1993)), individual security with greater informed trading impounds the information over a longer time and has larger return autocorrelation. If the information contains a marketwide component and the private signals are cross-sectionally correlated, then portfolios composed of securities with greater informed trading will have larger return autocorrelation. Many researchers have argued that institutional investors are more likely to be well informed than individual investors (Arbel and Strebel, 1983). To confirm that ADR return autocorrelation is information induced as a result of institutional investors' trading strategies, the lead-lag relation between portfolios with low and high institutional ownership is examined.

The Granger causality method is used to examine the lead-lag relation. The contemporaneous return of ADR portfolio with high (low) institutional ownership is regressed on its own five previous returns and the previous five returns for the similarly capitalized portfolio with low (high) institutional ownership:

$$R_{high,t} = \sum_{i=1}^{5} a_i d_{i,t} + \sum_{k=1}^{5} \left(a_{high,k} R_{high,t-k} + a_{low,k} R_{low,t-k} \right) + u_{high,t}. \quad (1)$$

$$R_{low,t} = \sum_{i=1}^{5} b_i d_{i,t} + \sum_{k=1}^{5} \left(b_{high,k} R_{high,t-k} + b_{low,k} R_{low,t-k} \right) + u_{low,t}. \quad (2)$$

where $R_{high,t}$ and $R_{low,t}$ are the returns at time t for ADR portfolios with high and low institutional ownership, the $d_{i,t}$ are dummy variables for each day of the week i, k is the lag in days and u is the error term.

According to Brennan et al. (1993), portfolios that are quick to reflect marketwide information have a better ability to predict the returns of portfolios that are slow to reflect marketwide information than the ability of the latter to predict the former. If institutional trading of ADRs reflects marketwide information and increases the speed at which information is reflected in prices of ADRs, then it is expected that $R_{high,t-k}$ will predict $R_{low,t}$ better than will $R_{low,t-k}$ predict $R_{high,t}$ in the above Granger causality regressions, that is, $b_{high,k}$ should be greater than $a_{low,k}$.

Table 6 shows the sum of the coefficients from the Granger causality regressions (1) and (2).

<Insert Table 6, 6a and 6b>

Table 6 shows that for small capitalization ADRs, a_{low} is 0.0149, and b_{high} is 0.0732. For medium capitalization a_{low} is -0.0102, and b_{high} is 0.1660. For large capitalization, a_{low} is -0.0798, and b_{high} is 0.2113. In each capitalization group, a_{low} is less than b_{high}. That is, the ability of b_{high} to predict R_{low} is much greater than the ability of a_{low} to predict R_{high}. The F-statistics are all significant at least at the 5% level and it means that we can reject the null hypothesis that $b_{high}=a_{low}$. This indicates ADR portfolios with

high institutional ownership reflect marketwide information sooner than ADR portfolios with less institutional ownership. The subperiod results in Table 6a and Table 6b show similar results.

Tables 7, 7a, and 7b show the results when only one lag is used in the Granger causality regressions. The results are similar to those in Tables 6, 6a and 6b.

<Insert Table 7, 7a, and 7b>

In short, returns on portfolios dominated by institutional investors lead the returns on portfolios dominated by individual investors, and institutional trading increases the speed with which prices reflect marketwide information. This can be interpreted as evidence that ADR return autocorrelation is associated with the information advantage of institutional investors.

VI. OTHER EXPLANATIONS OF RETURN AUTOCORRELATION

A: Nonsynchronous trading

A common explanation for portfolio autocorrelations is nonsynchronous trading.(e.g., Fisher, (1966); Scholes and Williams, (1977); Boudoukh (1994)). If a stock does not trade in a given time, the price adjustment is delayed. If this stock is grouped with other stocks that reflect market information immediately, then the portfolio will exhibit positive serial correlation. In order to determine if ADR return autocorrelation is related to nonsynchronous trading, we perform the following analysis on the nontrading of ADR. For stocks that do not trade, CRSP reports price as the negative of the midpoint of the bid-ask spread, then the number of the negative prices shown in CRSP can measure the extent of nontrading. We measure the nontrading of ADR as the ratio of the number of the negative ADR prices to the number of all ADR prices.

Our earlier results have shown that ADR portfolios with high institutional ownerships have larger return autocorrelation. If nonsynchronous trading is an explanation for this relation, then ADR portfolios with high institutional ownerships should have higher nontrading probability. The empirical results are shown in Table 8. Since the nontrading ratio in the 1980s is much higher, we focus in this case on the subperiods 1992-1998.

<Insert Table 8>

Table 8b shows that between 1992-1998, for small capitalization, the nontrading frequencies for ADR portfolios with high and low institutional ownership are 2.91 percent and 10.91 percent respectively. The t-statistic for testing that the two means are equal is 3.02 and is significant at the 1% level. For the medium capitalization group, the nontrading frequencies for ADR portfolios with high and low institutional ownership are 0.34 percent and 10.62 percent respectively. The t-statistic is 5.54 and is significant at the 1% level. For the large capitalization group, the nontrading frequencies for ADR portfolios with high and low institutional ownership are 0.02 percent and 5.92 percent respectively, the t-statistics is 5.51 and is significant at the 1% level. We can see that as firm capitalization increases, nontrading decreases. Moreover, ADR portfolios with high institutional ownership have lower nontrading probability.

Table 8a shows that between 1984-1991, the nontrading in all cases are higher than between 1992-1998. In all capitalization groups, the ADR portfolios with high institutional ownership have lower nontrading than ADR portfolios with low institutional ownership. The t-statistics are all significant at the 1% level.

The results in Table 8 therefore do not support the nontrading explanation for the relation between institutional ownerships and portfolio autocorrelation.

B: Bid-ask spreads and volatilities

Mech (1993) proposes that the differences in bid-ask spreads and volatilities across securities could also explain the relationship between portfolio autocorrelation and institutional ownership. He shows that transaction costs cause portfolio autocorrelation by slowing price adjustment. According to him, informed traders will trade on new information quickly when the difference between price and value is greater than the transaction costs. If the bid-ask spreads are too large or the volatilities are too small, then the transaction costs may be greater than the difference between price and value and prevent informed traders from trading on new information. Thus, the price adjustment will be delayed and result in larger autocorrelation. In Mech's model, the length of price adjustment delays is positively related to the bid-ask spread and negatively related to the volatility.

To see if bid-ask spreads and volatilities could explain the relation between portfolio autocorrelation and institutional ownership, bid-ask spreads and volatilities for portfolios sorted by capitalization and institutional ownership are evaluated. Here, volatility is estimated as the mean standard deviation of daily returns for securities within each portfolio sorted by capitalization and institutional ownership. Following Stoll (1978), Price is used as a proxy for bid-ask spread. The results are shown in Tables 9 and 10.

<Insert Table 9>

Table 9b shows that between 1992-1998, for small capitalization ADRs, the average prices for ADR portfolios with high and low institutional ownership are 24.54 and 11.93 respectively. The t-statistic for testing the null that the two means are equal is -8.36 and is significant at the 1% level. For medium capitalization ADRs, the prices for ADR portfolios with high and low institutional ownership are 32.70 and 17.80 respectively. The t-statistic is -9.93 and is significant at the 1% level. For large capitalization ADRs, the prices for ADR portfolios with high and low institutional ownership are 48.60 and 42.52 respectively. The t-statistic is -3.78 and is significant at the 1% level. We can see that as firm capitalization increases, ADR price increases. The results also show that institutions invest in ADRs with higher prices.

Between 1984-1991, Table 9a shows that in both the small and medium capitalization groups, the ADR portfolios with high institutional ownership also have higher price than ADR portfolios with low institutional ownership. The t-statistic is significant at the 1% level for the small capitalization group. For the large capitalization group, the price difference is not significant.

According to Stoll (1978), there is an inverse relationship between price and the magnitude of bid-ask spread. Our earlier results have shown that ADR portfolios with high institutional ownerships have larger autocorrelation. If the bid-ask spread can be a factor to explain the positive relationship between institutional ownerships and portfolio return autocorrelation, then the ADR portfolios with high institutional ownerships should have larger bid-ask spread. The reason being that large bid-ask spread delays ADR price adjustment and results in larger portfolio return autocorrelation. The empirical results in Tables 9a and 9b show that ADR portfolios with high institutional ownership exhibit

higher price, that is, smaller bid-ask spread. These results are opposite to what is expected if bid-ask spread can be a factor to explain the positive return autocorrelation in ADR.

As stated earlier, Mech (1993) suggests that low volatility impedes security trading and induces return autocorrelation. The volatility results in Table 10 show that between 1992-1998, for small capitalization ADRs, the mean standard deviations of daily returns for ADR portfolios with high and low institutional ownership are 0.0289 and 0.0375 respectively. The t-statistic for testing the null that the two means are equal is 1.97 and is not significant at 5% level. For medium capitalization ADRs, the mean standard deviations of daily returns for ADR portfolios with high and low institutional ownership are 0.0216 and 0.0245 respectively. The t-statistic is 1.04 and it is not significant. For large capitalization, the mean standard deviations of daily returns for ADR portfolios with high and low institutional ownership are 0.0184 and 0.0196 respectively. The t-statistic is 0.59 and it is also not significant . In the 1984-1991 subperiod, the results are similar. None of the three t-statistics is significant.

<Insert Table 10>

If volatility can be a factor to explain portfolio return autocorrelation, then the ADR portfolios with high institutional ownerships should have smaller volatility. The empirical results in Tables 10a and 10b however show that ADR portfolios with high institutional ownership do not exhibit significant smaller volatility than ADR portfolios with low institutional ownership. All the t- statistics are insignificant, which means that

the volatility difference between ADR portfolios with high institutional ownership and those with low institutional ownership is not significantly different from zero. Thus, volatility cannot be a factor to explain the portfolio return autocorrelation in ADRs.

VII. SUMMARY AND CONCLUSIONS

The finance literature has demonstrated that the strong positive serial correlation in daily return of common stock portfolio is too large to be explained by nonsynchronous trading alone. Sias and Starks (1997) suggest that trading strategy based on private information of institutional investors can lead to stock return autocorrelation. In this study, we examine the return autocorrelation of ADRs because 80% of the ADRs in US are owned by institutions. The difficulty for individual investors to obtain the home-country information of ADRs makes the private information of institutional investors more influential and significant. If institutions were to trade on their information and induce return autocorrelation, we expect the ADR market to provide a near perfect target for investigation. ADRs are ownership certificates of foreign companies that trade on US stock market and ADRs are attractive for institutions that are prevented from buying foreign stocks from overseas markets by their charters. ADRs are mainly bought by institutional investors.

The empirical results demonstrate that ADR individual security and portfolio daily return autocorrelations are positively related to institutional ownership. In addition, the returns on ADR portfolios with high institutional ownerships lead the returns on ADR portfolios with low institutional ownerships using Granger causality regressions. The empirical results also show that other explanations, such as nonsynchronous trading, bid-ask spread, and volatility of ADRs, cannot explain the return autocorrelation of ADRs.

Table 1

Institutional ownership and capitalization (1984-1998).

Each year, capitalization-sorted securities are further sorted into three equal-size portfolios by the fraction of shares held by institutional investors. The mean institutional ownership fraction and equity capitalization are given for portfolios with low, medium and high institutional ownership within each capitalization group.

	Institutional Ownership		
Capitalization	Low	Medium	High
Small	0.0067	0.0429	0.2409
Average	0.0016	0.0102	0.0872
Large	0.0006	0.0027	0.0415
	Capitalization (000)		
Capitalization	Low	Medium	High
Small	92.36	95.17	69.19
Average	733.65	668.50	610.86
Large	9249.77	9269.66	6824.64

Subperiod: 84-91:

	Institutional Ownership		
Capitalization	Low	Medium	High
Small	0.0060	0.0351	0.1980
Average	0.0013	0.0084	0.0726
Large	0.0006	0.0024	0.0468
	Capitalization (000)		
Capitalization	Low	Medium	High
Small	61.27	63.84	52.33
Average	588.99	571.41	459.73
Large	6344.88	8966.41	4702.03

Table 1 (Continued)

Subperiod: 92-98:

	Institutional Ownership		
Capitalization	Low	Medium	High
Small	0.0075	0.0518	0.2899
Average	0.0019	0.0122	0.1038
Large	0.0007	0.0031	0.0354
	Capitalization (000)		
Capitalization	Low	Medium	High
Small	127.89	130.97	88.46
Average	898.98	779.46	783.59
Large	12569.65	9616.24	9250.49

Table 2

Each year (1984-1998), capitalization-sorted securities are further sorted into three equal-size portfolios according to the fraction of shares held by institutional investors. The mean daily return autocorrelations for securities with low, medium, high institutional ownerships within each capitalization group are reported. (t statistics are in parenthesis). The F-statistics is calculated to test the null hypothesis that the mean individual ADR return autocorrelations with high and low (or high and medium, medium and low) institutional ownerships in each capitalization group are equal.

Entire period: (1984-1998)

Groups	Autocorrelation (t-statistics)	F-statistics Low=high	F-statistics Low=Medium	F-statistics Medium=high
Small:low	-0.0280 (-2.51)[b]	12.81[a]	3.34[c]	
Small:medium	0.0063 (0.56)			2.93[c]
Small:high	0.0853 (5.41)[a]			
Average size:low	-0.0039 (-0.55)	41.66[a]	5.35[b]	
Average size:medium	0.0493 (6.76)[a]			26.90[a]
Average size:high	0.0793 (7.40)[a]			
Large:low	0.0061 (0.62)	34.36[a]	16.64[a]	
Large:medium	0.0309 (2.91)[a]			4.71[b]
Large:high	0.0589 (5.35)[a]			

[a] significant at the 1% level.

[b] significant at the 5% level.

[c] significant at the 10% level.

Table 2a

Subperiod: 84-91

Groups	Autocorrelation (t-statistics)	F-statistics Low=high	F-statistics Low=Medium	F-statistics Medium=high
Small:low	-0.0048 (-0.35)	8.87[a]	0.38	
Small:medium	0.0085 (0.43)			8.60[a]
Small:high	0.1123 (4.38)[a]			
Average size:low	0.0078 (1.61)	12.18[a]	7.86[a]	
Average size:medium	0.0459 (3.40)[a]			3.54[b]
Average size:high	0.0906 (4.64)[a]			
Large:low	0.0053 (0.30)	5.50[a]	1.347	
Large:medium	0.0370 (1.90)[c]			1.69
Large:high	0.0751 (4.17)[a]			

[a] significant at the 1% level.

[b] significant at the 5% level.

[c] significant at the 10% level.

Table 2b

Subperiod: 92-98

Groups	Autocorrelation (t-statistics)	F-statistics Low=high	F-statistics Low=Medium	F-statistics Medium=high
Small:low	-0.0546 (-4.38)[a]	48.07[a]	7.027[a]	
Small:medium	0.0038 (0.37)			11.26[a]
Small:high	0.0543 (6.56)[a]			
Average size:low	-0.0170 (1.33)	34.79[a]	24.97[a]	
Average size:medium	0.0532 (12.366)[a]			5.68[a]
Average size:high	0.0663 (19.28)[a]			
Large:low	0.0070 (0.85)	10.12[a]	3.29[c]	
Large:medium	0.0240 (3.45)[a]			3.21[c]
Large:high	0.0404 (5.00)[a]			

[a] significant at the 1% level.
[b] significant at the 5% level.
[c] significant at the 10% level.

Table 3

Annual individual ADR firm regressions

Each year, individual ADR security daily return autocorrelations for all ADR securities are regressed on the fraction of shares held by institutional investors, the natural log of capitalization, and the annual average share price. T-statistics are reported in parentheses and are based on White's (White, 1980) heteroskedastic-consistent standard errors.

Year	Intercept	ln(capital)	Institutional Fraction	Average price	Adjusted R square
1984	-0.2518	0.0189	0.6442	0.0008	0.1415
	(-1.70)	(1.92[c])	(3.43[a])	(1.32)	
1985	0.1679	-0.0070	0.4977	0.0009	0.0760
	(1.64)	(-1.02)	(1.75[c])	(2.16[a])	
1986	0.0621	-0.0009	0.3665	0.0001	0.0500
	(0.41)	(-0.09)	(2.57[a])	(0.62)	
1987	0.0968	-0.0065	0.3589	-0.0001	0.1100
	(0.69)	(-0.67)	(3.05[a])	(-0.27)	
1988	-0.1734	0.0100	0.6121	0.0001	0.0350
	(-1.11)	(0.96)	(2.54[a])	(0.16)	
1989	0.0324	-0.0010	0.5213	0.0005	0.0290
	(0.28)	(-0.14)	(2.56[a])	(0.98)	
1990	-0.0425	0.0043	0.4146	0.0004	0.0300
	(-0.32)	(0.51)	(1.94a)	(1.02)	
1991	-0.0786	0.0053	0.3713	0.0002	0.0240
	(-0.80)	(0.84)	(4.54a)	(0.49)	
1992	-0.2593	0.0166	0.4611	0.0004	0.1220
	(-1.80)	(1.88[c])	(2.71[a])	(1.07)	
1993	-0.0562	0.0030	0.2512	0.0012	0.0870
	(-0.48)	(0.38)	(2.08b)	(1.63c)	
1994	0.0877	-0.0075	0.1766	0.0014	0.0660
	(0.74)	(-1.00)	(1.93[b])	(3.03[a])	
1995	-0.1453	0.0087	0.2213	0.0001	0.0320
	(-1.55)	(1.44)	(3.45a)	(0.15)	
1996	-0.1090	0.0065	0.1591	0.0007	0.0480
	(-1.45)	(1.32)	(2.97[a])	(1.57[c])	
1997	-0.0778	0.0051	0.1537	0.0003	0.0330
	(-1.23)	(1.23)	(3.19[a])	(1.01)	
1998	-0.0088	0.0017	0.1405	0.0003	0.0170
	(-0.13)	(0.38)	(2.32[a])	(0.84)	

[a] significant at the 1% level.

[b] significant at the 5% level.

[c] significant at the 10% level.

Table 4

Each year, capitalizaton-sorted securities are further sorted into three equal-size portfolios by the fraction of shares held by institutional investors. The daily portfolio return autocorrelations for low, medium, high institutional ownerships portfolios within each capitalization group are reported. The F-statistics is calculated to test the null hyopothesis that the portfolios with high and low institutional ownerships have the same autocorrelation. All the T and F statistics are based on the Newly-West autocorrelation- and heteroskedasticity-consistent standard errors.

Entire period: (1984-1998)

Portfolio	Autocorrelation (t-statistics)	F-statistics Low=high	F-statistics Low=Medium	F-statistics Medium=high
Small:low	0.0395 (2.38)	49.81[a]	6.30[a]	
Small:medium	0.0864 (4.97)[a]			20.40[a]
Small:high	0.1645 (10.02)[a]			
Average size:low	0.0643 (3.77)[a]	12.81[a]	3.25	
Average size:medium	0.1108 (6.71)[a]			1.67
Average size:high	0.1406 (7.99)[a]			
Large:low	0.0182 (1.40)	8.15[a]	2.48	
Large:medium	0.0641 (4.15)[a]			1.23
Large:high	0.0917 (5.25)[a]			

[a] significant at the 1% level.

Table 4a

Subperiod :(1984-1991)

Portfolio	Autocorrelation (t-statistics)	F-statistics Low=high	F-statistics Low=Medium	F-statistics Medium=high
Small:low	0.0223 (0.99)	16.64[a]	2.85	
Small:medium	0.0698 (3.11)[a]			11.12[a]
Small:high	0.1578 (6.51)[a]			
Average size:low	0.0384 (1.69)	19.58[a]	3.92	
Average size:medium	0.0809 (3.71)[a]			4.17[b]
Average size:high	0.1266 (5.30)[a]			
Large:low	-0.0055 (0.05)	4.30[b]	0.85	
Large:medium	0.0361 (1.88)			1.65
Large:high	0.0839 (3.64)[a]			

[a] significant at the 1% level.
[b]significant at the 5% level.

Table 4b

Subperiod :(1992-1998)

Portfolio	Autocorrelation (t-statistics)	F-statistics Low=high	F-statistics Low=Medium	F-statistics Medium=high
Small:low	0.0592 (2.42)	113.27[a]	4.47[b]	
Small:medium	0.1054 (3.95)[a]			7.51[a]
Small:high	0.1721 (7.70)[a]			
Average size:low	0.0938 (3.70)[a]	7.42[a]	3.33	
Average size:medium	0.1449 (5.89)[a]			0.32
Average size:high	0.1566 (6.02)[a]			
Large:low	0.0453 (2.00)	13.05[a]	36.16[a]	
Large:medium	0.0962 (4.08)[a]			0.09
Large:high	0.1006 (3.82)[a]			

[a] significant at the 1% level.
[b]significant at the 5% level.

Table 5

Each year (1984-1998), capitalization-sorted securities are further sorted into three equal-size portfolios by the fraction of shares held by institutional investors. The daily portfolio return autocorrelations for low, medium and high institutional ownerships portfolios within each capitalization group of each year are regressed on the annual means across the constituent securities of the natural log of the capitalization and the fraction of shares held by institutional investors. The results from a pooled regression of all 15 years and the results for subperiod 1984-1991 and 1992-1998 are shown in the following:

Period	Intercept	Institutional ratio	Log capitalization	Adjusted R-square
1984-1998	0.0724	0.4490	-0.0005	0.2540
	(1.63)	(6.14[a])	(-0.18)	
1984-1991	0.0974	0.5820	-0.0039	0.3080
	(1.65)	(4.61[a])	(-1.06)	
1992-1998	0.1390	0.2290	-0.0028	0.1360
	(1.98)	(2.59[a])	(-0.66)	

Table 6: Granger causality regressions (five lags are used)

Each year, capitalization-sorted securities are further sorted into three equal-size portfolios by the fraction of shares held by institutional investors. The daily return of each portfolio with high (low) institutional ownerships is regressed on its own previous five returns and the previous five returns for the similarly capitalized portfolio with low (high) institutional ownerships. The sums of the coefficients are reported below. The F statistics is calculated to test the null hypothesis that the ability of the lagged return on the high institutional portfolio to predict the return on a similar size low institutional portfolio is the same as the ability of the lagged return on the low institutional portfolio to predict the return on the high institutional portfolio of similar size. All F tests are based on the Newey- west (1987) autocorrelation- and heteroskedasticity-consistent standard errors.

Entire period: 1984-1998

	Independent variable		
Dependent variable	lag high	lag low	F - statistics
Small: high	0.1213	0.0149	
			5.45[b]
Small: low	0.0732	-0.0540	
Medium: high	0.0798	-0.0102	
			9.41[a]
Medium: low	0.1660	-0.0121	
Large: high	0.0799	-0.0798	
			17.53[a]
Large: small	0.2113	-0.1193	

[a]significant at the 1% level.
[b]significant at the 5% level.

Table 6a

Subperiod: 1984-1991

	Independent variable		
Dependent variable	lag high	lag low	F - statistics
Small: high	0.1724	-0.0578	
			5.00[b]
Small: low	0.0482	-0.0863	
Medium: high	0.1445	-0.0965	
			8.21[a]
Medium: low	0.2362	-0.0291	
Large: high	0.1045	-0.0752	
			9.68[a]
Large: small	0.1698	-0.1153	

[a] significant at the1% level.

[b] significant at the 5% level.

Table 6b

Subperiod: 1992-1998

	Independent variable		
Dependent variable	lag high	lag low	F - statistics
Small: high	0.1388	-0.0727	
			7.67[a]
Small: low	0.1585	-0.0172	
Medium: high	0.1169	-0.0181	
			5.39[b]
Medium: low	0.0854	0.0126	
Large: high	0.0330	-0.0851	
			8.20[a]
Large: small	0.2588	-0.1831	

[a] significant at the 1% level.
[b] significant at the 5% level.

Table 7: Granger causality regressions (one lag is used)

Each year, capitalization-sorted securities are further sorted into three equal-size portfolios by the fraction of shares held by institutional investors. The daily return of each portfolio with high (low) institutional ownerships is regressed on its own previous one returns and the previous one returns for the similarly capitalized portfolio with low (high) institutional ownerships. The sums of the coefficients are reported below. The F statistics is calculated to test the null hypothesis that the ability of the lagged return on the high institutional portfolio to predict the return on a similar size low institutional portfolio is the same as the ability of the lagged return on the low institutional portfolio to predict the return on the high institutional portfolio of similar size. All F tests are base on the Newey- west (1987) autocorrelation- and heteroskedasticity-consistent standard errors.

Entire period: 1984-1991 (only 1 lag is used)

	Independent variable		
Dependent variable	lag high	lag low	F - statistics
Small: high	0.1650	0.0076	
			5.44[b]
Small: low	0.0859	-0.0216	
Medium: high	0.1567	-0.0433	
			20.35[a]
Medium: low	0.1524	-0.0190	
Large: high	0.1121	-0.0337	
			26.72[a]
Large: small	0.1438	-0.0508	

[a] significant at the 1% level.

[b] significant at the 5% level.

Table 7a

Subperiod 1984-1991: (only 1 lag is used)

	Independent variable		
Dependent variable	lag high	lag low	F - statistics
Small: high	0.1678	-0.0386	
			11.70[a]
Small: low	0.0419	0.0015	
Medium: high	0.1877	-0.1151	
			53.34[a]
Medium: low	0.1513	-0.0416	
Large: high	0.1275	-0.0716	
			25.40[a]
Large: small	0.1108	-0.0633	

[a] significant at the 1% level.
[b]significant at the 5% level.

Table 7b

Subperiod 1992-1998: (only 1 lag is used)

	Independent variable		
Dependent variable	lag high	lag low	F - statistics
Small: high	0.1618	0.0372	
			6.40[a]
Small: low	0.1363	-0.0479	
Medium: high	0.1213	0.0387	
			5.22[b]
Medium: low	0.1537	0.0070	
Large: high	0.0945	0.0097	
			22.06[a]
Large: small	0.1815	-0.0365	

[a] significant at the 1% level.
[b] significant at the 5% level.

Table 8

Each year, capitalization-sorted ADR securities are further sorted into three equal-size portfolios by the fraction of shares held by institutional investors. Using the CRSP ADR data, the mean daily nontrading frequency for portfolios with low and high institutional ownership within each capitalization group from 1984 to 1991 and from 1992 to 1998 are given.

Table 8a: 1984-1991 subperiod

Daily non-trading:

	Low institutional ratio	High institutional ratio	t-statistic
Small	0.2668	0.0821	2.77[a]
Medium	0.2789	0.0780	4.51[a]
Large	0.2090	0.0560	3.54[a]

Table 8b: 1992-1998 subperiod

Daily non-trading:

	Low institutional ratio	High institutional ratio	t-statistic
Small	0.1091	0.0291	3.02[a]
Medium	0.1062	0.0034	5.54[a]
Large	0.0592	0.0002	5.51[a]

Table 9

Each year, capitalization-sorted ADR securities are further sorted into three equal-size portfolios by the fraction of shares held by institutional investors. Using the CRSP ADR data, the mean prices for portfolios with low and high institutional ownership within each capitalization group from 1984 to 1991 and from 1992 to 1998 are given.

Table 9a: 1984-1991 subperiod

Price:

	Low institutional ratio	High institutional ratio	t-statistic
Small	12.44	17.99	-3.29[a]
Medium	23.56	29.63	-1.46
Large	49.74	44.66	0.95

Table 9b: 1992-1998 subperiod

Price

	Low institutional ratio	High institutional ratio	t-statistic
Small	11.93	24.54	-8.36[a]
Medium	17.80	32.70	-9.93[a]
Large	42.52	48.60	-3.78[a]

Table 10

Each year, capitalization-sorted ADR securities are further sorted into three equal-size portfolios by the fraction of shares held by institutional investors. Using the CRSP ADR data, the mean standard deviation of daily returns for portfolios with low and high institutional ownership within each capitalization group from 1984 to 1991 and from 1992 to 1998 are given.

Table 10a: 1984-1991 Subperiod

Standard deviation of return:

	Low institutional ratio	High institutional ratio	t-statistic
Small	0.0255	0.0287	-1.48
Medium	0.0215	0.0216	-0.03
Large	0.0210	0.0174	1.80

Table 10b: 1992-1998 Subperiod

Standard deviation of return

	Low institutional ratio	High institutional ratio	t-statistic
Small	0.0375	0.0289	1.97
Medium	0.0245	0.0216	1.04
Large	0.0196	0.0184	0.59

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ESSAY THREE: NOISE, INVESTOR SENTIMENT, AND INSTITUTIONAL INVESTORS IN THE ADRS MARKET

I. INTRODUCTION

Fischer Black (1986) suggests that noise is as influential as information in financial markets. Investors who trade on noise are willing to trade even though it is better for them not to trade. They do so because they think the noise on which they base their trading is information.

From existing literature, we can identify three possible effects of noise on securities trading. First, market noise leads to the existence of noise trader risk. De Long, Shleifer, Summers, and Waldmann (1990) develop a noise trader risk model which argues that when investment decisions are made based on market noise, the decisions are irrational and unpredictable because they are led by investor sentiment in general. Hence, noise traders become a source of risk in the finanical markets. Second, the existence of noise in capital markets provides an opportunity for informed institutional investors to exploit their information advantage. Barclay and Warner (1993) show that informed institutional investors are more likely to engage in "stealth trading" strategies in which the institutions spread their trades gradually over time. Third, the irrational behavior of noise traders in a noisy market may cause asset prices to move away from their fundamental values and destabilize the market. On the other hand, rational institutional investors would take positions opposite to those of the noise traders and help stabilize the

market despite De Long et al. (1990) predict that institutional investors would fail to totally encounter the irrational activities of noise traders.

We examine the three possible effects of noise in the ADRs market. Our results show that ADR return is affected by investor sentiment in the ADRs market. ADR return increases (decreases) when investors are irrationally optimistic (pessimistic). We also find that in the low-noise period, ADRs with high institutional ownership exhibit autocorrelation similar to ADRs with low institutional ownership. However, in the high-noise period, ADRs with high institutional ownership exhibit significant higher autocorrelation than ADRs with low institutional ownership. The result implies institutional investors may have engaged in stealth trading to expolit a noisy market. Through a Granger causality regression, we find that returns on ADR portfolios with high institutional ownership lead the returns of those with low institutional ownership in the low-noise period, confirming that institutional trades reflect market information that is ultimately incorporated into other securities. Finally, we find that institutional investors help reduce volatilities of European ADRs returns. However, for ADRs from Asia and South America, the magnitude of the stabilizing arbitrage positions taken by institutional investors is insignificant.

The rest of the paper is organized as follows: In section I we briefly review the literature and discuss our motivation. In section II we describe the data and define the salient variables. In section III we discuss and present results on the effect of noise trader risk (investor sentiment) on ADR return. In sections IV and V we discuss and present results on ADR return autocorrelation and the cross-predictability of ADR portfolio returns as evidence of informed institutional investors' exploitation of their information

advantage in a noisy market. In section VI we examine the influence of institutional investors on stabilzing or destabilzing volatilities in the ADRs returns. In section VII we present a brief summary and conclusions.

II. LITERATURE AND MOTIVATION

Theoretical paper hypothesizing the existence of noise trading are handful (for example, Black (1986), Trueman (1988), De Long et al. (1989), (1990), Palomino (1996)). While Black (1986) does not give a reason why investors would rationally want to engage in noise trading, he asserts that it must account for an important fraction of total trading in securities markets. Trueman (1988) suggests that an investment manager has incentive to engage in noise trading because of the positive signal about his ability to collect private information. De Long et al. (1990) develop a noise trader risk model in which irrational noise trader sentiment drives security prices from their fundamental values. Noise traders are primarily individual investors given that they are on average less capable of gathering and interpreting information accurately. Their tendency to trade according to their sentiment renders their investment behavior totally unpredictable. According to the model, assets subject to unpredictable changes in investor sentiment must be underpriced in the market relative to their fundamental values. An application of this argument is the discounts of closed-end funds. A high level of noise trader risk is associated with large closed-end fund discounts, and a low level of noise trader risk is assoicated with small closed-end fund discounts. Moreover, movements in closed-end fund discounts result primarily from individual investors' irrational, but correlated trading patterns. Though De Long, Shleifer, Summers, and Waldmann (1990) suggest that rational institutional investors will take positions to offset the irrational tradings of individual investors, they also predict institutional investors would fail to fully offset the irrational behavior of individual investors.

Empirical studies providing direct evidence of noise trading are few. Golec (1997) examine bond activities of retailers after the release of weekly retail statistics by Johnson Reebok Service and find direct evidence that bond traders indeed trade on noise. Lee, Shleifer, and Thaler (1991) provide indirect evidence of noise trading by showing a significant link between investor sentiment and discounts of closed-end funds. They show that fluctuations in discounts of closed-end funds reflect changes in investor sentiment. That is, widening(narrowing) discounts reflect the irrational pessimism(optimism) of individual investors. Barclay and Warner (1993) confirm the presence of information-based stealth trading among institutional investors and thus provide indirect evidence of the existence of market noise. Regarding market destablization, the traditional theoretical view is that asset prices do not deviate significantly from their fundamental values as a result of noise trading. It is argued that incentives exist for skillful, rational speculators to compete against noise traders, and that these speculators are the marginal, price-setting investors (for example, see Friedman (1953), and Fama (1965)). However, De Long et al. (1990) suggest that asset prices can be much more volatile than traditioanl models would allow because rational arbitrageurs with short horizons will not offset noisy variations in asset price today because of the self-fulling belief that asset prices will vary unpredictably with market noise in future. In addition, De Long et al. (1990) further suggest that the noise trader risk caused by investor sentiment can be systematic and renders rational arbitrages ineffective. Palomino (1996) echos this suggestion by saying that nosie traders are agents with unpredicatble beliefs and that the willingness of arbitrageurs to exploit noise traders' misconceptions is low in a capital market that is less than perfect. Empirical evidence on whether irrational

(noise traders) investors destabilize financial markets or rational (institutional investors) traders stabilize markets in a noisy envirnoment is, however, lacking.

While theoretical papers on noise trading are handful, empirical literature is rare and indirect. As such, this study examines the effects of noise in the American Depository Receipts (ADRs) market. The ADRs market presents an interesting scenerio for studying this topic because of the following reasons. First, Patro (2000) shows that home-country information has a significant impact on ADR return. Given the difficulty in getting accurate information from foreign countries, investors in ADRs market are likely to subject to a considerable amount of market noise. Second, institutions are major players in the ADRs market. Examining the behavior of institutional investors in the noisy ADRs market thus provides evidence on whether informed institutional investors exploit their information advantage through stealth trading. Third, the simultanoues presence of noise and informed investors in the ADRs market allows us to investigate if the interactions between noise traders and rational investors stabilize or destabilize the market. In short, the ADRs market presents an unique environment in which we can examine the above-mentioned effects of noise directly and simultaneously, rather than indirectly and separately, in a noisy environment.

III. DATA AND VARIABLES DEFINITIONS

The sample analyzed in this study contains ADRs from 1995 to 2000.The sample period starts from 1995 because complete information about monthly discounts of the closed-end country funds is available from the *Standard and Poor's Security Owners' Stock Guide* only after 1995. Daily returns of ADRs are obtained from the Center for Research in Security Prices (CRSP) database and converted into monthly returns. The numbers of shares held by institutional investors and shares outstanding are obtained from the *Standard and Poor's Security Owners' Stock Guide.* The market equity capitalization is determined by multiplying price with number of outstanding shares of the ADR.

The ADRs are grouped into three portfolios based on their continent of origin: Asia, Europe, and South America. Each continent's ADR portfolio is further divided into two groups, those with high institutional ownership and those with low institutional ownership.

The following table shows the sample distribution by year:

ADR distribution by year

Year	Number of Asian ADRs	Number of European ADRs	Number of South American ADRs
1995	33	75	56
1996	44	95	60
1997	46	123	72

1998	50	127	71
1999	54	129	73
2000	56	132	74

De Long, Shleifer, Summers, and Waldmann (1990) and Lee, Shleifer, and Thaler (1991) have used the terms 'noise trader risk' and 'investor sentiment' interchangeably. Following Lee, Shleifer, and Thaler (1991), we use the change in closed-end fund discount (Δ discount) to measure the amount of noise trader risk. The discount of each fund is the difference between the fund's net asset value and its price divided by the net asset value. By grouping all the closed-end country funds in the US into Asian, European, and South American funds, the average change in discount of the funds in each group serves as a proxy for investor sentiment regarding the investment outlook of the continent. According to Lee, Shleifer, and Thaler (1991), a widening of the discounts implies investors are more pessimistic whereas a narrowing of the discounts implies investors are more optimistic. Noise trader risk or investor sentiment refers to the irrational behavior of investors. Noise trader risk, however, is not exactly the same as the market noise described by Black (1986). In the words of Fisher Black, "I use the word "noise" in several senses. Noise is contrasted with information. Noise is what makes our observations imperfect. Noise is the arbitrary element in expectations." That is, noise is something that is anti-information and thus not investor sentiment per se.

The literature has not yet developed a proxy to measure noise in the investment markets. In this study, we propose to use the level of closed-end fund discount as a proxy

for market noise. Our reason is that in a noisy market, noise trader risk would be high because investor sentiment may change more abruptly in such an environment. In a less noisy market, noise trader risk would be low because there are less stimulus to cause investor sentiment to shift suddenly. Given that the change in closed-end fund discount (Δ discount) would be higher (lower) when the level of closed-end fund discount is high (low), it is reasonable to suggest that the level of closed-end fund discount could serve as a proxy for market noise. A large discount implies the market is noisy, and a small discount implies the market is less noisy.[1] For each ADR group, each year can be classified as either a high-noise year or low-noise year based on whether the discount is larger or smaller than the median. The average discounts in the high-noise period and low-noise period for Asia, Europe and South America are shown in the following table, and the F-statistic is calculated to test the null hypothesis that the mean discounts in the high-noise and low-noise periods are equal.

Closed-end country funds discounts in high-noise and low-noise periods

Continent	Average Discount (Low-noise period)	Average Discount (High-noise period)	F-statistic
Asia	3.8154	11.4722	20.44[a]
Europe	14.9132	16.1234	2.52
South America	9.7370	22.4369	46.38[a]

IV. THE EFFECT OF INVESTOR SENTIMENT AND INSTITUTIONAL INVESTORS ON ADR RETURN

Investing in ADRs provide a convenient way for diversifying portfolio risk internationally. The ADRs market has experienced an explosive growth in the last 30 years. In 1970, there are only 18 ADRs traded in the U.S. In the year 2000, the number of listed ADRs had increased to 475. Although the ADRs market is dominated by institutional investors, the difficulty of obtaining accurate and complete information from foreign countries suggests that influence of noise can be considerable in this market.

To study the effects of investor sentiment and institutional ownership in the ADRs market, the following regression is performed:

$$R_t = a_0 + a_1 R_{t-1} + a_2 \Delta \text{ Discount}_t + a_3 \Delta \text{ Institutional Ownership}_t + \varepsilon_t$$

Where R_t is the compounded monthly ADRs portfolio return at time t for each continent and R_{t-1} is the ADRs portfolio return at time t-1 for each continent. Δ Discount is the difference in the average discount from period t to t-1 on close-end fund for each continent. According to Lee, shleifer, and Thaler (1991), when the change in average discount (Δ Discount) is positive, i.e., the average discount widens, individual investors are more pessimistic and asset returns would be affected negatively. Conversely, when Δ Discount is negative, the individual investors are more optimistic and asset returns would be affected positively. Thus, if investor sentiment is priced in the ADRs market, the coefficient of Δ Discount should be negative and significant. Lee, Shleifer, and Thaler (1991) report a significant negative relationship between the returns of NYSE stocks and the average Δdiscount of a basket of domestic closed-end funds.

ΔInstitutional Ownership is the change in the ratio of institutional ownership between month t and month t-1 for each continent. A priori, we expect ADR return to be positively related to Δinstitutional ownership. That is, ADR return would be higher or lower when institutions increase or decrease their holdings. The R_{t-1} is for controlling the effect for serial correlation in ADR return.

The regression results for each continent are shown in Table I.

<Insert Table I here>

In Table I, it is shown that the coefficients of R_{t-1} are 0.2470, 0.3190, and 0.3870, for Asia, Europe, and South America respectively. The t-statistics are 2.29, 2.74, and 3.68 and all are significant at the 5% level, implying that there is positive autocorrelation in ADRs portfolio return. The coefficient of ΔDiscount is -0.0056 for Asia, -0.0060 for Europe, and -0.0113 for South America. The t-statistics are –4.93, -4.48, and –6.46 respectively. All the t-statistics are significant at the 1% level. That is, ADR return is affected by investor sentiment in the ADRs market. When investor sentiment becomes irrationally optimistic or pessimistic, as reflected by a narrowing or widening of the discount of closed-end country funds, ADR return of the same continent moves higher and lower correspondingly. The result is consistent with that of Lee, Shleifer, and Thaler (1991). For both Asia and South America, the coefficients of ΔInstitutional Ownership are positive and significant, that is, changes in institutional ownership are positively related to the ADRs portfolio returns. The coefficient of ΔInstitutional Ownership is also positive for Europe, though insignificant. It is possible that given information about

European countries is more accessible than that of Asia and South American, the role of institutional ownership of European ADRs is therefore less influential. This conjecture is consistent with our earlier observation that the noise levels of the high-noise and low-noise periods are similar for Europe.

In the noise trader risk model of DeLong, Shleifer, Summers, and Waldmann (1990), they suggest that rational institutional investors may exploit irrational behavior of noise traders by taking positions opposite to those of the noise traders. However, the model also predicts that institutional investors would not be completely successful because noise trader risk can be systematic and renders the arbitrage activities of institutional investors futile. The significantly negative coefficients of ΔDiscount in Table I support the postulations of the noise trader risk model of DeLong, Shleifer, Summers, and Waldmann (1990). That is, investor sentiment has a significant effect even in the presence of rational institutional investors. In other words, institutional investors are unable to neutralize the effect of trading led by irrational investor sentiment.

Table I shows that noise trader risk is important even in the presence of institutional investors. It would be of interest to know then if the impacts of investor sentiment and institutional ownership on the ADR return are different in the high-noise and low-noise periods. To study this, we further classify the years in which the discount is larger than the median as high-noise years and those years in which the discount is smaller than the median as low-noise years for each continent. Regression results are shown in Table II.

<Insert Table II here >

Table II shows that investor sentiment is important in determining ADR return in both the high-noise and low-noise periods. However, change in institutional ownership has a significant impact on the returns of Asian and South American ADRs only during the high-noise period. Institutional ownership is not significant at all in the low-noise period. Conceivably, when the market is noisy, the information possessed by institutional investors becomes more important. During low-noise period, the information advantage of institutional investors may not be significant. This is probably why institutional ownership does not play a significant role in the pricing of European ADRs in both the high-noise and low-noise periods because information about European markets is more accurate and readily available to investors.

V. MARKET NOISE AND ADR RETURN AUTOCORRELATION

Table I and II show that noise trader risk is present in the ADRs market. If the ADRs market were noisy, then the private information of institutional investors would be valuable and it is logical that institutional investors will exploit their informational advantage. One possible way to do so is the use of "stealth trading" strategies in which the institutions spread their trades gradually over time. According to Barclay and Warner (1993), stealth trading would induce ADR return autocorrelation. While insitutional investors may stealth trade frequently in the ADRs market, we expect the likelihood is higher in the high-noise period than the low-noise period. Thus, we expect that in the high-noise period, ADRs with high institutional ownership would exhibit significant higher autocorrelation than ADRs with low institutional ownership. In the low noise period, ADRs with high institutional ownership would exhibit similar or higher autocorrelation than ADRs with low institutional ownership. The return autocorrelations of all individual ADRs in the high-noise and low-noise periods are shown in Table III.

<Insert Table III here >

Panel A of Table III shows that in the low-noise period, for both Asia and South America, ADRs with high institutional ownership exhibit autocorrelations simialr to ADRs with low institutional ownership. For Asia, the mean daily autocorrelations for individual ADRs with low institutional ownership and high institutional ownership are 0.0040 and 0.0164 respectively. The t-statistic is 0.46 and not significant. For South

America, the mean daily autocorrelations for individual ADRs with low institutional ownership and high institutional ownership are 0.0185 and 0.0391 respectively. The t-statistic is 1.06 and not significant. For Europe, ADRs with high institutional ownership exhibit higher autocorrelation than ADRs with low institutional ownership.

For the high-noise period, panel B of Table III shows that ADRs with high institutional ownership exhibit significant higher autocorrelation than ADRs with low institutional ownership for Asia, Europe, and South America. For Asia, the mean daily autocorrelations for individual ADRs with low institutional ownership and high institutional ownership are –0.0030 and 0.0504 respectively. The t-statistic is 10.6, significant at the 1% level. For Europe, the mean daily autocorrelations for individual ADRs with low institutional ownership and high institutional ownership are –0.0169 and 0.0311 respectively. The t-statistic is 16.26 and significant at the 1% level. For South America, similar results are obtained.

In sum, the results in table III support our earlier conjecture that institutional investors exploit their information advantage in the noisy ADRs market.

VI. CROSS-PREDICTABILITY OF ADR PORTFOLIO RETURNS IN HIGH-NOISE AND LOW-NOISE PERIODS

From the above, we see that noise is present in the ADRs market and institutional investors react differently in high-noise and low-noise environments. In order to confirm that institutional trades contain information not found in non-institutional trades, a Granger causality regression model is used. For each continent's ADR portfolio the following regressions are performed for the high-noise and low-noise periods separately:

$$R_{high,t} = \sum_{i=1}^{5} a_i d_{i,t} + \sum_{k=1}^{5} \left(a_{high,k} R_{high,t-k} + a_{low,k} R_{low,t-k} \right) + u_{high,t}. \quad (1)$$

$$R_{low,t} = \sum_{i=1}^{5} b_i d_{i,t} + \sum_{k=1}^{5} \left(b_{high,k} R_{high,t-k} + b_{low,k} R_{low,t-k} \right) + u_{low,t}. \quad (2)$$

Where $R_{high,t}$ and $R_{low,t}$ are the returns at time t for ADR portfolios with high and low institutional ownership, the $d_{i,t}$ are dummy variables for each day of the week i, k is the lag in days and u is the error term.

According to Brennan et al. (1993), portfolios that are first to reflect marketwide information have a better ability to predict the returns of portfolios that are late to reflect marketwide information than the ability of the latter to predict the former. That is, if institutional investors trade on information, returns on portfolios with high institutional ownership should lead the returns of those portfolios that have low institutional ownership.

For both the low-noise period and the high-noise periods, we expect returns on ADR portfolios with high institutional ownership to lead the returns of those with low

institutional ownership if institutions trade on information. That is, we expect $R_{high,t-k}$ to predict $R_{low,t}$ better than $R_{low,t-k}$ to predict $R_{high,t}$. In the Granger causality regressions, we therefore expect $b_{high,k}$ to be larger than $a_{low,k}$.

<Insert Table IV here >

Panel A of Table IV shows that in the low-noise period, returns on ADR portfolios with high institutional ownership lead the returns of those with low institutional ownership for all three continents. For Asia, a_{low} is 0.0172, and b_{high} is 0.0770. For Europe, a_{low} is -0.0104, and b_{high} is 0.0351. For South America, a_{low} is -0.0290, and b_{high} is 0.0825. For each continent, a_{low} is less than b_{high}. The F-statistics, Wilcoxon Z - values, and Kruskal-Wallis Chi-squares are all significant at the 5% level. These results show that the ability of $R_{high,t-k}$ to predict $R_{low,t}$ is much greater than the ability of $R_{low,t-k}$ to predict $R_{high,t}$. That is, even though the market noise is low relatively speaking, ADR portfolios with high institutional ownership still reflect marketwide information sooner than ADR portfolios with less institutional ownership.

In the high-noise period, we observe interesting and unexpected results. The returns of high institutional ownership ADR portfolios do not lead the returns of those with low institutional ownership in Asia and South America. For Asia, a_{low} is 0.0031, and b_{high} is 0.0213. For South America, a_{low} is 0.0385, and b_{high} is 0.0807. In both cases, the F-statistics, Wilcoxon Z values, and Kruskal-Wallis Chi-squares are not significant.

These results mean that we cannot reject the null hypothesis that $b_{high} = a_{low}$, that is, the ability of $R_{high,t-k}$ to predict $R_{low,t}$ is not much greater than the ability of $R_{low,t-k}$ to predict $R_{high,t}$. There are two possible reasons for these results. One reason may be that in the high-noise period, institutions deliberately divulge their information very slowly over time through stealth trading, making their information advantage less useful for others to predict returns. This is consistent with our earlier results in Table III that insitutions stealth trade particularly in the high-noise period. The other possible reason is that in the high-noise period risk exposure is conceivably higher for investments in Asian and South American ADRs, institutional investors may be affected by their risk concern such that their ability to impound information in ADR prices is affected. Sias and Stark (1997) suggest that if institutional investors are motivated to trade for reasons not assoicated with information, then there is no reason to expect the returns on portfolios with high institutional ownership to lead the returns on portfolios with low institutional ownership. For European ADRs, the risk is conceivably lower than those of Asian and South American ADRs, returns on portfolios with high institutional ownership lead the returns on portfolios with low institutional ownership because institutional investors' ability to impound information in ADR prices is less affected by risk concern. This conjecture regarding the concern of risk by institutional investors is consistent with the results in the following section.

VII. THE EFFECT OF INSTITUTIONAL INVESTORS IN ADRS MARKET : DESTABILIZING OR STABILIZING?

The above results demonstrate that the ADRs market is noisy. ADRs prices may move away from their fundamental values as investment decisions are led by investor sentiment. One observable consequence is that the ADR return volatility would be higher in the high-noise period. This is confirmed by the numbers in the following table, implying noise traders destabilize financial markets.

	ADR Return Volatility		
	Low-noise	High-noise	T-statistic
Asia	0.0230	0.0308	-13.96[a]
Europe	0.0232	0.0269	-14.66[a]
South America	0.0282	0.0347	-10.81[a]

De Long, Shleifer, Summers, and Waldmann (1990) suggest that rational investors such as institutions will offset, though incomplete, the irrational activities of the noise traders. Given such postulation, the next logical question is whether institutional investors help destabilize or stabilize volatility of the ADRs market. The following regression is performed to answer this question.

$$\delta_{it}^2 = a0 + a1\,\delta_{i,t-1}^2 + a2\,(\Delta \text{ Discount})_t + a3\,(\Delta \text{ Institutional Ownership})_t + \varepsilon_t$$

where δ_{it}^2 is the volatility of the ADR return in time period t for each portfolio, and $\delta_{i,t-1}^2$ is the volatility of the ADR return in time period t–1.

<Insert Table V here>

Table V shows that for Europe, the coefficient of the change in institutional ownership is –0.8370 and it is significant at the 5% level, that is, institutional investors is negatively related to the volatility of the stock return. This result means that institutional investors contribute to stabilize the market of European ADRs. That is, institutions have helped offset the irrational behavior of noise traders. The coefficients of the change in institutional ownership for Asia and South America, on the other hand, are negative but insignificant. That is, institutional investors have no significant effect on the volatilities of these two continents' ADRs. The results in Table V deserve some explanations.

In finance literature, it is well known that rational investors arbitrage and bring prices closer to fundamental values. The effectiveness of arbitrageurs however relies crucially on the stabilizing powers of rational speculation. Some studies have questioned the effectiveness of such speculation in the presence of risk aversion. For example, DeLong, Shleifer, Summers, and Waldmann (1987) show that the unpredictability of noise traders' beliefs creates a risk that deters rational arbitrageurs from aggressively betting against them, and rational speculation is thus less effective. Figlewski (1979) also shows that it might take a very long time for noise traders to lose most of their money if rational investors must bear fundamental risk in betting against them, and such fundamental risk deters rational speculation. Both of these two papers suggest that the

magnitude of the stabilizing arbitrage positions taken by rational investors might be limited. Investors may regard Asia and South America as more risky when compared with Europe, and rational investors are therefore less likely to counter the unpredictable noise trader risk in Asia and South America. Thus, the magnitude of the stabilizing arbitrage positions taken by rational investors might be small and insignificant in both Asia and South America.

The coefficients of ΔDiscount are all negative, though only significant for Asia and South America. That is, noise trader risk affects ADRs volatility. This is consistent with DeLong, Shleifer, Summers, and Waldmann (1990) that noise trading is a source of risk in financial markets.

We also perform the above regression for both the high-noise period and the low-noise period, and the results are shown in Table VI.

<Insert Table VI here>

Results similar to those of Table V are found. Table VI shows that for Europe, the coefficients of the change in institutional ownership are negative and significant in both the high-noise and low-noise periods. Again, this may be due to the lesser degree of risk aversion among arbitragers in this market. For Asia and South America, the coefficients of the change in institutional ownership are not significant in either the high-noise period or the low-noise period. For Asia and South America, the aversion to risk greatly limits rational investors' willingness to bet against noise traders in both the high-noise and low-noise periods.

VIII. SUMMARY AND CONCLUSIONS

This study examines the effects of noise in the American Depository Receipts (ADRs) market. From existing literature, we can identify three possible effects of noise on securities trading. First, market noise leads to the existence of noise trader risk. Second, the existence of noise in capital markets provides an opportunity for informed institutional investors to exploit their information advantage. Third, the irrational behavior of noise traders in a noisy market may cause the market to destabilize, though rational institutional investors would take positions opposite to those of the noise traders and help stabilize the market. We examine the three possible effects of noise in the ADRs market. The ADRs market presents an unique environment in which we can examine the above-mentioned effects of noise directly and simultaneously in a noisy environment.

Our results show that the ADR return is affected by investor sentiment in the ADRs market. ADR return increases (decreases) when investors are irrationally optimistic (pessimistic). We also find that in the low-noise period, ADRs with high institutional ownership exhibit autocorrelation similar to ADRs with low institutional ownership. However, in the high-noise period, ADRs with high institutional ownership exhibit significant higher autocorrelation than ADRs with low institutional ownership. The result implies institutional investors may have engaged in stealth trading. Through a Granger causality regression, we find that returns on ADR portfolios with high institutional ownership lead the returns of those with low institutional ownership in the low-noise period, confirming that institutional trades reflect market information

ultimately incorporated into other stocks. Finally, we find that rational investors help stabilize ADRs market in Europe. However, for Asia and South America, the magnitude of the stabilizing arbitrage positions taken by rational investors is insignificant.

ENDNOTES

1. Since noise and ΔDiscount may be correlated and cause selection bias, we perform tests for difference in means of ΔDiscount between the high-noise and low-noise periods for each of the ADR portfolios. All the test statistics are insignificant, showing no selection bias.

TABLE I

Each year, all ADRs are grouped into three portfolios based on their country of origin: Asia, Europe, and South America. R_t is the ADRs portfolio return at time t for each continent and R_{t-1} is the ADRs portfolio return at time t-1 for each continent. We also group all the closed-end country funds in US into Asian, European, and South American funds. The discount is the difference between the fund's net asset value and its price divided by the net asset value. The discount of each continent is the average discount of the funds in each group, and Δ Discount is the difference of discount between month t and month t-1 for each continent. Δ Institutional Ratio is the change of the average institutional ownership between month t and month t-1 for each continent.

$$R_t = a_0 + a_1 R_{t-1} + a_2 \Delta \text{ Discount}_t + a_3 \Delta \text{ Institutional Ownership}_t + \varepsilon_t$$

	Intercept	R_{t-1}	Δ Discount	Δ Institutional Ownership	Adjusted R-square
All ADRs	0.0043	0.3110	-0.0075	1.2690	0.3020
	(0.92)	(5.02[a])	(-9.19[a])	(2.01[b])	
Asia	-0.0166	0.2470	-0.0056	3.5100	0.2910
	(-1.23)	(2.29[b])	(-4.93[a])	(2.10[b])	
Europe	0.0094	0.3190	-0.0060	0.7130	0.2410
	(1.79)	(2.74[a])	(-4.48[a])	(1.28)	
S.America	0.0058	0.3870	-0.0113	4.4090	0.3820
	(0.67)	(3.68[a])	(-6.46[a])	(1.67[c])	

[a] significant at the1% level.

[b] significant at the 5% level.

[c] significant at the 10% level.

TABLE II

Each year, all ADRs are grouped into three portfolios based on their country of origin: Asia, Europe, and South America. R_t is the ADRs portfolio return at time t for each continent and R_{t-1} is the ADRs portfolio return at time t-1 for each continent. We also group all the closed-end country funds in US into Asian, European, and South American funds. The discount is the difference between the fund's net asset value and its price divided by the net asset value. The discount of each continent is the average discount of the funds in each group, and Δ Discount is the difference of discount between month t and month t-1 for each continent. We further classify the years in which the discount is larger than the median as high-noise years and those years in which the discount is smaller than the median as low-noise years for each continent. The regressions are performed in both the low-noise and high-noise periods.

$$R_t = a_0 + a_1 R_{t-1} + a_2 \Delta \text{ Discount}_t + a_3 \Delta \text{ Institutional Ownership}_t + \varepsilon_t$$

A: Low-noise period:

	Intercept	R_{t-1}	Δ Discount$_t$	Δ Institutional Ownership	Adjusted R-square
All ADRs	-0.0003	0.2990	-0.0056	1.5230	0.25
	(-0.01)	(3.41[a])	(-5.33[a])	(1.60)	
Asia	-0.0022	0.4710	-0.0029	2.1500	0.22
	(-0.15)	(3.20[a])	(-2.38[a])	(1.16)	
Europe	0.0159	0.4050	-0.0037	0.7800	0.28
	(0.39)	(2.69[a])	(-2.14[a])	(1.09)	
S.America	0.0132	0.4320	-0.0110	7.6920	0.39
	(0.98)	(2.88[a])	(-4.25[a])	(1.36)	

[a] significant at the1% level.

[b] significant at the 5% level.

[c] significant at the 10% level.

TABLE II (Continued)

B: High-noise period:

	Intercept	R_{t-1}	Δ Discount$_t$	Δ Institutional Ownership	Adjusted R-square
All ADRs	-0.0092	0.1880	-0.0080	1.8460	0.25
	(-1.24)	(2.15[b])	(-5.79[a])	(1.98[b])	
Asia	-0.0343	0.0456	-0.0072	5.5660	0.30
	(-1.59)	(0.72)	(-3.61[a])	(2.01[b])	
Europe	0.0039	0.2500	-0.0060	0.4590	0.19
	(0.50)	(1.52)	(-3.22[a])	(0.61)	
S.America	-0.0242	0.0686	-0.0094	8.0250	0.24
	(-1.54)	(0.36)	(-3.05[a])	(2.02[b])	

[a] significant at the1% level.
[b] significant at the 5% level.
[c] significant at the 10% level.

Table III

Each year, all ADRs are grouped into three portfolios based on their country of origin: Asia, Europe, and South America. Each continent's ADR portfolio is further divided into those with high institutional ownership and those with low institutional ownership. We also group all the closed-end country funds in US into Asian, European, and South American funds. The discount is the difference between the fund's net asset value and its price divided by the net asset value. The discount of each continent is the average discount of the funds in each group. We further classify the years in which the discount is larger than the median as high-noise years and those years in which the discount is smaller than the median as low-noise years for each continent. The mean daily return autocorrelations for individual ADRs in both the high-noise period and the low-noise period are reported. The t-statistic is calculated to test the null hypothesis that the mean daily return autocorrelation of individual ADRs with high institutional ownership is equal with the mean daily return autocorrelation of individual ADRs with low institutional ownership.

A: Autocorrelation of individual ADRs in the low noise period:

	Low institutional ownership ratio	High institutional ownership ratio	t-statistic
Asia	0.0040	0.0164	0.46
Europe	-0.0215	0.0419	20.42[a]
South America	0.0185	0.0391	1.06

B: Autocorrelation of individual ADRs in the high noise period:

	Low institutional Ownership ratio	High institutional ownership ratio	t-statistic
Asia	-0.0030	0.0504	10.61[a]
Europe	-0.0169	0.0311	16.26[a]
South America	0.0383	0.0767	5.68[a]

[a] significant at the1% level.

TABLE IV

Each year, all ADRs are grouped into three portfolios based on their country of origin: Asia, Europe, and South America. Each continent's ADR portfolio is further divided into those with high institutional ownership and those with low institutional ownership. We also group all the closed-end country funds in US into Asian, European, and South American funds. The discount is the difference between the fund's net asset value and its price divided by the net asset value. The discount of each continent is the average discount of the funds in each group. We further classify the years in which the discount is larger than the median as high-noise years and those years in which the discount is smaller than the median as low-noise years for each continent. The daily return of each continent portfolio with high (low) institutional ownerships is regressed on its own previous five returns and the previous five returns for the same continent portfolio with low (high) institutional ownerships in both the high-noise period and the low-noise period. The sums of the coefficients are reported below. The F-statistic is calculated to test the null hypothesis that the ability of the lagged return on the high institutional portfolio to predict the return on the same continent portfolio with low institutional ownership is the same as the ability of the lagged return on the low institutional portfolio to predict the return on the high institutional portfolio of the same continent in both the high-noise period and the low-noise period. Wilcoxon t Z value, and Kruskal-Wallis Chi-square are also shown in Table IV.

$$R_{high,t} = \sum_{i=1}^{5} a_i d_{i,t} + \sum_{k=1}^{5} \left(a_{high,k} R_{high,t-k} + a_{low,k} R_{low,t-k} \right) + u_{high,t}. \qquad (1)$$

$$R_{low,t} = \sum_{i=1}^{5} b_i d_{i,t} + \sum_{k=1}^{5} \left(b_{high,k} R_{high,t-k} + b_{low,k} R_{low,t-k} \right) + u_{low,t}. \qquad (2)$$

A: Low-noise period:

	Dependent Variable	$R_{high,t-k}$ (Independent variable)	$R_{low,t-k}$ (Independent variable)	F-statistic	Wilcoxon Z-value	Kruskal-Wallis Chi-square
Asia	$R_{high,t}$	0.0500	0.0172	4.46[b]	1.87[b]	3.58[b]
Asia	$R_{low,t}$	0.0770	-0.0247			
Europe	$R_{high,t}$	0.0458	-0.0104	5.20[b]	2.10[b]	4.50[b]
Europe	$R_{low,t}$	0.0351	-0.0316			
S.Am	$R_{high,t}$	0.0518	-0.0290	5.47[b]	1.74[b]	3.11[c]
S.Am	$R_{low,t}$	0.0825	-0.0555			

TABLE IV (Continued)

B: High-noise period:

	Dependent Variable	$R_{high,t-k}$ (Independent variable)	$R_{low,t-k}$ (Independent variable)	F-statistic	Wilcoxon Z-value	Kruskal-Wallis Chi-square
Asia	$R_{high,t}$	0.0474	0.0031	0.44	0.71	0.53
Asia	$R_{low,t}$	0.0213	0.0088			
Europe	$R_{high,t}$	0.0369	-0.0030	3.81[b]	1.52[c]	2.36[c]
Europe	$R_{low,t}$	0.0561	-0.0092			
S.Am	$R_{high,t}$	0.0713	0.0385	0.62	0.21	0.05
S.Am	$R_{low,t}$	0.0807	0.0183			

[a] significant at the 1% level.
[b] significant at the 5% level.
[c] significant at the 10% level.

Table V

Each year, all ADRs are grouped into three portfolios based on their country of origin: Asia, Europe, and South America. We also group all the closed-end country funds in US into Asian, European, and South American funds. The discount is the difference between the fund's net asset value and its price divided by the net asset value. The discount of each continent is the average discount of the funds in each group. The volatility of the return for time t for each portfolio is then regressed on the volatility of the return for time t −1, the difference of discount between month t and month t-1 for each continent (Δ Discount), and the change of the institutional ownership between month t and month t-1 for each portfolio (Δ Institutional Ratio).

$$\delta_{it}^2 = a0 + a1\,\delta_{i,t-1}^2 + a2\,(\Delta \text{ Discount})_t + a3\,(\Delta \text{ Institutional Ownership})_t + \varepsilon_t$$

	Intercept	$\delta_{i,t-1}^2$	Δ Discount	Δ Institutional Ownership	Adjusted R-square
Asia	0.0518	0.4750	-0.0033	1.8900	0.3270
	(3.48)	(4.72[b])	(-3.76[a])	(1.43)	
Europe	0.0569	0.5090	-0.0011	-0.8370	0.3870
	(4.43)	(4.71[a])	(-1.40)	(-1.98[b])	
S.America	0.1210	0.3960	-0.0027	-1.1090	0.1790
	(1.82)	(3.60[a])	(-2.53[a])	(-0.58)	

[a] significant at the1% level.

[b] significant at the 5% level.

[c] significant at the 10% level.

Table VI

Each year, all ADRs are grouped into three portfolios based on their country of origin: Asia, Europe, and South America. We also group all the closed-end country funds in US into Asian, European, and South American funds. The discount is the difference between the fund's net asset value and its price divided by the net asset value. The discount of each continent is the average discount of the funds in each group. We further classify the years in which the discount is larger than the median as high-noise years and those years in which the discount is smaller than the median as low-noise years for each continent. The volatility of the return for time t for each portfolio is then regressed on the volatility of the return for time t –1, the difference of discount between month t and month t-1 for each continent (Δ Discount), and the change of the institutional ownership between month t and month t-1 for each portfolio (Δ Institutional Ratio) for both the high-noise period and the low-noise period.

$$\delta_{it}^2 = a0 + a1\,\delta_{i,t-1}^2 + a2\,(\Delta \text{ Discount})_t + a3\,(\Delta \text{ Institutional Ownership})_t + \varepsilon_t$$

A: Low-noise period:

	Intercept	$\delta_{i,t-1}^2$	Δ Discount	Δ Institutional Ownership	Adjusted R-square
Asia	0.0270	0.5650	-0.0037	2.5890	0.42
	(1.24)	(4.07[b])	(-3.17[a])	(1.46)	
Europe	0.0593	0.5460	-0.0005	-1.4290	0.33
	(3.06)	(3.35[a])	(-0.68)	(-2.12[b])	
S.America	0.0342	0.7200	-0.0022	1.9590	0.49
	(1.97)	(5.50[a])	(-2.18[a])	(0.78)	

[a] significant at the1% level.

[b] significant at the 5% level.

[c] significant at the 10% level.

B: High-noise period:

	Intercept	$\delta^2_{i,t-1}$	Δ Discount	Δ Institutional Ownership	Adjusted R-square
Asia	0.0804	0.3290	-0.0035	1.9100	0.19
	(3.93)	(2.06[b])	(-2.31[b])	(0.87)	
Europe	0.0788	0.3100	-0.0014	-1.7020	0.46
	(4.01)	(1.83[c])	(-1.37)	(-2.58[a])	
S.America	0.1180	0.2240	-0.0032	1.6620	0.13
	(4.46)	(1.36)	(-1.83[c])	(0.63)	

[a] significant at the1% level.
[b] significant at the 5% level.
[c] significant at the 10% level.

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