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Does the Japanese Closed-End Fund Puzzle Exist? An Empirical Study of the Efficiency of the Financial Market in Japan

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ABSTRACT

This paper examines the efficiency of the Japanese financial market from the point of divergence of the net asset values of an ETF (Exchange Trade Fund) and its prices. "Discounts," which mean the ETF price is lower than its net asset value per share, were found on the average, and no co-integration relationships between the two variables were observed, implying that arbitrage opportunities exist. Furthermore, a correlation between the changes in the discount rates and the small capital stock index were found, consistent with the Investor Sentiment Hypothesis of the so-called closed end fund puzzle. However, these phenomena were not observed in an ETF (i.e., Standard & Poor's Depositary Receipts traded in the U.S).

JEL Classification: G12, G14, G15

Keywords: Closed end fund puzzle; ETF; Co-integration; Japanese financial market

I. INTRODUCTION

There are a variety of approaches to analyzing the efficiency of financial markets. The so-called closed-end fund puzzle has recently been drawing attention in relation to investment funds. The closed-end fund puzzle refers to the phenomena wherein the net asset value (NAV) of portfolios held by a closed-end fund (a company-type fund) and the trading price of the fund share diverge. Many hypotheses have been formed to explain the divergence of the two, which supposedly should have the same value, and particularly to describe the reason for the "discount," i.e., the fund's trading price falling below the value of its portfolios.

Lee, Shleifer and Thaler (1991), Thaler (1998), and Shleifer (2000) have suggested four major hypotheses that could explain the closed-end fund puzzle[1], as follows: (1) Agency Cost Hypothesis, (2) Non-liquid Assets Holding Hypothesis, (3) Tax Hypotheses, and (4) Investor Sentiment Hypothesis. The Agency Cost Hypothesis in (1) places importance on the high cost of the trust management fees and operating costs, including the execution costs paid to a management company and the costs arising out of potential conflicts of interest between the investors and a management company. It claims that the selling price of a fund is discounted because of these costs. The Non-liquid Asset Holding Hypothesis in (2) above views the portfolios of a fund as containing financial assets with low liquidity, and states that the apparent discount occurs because of excessive valuation of those assets. The Tax Hypothesis in (3) also claims that the fund's portfolio is over-valued because the NAV does not reflect the tax on unrealized capital gains. If this is the case, the bigger the latent gain, the higher the discount level should become. The Investor Sentiment Hypothesis in (4) assumes that there is some kind of constraint on arbitrage between a fund's shares and the portfolio, and states that those elements that affect the demands on a fund, the individual investor sentiment in particular, have something to do with the emergence of and the fluctuations in the discount or premiums.

Lee, Shleifer and Thaler (1991) observed the discount patterns in the funds traded in the U.S. market[2], examined the validity of the four hypotheses, and ultimately supported the Investor Sentiment Hypothesis. Dimon and Minio-Kozerski (1998) provided an overview of arguments regarding the closed-end fund puzzle and analyzed funds traded in the U.K[3].

However, in Japan there has been little research on this subject, because corporate type funds were prohibited before 1998, and have not become popular even though the ban was lifted in 1998[4]. There is, however, a contract-type (not company type) fund called the ETF, the Exchange Traded Fund, e.g., the Nikkei 300 ETF, which was started in 1995 and is similar in structure to the closed-end fund.

The ETF is basically characterized as follows: (1) investment is made only in stocks that are components of an underlying index (the actual stocks are purchased in accordance with the weight of the index); (2) beneficiary certificates are bought and sold at an exchange anytime during market hours; (3) only large investors (e.g., those investing several billion yen) can increase their contribution by putting money into the fund or cancel their contribution by exchanging beneficiary certificates for actual stocks; (4) margin trading is available; (5) taxes and commissions on trades are

basically the same as for actual stock trade, and (6) commissions are lower than for open-ended funds (no sales commissions).

ETFs have an over fifteen-year history in the United States and Britain, thanks to their lower commissions and easy-to-understand investment strategy. In the United States, for example, outstanding ETFs reached $226 billion as of December, 2004, centering on the Standard & Poor's Depositary Receipts (SPDR), which tracks the S&P500, and the Nasdaq-100 index tracking stocks (NASDAQ100), which tracks the NASDAQ100. In Japan, the Nikkei 300 Index ETF was introduced in 1995, and the Nikkei 225 ETF and TOPIX ETF were launched in 2001, although outstanding ETFs in Japan were only $2.6 billion as of December 2004.

From the characteristics of the ETF, we can consider ETFs to be pseudo closed-end funds to which the Agency Cost Hypothesis and the Non-liquid Assets Holding Hypothesis are less likely to apply, because the ETF invests mechanically according to its index and contain shares with high liquidity. Therefore, we can examine the causes of discounts and premiums further even if a closed end fund puzzle exists in the ETF. In the following sections, I will examine the divergence between the net asset value and trading price of ETFs, and compare the Japanese ETFs, particularly the Nikkei 300 Index ETF with the SPDR traded in the U.S.

The remainder of this paper is organized as follows. In section II, a brief review of the literature on the relationship between the index fund and the efficiency of the financial market is presented. In section III, the data and methodology used in this paper are described. In section IV, the results of basic statistics and the co-integration test for the Japanese ETF and its index are described and compared with the SPDR of the U.S. In section V, the possible reasons for the existence of discounts or premiums are examined. Section 6 concludes this paper.

II. INDEX FUND AND THE EFFICIENCY OF THE FINANCIAL MARKET

Standard portfolio theories such as the Capital Asset Pricing Model (CAPM) insist that when the market is perfect, i.e., competitive, no transaction cost, unlimited asset divisibility, and perfect information among investors, the price of a financial asset is determined only by the risk free rate and the riskness of the asset, e.g., the correlation between itself and the market portfolio, and investors cannot continue to receive returns exceeding the price thus determined. In other words, even if an investor spent money analyzing the stocks or devised a complex investment strategy, he could not outperform the market. This is one of the reasons why passive management like index funds is advocated. In addition, index funds serve as an efficient way for small investors to diversify their investments when transaction costs, such as commissions and the constraint on the availability of funds to invest, exist.

Index funds also have an advantage from the standpoint of asymmetry of information. For example, when we think about the asymmetry of information between fund managers and investors (owners of funds), since the investment method used with index funds – tracking a particular index – is defined by external factors, the so-called agency problem is less likely to occur.

Furthermore, index funds may alleviate the free rider problem at a corporate takeover. Bolton and von Thadden (1998) insist that individual investors often trade index funds for liquidity, and this trading behavior, which is called "noise trading", might alleviate the free rider problem, increasing the possibility of the success of a corporate takeover that would force discipline on corporate management.

On the other hand, there is an argument that undermines the advantages of index funds. In particular, the study of behavioral finance[5] emphasizes that the non-arbitrage opportunity condition is not satisfied in the real world, and irrationality or psychological factors among investors might have a significant influence on the market, suggesting that index funds might do more harm than good.

For example, active management, in which costly stock screening is performed, may result on average in better performance than passive management when there is an arbitrage opportunity. Furthermore, since trading patterns for index funds are easy to predict for other investors due to their mechanical investment rules, the so-called front-running trading or stock price manipulation may arise, and stock prices may fluctuate inefficiently. DeLong et al. (1990b) examined a scenario where it would be more advantageous for rational investors to trade at a price divergent from fundamentals than to engage in arbitrage, a scenario which might often be at work in index funds[6]. Similarly, Shleifer (2000) insisted that individual investors' behaviors such as noise trading could destabilize the stock market, which might cause market inefficiencies and heighten divergence from fundamental values.

In the following sections, the efficiency of the Japanese financial market from the point of divergence of the NAV of an ETF and its prices will be examined. Whether the so-called closed end fund puzzle exists in Japan will be examined, and the possible causes of discounts or premiums will also be analyzed.

III. DATA AND METHODOLOGY

Our sample consists of prices of the Nikkei 300 ETF in Japan and of the SPDR in the U.S. All data are daily data for the period from the beginning of April 1996 to the end of December 2004. To analyze the discounts or premiums of the price of ETFs, we used its corresponding indices as a proxy value of its net asset value. This means that the discount rate of the price of ETF is calculated by

$$\text{Discount rate} = (\text{underlying stock index} - \text{ETF price}) / \text{underlying stock index} \quad (1)$$

Data concerning indices and funds' selling prices were taken from the Nikkei Quick Information Technology, Co., Ltd., the Tokyo Stock Exchange, and the American Stock Exchange. It is generally considered that there may be a difference between the net asset value of the ETF and the underlying index reflecting trust management fees and dividends. Due to the constraint on the availability of data on the net asset value of ETF, however, I have used stock indices instead. In fact, according to management company reports, the percentage of diversion between an underlying index and a net asset value is very small. Thus, this simplification of the assumption will not harm the following analysis.

Regarding the methodology, we used the co-integration test to examine whether or not systematic arbitrage opportunities, i.e., discounts or premiums, exist in ETF. The co-integration test is a time series analysis to check whether there is a stable, long-run relationship among variables. It is often used not only in the analysis of market efficiency, but also for structural analysis among macroeconomic variables. First, a unit root test is usually conducted in which the non-stationarity of statistical data is examined. Second, if the variables are shown to be integrated in order one using the unit root test, whether or not a co-integration relationship among variables exists will be examined. If the financial market is efficient, and sufficient arbitrage activities are taking place between the price of the ETF and its portfolios, we can expect that a co-integration relationship between them will be observed and the co-integration vectors will become (1, -1), especially when trust management and other fees are close to zero. In this paper, we use two types of unit root tests, the Augmented Weighted Symmetric τ Test and the Augmented Dickey-Fuller Test. In addition, the Augmented Dicker-Fuller Test and Johansen Test, respectively, were used for the co-integration tests.

IV. EMPIRICAL ANALYSIS

A. Summary Statistics on Discount Rates

Figure 1 shows the graphs of the discount rates, which were defined as above, of the Nikkei 300 index ETF and the SPDR traded in the U.S, using daily data for the period from the beginning of April 1996 to the end of December 2004. As can be seen from Figure 1, while the SPDR's discount rates hover at around 0, those of the Nikkei 300 Index ETF fluctuate irregularly within a range of -8% to 5%. In addition, both the average and standard deviation of discounts of the Nikkei 300 index ETF seem to exceed that of the SPDR. The summary statistics of the discounts are shown in Table 1.

Figure 1
Change in discounts rates

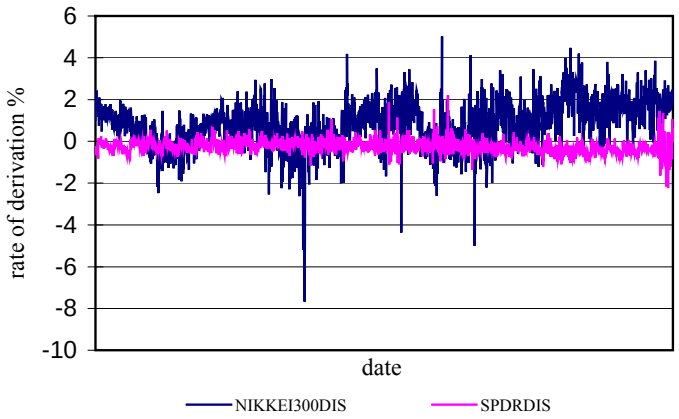


Table 1
Summary statistics on discounts rates

	Average	Standard deviation	Minimum	Maximum
Nikkei 300 ETF	0.83	1.03	-7.67	5.02
SPDR	-0.26	0.32	-2.18	2.2

Sample Period: from the beginning of April, 1996 to the end of December, 2004

The discount rates observed in the past research in the United States and Europe were typically about 10 to 20%, and therefore we can say that the Japanese discount rates were relatively low in comparison. Japanese ETFs, however, sometimes temporarily diverged more than $\pm$ 5%, and therefore a more detailed statistical examination seems necessary to find out whether there were enough arbitrage activities between actual stocks and funds by using the co-integration test.

B. Results of Co-integration Tests

Table 2 shows the results of unit root tests (the Augmented Weighted Symmetric τ Test and Augmented Dickey-Fuller Test). The results imply that four variables, the Nikkei 300 Index, the price of the Nikkei 300 ETF, the S&P 500 Index and the price of the SPDR are all integrated in order one.

Table 3 shows the result of the co-integration tests between the prices of the ETFs and their underlying indices. Regarding the SPDR and S&P500 index, both of the co-integration tests, the Augmented Dicker-Fuller Test and Johansen Test, reject the null hypothesis that a co-integration relationship does not exist[7], with the co-integration vectors also being very close to (1, -1). In other words, sufficient arbitrage activities were taking place in the SPDR and the closed-end fund puzzle does not exist.

Table 2
Result of unit root test (Nikkei 300, SPDR)

Variables	Level		Integrated of Order One	
	WTD.SYM Test	ADF Test	WTD.SYM Test	ADF Test
Nikkei 300 Index	-1.94(6)	-1.93(6)	-21.68(5)**	-21.66(5)**
Nikkei 300 ETF	-1.93(19)	-2.03(19)	-11.37(18)**	-11.32(18)**
S&P500 Index	-1.23(15)	-1.58(15)	-18.29(14)**	-12.19(14)**
SPDR	-1.24(15)	-1.57(14)	-12.84(13)**	-12.89(13)**

WTD.SYM: Augmented Weighted Symmetric τ Test
ADF: Augmented Dickey-Fuller τ Test.
Numbers in parentheses are lag orders (based on AIC Standard).
Sample Period: April 1996 to December 2004, daily.
** : 1% level of significance * : 5% level of significance

Table 3
Result of co-integration test (Nikkei 300, SPDR)

Variables	ADF Test	(Co-integration Vector)	JOH Test	(Co-integration Vector)
Nikkei 300 Index and Nikkei 300 ETF	-3.87(22)	(1,-1.024)	24.35(22)*	(1, -1.032)
S&P500 Index and SPDR	-11.15(26)**	(1,-1.0006)	122.1(25)**	(1, -1.001)
Between Nikkei 300 Future Index and Nikkei 300 Index	-8.25(20)**	(1, -0.998)	73.68(20)**	(1, -1.0001)
Between Nikkei 300 Future Index and Nikkei 300 ETF	-4.418(16)*	(1, -0.983)	24.09(3)*	(1, -0.998)

ADF: Augmented Dickey-Fuller τ Test.

JOH: Johansen's maximal eigenvalue test (H_0: number of co-integration vectors is zero)
Sample Period: April 1996 to December 2004
** : 1% level of significance * : 5% level of significance
Remark: Analysis for Nikkei 300 Future Index was done after confirming I (1) by unit root tests.

As for the Nikkei 300 ETF, neither tests showed any significant long-run stable relationship between the Nikkei 300 ETF and the Nikkei 300 index. I have also conducted a similar analysis of the relationships between the Nikkei 300 Future Index and the Nikkei 300 Index as well as between it and the Nikkei 300 ETF. A strong co-integration relationship was observed between the Nikkei 300 Index and the Nikkei 300 Future Index, whereas between the Nikkei 300 ETF and the Nikkei 300 Future Index, no particularly statistically significant relationship was observed. This result may suggest that the non-arbitrage condition was not satisfied in the Nikkei 300 ETF.

C. Results of the Newly Introduced ETFs

In July 2001, new types of ETFs, of which the underlying stock index are the Nikkei 225 index and the TOPIX were launched[8], i.e., the Nikkei 225 ETFs, the Daiwa 225 ETF, the Listed 225 ETF, the Daiwa TOPIX ETF, and the Listed TOPIX ETF.

Tables 4 and 5 show the results of the co-integration tests for the newly introduced ETFs and its indices, although the sample period is from July 13th of 2001 to the end of December 2004. The results suggest that the newly-introduced ETFs have more stable relationships with their underlying indices than the Nikkei 300 ETF, but the significance of these relationships was not so high[9].

V. ANALYSIS OF CAUSES FOR DISCOUNTS

In this section, I will examine causes for the discounts or the arbitrage opportunities observed above, considering the hypotheses for the closed-end fund puzzle already mentioned.

Table 4
Results of unit root test (New ETFs)

Name of the ETF	Level		Integrated of Order One	
	WTD.SYM Test	ADF Test	WTD.SYM Test	ADF Test
Nikkei 225 Index	-1.49(2)	-2.22(2)	-16.68(2)**	-16.73(2)**
Nikkei 225 ETF	-1.69(3)	-2.30(3)	-16.46(2)**	-16.51(2)**
Daiwa 225 ETF	-1.60(3)	-2.29(3)	-16.77(2)**	-16.58(2)**
Listed 225 ETF	-1.51(2)	-2.21(2)	-16.52(2)**	-15.07(3)**
TOPIX	-1.13(3)	-2.25(3)	-16.94(2)**	-17.00(2)**
Daiwa TOPIX ETF	-1.14(2)	-2.27(2)	-15.24(3)**	-15.29(3)**
Listed TOPIX ETF	-1.18(2)	-2.27(2)	-15.35(3)**	-15.39(3)**

WTD.SYM: Augmented Weighted Symmetric τ Test.

ADF: Augmented Dickey-Fuller τ Test.
Numbers in parentheses are lag orders (based on AIC Standard).
** : 1% level of significance * : 5% level of significance

Table 5
Results of cointegration test (New ETFs)

Variables	ADF Test	(Co-integration Vector)	JOH Test	(Co-integration Vector)
Nikkei 225 and Nikkei 225 ETF	-4.80(10)*	(1, -0.998)	47.97(5)**	(1, -0.998)
Nikkei 225 and Daiwa 225 ETF	-4.11(12)*	(1, -1.004)	39.96(4)*	(1, -1.005)
Nikkei 225 and Listed 225 ETF	-5.91(7)**	(1, -0.998)	45.99(5)**	(1, -0.998)
TOPIX and Daiwa TOPIX ETF	-4.39(8)*	(1, -1.002)	33.20(5)*	(1, -1.003)
TOPIX and Listed TOPIX ETF	-3.72(9)	(1, -1.003)	26.803(4)*	(1, -1.004)

ADF: Augmented Dickey-Fuller τ Test.

JOH: Johansen's maximal eigenvalue Test (H_0: number of co-integration vectors is zero)
Period: July 2001 to December 2004
** : 1% level of significance * : 5% level of significance
Numbers in parentheses are lag orders.

First, the Agency Cost Hypothesis will be examined. The trust management fees of the Nikkei 300 ETF and SPDR are 0.52% and 0.12%[10], respectively. However, the discount rates themselves change daily, so these fees themselves do not seem to provide a sufficient explanation for the variation in the discount rates. Furthermore, in the ETF,

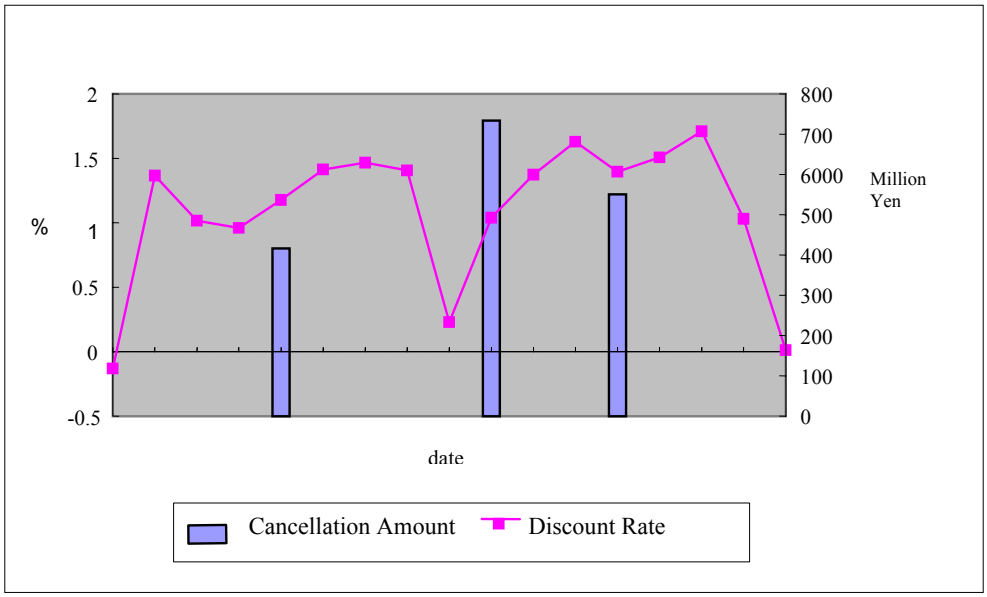
fund managers have no discretion about investment decisions due to the structure of the ETF, in which investments are made mechanically to track a particular index. It is, therefore, unlikely that the agency costs hypothesis is applicable.

Second, the Non-liquid Assets Holding Hypothesis does not also seem to be a cause for the discount, because the component stocks of the indices underlying the ETFs are all listed in the first section of the Tokyo Stock Exchange, and are supposed to have relatively high liquidity[11].

Third, since the tax rate is assumed to be constant, it seems to be difficult for the Tax Hypothesis to explain the discount rate fluctuations as with the Agency Cost Hypothesis. Furthermore, a stable positive relationship between the increase in the prices of ETFs and the increase in the discount rates, which is expected to be observed under the Tax Hypothesis, was not found[12].

Fourth, there is a view that the prohibition of in-kind subscription in the Nikkei 300 ETF gives rise to transaction costs for arbitration, resulting in the discounts. However, the prohibition of an in-kind subscription itself could not be a discount-generating factor but a premium-generating factor. In addition, Figure 2 shows the relationship between discount rates and the monetary amounts of cancellation for the Nikkei 300 ETF on a monthly basis. No clear relationship, such as when the discount rate was high, cancellation of subscriptions, i.e., exchange with actual stocks increased, was observed between them. Therefore, it is questionable whether sufficient arbitrage was taking place between the actual stocks and the ETF.

Figure 2
Relationship between discounts and cancellations of funds in Nikkei 300 ETF



Finally, the Investor Sentiment Hypothesis is examined. Lee and Shleifer and Thaler (1991) argued that noise trading by individual investors was the major explanation for the discount rate fluctuations. They support the Investor Sentiment Hypothesis by showing the fact that a negative correlation exists between changes in the discount rate and returns on small capital stocks that are largely traded by individual investors and have no relationship with a fund's portfolio.

Table 6 shows the result of the OLS regression analysis on the relationships between small capital stock indices, i.e., the TOPIX-SMALL and S&P-SMALL, and the discount rates of the Japanese ETFs and SPDR. This table shows that the TOPIX-SMALL had significant negative relationships not only with the discount rate fluctuations of the Nikkei 300 ETF, but also with those of newly listed ETFs. These results are in contrast to that of the U.S. SPDR. These results may suggest that the individual investor's sentiment might have influenced the Japanese ETF prices and the Investor Sentiment Hypothesis is valid for the ETF market in Japan.

Table 6
Small capital stock indices and changes in ETF discount rates

	Nikkei 300 ETF	Nikkei 225 ETF A	Nikkei 225 ETF B	Nikkei 225 ETF C	TOPIX ETF D	TOPIX ETF E	SPDR
Constant Term	-3.71E-03	4.31E-04	4.19E-03	4.15E-03	-6.60E-03	3.29E-03	0.063
	(-0.17)	(0.005)	(0.05)	(0.05)	(0.08)	(0.04)	(1.67)
Change in Discount Rates	-0.141**	-0.307**	-0.359**	-0.278**	-0.448**	-0.426**	-0.015
	(-2.12)	(-2.67)	(-3.87)	(-2.49)	(-3.99)	(-4.28)	(-0.61)
TOPIX	0.810**	0.792**	0.808**	0.797**	0.762**	0.759**	
	(43.52)	(16.99)	(19.61)	(17.15)	(17.28)	(17.51)	
S&P500							0.866**
							(21.13)
ADR2	0.68	0.89	0.90	0.88	0.91	0.91	0.62
DW	1.52	1.84	1.74	1.81	1.75	1.54	2.00

Explained Variable: Small Cap Stock Indices (TOPIX-SMALL (Japan), S&P-SMALL (USA))

Sample Period: July 2001 to December 2004 for Nikkei ETFs and SPDR.

OLS Estimation. Numbers in parentheses are t values.
** : 1% level of significance
* : 5% level of significance

VI. CONCLUSION

In this paper, I analyzed the efficiency of the financial market from the divergence of the net asset values of ETFs from their prices, i.e., whether or not the so-called closed-end puzzle exists in Japan.

The analysis showed that statistically significant discount rates or no co-integration relationships between the price of the fund and its index were found in the Japanese ETF markets. In addition, a correlation between the changes in discount rates and the small capital stock index was observed, consistent with the so-called Investor Sentiment Hypothesis. However, these phenomena were not observed in SPDR traded in the US market.

Although this paper finds that systematic arbitrage opportunities exist in the Japanese ETF market, we did not examine the reason why these arbitrage opportunities do not disappear. It is generally expected in Japan that specified securities firms that sell ETF funds to a management company under a special agreement undertake arbitrage transactions. However, there may be a factor that makes it difficult for the securities firms to execute arbitrage efficiently. For example, the low fees and commissions on ETFs may lower securities firms' incentives to develop the ETF market in Japan, which weakens market liquidity or market thickness as a result. These aspects of ETF markets and the incentives of securities firms in Japan have not yet been examined, and should be discussed in the future.

ENDNOTES

1. In addition to these hypotheses, there are views such as (1) discount is occurring because particular fund holders (major stockholders) are receiving some form of personal benefit from the funds, and (2) sales representatives of a fund are not motivated to make an effort to sell due to lower selling and trust management fees compared to other open-ended funds, which affect investors' demand (and causes discounts).
2. They point out that the following four abnormalities were observed in the closed-end fund puzzle in the United States:
   (1) Discount decreased when new funds were created (generation of premium);
   (2) Discount was observed normally;
   (3) Discount rates fluctuated with the passage of time, and there was a positive correlation among funds; and
   (4) Discount became zero when redemption/liquidation was announced.
   They claim that only the Investor Sentiment Theory can explain these abnormalities.
3. Dimon and Minio-Kozerski (1998) question the validity of the Tax Hypothesis in their conclusions, because even in the United Kingdom where an individual investor's capital gains are tax-exempt, discounts still exist.
4. The only exception is real estates funds (Japanese REIT). In addition, although there are funds in Japan that have closed periods (generally 3 to 6 months) during

which time redemption is prohibited (open-ended funds and unit funds), the funds themselves are not designed to be traded on the market.

5. Shleifer (2000), Thaler (1992), Mullainathan and Thaler (2000) and others have written articles on behavioral finance.
6. Wurgler and Zhuravskaya (2001) pay attention to the fact that when the S&P500 component stocks were replaced, stocks with more heavily weighted indices tended to experience greater price changes. They also discuss the impact of index funds on stock prices.
7. In the Johansen Test, both of the null hypothesis that the number of co-integration vectors is zero and that the number of co-integration vectors is two are rejected.
8. These new ETFs are traded under almost the same mechanisms as the Nikkei 300 ETF. They are, however, different in that in-kind subscription is available, i.e., actual stock certificates are exchanged for funds certificates.
9. As for the average discount rates of newly introduce ETFs, they are all between -0.78 to -0.21%, implying that premiums, not discounts, are observed.
10. It is 0.19% until March 2000.
11. Since TOPIX (Tokyo Stock Price Index) has many component stocks, some of which have poor liquidity or very weak financial performances, we cannot necessarily reject the (2) Non-Liquid Assets Holding Hypothesis up front.
12. I have run the least square regression by using the amount obtainable by subtracting a price of the ETF from the Nikkei 300 index as the explained variable, and a difference in the ETF prices as the explanatory variable. A strong positive relationship was expected to be observed between the two. The explanatory variable (the regression coefficient for a difference in ETF prices), however, went below 26%, a tax rate for self-assessed tax, and the R-squares (R^2) was also very small (R^2 = 5.38E-03).

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