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04

"Volatility Anomaly" in the Japanese Equity Market and Behavior of Foreign Institutional and Domestic Individual Investors

Abstract

It is widely known that stocks with higher historical volatility tend to produce lower subsequent return in equity markets across the world. We show that "volatility anomaly" in the Japanese equity market is, at least partly, attributable to foreign institutional investors and domestic individual investors who trade stocks on margin. First, foreign investors and domestic individual investors overweight high-beta stocks and positively-skewed stocks, respectively. Second, the anomaly weakens or even reverses when investments of foreign investors and domestic individual investors who trade stocks on margin increase, while it strengthens when their investments decrease. Third, when investments by foreign investors rise, they buy high-beta stocks more than low-beta stocks, whereas when their investments shrink, they sell high-beta stocks more than low-beta stocks. When investments of domestic individual investors who trade stocks on margin rise, they buy positively-skewed stocks more than negatively-skewed stocks, whereas when their investments shrink, they sell positively-skewed stocks more than negatively-skewed stocks. Our results suggest that, behind the "volatility anomaly," there is a preference for high-beta securities by institutional investors and a preference for positively skewed securities by individual investors.

Key words: volatility, anomaly, behavioral bias, institutional investor, individual investor

JEL classification: G11, G12, G14

I. Introduction

It is widely known that stocks with higher historical volatility tend to produce lower subsequent return in equity markets across the world. The phenomenon, "volatility anomaly," has been known since 1970s, when Black et al. (1972) noted that the relationship between the beta and return was much flatter than predicted by the CAPM, and Haugen and Heins (1972, 1975) pointed that over the long run stock portfolios with lesser variance in monthly returns had experienced greater average returns than their "riskier" counterparts. In fact, the famous claim of Fama and French (1992) that "beta is dead," and their subsequent proposition of the three-factor model (Fama and French 1993) were a response to those empirical findings. But recent findings by Ang et al. (2006, 2009) that stocks with high idiosyncratic volatility relative to the Fama and French three-factor model have abysmally low average returns, and that the effect is individually significant in each G7 country, stimulated a renewed interest in this topic among finance academicians.

As was the case for the debate on other financial market anomalies, researchers are divided into two camps. Those who support the efficient market view have proposed interpretations of the "volatility anomaly" in which they maintain their fundamental credo that expected returns on investments in high-risk securities are higher than those in low-risk investments (Fu 2009, Huang et al. 2010, Chen and Petkova 2012, Avramov, Cederburg, and Hore 2012). In contrast, those who do not support the efficient market view have offered behavioral models that can explain the "volatility anomaly." Barberis and Huang (2008) developed a model where there exist irrational investors who overweight low tail probabilities assigned to the state of the world in which they make a lot of money by investing in a positively-skewed stock, and show that volatile stocks – to be more precise, positively-skewed stocks – are overvalued in equilibrium, and therefore yield low average returns. Baker et al. (2011) argued that behind the "beta anomaly," there is a preference for high-beta securities by typical institutional investors whose mandate is to beat a fixed benchmark.

In this paper we perform an empirical research based on the behavioral views, aiming at better understanding of mechanism of the "volatility anomaly." There are some researches

that found evidences of existence of those preferences that may cause the "volatility anomaly." For example, Kumar(2009) used a 6-year panel of portfolio holdings and trades of a group of individual investors at a large U.S. discount brokerage house, and found that individual investors prefer stocks with lottery features at the aggregate level. To our knowledge, however, little empirical research which directly relates actual investor behavior with the "volatility anomaly" in the market has been done. We not only ask which investor prefers and invests in stocks with high volatility, but also examine what investment behavior of such an investor produces the anomaly. We perform our empirical research employing data of Japanese stock market, to exploit an advantage that data of both investment flow and share ownership by investor category are readily available in the Japanese equity market.

Our findings are summarized as follows. First, in the Japanese equity market, foreign institutional investors and domestic individual investors overweight high-beta stocks and positively-skewed stocks, respectively. Second, the volatility anomaly weakens or even reverses when investments of foreign investors and domestic individual investors who trade stocks on margin increase, while it strengthens when their investments decrease. Third, when investments by foreign investors rise, they buy high-beta stocks more than low-beta stocks, whereas when their investments shrink, they sell high-beta stocks more than low-beta stocks. When investments of domestic individual investors who trade stocks on margin rise, they buy positively-skewed stocks than negatively-skewed stocks, whereas when their investments shrink, they sell positively-skewed stocks more than negatively-skewed stocks. Our results are consistent with Baker et al. (2011) and Barberis and Huang (2008), and suggest that, behind the "volatility anomaly," there is a preference for high-beta securities by institutional investors and a preference for positively skewed securities by individual investors.

II. Beta anomaly and skewness anomaly

In this paper, we base our research on two existing behavioral interpretations of the volatility anomaly. The first is Baker et al. (2011) who view that demand for high-beta stocks by institutional investors whose mandate is to beat a benchmark results in over-valuation and low average return of those stocks. The second is Barberis and Huang (2008) who argue that

irrational investors' preference for positively-skewed securities causes over-pricing and poor average return of those securities.

We view that both of each view can complementary help explain the "volatility anomaly." It is easily seen that market-related component is a part of the total volatility. If high-beta stocks tend to be overvalued because of the demand from institutional investors, and therefore yield low average return, this will at least be a part of the explanation of the "volatility anomaly," On the other hand, there is no statistical relationship between skewness and volatility. However, it is an empirical fact that, in the cross-section, stocks with high-skewness tend to be volatile (Chen et al. 2001). Mitton and Vorknik (2007) noted that volatile individual stocks, with limited liability, are also skewed, and Boyer et al. (2010) argued that volatility is a proxy for expected skewness. Given these views, if positively-skewed stocks tend to be overvalued because of the irrational investors' demand, and therefore produce low average return, this will also be considered a part of the explanation of the "volatility anomaly."

Thus our empirical research focuses on the two important components of the total volatility: market-related volatility and skewness. We decompose the "volatility anomaly" into corresponding two parts, call them "beta anomaly" and "skewness anomaly," respectively, and analyze each part separately in following sections.

III. Beta Anomaly and Foreign Institutional Investors

In this section, we examine the "beta anomaly," which is an important part of the "volatility anomaly." Let us begin with an empirical evidence of the "beta anomaly" in the Japanese equity market. We calculate beta using the CAPM, considering the market portfolio consisting of all stocks listed in the Tokyo Stock Exchange (TSE henceforth). Using data for January 1985 – June 2012, we sort stocks that were listed in the 1st section of the TSE into five groups for each month according to five-year trailing beta, and track the returns on these portfolios. Figure 1 shows the results.

Regardless of whether we assume market capitalization weight or equal weight in calculating portfolio return, low-beta portfolio outperformed high-beta portfolio over the

period. Panel A shows that a yen invested in the lowest-beta portfolio with market capitalization weight in January 1985 increased to ¥3.47. In contrast, a yen invested there was worth ¥0.33 at the end of June 2012, assuming no transaction costs. Geometric average annual return of the lowest-beta portfolio is 4.6 percent, while that of the highest-beta portfolio is negative 3.9 percent, and the difference in average annual returns between the extreme quintile portfolios is 855 basis points. Panel B shows the same analysis with equally weighted portfolio returns. Although the difference in average annual returns between the extreme quintile portfolios is 507 basis points and is smaller than the previous analysis, the basic conclusion holds.

Baker et al. (2011) argued that, behind the "beta anomaly," there is a preference for high-beta securities by institutional investors whose mandate is to beat a fixed benchmark. Their argument is straightforward. An institutional investor typically assumes that the expected return on the equity market is greater than the risk-free rate. Also, she typically cannot use leverage. Say that her mandate is to beat the S&P500 index. Given these conditions, she has a strong incentive to overweight high-beta stocks to outperform the S&P500 index. The incentive is so powerful that she tends to prefer high-beta and low-alpha stocks to low-beta and high-alpha stocks. In other words, even if high-beta stocks are overvalued and low-beta stocks are undervalued, she is not motivated enough to exploit the mispricing, which causes the "beta anomaly."

Their argument implies that, when an institutional investor expects that the expected return on the equity market is negative in the short-run, her preference for high-beta securities will reverse. Therefore, in a "normal" period when she anticipates positive excess return on the equity market, she prefers to own high-beta stocks, helping to boost performance of those stocks. Thus the "beta anomaly" should weaken or reverse in the "normal" period. In contrast, in an "abnormal" period when she expects negative return on the equity market, she prefers to own low-beta stocks and to sell high-beta stocks. The "beta anomaly," should strengthen during the "abnormal" period.

This argument, if it is valid, should help explaining the "beta-anomaly" in the Japanese equity market. Institutional ownership of equities has significantly increased for the last half a century across the world, and Japan is no exception. According to the survey by Japanese

Stock Exchanges Conference, proportion of listed Japanese companies' outstanding shares held by domestic and foreign institutions increased from 6 percent in 1980 to 34 percent in 2012[1]. More importantly, proportion of value of equity traded in a period (say, a day or a week) by the institutional investors has significantly risen for the last 20 years, and is about 70 to 80 percent in recent years[2]. Most institutional investors participating in the Japanese equity market, except for hedge funds, are considered to have a fixed benchmark, such as the MSCI-Japan index.

We test following hypotheses implied by Baker et al. (2011). First, institutional investors should overweight high-beta stocks relative to low-beta stocks. Second, a positive correlation should be observed between institutional investors' money flow into the Japanese equity market and performance of high-beta portfolios relative to low-beta portfolios. Third, institutional investors should buy more high-beta stocks than low-beta stocks when, on an aggregated basis, they heavily net buy Japanese equities. In contrast, they should sell more high-beta stocks than low-beta stocks when, on an aggregated basis, they heavily net sell Japanese equities.

In the Japanese equity market, data of both investment flow and share ownership by investor category are available. Therefore, we can analyze investment behavior of institutional investors in terms of both their money flow during a particular period, and their equity share ownership at a particular point of time. This feature makes the hypotheses above testable.

Although there are both domestic and foreign institutional investors, we focus solely on foreign investors in the subsequent analysis, observing that the proportion of value of equity traded by domestic institutional investors is minor relative to that of foreign investors.

Let us now proceed to hypothesis testing using our empirical data. First, we test whether foreign investors overweight high-beta stocks relative to low-beta stocks. Our universe here is TSE1 listed companies with March or September ending fiscal year. Using

[1] We consider "pension trust" and "investment trust" domestic institutional investors. Proportion of equity share is calculated on the market capitalization basis.

[2] We consider "foreign investors," "trust banks," and "investment trusts," institutional investors. In calculating proportion of value of equity traded in a period by institutional investors, proprietary trading is excluded.

their panel data as of the end of every six month from March 1985 to September 2012, we run a regression, where dependent variable is proportion of a company's outstanding shares held by foreign investors and independent variables are historical beta value and other control variables. Independent variables are estimated as of the end of every six month from February 1985 to August 2012. The beta value is estimated by using 60 months of trailing returns. The result, shown in Table 1, is consistent with the hypothesis. Regression coefficients on beta value are positive and statistically significant at the 5 percent level, regardless of whether we add other control variables or not.

Second, we test whether there is a positive correlation between foreign investors' aggregate money flow into the Japanese equity market and performance of high-beta portfolios relative to low-beta portfolios in the Japanese equity market. We examine monthly data of foreign investors' net purchases of TSE listed stocks, and compare them with the difference in monthly returns between the extreme quintile portfolios sorted on beta value. The result is consistent with our hypothesis. Figure 2, where we show the former by the bar chart and the cumulative difference in monthly returns between the extreme quintile portfolios sorted on beta value by the line chart, gives us an intuition. While performance of high-beta portfolios relative to low-beta portfolios is mostly downward trending, when foreign investors' net purchases of Japanese stocks are large positive, the trend either weakens or even reverses. In fact, correlation coefficient between monthly data of foreign investors' net purchases of TSE listed stocks and the difference in average annual returns between the extreme quintile portfolios sorted on beta value is 0.39 with *t*-statistics of 7.69.

Third, we examine foreign investors' actual investment behavior at the micro level. In particular, we test whether foreign investors buy more high-beta stocks than low-beta stocks when, on an aggregated basis, they heavily net buy Japanese equities. At the same time, we test whether they sell more high-beta stocks than low-beta stocks when, on an aggregated basis, they heavily net sell Japanese equities. For this purpose, we sort 27 yearly cross-section data from years 1985 to 2011 on size of foreign investors' aggregate net purchases of Japanese equities (relative to total market capitalization of Japanese equities). We use nine panels where foreign investors' net purchases are the largest, and another nine panels where their net purchases are the smallest, to see their investment behavior in each of

the environment. Our universe here is TSE1 listed companies with March ending fiscal year. Using their panel data as of the end of each fiscal year, we run a regression, where dependent variable is change in proportion of a company's outstanding shares held by foreign investors during the year, and independent variables are historical beta value and other control variables. Independent variables are estimated as of the end of each fiscal year. The beta value is estimated by using 60 months of trailing returns.

Panel A of Table 2 shows the result of panels of nine fiscal years when foreign investors' aggregate net purchases of Japanese equities are the largest. Regression coefficients on beta value are positive and statistically significant at the 5 percent level, regardless of whether we add other control variables or not. That is, when foreign investors heavily net buy Japanese equities, they buy more high-beta stocks than low-beta stocks. Panel B, showing the result of panels of nine fiscal years when foreign investors' aggregate net purchases of Japanese equities are the smallest, exhibits their contrasting behavior. Regression coefficients on beta value are negative and statistically significant at the 5 percent level, regardless of whether we add other control variables or not. That is, when foreign investors heavily net sell Japanese equities, they sell more high-beta stocks than low-beta stocks.

Our results are consistent with the hypotheses implied by Baker et al. (2011). First, foreign investors overweight high-beta stocks relative to low-beta stocks. Second, foreign investors' net purchases of Japanese equities and performance of high-beta portfolios relative to low-beta portfolios are positively correlated. Third, when foreign investors heavily net buy Japanese equities, they buy more high-beta stocks than low-beta stocks. In contrast, when foreign investors heavily net sell Japanese equities, they sell more high-beta stocks than low-beta stocks. These results suggest that there is a preference for high-beta securities by foreign investors behind "beta anomaly" in the Japanese equity market.

Before closing this chapter, we emphasize our finding that when foreign investors heavily net sell Japanese equities, they sell more high-beta stocks than low-beta stocks. While they are motivated to buy high-beta stocks during a "normal" period when they expect positive excess return on the equity market, they are motivated to sell them during an "abnormal" period when they anticipate negative excess return. In the traditional finance

framework, it is rarely discussed that investors sometimes expect negative excess return on the equity market, but in reality, this happens. When this is the case, institutional investors sell more high-beta stocks than low-beta stocks, contributing to the "beta-anomaly."

IV. Skewness Anomaly and Domestic Individual Investors

Let us now turn our eyes to the "skewness anomaly," which we consider is another important part of the "volatility anomaly." As a starter, we look at an empirical evidence of the "skewness anomaly" in the Japanese equity market. We define security i's skewness ($SKEW_i$) as follows.

$$SKEW_i == E[(R_i - \mu_i)^3] / \sigma_i^{\,3} \quad (1)$$

In equation (1), R_i is return of security i, and μ_i and σ_i are average and standard deviation of security i's return, respectively. We calculate skewness using the equation (1). Using data for January 1985 – June 2012, we sort TSE1 listed stocks into five groups for each month according to five-year trailing skewness, and track the returns on these portfolios. Figure 3 shows the results.

Regardless of whether we assume market capitalization weight or equal weight in calculating portfolio return, low skewness portfolio outperformed high skewness portfolio over the period. Panel A shows that a yen invested in the lowest-skewness portfolio with market capitalization weight in January 1985 increased to ¥2.38. In contrast, a yen invested there was worth ¥0.69 at the end of June 2012, assuming no transaction costs. Geometric average annual return of the lowest-beta portfolio is 3.2 percent, while that of the highest-beta portfolio is negative 1.3 percent, and the difference in average annual returns between the extreme quintile portfolios is 455 basis points. Panel B shows the same analysis with equally weighted portfolio returns. The difference in average annual returns between the extreme quintile portfolios is 654 basis points and is larger than the previous analysis.

Barberis and Huang (2008) developed a model where there exist irrational investors whose preference is expressed by "cumulative prospect theory (Kahneman and Tversky

1979, Tversky and Kahneman 1992).” In particular, just as they buy a lottery with a small chance of a very large payoff even if they know its expected payoff is negative, they overweight low tail probabilities assigned to the state of the world in which they make a lot of money by investing in a positively-skewed stock. In equilibrium, positively-skewed stocks are overvalued, and therefore yield low average returns.

While it is true that a lot of people show their preference for a lottery-like payoffs in experiments, whether they show a similar preference and invest accordingly in the actual financial market or not is not clear until we conduct an empirical investigation. Kumar(2009) used a 6-year panel of portfolio holdings and trades of a group of individual investors at a large U.S. discount brokerage house, and found that individual investors prefer stocks with lottery features at the aggregate level. Our agenda here is to test whether a similar preference of individual investors is observed in the Japanese stock market, and whether their investment behavior affects the “skewness anomaly.”

We test following hypotheses implied by Barberis and Huang (2008). First, domestic individual investors should overweight positively-skewed stocks relative to negatively-skewed stocks. Second, a positive correlation should be observed between domestic individual investors’ money flow into the Japanese equity market and performance of positively-skewed portfolios relative to negatively-skewed portfolios. Third, domestic individual investors should buy more positively-skewed stocks than negative-skew stocks when, on an aggregated basis, they heavily net buy Japanese equities. In contrast, they should sell more positively-skewed stocks than negatively-skewed stocks when, on an aggregated basis, they heavily net sell Japanese equities.

First, we test whether domestic individual investors overweight positively-skewed stocks relative to negatively-skewed stocks. Our universe here is TSE1 listed companies with March or September ending fiscal year. Using their panel data as of the end of every six month from March 1985 to September 2012, we run a regression, where dependent variable is proportion of a company’s outstanding shares held by domestic individual investors and independent variables are historical skewness value and other control variables. Independent variables are estimated as of the end of every six month from February 1985 to August 2012. The skewness value is estimated by using 60 months of

trailing returns. The result, shown in Table 3, is consistent with the hypothesis. Regression coefficients on skewness value are positive and statistically significant at the 5 percent level, regardless of whether we add other control variables or not.

Second, we test whether there is a positive correlation between domestic individual investors' aggregate money flow into the Japanese equity market and performance of positively-skewed portfolios relative to negatively-skewed portfolios in the Japanese equity market. We examine monthly data of domestic individual investors' net purchases of TSE listed stocks, and compare them with the difference in monthly returns between the extreme quintile portfolios sorted on skewness value. The result here is not consistent with the hypothesis on the surface. Correlation coefficient between monthly data of domestic individual investors' net purchases of TSE listed stocks and the difference in average annual returns between the extreme quintile portfolios sorted on skewness value is negative 0.10 with *t*-statistics of 1.75.

In "Investment Trends by Investor Category" statistics, the TSE classifies domestic individual investors' money flow into two parts: money flow of domestic individual investors who trade stocks by cash (cash traders), and money flow of domestic individual investors who trade stocks on margin (margin traders). Using this classification, we separately calculate correlation coefficients. We find that, while correlation coefficient between cash traders' net purchases and the difference in returns between the extreme quintile portfolios sorted on skewness value is negative 0.19 with *t*-statistics of 3.54, correlation coefficient between margin traders' net purchases and the difference in returns between the extreme quintile portfolios sorted on skewness value is positive 0.15 with *t*-statistics of 2.72. This analysis suggests that investment behavior of cash traders and that of margin traders are very different, even if both are grouped as domestic individual investors in other statistics. Our hypothesis that a positive correlation should exist between domestic individual investors' aggregate money flow into the Japanese equity market and performance of positively-skewed portfolios relative to negatively-skewed portfolios in the Japanese equity market holds, but only for a subgroup of domestic individual investors who trade stocks on margin. In Figure 4, we compare monthly data of domestic individual margin traders' net purchases of TSE listed stocks with the cumulative difference in

average monthly returns between the extreme quintile portfolios sorted on skewness value. It is easily seen that, while performance of positively-skewed portfolios relative to negatively-skewed portfolios is mostly downward trending, when domestic individual margin traders heavily net buy Japanese stocks, the trend either weakens or even reverses.

Third, we examine domestic individual investors' actual investment behavior at the micro level. In particular, we test whether domestic individual investors buy more positively-skewed stocks than negatively-skewed stocks when, on an aggregated basis, they heavily net buy Japanese equities. At the same time, we test whether they sell more positively-skewed stocks than negatively-skewed stocks when, on an aggregated basis, they heavily net sell Japanese equities. For this purpose, we sort 27 yearly cross-section data from years 1985 to 2011 on size of domestic individual margin traders' aggregate net purchases of Japanese equities (relative to total market capitalization of Japanese equities). We use nine panels where domestic individual margin traders' net purchases are the largest, and another nine panels where their net purchases are the smallest, to see their investment behavior in each of the environment. Our universe here is TSE1 listed companies with March ending fiscal year. Using their panel data as of the end of each fiscal year, we run a regression, where dependent variable is change in proportion of a company's outstanding shares held by domestic individual investors during the year, and independent variables are historical beta value and other control variables. Unfortunately, since we cannot separate margin traders with cash traders among domestic individual investors in statistics of share ownership, here we focus on investment behavior of domestic individual investors as a whole. Independent variables are estimated as of the end of each fiscal year. The skewness value is estimated by using 60 months of trailing returns.

Panel A of Table 4 shows the result of panels of nine fiscal years when domestic individual margin traders' aggregate net purchases of Japanese equities are the largest. Regression coefficients on skewness value are positive and statistically significant at the 5 percent level, regardless of whether we add other control variables or not. That is, when domestic individual margin traders heavily net buy Japanese equities, they buy more positively-skewed stocks than negatively-skewed stocks. Panel B, showing the result of panels of nine fiscal years when domestic individual margin traders' aggregate net purchases

of Japanese equities are the smallest, exhibits their contrasting behavior. Regression coefficients on skewness value are negative and statistically significant at the 5 percent level, regardless of whether we add other control variables or not. That is, when domestic individual margin traders heavily net sell Japanese equities, they sell more high-beta stocks than low-beta stocks.

Our results are consistent with the hypotheses implied by Barberis and Huang (2008). First, domestic individual investors overweight positively-skewed stocks relative to negatively-skewed stocks. Second, domestic individual margin traders' net purchases of Japanese equities and performance of positively-skewed portfolios relative to negatively-skewed portfolios are positively correlated. Third, when domestic individual margin traders heavily net buy Japanese equities, they buy more positively-skewed stocks than negatively-skewed stocks. In contrast, when they heavily net sell Japanese equities, they sell more high-beta stocks than low-beta stocks. These results suggest that there is a preference for positively-skewed stocks by domestic individual margin traders behind "skewness anomaly" in the Japanese equity market.

We emphasize our finding that when domestic individual margin traders heavily net sell Japanese equities, they sell more positively-skewed stocks than negatively-skewed stocks. While they show a strong preference to buy positively-skewed stocks during a "normal" period when they feel like gambling, they are forced to sell them once they find their bets are wrong. In the traditional finance framework, it is rarely discussed that investors sometimes are forced to dispose of their wrong bets, but in reality, this happens. When this is the case, individual margin traders sell more positively-skewed stocks than negatively-skewed stocks, contributing to the "skewness-anomaly."

V. Conclusion

In response to the "volatility anomaly," economists have developed behavioral interpretations of it. Barberis and Huang (2008) pointed an importance of irrational investors' preference for positively-skewed stocks, and Baker et al. (2011) emphasized institutional investors' preference for high-beta securities. Although some researchers

found evidences of existence of such preferences (e.g., Kumar 2009), to our knowledge, little empirical research which directly relates actual investor behavior with the "volatility anomaly" in the market has been done. Our research shows not only that, in the Japanese equity market, foreign investors usually overweight high-beta stocks, but also that the "beta anomaly" weakens or even reverses when investments of foreign investors increase, while it strengthens when their investments decrease, and that when their investments shrink, they sell more high-beta stocks than low-beta stocks, contributing to the "beta-anomaly." We also show not only that domestic individual investors overweight positively-skewed stocks, but also that the "skewness anomaly" weakens or reverses when investments of domestic individual margin traders increase, while it strengthens when their investments decrease, and that when their investments shrink, they sell more positively-skewed stocks than negatively-skewed stocks, contributing to the "skewness-anomaly." Our results show that "volatility anomaly" in the Japanese equity market is, at least partly, attributable to foreign institutional investors and domestic individual investors who trade stocks on margin.

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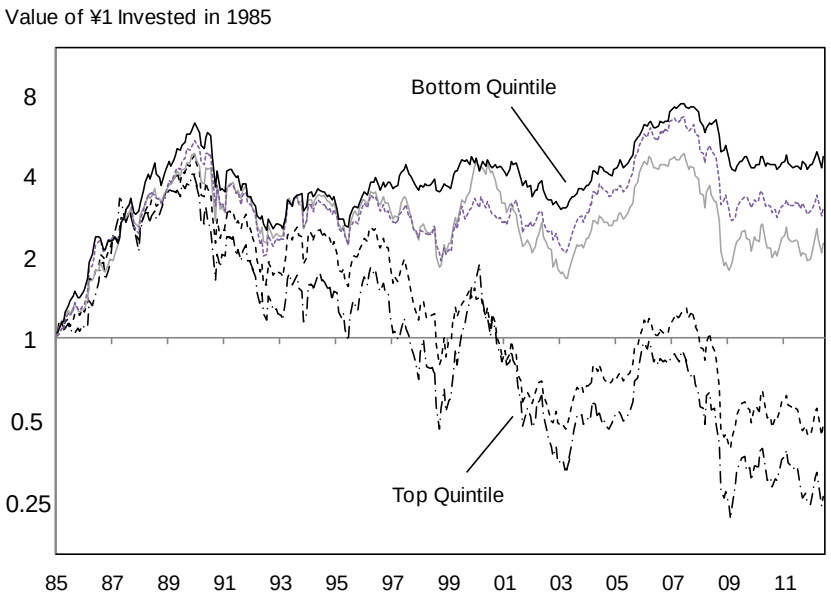
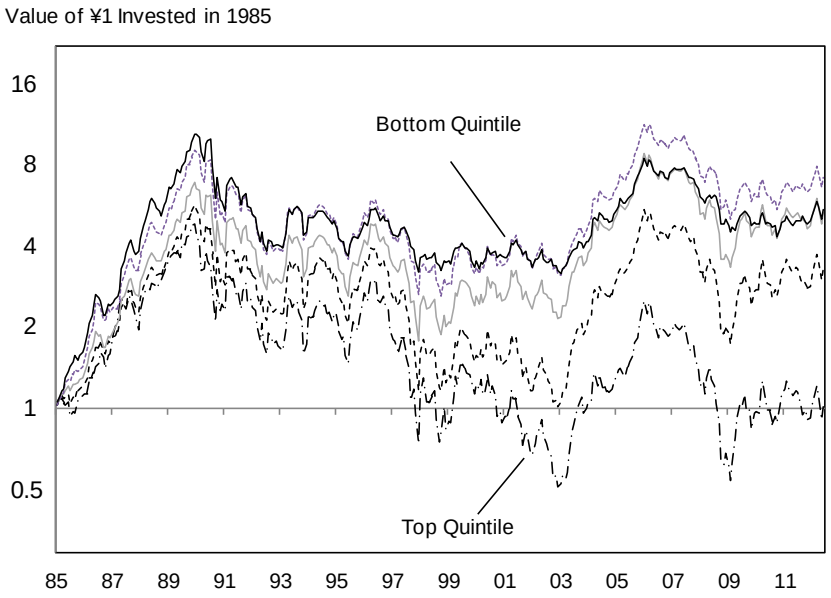
Figure 1

Returns by Beta Quintile, January 1985 – June 2012

A. Market capitalization weighted



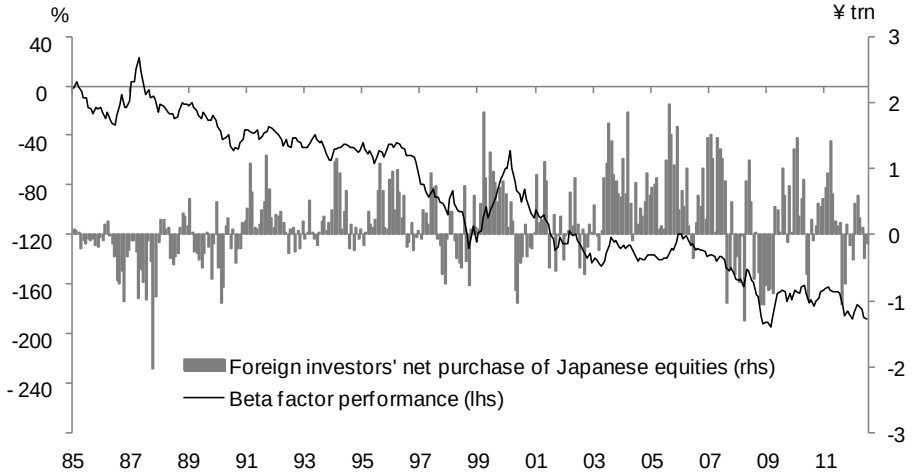
B. Equal weighted



Notes: For each month, we sort all TSE1 listed stocks into five equal quintiles according to trailing beta. In January 1985, ¥1 is invested according to market capitalization weights (Panel A), or equal weights (Panel B). We estimate beta by using up to 60 months of trailing returns (i.e., return data starting as early as January 1980). At the end of each month, we rebalance each portfolio, excluding all transaction costs.

Figure 2

Foreign Investors' Net purchases of Japanese Equities and the Cumulative Difference in Average Returns between the Extreme Quintile Portfolios Sorted on Beta Value

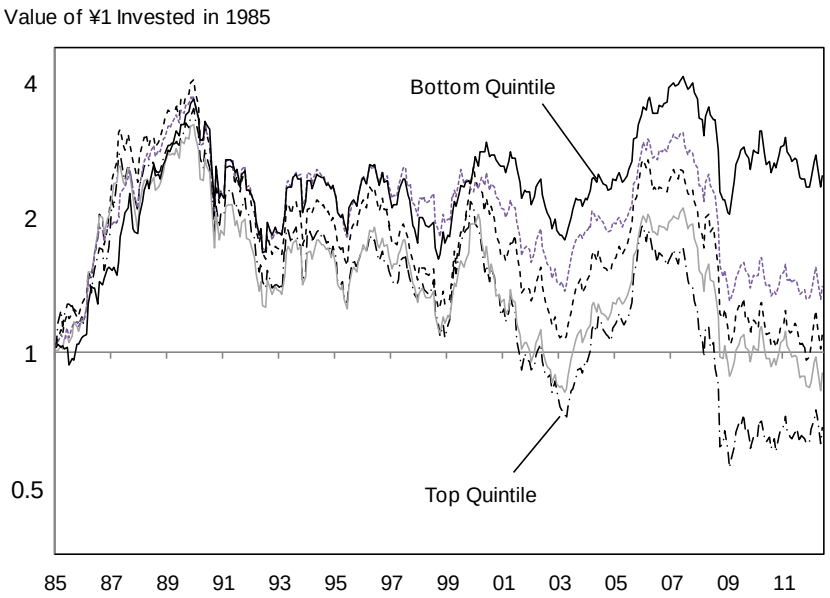


Notes: Foreign investors' net purchases of Japanese equities are the difference in value of purchases and value of sales of TSE listed stocks by foreign investors. Beta factor performance is the cumulative difference in average annual returns between the extreme quintile portfolios sorted on beta value. See notes for Panel A of Figure 1for how to calculate portfolio returns.

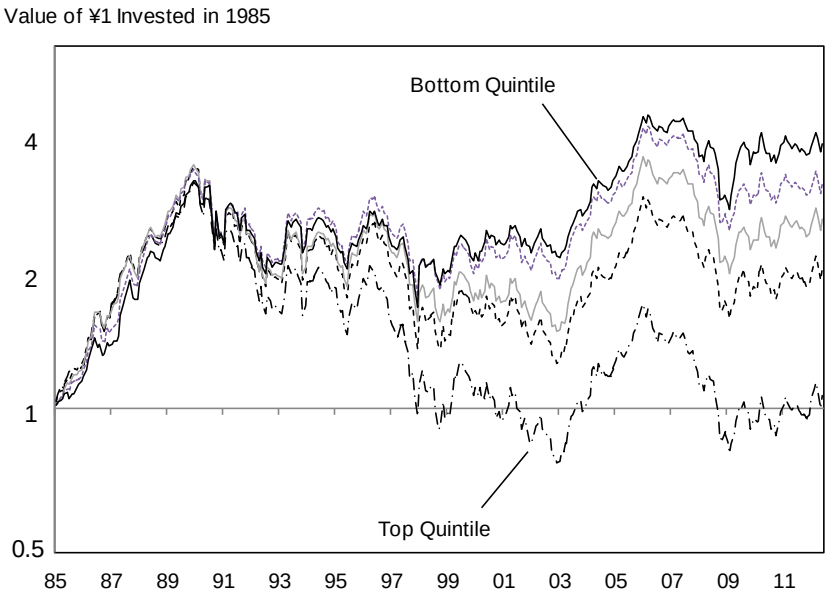
Figure 3

Returns by Skewness Quintile, January 1985 – June 2012

A. Market capitalization weighted



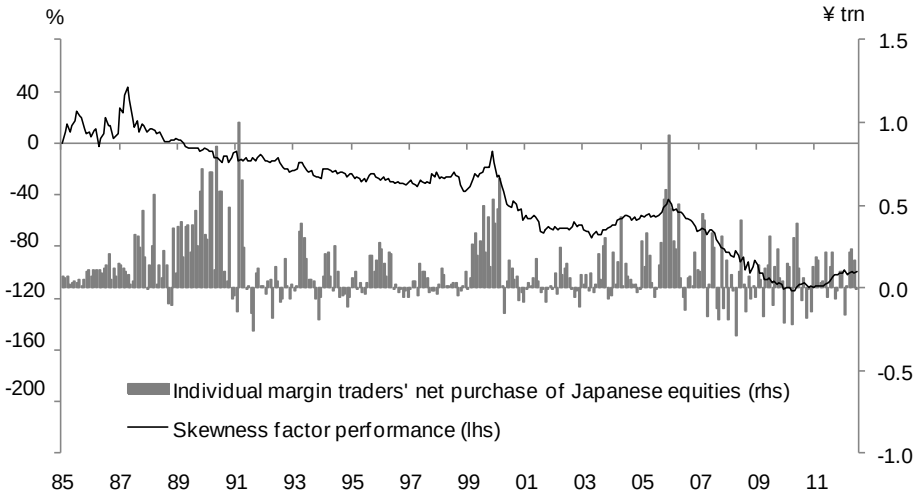
B. Equal weighted



Notes: For each month, we sort all TSE1 listed stocks into five equal quintiles according to trailing skewness. In January 1985, ¥1 is invested according to market capitalization weights (Panel A), or equal weights (Panel B). We estimate skewness by using up to 60 months of trailing returns (i.e., return data starting as early as January 1980). At the end of each month, we rebalance each portfolio, excluding all transaction costs.

Figure 4

Domestic Individual Investors' Net purchases of Japanese Equities and the Cumulative Difference in Average Returns between the Extreme Quintile Portfolios Sorted on Skewness



Notes: Individual margin traders' net purchases of Japanese equities are the difference in value of purchases and value of sales of TSE listed stocks by individual investors who trade stocks on margin. Skewness factor performance is the cumulative difference in average annual returns between the extreme quintile portfolios sorted on skewness value. See notes for Panel A of Figure 3for how to calculate portfolio returns.

Table 1

Panel Data Regression of Proportion of Outstanding Shares Held by Foreign Investors

	Beta value	Log Market Capitalization	Book to Market Ratio	Forecast Return on Equity	Analysts' Investment Rating	Number of Observations
(1)	0.07					53,936
	(3.03)					
(2)	0.09	0.57				53,936
	(4.01)	(18.29)				
(3)	0.08	0.57	-0.01			53,936
	(3.89)	(16.66)	(-0.30)			
(4)	0.10	0.52		0.04	-0.05	18,415
	(4.85)	(20.06)		(2.46)	(-3.95)	

Notes: Taking a universe of TSE1 listed companies with March or September ending fiscal year, and their cross-sectional data as of the end of every six month from March 1985 to September 2012, we run a panel data regression, where dependent variable is proportion of a company's outstanding shares held by foreign investors and independent variables are historical beta value and other control variables. Independent variables are estimated as of the end of every six month from February 1985 to August 2012. The beta value is estimated by using 60 months of trailing returns. Forecast return on equity is calculated as forecast net income divided by book equity as of the end of most recent fiscal year. Forecast net income is taken from consensus data, where we prioritize those of IFIS, I/B/E/S, and QUICK. When the consensus data are not available, we supplement the forecast data either by Nomura analyst or by Toyo- Keizai. Analysts' investment rating is taken from I/B/E/S consensus data, where 1 corresponds to Strong Buy and 5 corresponds to Strong Sell. Although we add year dummies as explanatory variables, we omit to show coefficients on those. Both dependent and independent variables are normalized with average of zero and standard deviation of one. Inside parentheses are *t*-statistics adjusted both for serial and cross-sectional correlation (Peterson 2009 and Thompson 2011).

Table 2

Panel Data Regression of Change in Proportion of Shares Held by Foreign Investors

Panel A: Years when foreign investors' net purchases of Japanese equities were the largest（Fiscal years 1991, 1993, 1995, 1999, 2003-06, and 2009）

	Beta value	Log Market Capitalization	Book to Market Ratio	Change in Forecast ROE
(1)	0.06			
	(2.18)			
(2)	0.08	0.22		
	(3.14)	(6.02)		
(3)	0.07	0.22	-0.03	
	(3.07)	(6.48)	(-2.26)	
(4)	0.08	0.23		0.00
	(3.16)	(6.04)		(1.58)
(5)	0.07	0.22	-0.03	0.00
	(3.23)	(6.88)	(-1.04)	(1.54)

Panel B: Years when foreign investors' net purchases of Japanese equities were the smallest（Fiscal years 1986-87, 1997-98, 2001-02, 2007-08, and 2011）

	Beta value	Log Market Capitalization	Book to Market Ratio	Change in Forecast ROE
(1)	-0.11			
	(-2.60)			
(2)	-0.11	-0.04		
	(-2.59)	(-0.91)		
(3)	-0.11	-0.07	-0.07	
	(-2.65)	(-1.43)	(-2.61)	
(4)	-0.11	-0.04		0.01
	(-2.67)	(-0.85)		(0.59)
(5)	-0.11	-0.07	-0.08	0.01
	(-2.71)	(-1.49)	(-3.25)	(0.71)

Notes: Taking a universe of TSE1 listed companies with March ending fiscal year, and their cross-sectional data as of the end of each fiscal year from 1985 to 2011, we run a regression, where dependent variable is change in proportion of a company's outstanding shares held by foreign investors during the year, and independent variables are historical beta value and other control variables. Panel A shows the result of panels of nine fiscal years when foreign investors' aggregate net purchases of Japanese equities are the largest. Panel B shows the result of panels of nine fiscal years when foreign investors' aggregate net purchases of Japanese equities are the smallest. The beta value is estimated by using 60 months of trailing returns. Forecast return on equity is calculated as forecast net income divided by book equity as of the end of most recent fiscal year. Forecast net income is taken from consensus data, where we prioritize those of IFIS, I/B/E/S, and QUICK. When the consensus data are not available, we supplement the forecast data either by Nomura analyst or by Toyo- Keizai. Although we add year dummies as explanatory variables, we omit to show coefficients on those. Both dependent and independent variables are normalized with average of zero and standard deviation of one. Inside parentheses are *t*-statistics adjusted both for serial and cross-sectional correlation (Peterson 2009 and Thompson 2011).

Table 3

Panel Data Regression of Proportion of Shares Held by Domestic Individual Investors

	Skewness Value	60 month Trailing Return	Beta Value	Log Market Capitalization	Book to Market Ratio	Number of Observations
(1)	0.18					31,071
	(8.55)					
(2)	0.21	-0.24				31,071
	(10.28)	(-8.47)				
(3)	0.06		0.03	-0.47	-0.05	31,071
	(4.40)		(1.22)	(-13.06)	(-1.70)	

Notes: Taking a universe of TSE1 listed companies with March or September ending fiscal year, and their cross-sectional data as of the end of every six month from March 1985 to September 2012, we run a panel data regression, where dependent variable is proportion of a company's outstanding shares held by individual investors and independent variables are historical skewness value and other control variables. Independent variables are estimated as of the end of every six month from February 1985 to August 2012. The skewness value is estimated by using 60 months of trailing returns. Although we add year dummies as explanatory variables, we omit to show coefficients on those. Both dependent and independent variables are normalized with average of zero and standard deviation of one. Inside parentheses are *t*-statistics adjusted both for serial and cross-sectional correlation (Peterson 2009 and Thompson 2011).

Table 4

Panel Data Regression of Change in Proportion of Shares Held by Domestic Individual Investors

Panel A: Years when domestic individual margin traders' net purchases of Japanese equities were the largest（Fiscal years 1985-87, 1989-90, 1995, 1999, and 2004-05）

	Skewness Value	Log Market Capitalization	Book to Market Ratio	Change in Forecast ROE
(1)	0.07			
	(2.06)			
(2)	0.07	-0.03		
	(2.29)	(-0.39)		
(3)	0.06	-0.03	-0.01	
	(2.31)	(-0.43)	(-0.34)	
(4)	0.07	-0.03		0.00
	(2.25)	(-0.40)		(0.10)
(5)	0.07	-0.03	-0.01	0.00
	(2.28)	(-0.45)	(-0.28)	(0.07)

Panel B: Years when domestic individual margin traders' net purchases of Japanese equities were the smallest（Fiscal years 1991-92, 1994, 1996, 2000-02, and 2007-08）

	Skewness Value	Log Market Capitalization	Book to Market Ratio	Change in Forecast ROE
(1)	-0.10			
	(-2.71)			
(2)	-0.09	0.06		
	(-2.88)	(1.39)		
(3)	-0.09	0.06	0.02	
	(-2.92)	(1.44)	(1.10)	
(4)	-0.09	0.06		0.00
	(-2.97)	(1.46)		(0.49)
(5)	-0.09	0.06	0.02	0.00
	(-3.02)	(1.47)	(1.11)	(0.51)

Notes: Taking a universe of TSE1 listed companies with March ending fiscal year, and their cross-sectional data as of the end of each fiscal year from 1985 to 2011, we run a regression, where dependent variable is change in proportion of a company's outstanding shares held by domestic individual investors during the year, and independent variables are historical skewness value and other control variables. Panel A shows the result of panels of nine fiscal years when domestic individual margin traders' aggregate net purchases of Japanese equities are the largest. Panel B shows the result of panels of nine fiscal years when domestic individual margin traders' aggregate net purchases of Japanese equities are the smallest. The skewness value is estimated by using 60 months of trailing returns. Forecast return on equity is calculated as forecast net income divided by book equity as of the end of most recent fiscal year. Forecast net income is taken from consensus data, where we prioritize those of IFIS, I/B/E/S, and QUICK. When the consensus data are not available, we supplement the forecast data either by Nomura analyst or by Toyo- Keizai. Although we add year dummies as explanatory variables, we omit to show coefficients on those. Both dependent and independent variables are normalized with average of zero and standard deviation of one. Inside parentheses are *t*-statistics adjusted both for serial and cross-sectional correlation (Peterson 2009 and Thompson 2011).

“Volatility Anomaly” in the Japanese Equity Market and Behavior of Foreign Institutional and Domestic Individual Investors

Seiichiro Iwasawa, The NUCB Graduate School
Tomonori Uchiyama, Nomura Securities Co., Ltd.

July 3, 2013

Outline

- Volatility anomaly
  - Beta anomaly and skewness anomaly
- Behavioral interpretation
  - Baker, Bradley, and Wurgler (2011 FAJ)
  - Barberis and Huang (2008 AER)
- Our paper : empirical evidences consistent with the behavioral interpretation in the Japanese equity market

Volatility anomaly

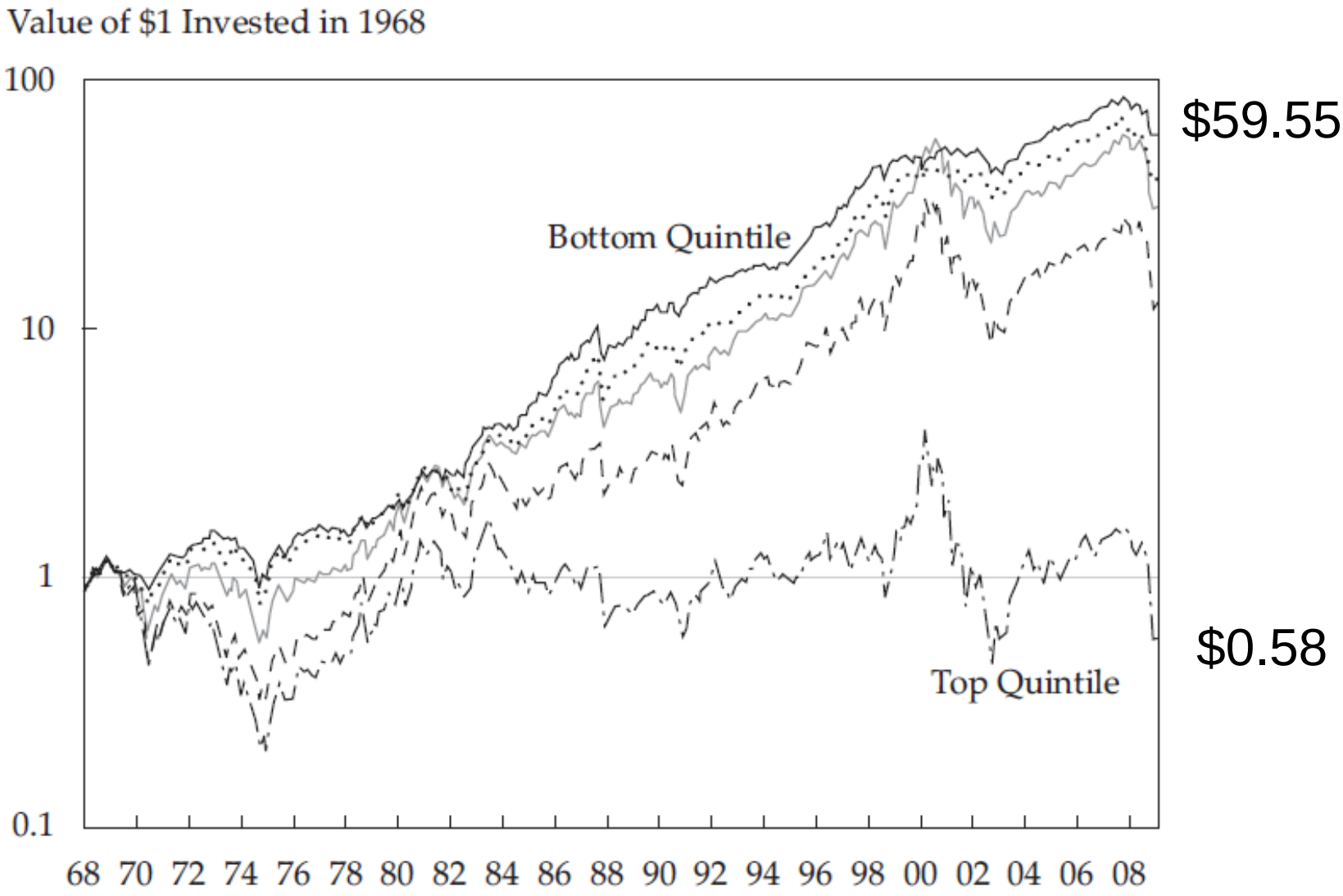
- Stocks with higher historical volatility tend to produce lower subsequent return

- Observed in equity markets around the world

Volatility anomaly: evidence in US

- US: Baker, Bradley, and Wurgler (2011)
  - All US listed stocks
  - Jan 1968 – Dec 2008
  - Sort stocks into five groups for each month
  - According to 60-month trailing total volatility
  - Top quintile portfolio: -1.3%/yr (VW)
  - Bottom quinile portfolio:+10.5%/yr (VW)

US stock returns by volatility quintile



Source: Baker et al. (2011) Panel A of Figure 1

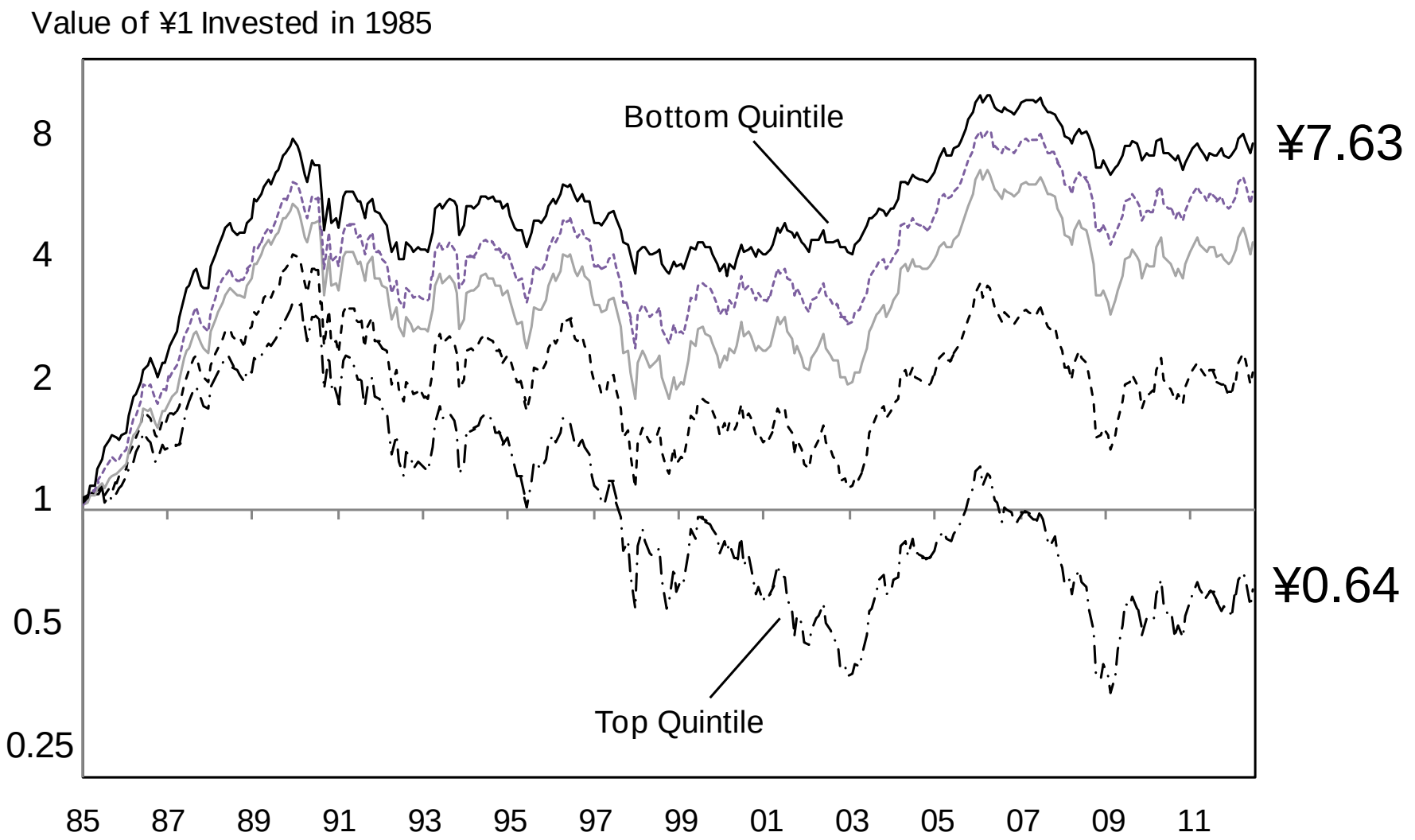
Volatility anomaly: evidence in Japan

- Japan

  - All TSE1 listed stocks
  - Jan 1985 – June 2012
  - Sort stocks into five groups for each month
  - According to 60-month trailing total volatility

  - Top quintile portfolio: -1.6%/yr (VW)
  - Bottom quintile portfolio: +7.7%/yr (VW)

Japanese stock returns by volatility quintile (VW)



Source: Authors' own calculation, based on TSE data

Volatility anomaly: a very brief review of literature

- Black, Jensen, and Sholes(1972)
- Haugen and Heins(1972)

- Fama and French (1992, 1993)
  - $R_i = \{R_f + \beta_i (R_m - R_f) + \gamma_i SMB + \delta_i HML\} + \varepsilon_i$

- Ang, Hodrick, Xing, and Zhang(2006, 2009)
  - Stocks with high idiosyncratic volatility relative to the FF three-factor model have abysmally low average returns

Volatility anomaly: two interpretations

- Efficient market view
  - Fu (2009 JFE)
  - Huang, Liu, Rhee, and Zhang (2010 RFS)
  - Chen and Petkova (2012 RFS)
  - Avramov, Cederburg and Hore (2012)

- Behavioral view
  - Baker, Bradley, and Wurgler (2011 FAJ)
  - Barberis and Huang (2008 AER)

Our paper

- An empirical research based on the behavioral views
  - We directly relate actual investor behavior with the volatility anomaly
    - Little research has been done so far
  - We employ data of Japanese stock market
    - Data of both investment flow and proportion of shares owned by investor type are available

Our results suggest…

- Behind the “volatility-anomaly,”…
  - There is a preference for high-beta securities by foreign institutional investors
  - There is a preference for positively skewed securities by individual investors who trade stocks on margin

Decomposition of volatility anomaly

- We work with two “components” of total volatility: beta and skewness
  - $\beta_{im} \equiv \mathrm{Cov}[R_i, R_m] / \mathrm{Var}[R_m]$
  - $\mathrm{SKEW}_i \equiv E[(R_i - \mu_i)^3] / \sigma_i^3$

- Volatility anomaly
  - $\doteqdot$ Beta anomaly + Idiosyncratic volatility anomaly
  - $\doteqdot$ Beta anomaly + Skewness anomaly

Decomposition of volatility anomaly

- Boyer, Mitton, and Vorknik (2010RFS)
  - It makes sense for idiosyncratic volatility to be positively related to skewness
    - E.g., Stocks with high idiosyncratic volatility tend to have growth options, which implies high skewness in returns

- Uchiyama and Iwasawa (2012 Gendai Finance)
  - Roughly half of the idiosyncratic volatility anomaly can be explained by the skewness anomaly

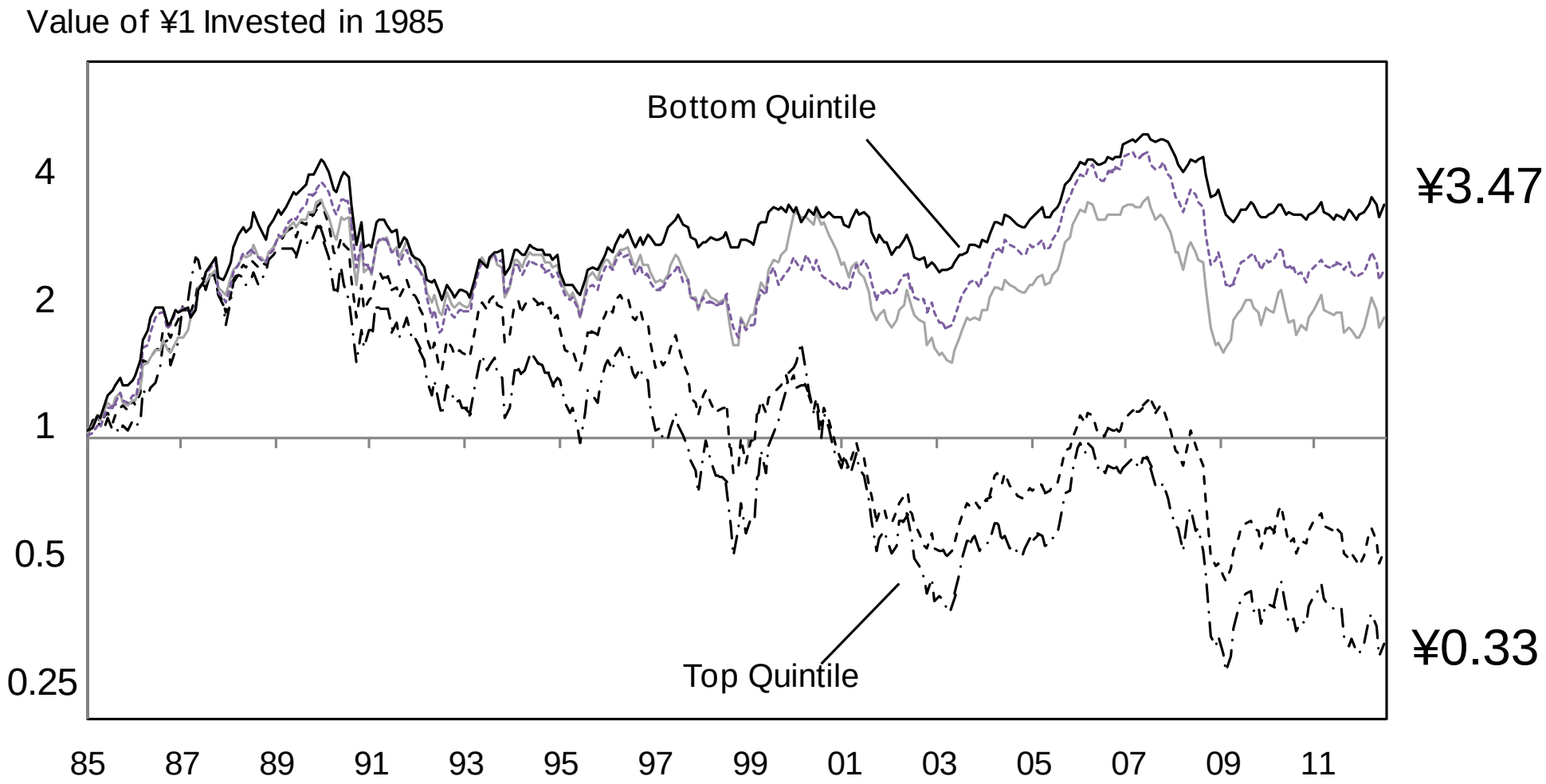
Beta anomaly

Japan

- All TSE1 listed stocks
- Jan 1985 – June 2012
- Sort stocks into five groups for each month
- According to 60-month trailing beta

- Top quintile portfolio: -3.9%/yr (VW), 0.0%/yr (EW)
- Bottom quintile portfolio: 4.6%/yr (VW), 5.1%/yr (EW)

Japanese stock returns by beta quintile (VW)



Source: Figure 1 of Iwasawa and Uchiyama(2013)

Baker, Bradley, and Wurgler (2011)

- Institutional investors whose mandate is to beat a fixed benchmark have a preference for high-beta securities
  - An institutional investor typically assumes $E[R_m - R_f] > 0$
  - She typically cannot use leverage
  - Say that her mandate is to beat the S&P500 index
  - She has a strong incentive to overweight high-beta stocks
    - She tends to prefer high-beta and low-alpha stocks to low-beta and high-alpha stocks
  - In equilibrium, high-beta stocks tend to be overvalued

Baker, Bradley, and Wurgler (2011)

- Their argument suggests the following

- In a "normal" period when institutional investors assume $E[R_m - R_f] > 0$
  - They buy high-beta stocks more than low-beta stocks
  - High-beta stocks outperform low-beta stocks

- In an "abnormal" period when they assume $E[R_m - R_f] < 0$
  - They sell high-beta stocks more than low-beta stocks
  - High-beta stocks underperform low-beta stocks

Hypotheses implied by Baker, Bradley, and Wurgler (2011)

- H1: Institutional investors overweight high-beta stocks

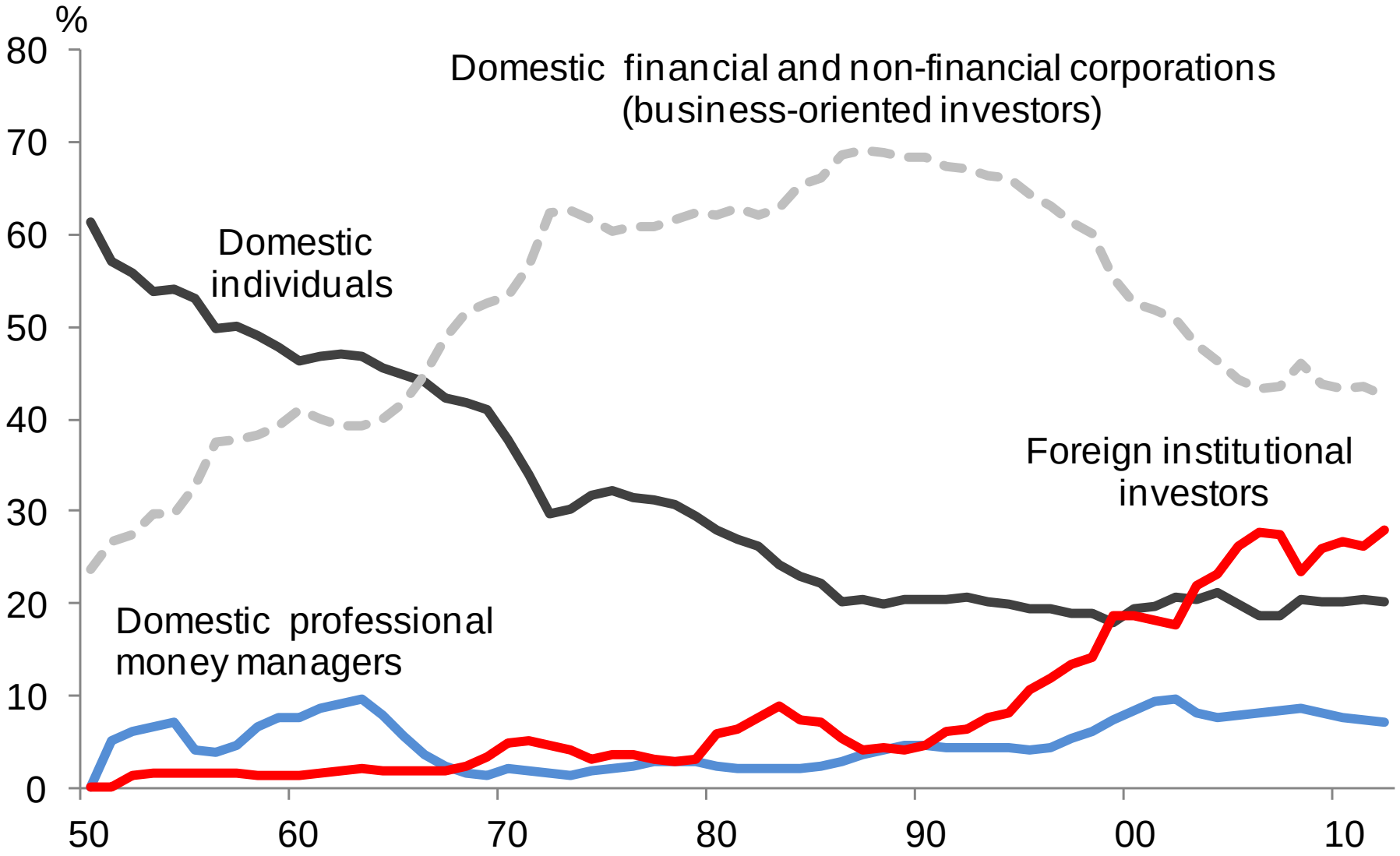
- H2: A positive correlation exists between institutional investors' money flow into the Japanese equity market and performance of high-beta portfolios relative to low-beta portfolios

- H3: Institutional investors buy (sell) more high-beta stocks than low-beta stocks when they heavily net buy (sell) Japanese equities

Institutional investors in the Japanese equity market

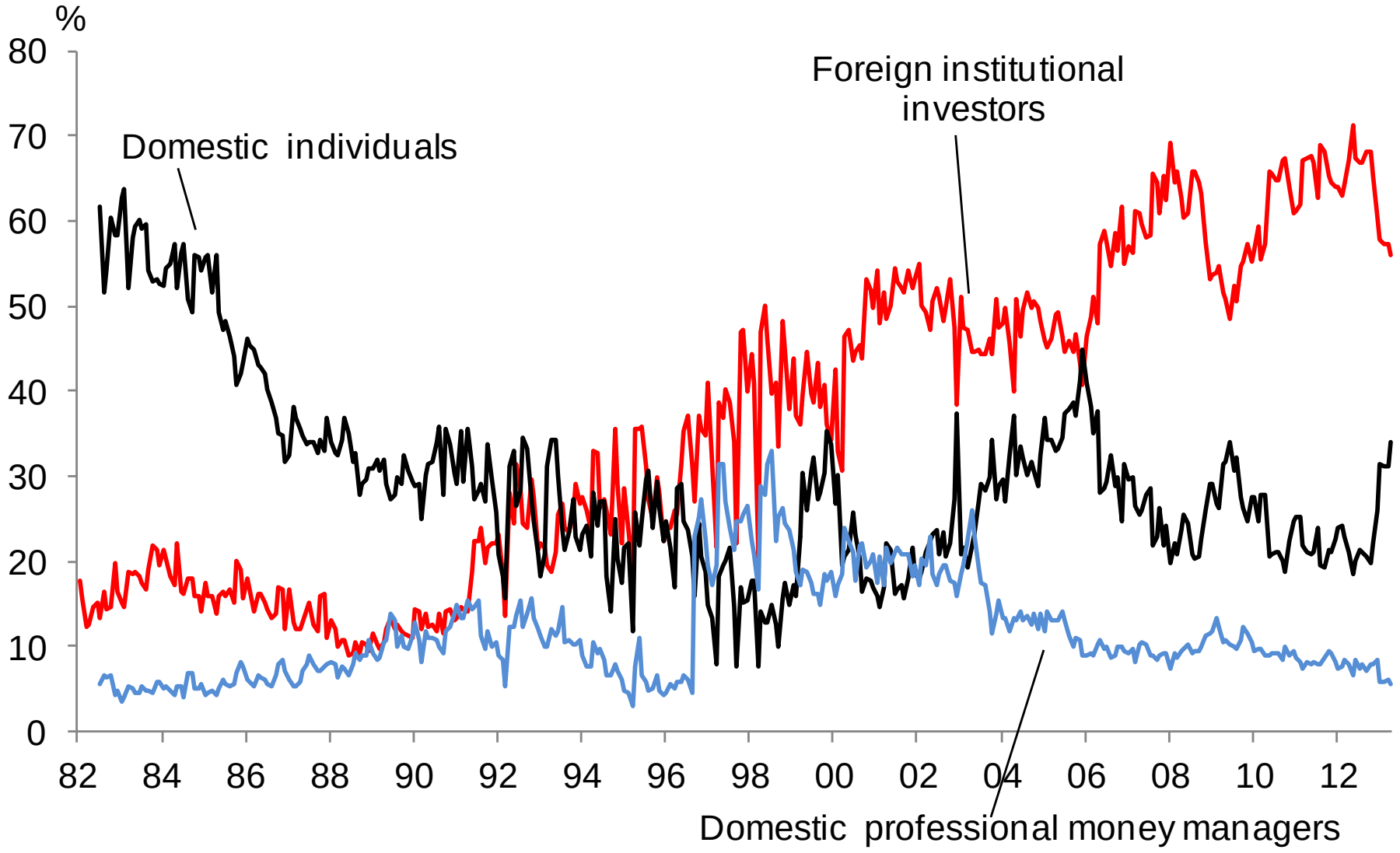
- We focus on foreign institutional investors
  - According to share-ownership survey, 28.0% of listed Japanese companies' shares is owned by "foreigners," as of March 2013
  - More importantly, in recent years, proportion of value of equity traded by "foreigners" is 50-70%

Proportion of Japanese shares owned by investor type



Note: Value-weighted basis. Source: “Share-ownership Survey,” Tokyo Stock Exchange

Proportion of shares traded by investor type



Source: “Trading value by investor category,” Tokyo Stock Exchange

H1: Institutional investors overweight high-beta stocks

- We run a panel data regression, where…
  - Dep var: proportion of a company's outstanding shares held by foreign investors
  - Indep vars: historical beta value, and other control vars
  - Both dep and indep vars are converted to N(0,1)

  - TSE1 listed cos with Mar or Sept ending fiscal year
  - 56 panels: every six month from April 1985 to Sept 2012

Panel data regression of proportion of outstanding shares held by foreign investors

	Beta value	Log Market Capitalization	Book to Market Ratio	Forecast Return on Equity	Analysts' Investment Rating	Number of Observations
(1)	0.07					53,936
	(3.03)					
(2)	0.09	0.57				53,936
	(4.01)	(18.29)				
(3)	0.08	0.57	-0.01			53,936
	(3.89)	(16.66)	(-0.30)			
(4)	0.10	0.52		0.04	-0.05	18,415
	(4.85)	(20.06)		(2.46)	(-3.95)	

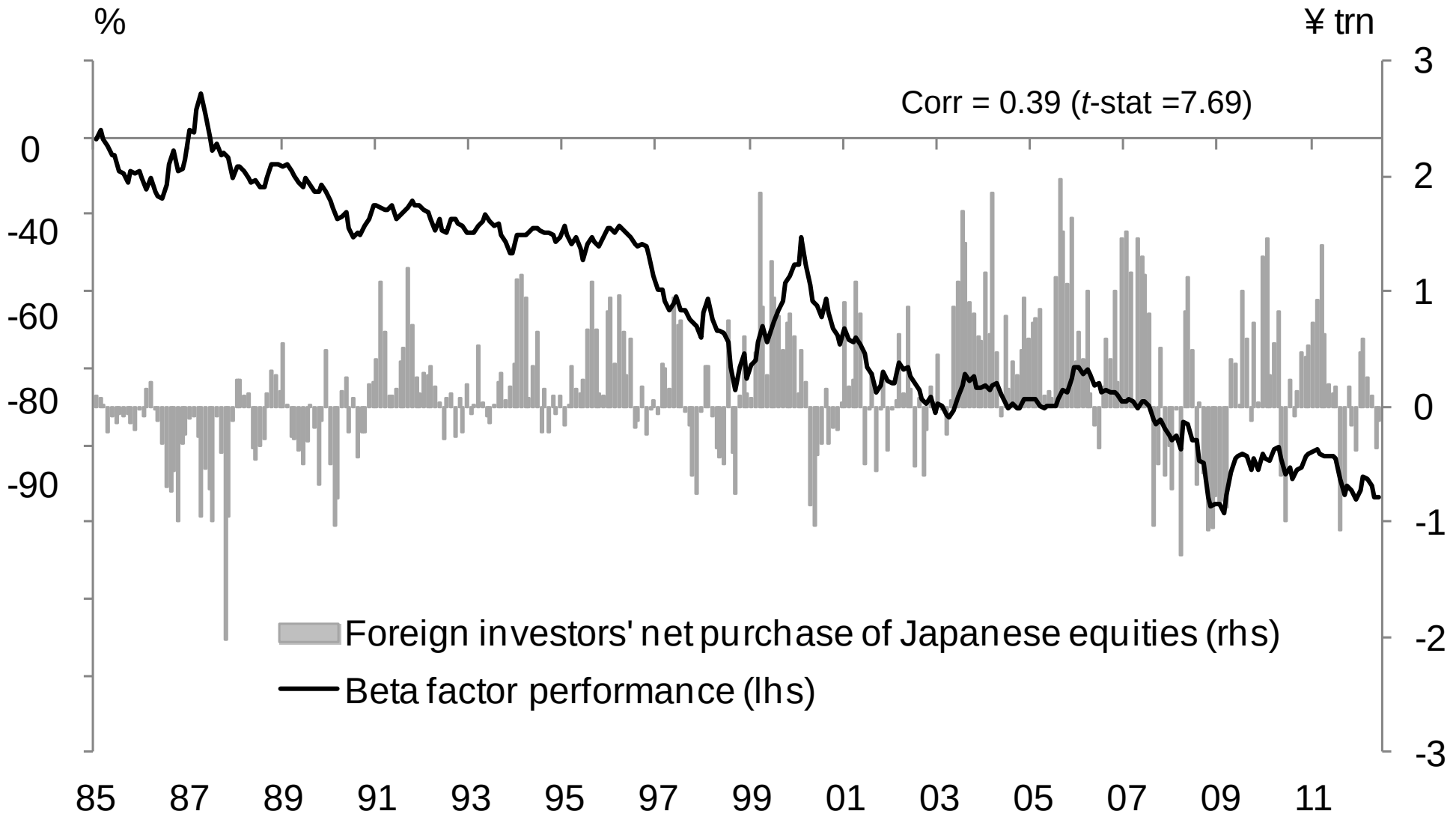
Note: Inside parentheses are *t*-statistics adjusted both for serial and cross-sectional correlation (Peterson 2009 and Thompson 2011)

H2: Institutional money flow and performance of beta

- We examine monthly data of foreign investors' net purchases of TSE listed stocks…

- … and compare it with the difference in monthly returns between the extreme quintile portfolios sorted on beta value
  - (Cumulative) performance of "Top quintile" – "Bottom quintile" on p.14

Foreign investors' money flow and performance of beta



Source: Figure 2 of Iwasawa and Uchiyama (2013)

H3: Institutional investors buy(sell) more high-beta stocks when they heavily net buy(sell) Japanese stocks

- We sort 27 yearly cross-sectional data from years 1985 to 2011 on size of foreign investors' aggregate net purchases of Japanese equities (relative to total market capitalization of them)
  - We use nine panels where foreign investors' net purchases are the largest
  - We use another nine panels where foreign investors' net purchases are the smallest

H3: Institutional investors buy(sell) more high-beta stocks when they heavily net buy(sell) Japanese stocks

- For each group of panels, we run a panel regression, where…
  - Dep var: change in proportion of a company's outstanding shares held by foreign investors during the year
  - Indep vars: historical beta value, and other control variables
  - Both dep and indep vars are converted to N(0,1)

Panel data regression of change in proportion of shares held by foreign investors

Panel A: Years when foreign investors' net purchases of Japanese equities were the largest（Fiscal years 1991, 1993, 1995, 1999, 2003-06, and 2009）

	Beta value	Log Market Capitalization	Book to Market Ratio	Change in Forecast ROE
(1)	0.06 (2.18)			
(2)	0.08 (3.14)	0.22 (6.02)		
(3)	0.07 (3.07)	0.22 (6.48)	-0.03 (-2.26)	
(4)	0.08 (3.16)	0.23 (6.04)		0.00 (1.58)
(5)	0.07 (3.23)	0.22 (6.88)	-0.03 (-1.04)	0.00 (1.54)

Note: Inside parentheses are *t*-statistics adjusted both for serial and cross-sectional correlation (Peterson 2009 and Thompson 2011)

Panel data regression of change in proportion of shares held by foreign investors

Panel B: Years when foreign investors' net purchases of Japanese equities were the smallest（Fiscal years 1986-87, 1997-98, 2001-02, 2007-08, and 2011）

	Beta value	Log Market Capitalization	Book to Market Ratio	Change in Forecast ROE
(1)	-0.11 (-2.60)			
(2)	-0.11 (-2.59)	-0.04 (-0.91)		
(3)	-0.11 (-2.65)	-0.07 (-1.43)	-0.07 (-2.61)	
(4)	-0.11 (-2.67)	-0.04 (-0.85)		0.01 (0.59)
(5)	-0.11 (-2.71)	-0.07 (-1.49)	-0.08 (-3.25)	0.01 (0.71)

Note: Inside parentheses are *t*-statistics adjusted both for serial and cross-sectional correlation (Peterson 2009 and Thompson 2011)

Beta anomaly: summary of our results

- Foreign investors overweight high-beta stocks

- A positive correlation exists between foreign investors' money flow into the Japanese equity market and performance of high-beta portfolios relative to low-beta portfolios

- Foreign investors buy (sell) more high-beta stocks than low-beta stocks when they heavily net buy (sell) Japanese equities

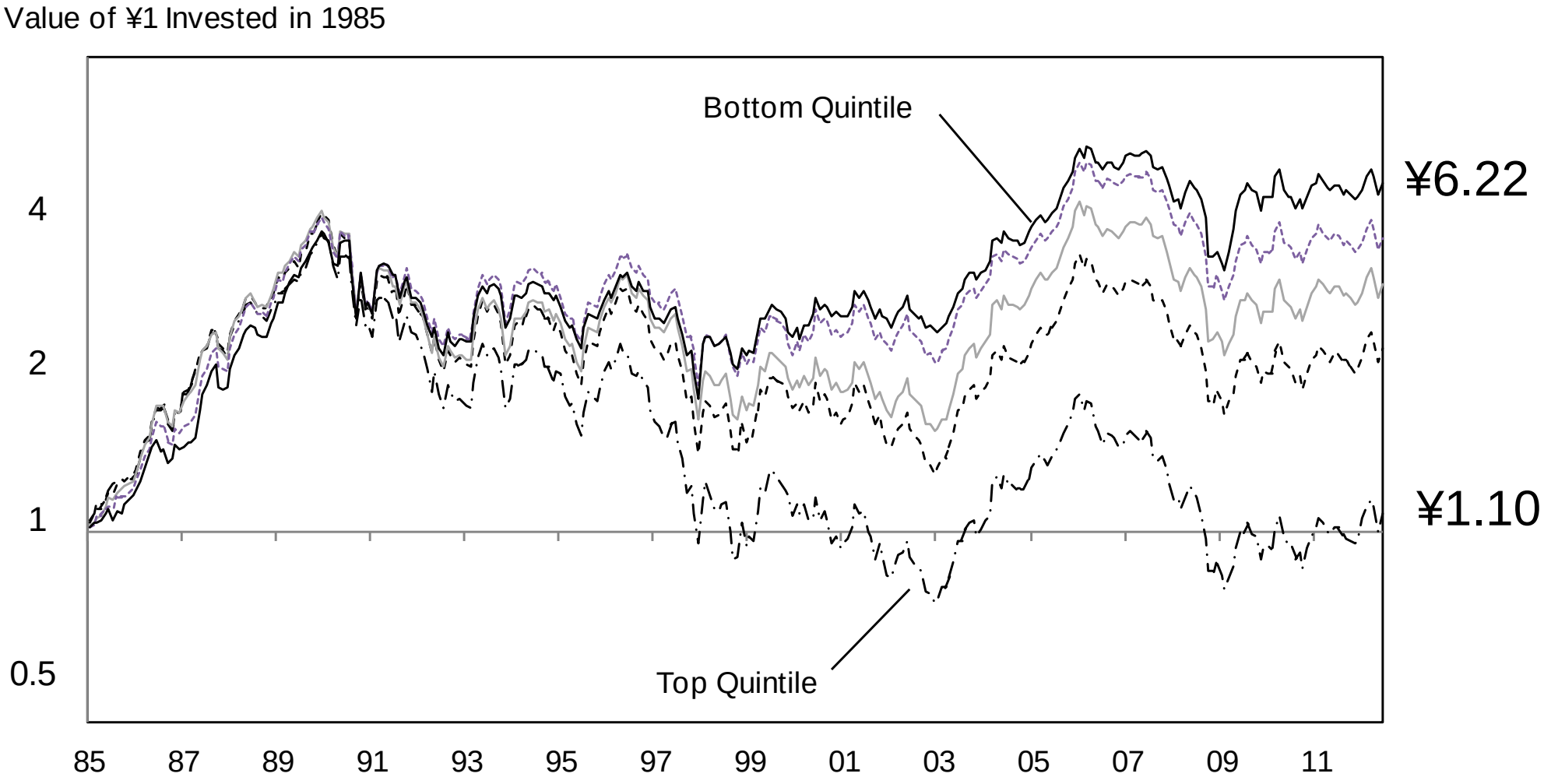
Skewness anomaly

- Japan

  - All TSE1 listed stocks
  - Jan 1985 – June 2012
  - Sort stocks into five groups for each month…
  - According to five-year trailing skewness

  - Top quintile portfolio: -1.3%/yr (VW), 0.3%/yr (EW)
  - Bottom quintile portfolio: 3.2%/yr (VW), 6.9%/yr (EW)

Japanese stock returns by skewness quintile (EW)



Source: Figure 3 of Iwasawa and Uchiyama (2013)

Barberis and Huang (2008)

- (Some) people buy a lottery, attracted by a small chance of a very large payoff (Kahneman and Tversky 1979)

- Assume that there are investors who irrationally overvalue lottery-like stocks with a small chance of a very large payoff

- It is shown that, in equilibrium, positively-skewed stocks are overvalued, and therefore yield low average return

Hypotheses implied by Barberis and Huang(2008)

- (Some) individual investors overweight positively-skewed stocks

- A positive correlation exists between (some) individual investors' money flow into the Japanese equity market and performance of positively-skewed portfolios relative to negatively-skewed portfolios

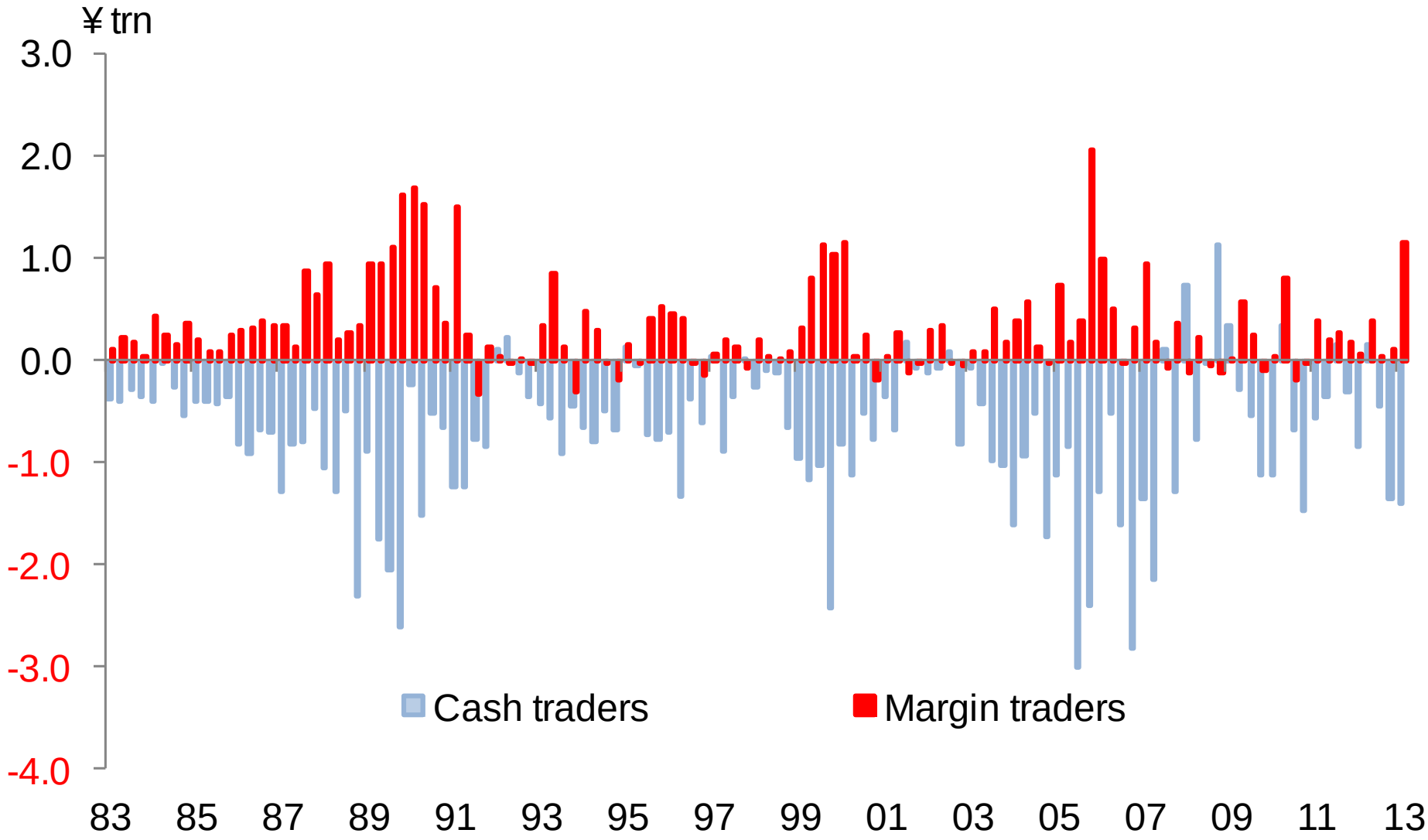
- (Some) individual investors buy (sell) more positively-skewed stocks than negatively-skewed stocks when they heavily net buy (sell) Japanese equities

Individual investors in the Japanese equity market

- "Trading by investor type" statistics categorize domestic individual investors into two groups
  - Those who trade stocks with cash –"cash traders"
  - Those who trade stocks on margin – "margin traders"

- Money flow data of each group suggest that a group of "cash traders" and a group of "margin traders" behave very differently

Quarterly net purchases of Japanese stocks by cash traders and by margin traders



Source: “Trading value by investor category,” Tokyo Stock Exchange

H1: Individual investors overweight positively-skewed stocks

- We run a panel data regression, where…
  - Dep var: proportion of a company's outstanding shares held by individual investors
  - Indep vars: historical skewness value, and other control vars
  - Both dep and indep vars are converted to N(0,1)

  - TSE1 listed cos with Mar or Sept ending fiscal year
  - 56 panels: every six month from April 1985 to Sept 2012

Panel data regression of proportion of outstanding shares held by individual investors

	Skewness Value	60 month Trailing Return	Beta Value	Log Market Capitalization	Book to Market Ratio	Number of Observations
(1)	0.18					31,071
	(8.55)					
(2)	0.21	-0.24				31,071
	(10.28)	(-8.47)				
(3)	0.06		0.03	-0.47	-0.05	31,071
	(4.40)		(1.22)	(-13.06)	(-1.70)	

Note: Inside parentheses are *t*-statistics adjusted both for serial and cross-sectional correlation (Peterson 2009 and Thompson 2011)

H2: Individuals' money flow and performance of skewness

- We examine monthly data of individual investors' net purchases of TSE listed stocks,…

- …and compare it with the difference in monthly returns between the extreme quintile portfolios sorted on skewness value,…
  - (Cumulative) performance of "Top quintile" − "Bottom quintile" on p.31

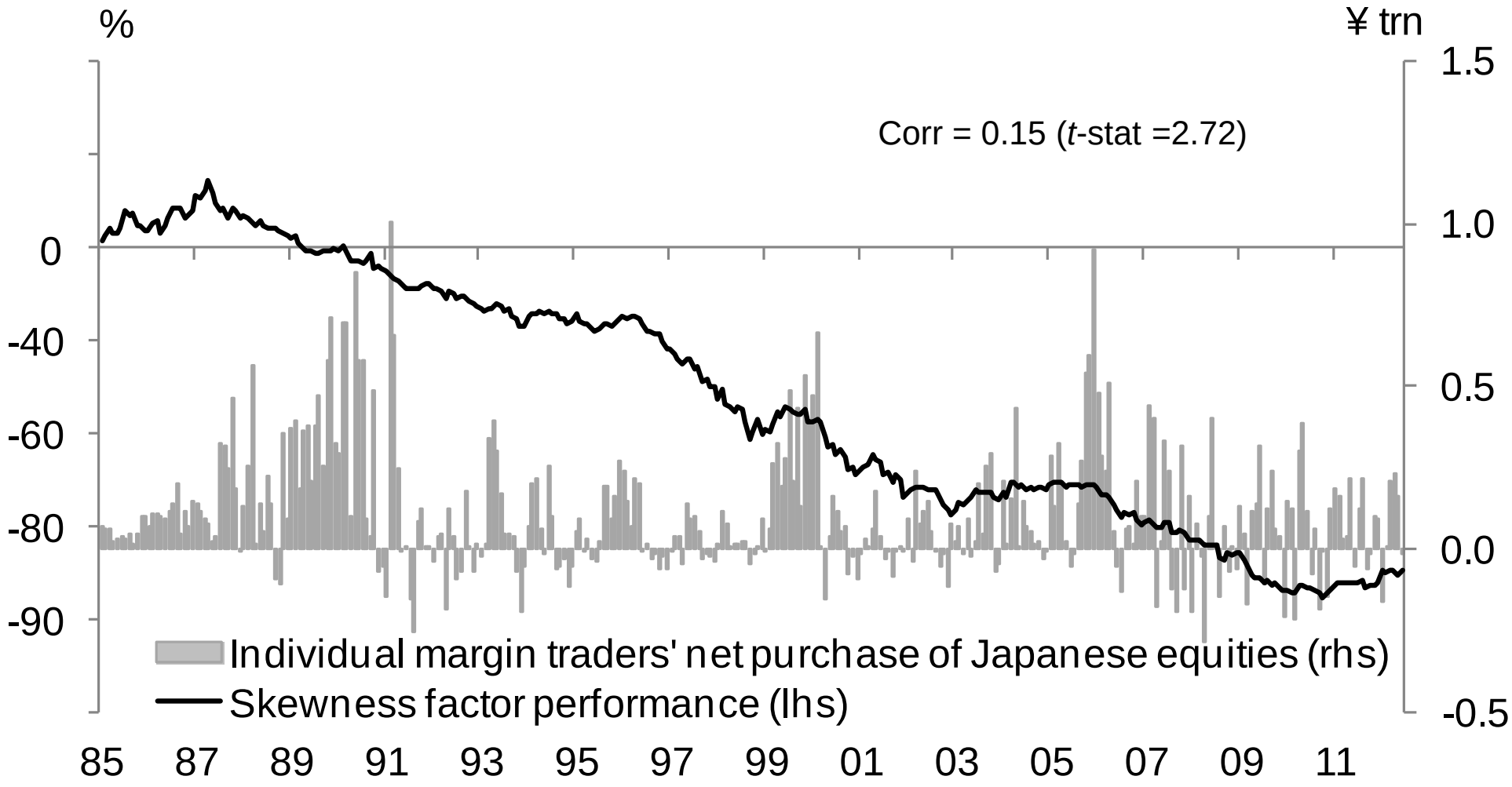
H2: Individuals' money flow and performance of skewness

- Corr(Individuals' flow, skewness performance) =-0.10(*t*-stat=1.75)

- Corr(Cash traders' flow, skewness performance) =-0.19(*t*-stat=3.54)

- Corr(Margin traders' flow, skewness performance) =+0.15(*t*-stat=2.72)

Margin traders' money flow and performance of skewness



Source: Figure 4 of Iwasawa and Uchiyama (2013)

H3: Individual investors buy(sell) more positively-skewed stocks when they heavily net buy(sell) Japanese stocks

- We sort 27 yearly cross-sectional data from years 1985 to 2011 on size of individual margin traders' aggregate net purchases of Japanese equities (relative to total market capitalization of Japanese equities)
  - We use nine panels where individual margin traders' net purchases are the largest
  - We use another nine panels where individual margin traders' net purchases are the smallest

H3: Individual investors buy(sell) more positively-skewed stocks when they heavily net buy(sell) Japanese stocks

- For each group of panels, we run a panel regression, where…
  - Dep var: change in net margin buying by individual investors (relative to market capitalization)
  - Indep vars: historical skewness value, and other control variables
  - Both dep and indep vars are converted to N(0,1)

  - Correction: In the paper, we state dep var is change in proportion of shares held by individual investors

Panel data regression of change in net margin buying by individual investors

Panel A: Years when domestic individual margin traders' net purchases of Japanese equities were the largest（Fiscal years 1985-87, 1989-90, 1995, 1999, and 2004-05）

	Skewness Value	Log Market Capitalization	Book to Market Ratio	Change in Forecast ROE
(1)	0.07 (2.06)			
(2)	0.07 (2.29)	-0.03 (-0.39)		
(3)	0.06 (2.31)	-0.03 (-0.43)	-0.01 (-0.34)	
(4)	0.07 (2.25)	-0.03 (-0.40)		0.00 (0.10)
(5)	0.07 (2.28)	-0.03 (-0.45)	-0.01 (-0.28)	0.00 (0.07)

Note: Inside parentheses are *t*-statistics adjusted both for serial and cross-sectional correlation (Peterson 2009 and Thompson 2011)

Panel data regression of change in net margin buying by individual investors

Panel B: Years when domestic individual margin traders' net purchases of Japanese equities were the smallest（Fiscal years 1991-92, 1994, 1996, 2000-02, and 2007-08）

	Skewness Value	Log Market Capitalization	Book to Market Ratio	Change in Forecast ROE
(1)	-0.10 (-2.71)			
(2)	-0.09 (-2.88)	0.06 (1.39)		
(3)	-0.09 (-2.92)	0.06 (1.44)	0.02 (1.10)	
(4)	-0.09 (-2.97)	0.06 (1.46)		0.00 (0.49)
(5)	-0.09 (-3.02)	0.06 (1.47)	0.02 (1.11)	0.00 (0.51)

Note: Inside parentheses are *t*-statistics adjusted both for serial and cross-sectional correlation (Peterson 2009 and Thompson 2011)

Skewness anomaly: summary of our results

- Individual investors overweight positively-skewed stocks

- A positive correlation exists between individual margin traders' money flow into the Japanese equity market and performance of positively-skewed portfolios relative to negatively-skewed portfolios

- Individual margin traders buy (sell) more positively-skewed stocks than negatively-skewed stocks when they heavily net buy (sell) Japanese equities

Conclusion

- We show that “volatility anomaly” in the Japanese equity market is, at least partly, attributable to foreign institutional investors and domestic individual investors who trade stocks on margin

- Our results suggest that, behind the “volatility anomaly,” there is a preference for high-beta securities by institutional investors and a preference for positively-skewed securities by individual investors

Appendix

- Simultaneity issue in panel regressions for H3
  - Dep var: change in proportion of a company's outstanding shares held by foreign investors during the year (say from Apr 2011 to Mar 2012)
  - Indep var: 60-month trailing beta value (estimated from April 2007 to Mar 2012)
  - This setting causes a partial overlap of measurement periods of dep and indep vars and a simultaneity problem arises as a result

Appendix

- To avoid the problem, we repeat the regressions, using trailing beta value estimated for 60 months up to the beginning of each fiscal year: for example,…
  - Dep var: change in proportion of a company's outstanding shares held by foreign investors during the year (say from Apr 2011 to Mar 2012)
  - Indep var: 60-month trailing beta value (estimated from April 2006 to Mar 2011)

Panel data regression of change in proportion of shares held by foreign investors

Panel A: Years when foreign investors' net purchases of Japanese equities were the（Fiscal years 1991, 1993, 1995, 1999, 2003-06, and 2009）

	Beta value	Log Market Capitalization	Book to Market Ratio	Change in Forecast ROE
(1)	0.03 (1.04)			
(2)	0.04 (1.56)	0.21 (5.01)		
(3)	0.03 (1.33)	0.20 (5.39)	-0.04 (-2.52)	
(4)	0.04 (1.52)	0.21 (5.01)		0.00 (0.93)
(5)	0.03 (1.42)	0.20 (5.83)	-0.03 (-1.08)	0.00 (0.88)

Note: Inside parentheses are *t*-statistics adjusted both for serial and cross-sectional correlation (Peterson 2009 and Thompson 2011)

Panel data regression of change in proportion of shares held by foreign investors

Panel B: Years when foreign investors' net purchases of Japanese equities were the（Fiscal years 1986-87, 1997-98, 2001-02, 2007-08, and 2011）

	Beta value	Log Market Capitalization	Book to Market Ratio	Change in Forecast ROE
(1)	-0.09 (-3.55)			
(2)	-0.09 (-2.95)	-0.03 (-0.53)		
(3)	-0.09 (-3.09)	-0.05 (-0.95)	-0.07 (-2.29)	
(4)	-0.09 (-3.06)	-0.03 (-0.48)		0.01 (0.52)
(5)	-0.09 (-3.16)	-0.06 (-1.01)	-0.08 (-2.74)	0.01 (0.64)

Note: Inside parentheses are *t*-statistics adjusted both for serial and cross-sectional correlation (Peterson 2009 and Thompson 2011)

Panel data regression of change in net margin buying by individual investors

Panel A: Years when domestic individual margin traders' net purchases of Japanese equities were the largest（Fiscal years 1985-87, 1989-90, 1995, 1999, and 2004-05）

	Skewness Value	Log Market Capitalization	Book to Market Ratio	Change in Forecast ROE
(1)	-0.04 (-1.34)			
(2)	-0.05 (-2.14)	-0.05 (-0.62)		
(3)	-0.05 (-2.32)	-0.06 (-0.70)	-0.03 (-0.87)	
(4)	-0.05 (-1.93)	-0.05 (-0.63)		0.00 (-0.19)
(5)	-0.05 (-2.10)	-0.06 (-0.74)	-0.03 (-0.70)	0.00 (-0.29)

Note: Inside parentheses are *t*-statistics adjusted both for serial and cross-sectional correlation (Peterson 2009 and Thompson 2011)

H3: Individual investors buy(sell) more positively-skewed stocks when they heavily net buy(sell) Japanese stocks

Panel B: Years when domestic individual margin traders' net purchases of Japanese equities were the smallest（Fiscal years 1991-92, 1994, 1996, 2000-02, and 2007-08）

	Skewness Value	Log Market Capitalization	Book to Market Ratio	Change in Forecast ROE
(1)	-0.12			
	(-3.01)			
(2)	-0.11	0.07		
	(-3.14)	(1.46)		
(3)	-0.10	0.08	0.02	
	(-3.16)	(1.51)	(1.08)	
(4)	-0.10	0.07	0.00	0.00
	(-3.07)	(1.49)	(0.00)	(0.26)
(5)	-0.10	0.08	0.02	0.00
	(-3.10)	(1.53)	(1.13)	(0.33)

Note: Inside parentheses are *t*-statistics adjusted both for serial and cross-sectional correlation (Peterson 2009 and Thompson 2011)

Appendix

- Our additional analysis partially rejects our H3
  - Institutional investors do not seem to buy more (lagged) high-beta stocks when they heavily net buy Japanese stocks
  - Individual margin traders do not seem to buy more (lagged) positively-skewed stocks when they heavily net buy Japanese stocks
- <u>But the following H3s were robust</u>
  - Institutional investors sell more (lagged) high-beta stocks when they heavily net sell Japanese stocks
  - Individual margin traders sell more (lagged) positively-skewed stocks when they heavily net sell Japanese stocks

Volatility Anomaly in the Japanese Equity Market and Behavior of Foreign Institutional and Domestic Individual Investors

by Seiichiro Iwasawa and Tomonori Uchiyama

Discussion by Chu Zhang

HKUST

Contributions of the Paper

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Contributions of the Paper

Two main findings:

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Contributions of the Paper

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The authors take a stand of behavioral finance.

Comments and Suggestions

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2. Their connections to the volatility anomaly, if any, should also be established.

Comments and Suggestions

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   Can this be established more directly?
2. The trading data (i.e., the change in holding data) can help establish (or reject) this.