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Connecting Markets East & West

Japanese equity quantitative strategy

Global Quantitative Investment Strategies Conference

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See Appendix A-1 for analyst certification, important disclosures and the status of non-US analysts.

Any authors named on this report are research analysts unless otherwise indicated.

Topics

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- The shift to passive management in Japan and its market impacts

- The expanding of “highly active funds” management such as "under-diversified fund" or "concentrated fund" and its problems

- Importance of avoiding herding regardless whether quant or fundamental based active funds, when shifting to passive management

Underperformance of traditional active funds in Japanese stock market

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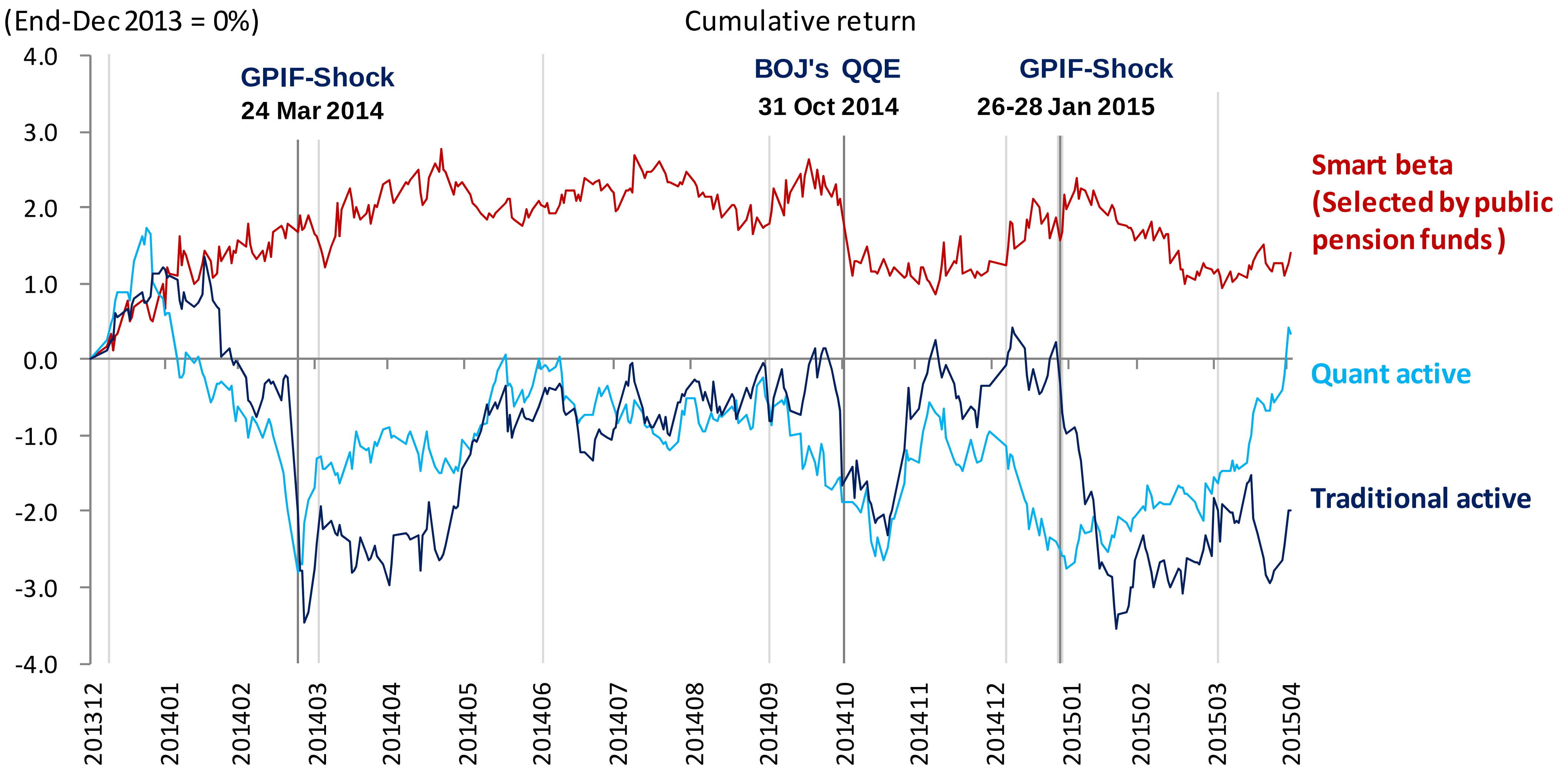
Performance of Japanese equity funds



Note: The performance of traditional active funds is shown as the difference in returns between stocks overweighted and underweighted by domestic investment trusts and pension funds. The performance of quant active funds is shown as the average return (Jensen's alpha) on 18 funds (domestic publicly offered investment trusts and overseas funds) that invest in Japanese equities. The performance of smart beta funds is shown as the average excess return versus the TOPIX on six funds (the Nomura RAFI Japan Equity Fund, the S&P GIVI Japan gross total return index, the DFA Japanese Small Company Portfolio, the FTSE RAFI Japan 350 QSR including dividends, the FTSE GWA Japan including dividends, and the MSCI Japan Minimum Volatility Index). Sample period was Jan 2014–1 May 2015. We did not take transaction costs into account, except in the case of funds that have closed. Analysis is based on historical data and does not guarantee future performance.

Source: Nomura

GPIF-Shock broke out in 2014
Public pension funds follow GPIF's manager structure

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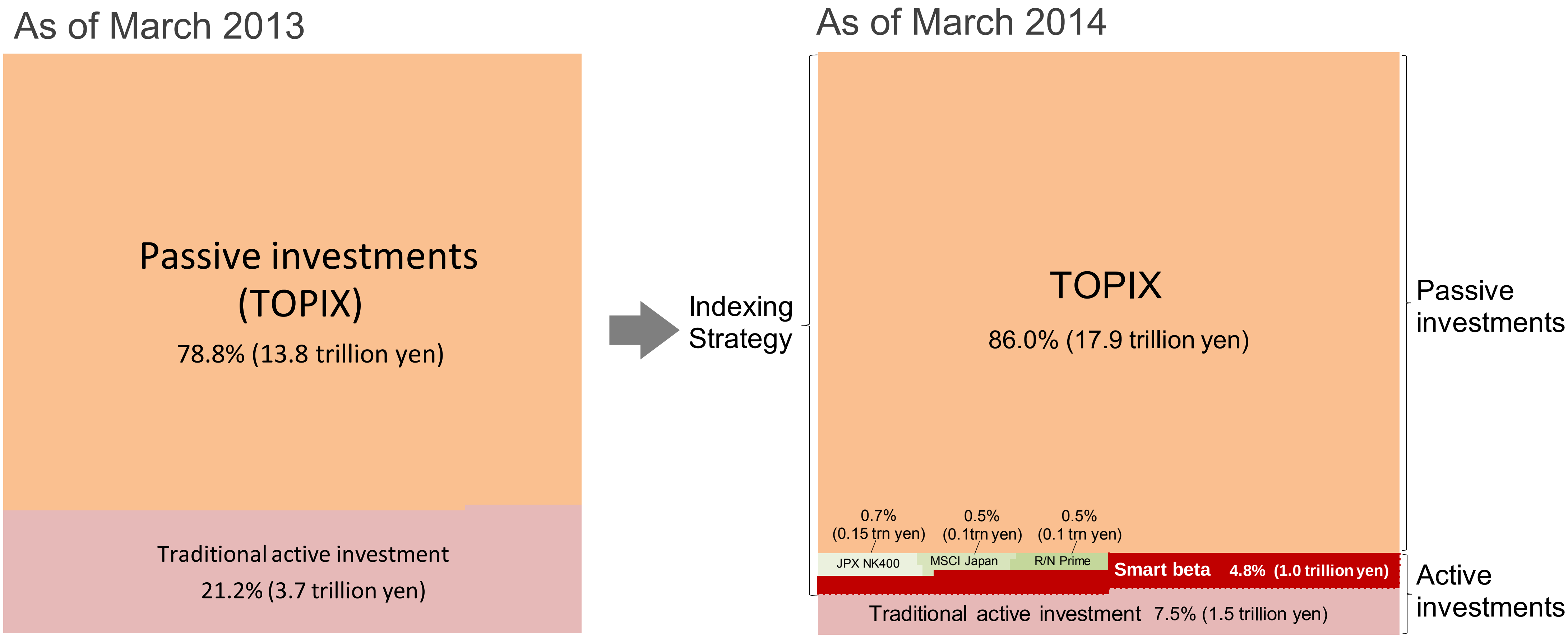
Overview of changes to fund manager structure



Source: Nomura, based on GPIF data

Estimated money flows :
Buying passive and selling active funds by public pension funds are expected

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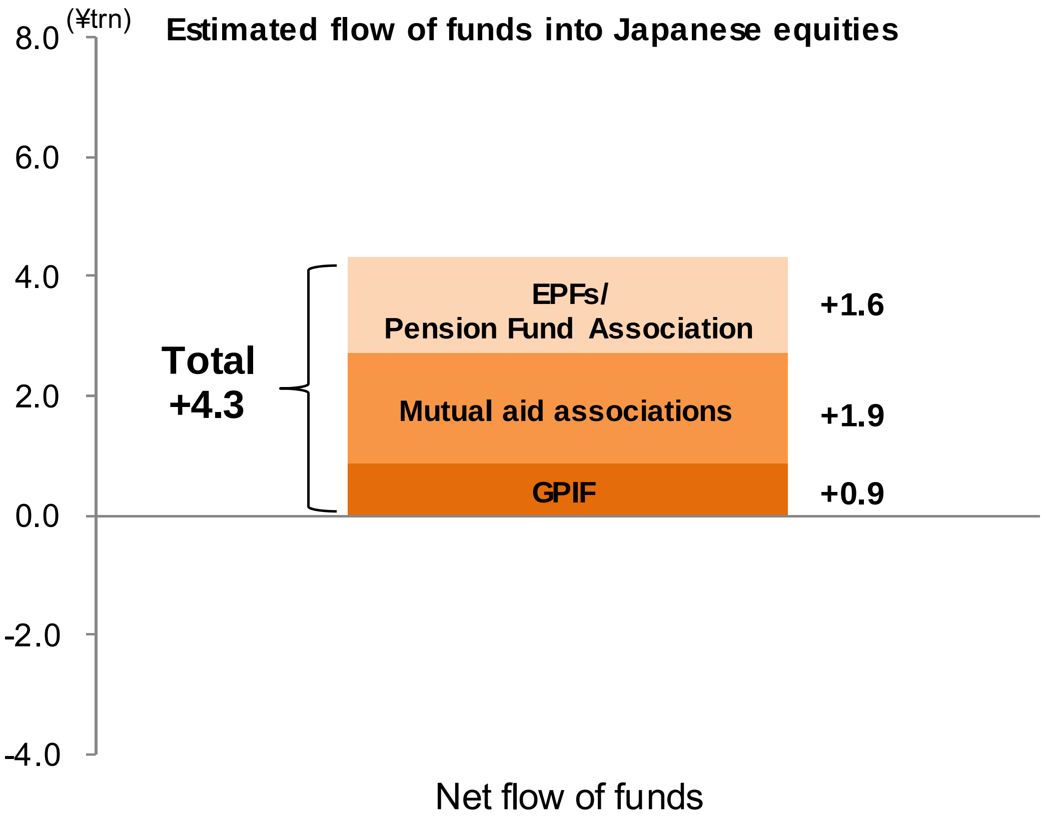
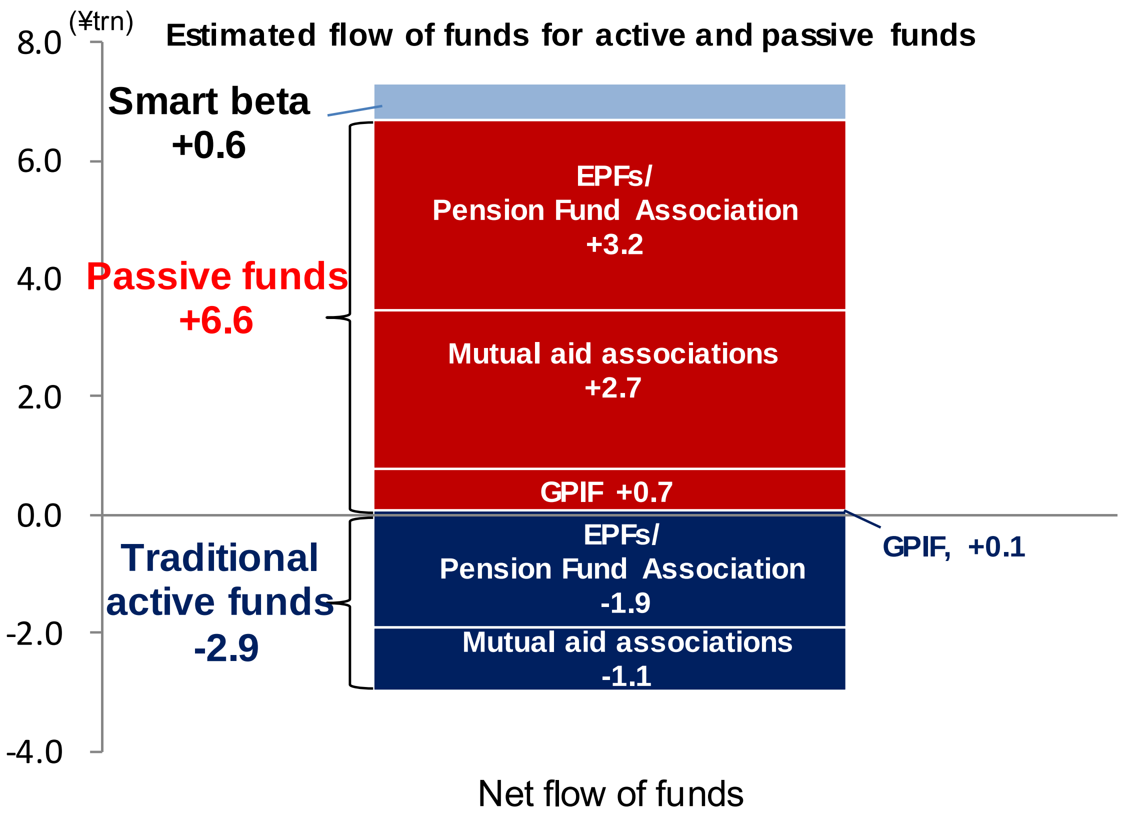
Effect of increase in domestic stock ratio



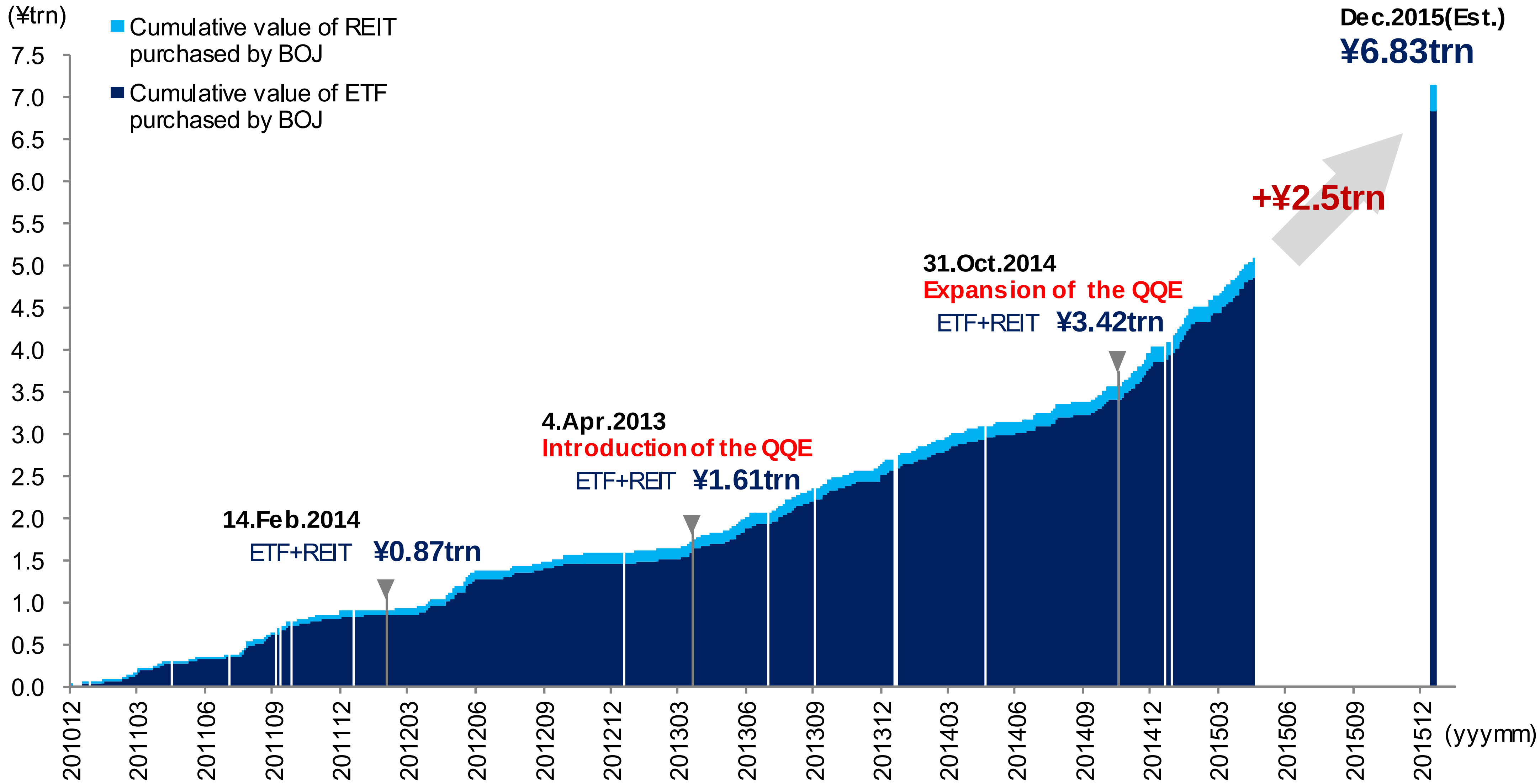
Effect of passive/smart beta shift



Source: Nomura

BOJ's QQE also encourages money flows into passive funds

Cumulative value of ETF/REIT purchased by BOJ

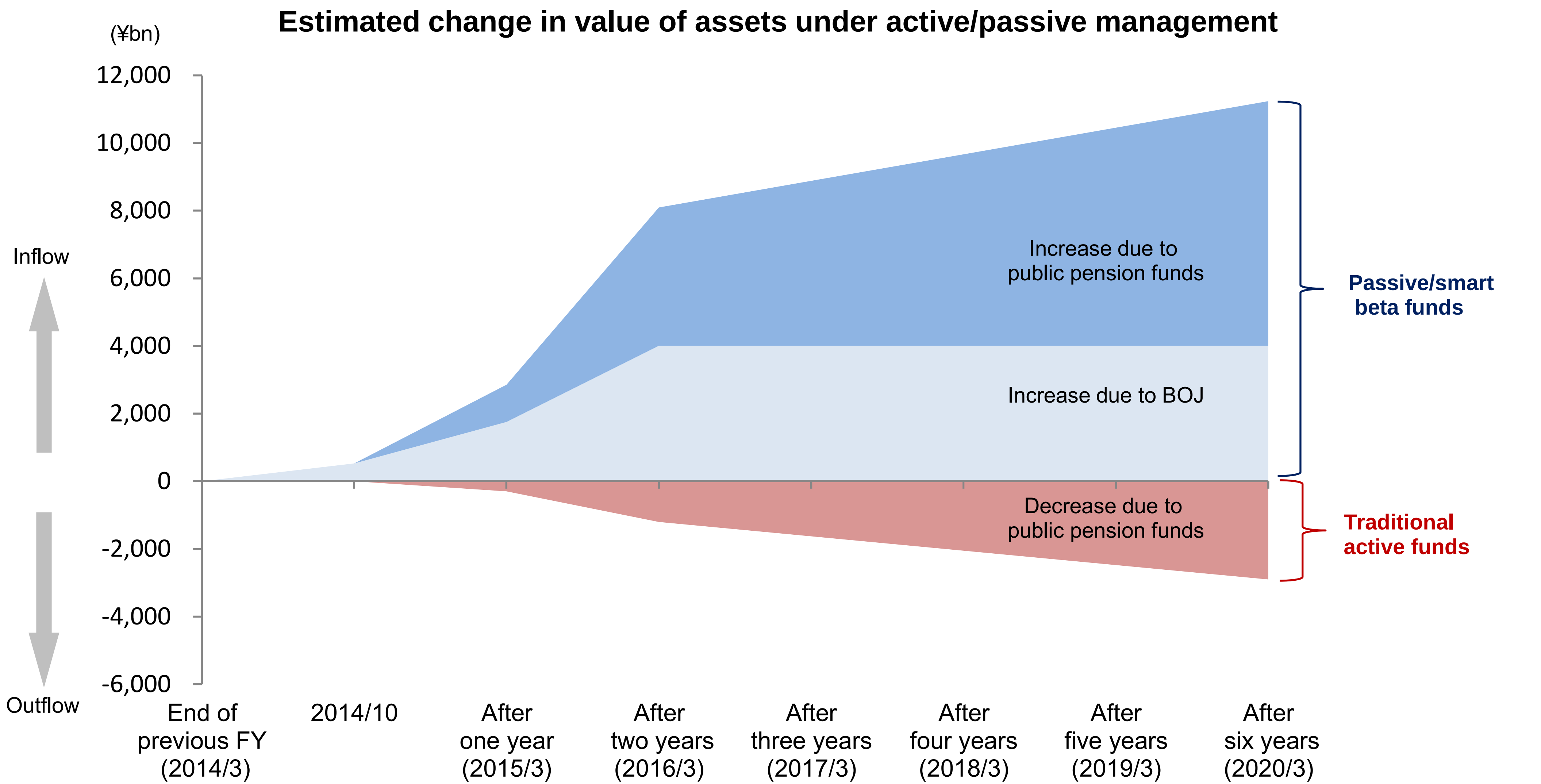


Note: Figures show cumulative value of ETF/REIT purchased by the Bank of Japan (BOJ) and cumulative return of TOPIX. Sample period was Dec 2010 through 1 May 2015. Estimated figures as of end-Dec 2015 is total of BOJ's holding ETF/REIT as of 1 May 2015 and the rest of annual purchases.

Source: Nomura, based on the Bank of Japan

We expect ¥10trn to shift to passive management over the next five years or so

Estimated flow of funds from active to passive management (public pension funds + BOJ easing)

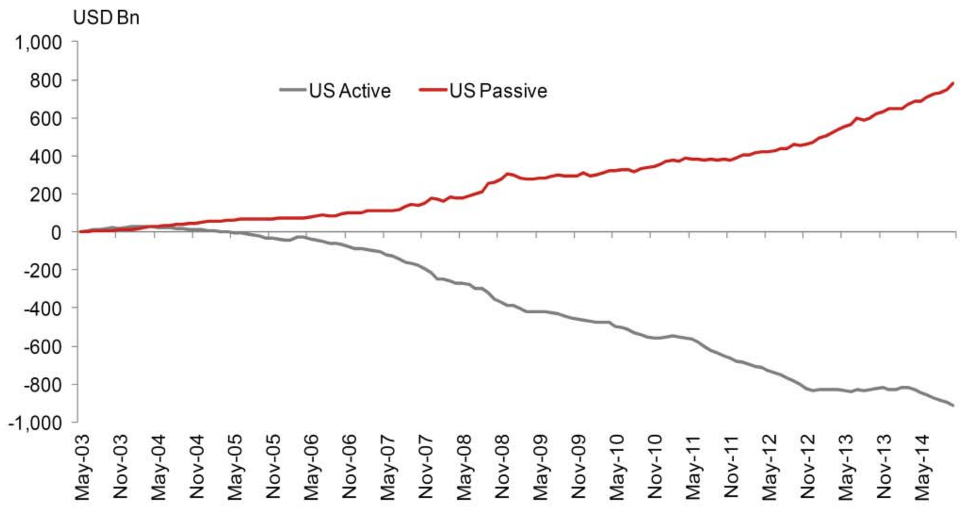


Source: Nomura

Passive shift in global markets (Inigo(2014))

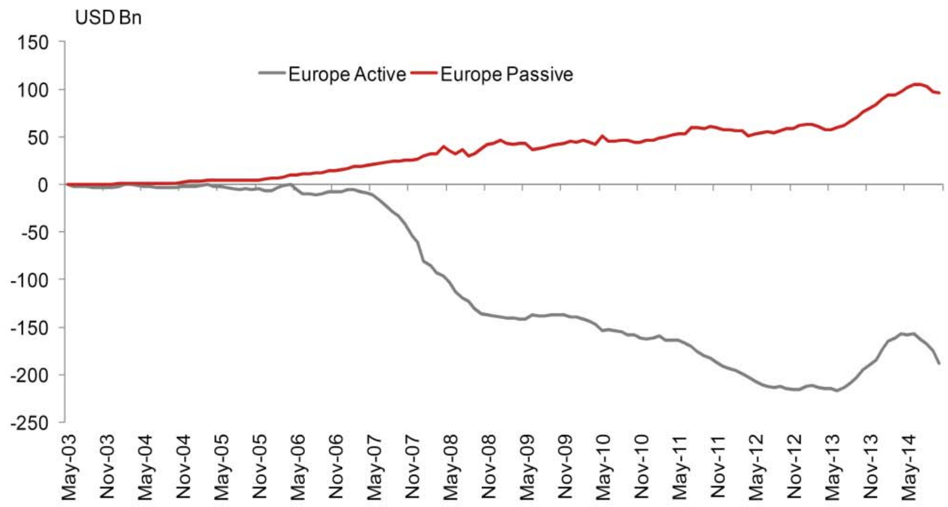
Passive shift in US and Europe : Inigo(2014)

Fig. 27: The US has seen a trend loss in active share…



Source: EPFR, Nomura strategy research

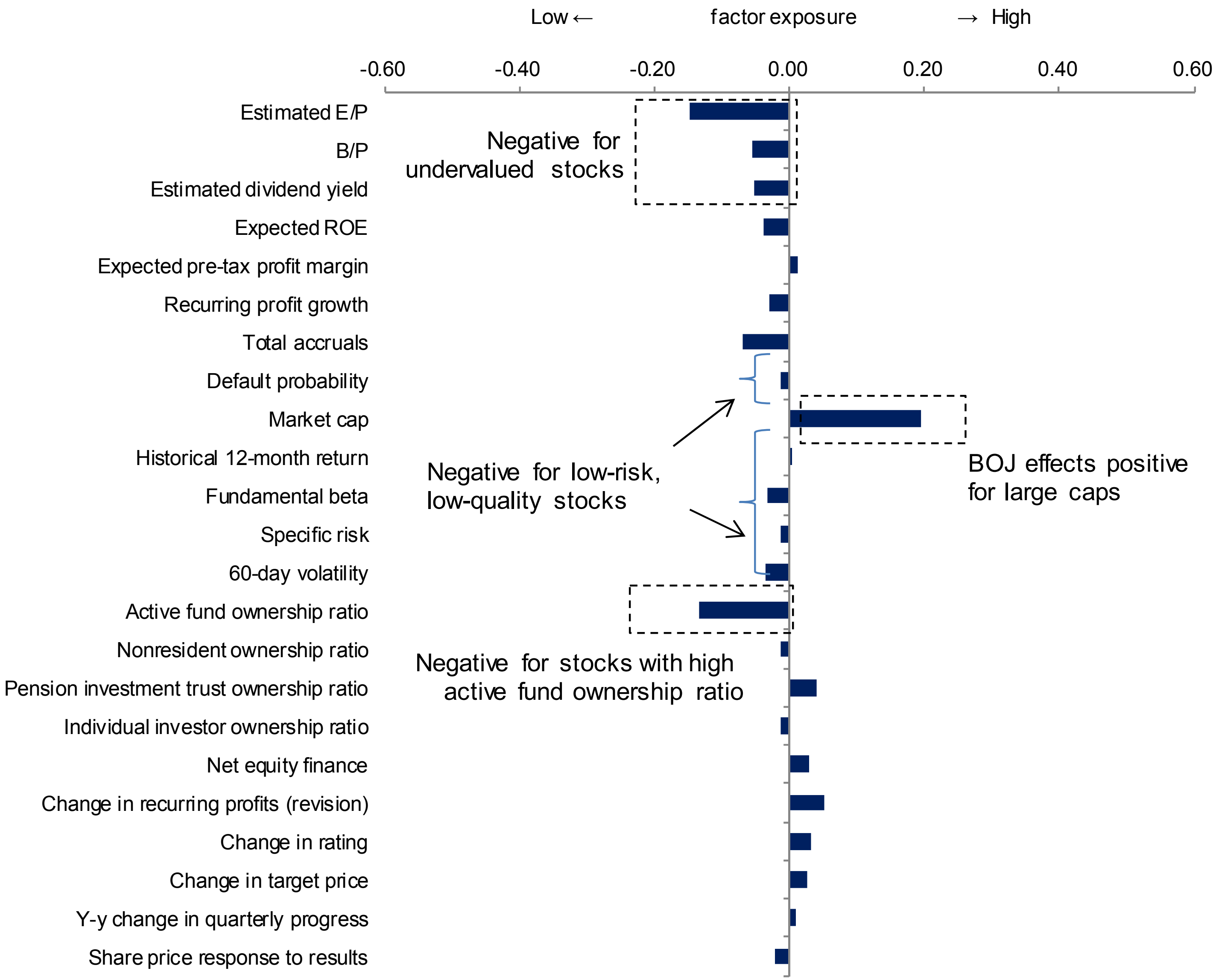
Fig. 28: … while in Europe active had been doing relatively well until recently



Source: EPFR, Nomura strategy research

Factor impact-effects from passive shift of public pension funds and BOJ's additional easing

Factor impact (effects from public pension fund shift to passive management and BOJ's additional easing)



Note: We simulated fund portfolios assuming the flow of funds: inflows of ¥6.6trn into passive portfolios and ¥0.6trn into smart beta funds, outflow of ¥2.9trn from active funds. We then assessed exposure to the main factors. We used data at the beginning of December 2014.

Source: Nomura

Global comparison:
Value factor lost effectiveness, and investors preferred low-risk stocks in Japanese market

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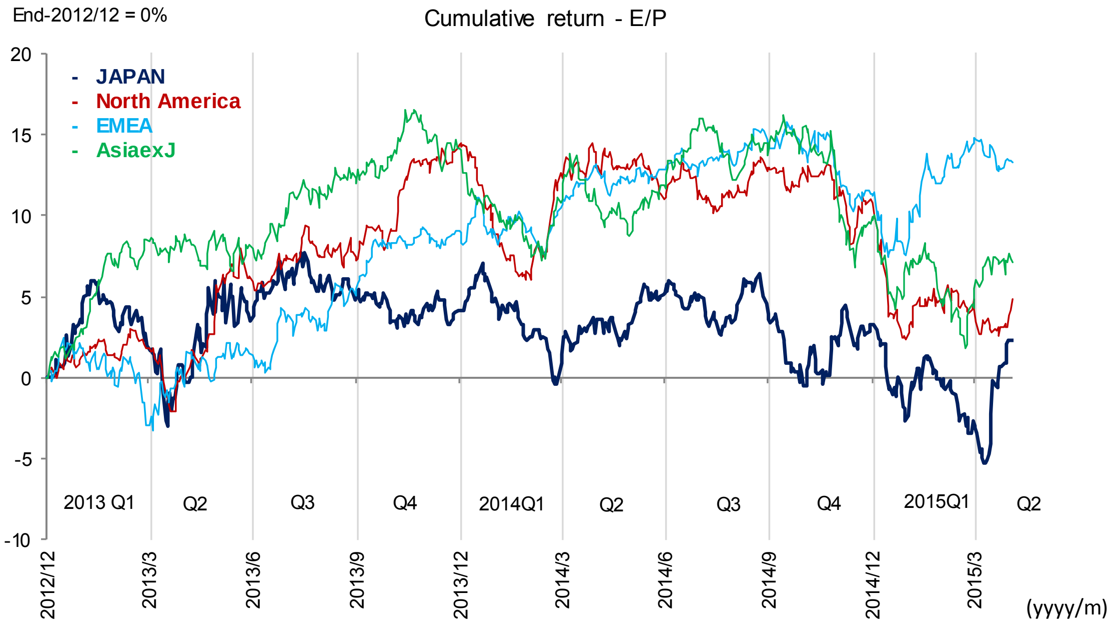
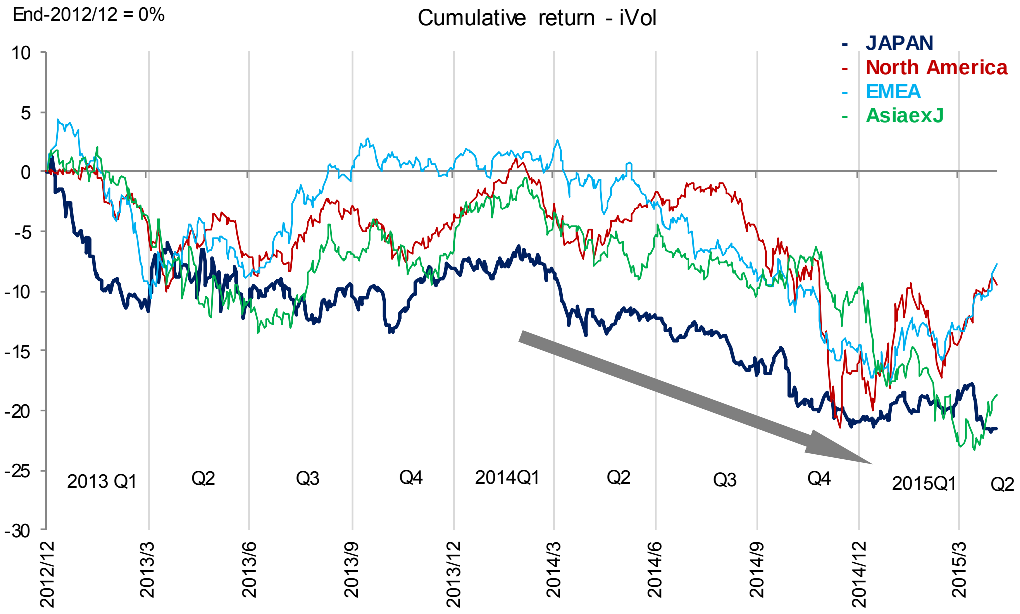
Global comparison

(a) Value (E/P)



(b) Risk (specific risk iVol)



Note: We calculated factor returns (estimated E/P and specific risk) for MSCI World Index constituent stocks in each region: Japan, North America, EMEA, and Asia/Pacific (ex Japan). All returns are on a dollar-denominated basis. We did not take transaction costs into account. Analysis is based on historical data and does not guarantee future performance. Sample period was Jan 2013–5 May 2015.
Source: Nomura

The stocks bought by public pension funds and BOJ outperformed
Long: positive impact stocks + short: negative impact stocks

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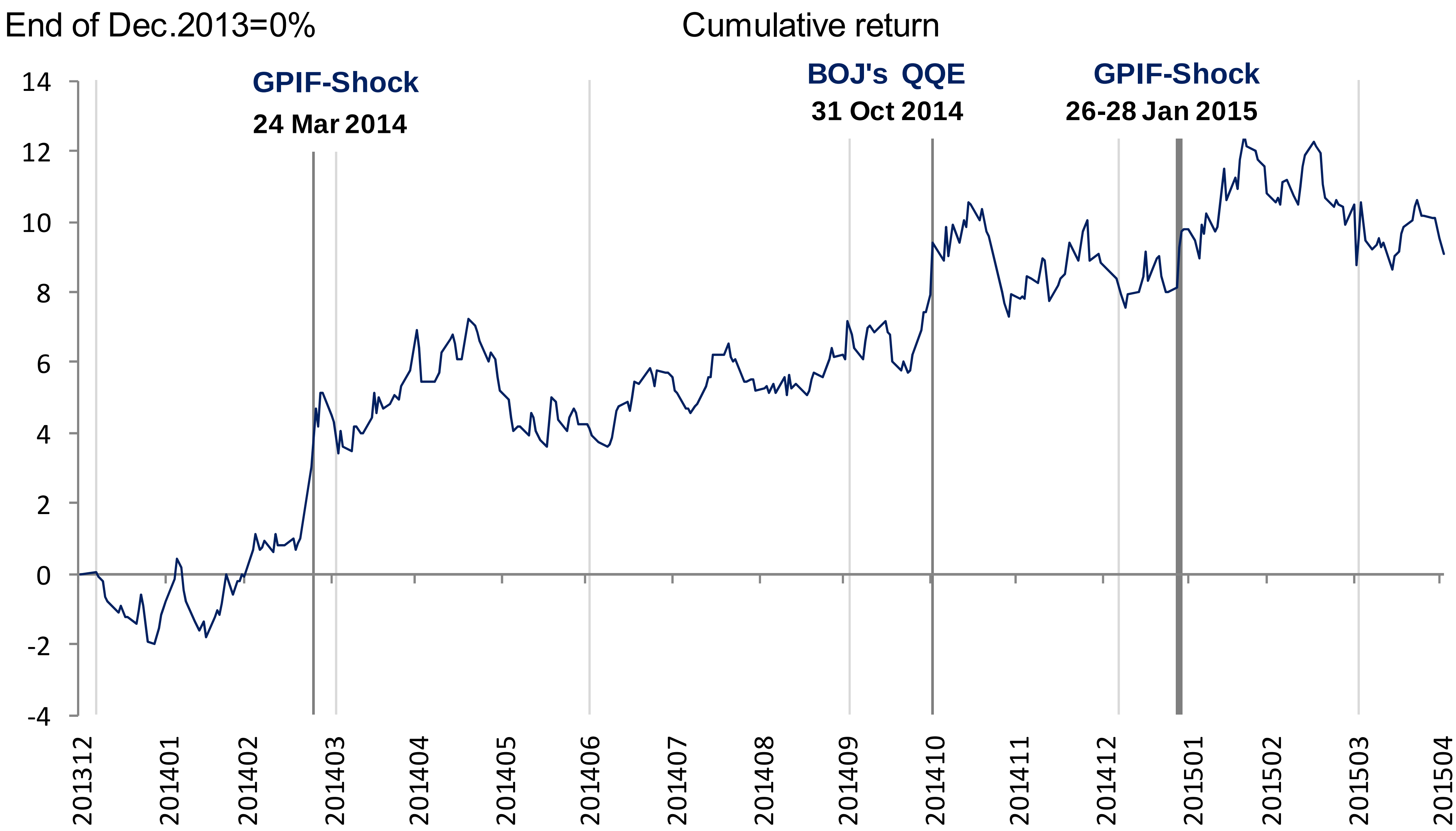
Strategy using estimated impact from passive shift

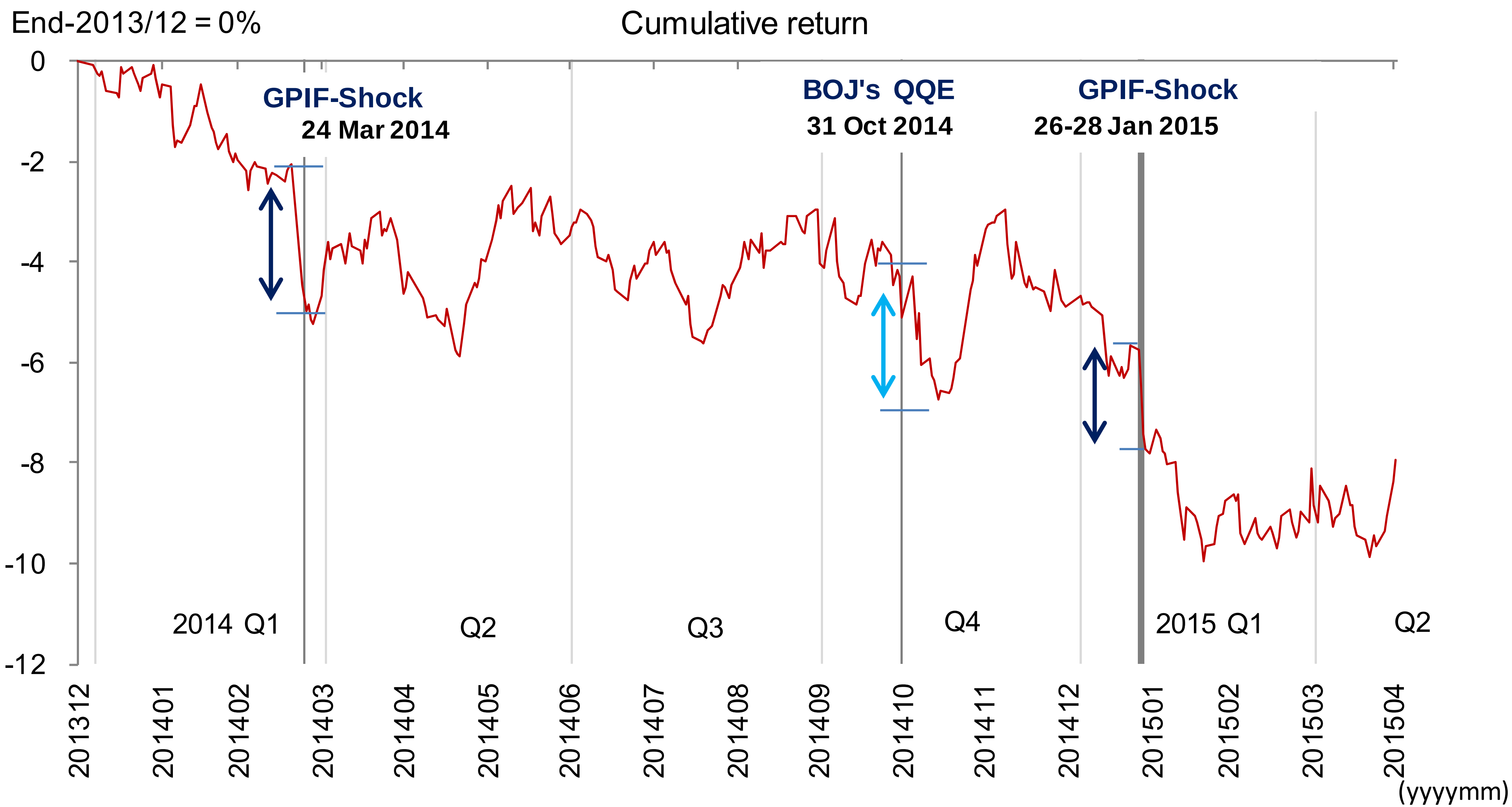


Note: We divided the universe of TOPIX 500 stocks into quintiles based on each stock's estimated trading impact from passive shift, at the beginning of each month. Figure shows the cumulative daily return (equally weighted basis) on a strategy of going long on the stocks in the quintile with the highest factor values (ie, the highest impact stocks) and short on the stocks in the quintile with the lowest factor values (ie, the lowest impact stocks). We did not take trading costs into account. Analysis is based on historical share prices and does not guarantee future performance. Sample period was January 2014 through 1 May 2015.

Source: Nomura

Stocks with high active fund ownership ratios underperformed

Performance of stocks concentrated positions by active funds

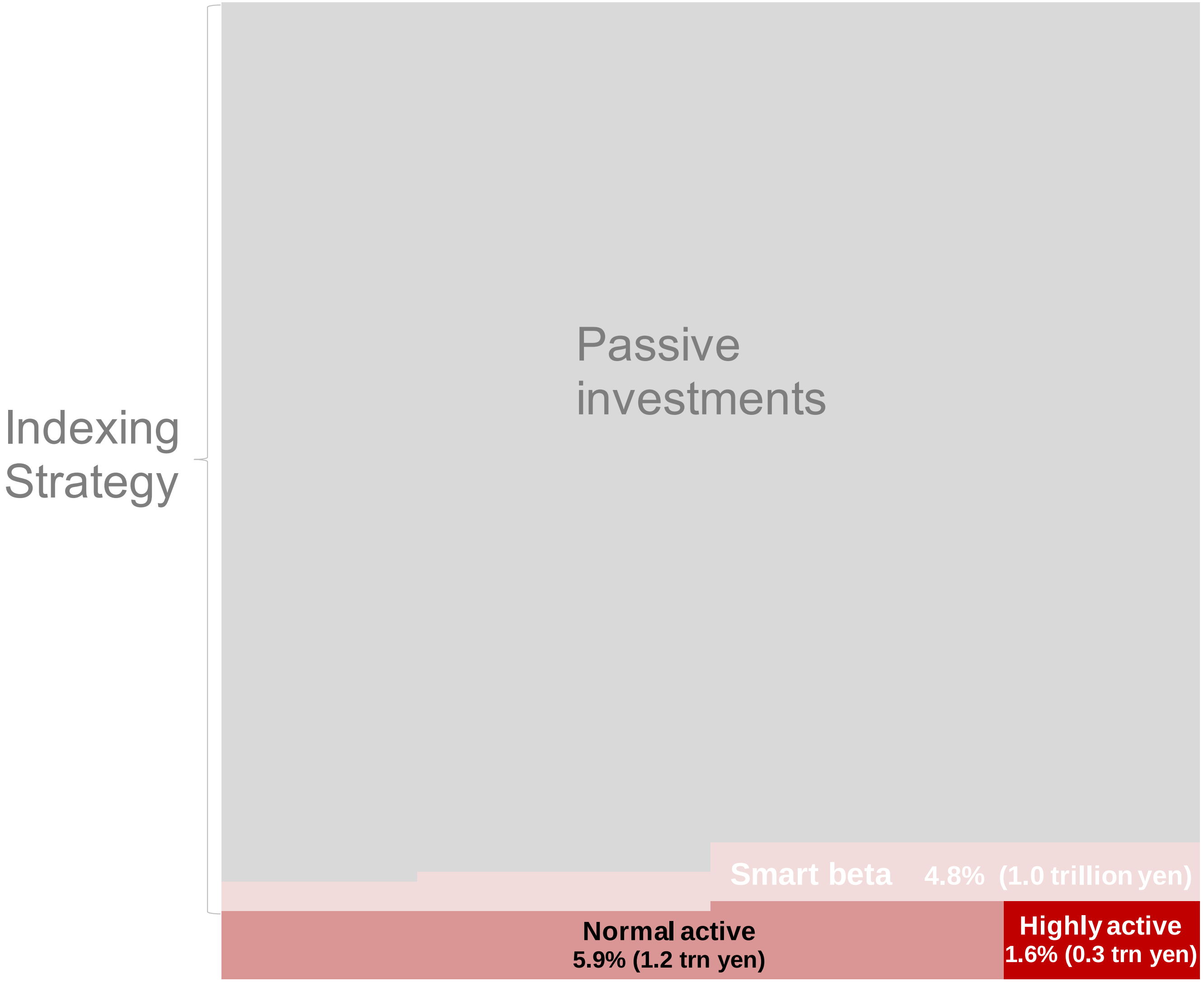


Note: We divided the universe of TOPIX 500 stocks into quintiles based on each stock's active funds' share ownership ratio, at the beginning of each month. Figure shows the cumulative daily return (equally weighted basis) on a strategy of going long on the stocks in the quintile with the highest factor values (ie, the most overweight stocks) and short on the stocks in the quintile with the lowest factor values (ie, the most underweight stocks). We did not take trading costs into account. Analysis is based on historical share prices and does not guarantee future performance. Sample period was January 2014 through 1 May 2015.

Source: Nomura

Another approach by GPIF
Highly Active was adopted in Traditional Active investment

Overview of changes to fund manager structure As of March 2014



Average of Active share is 0.95
Average number of stocks is 43

<GPIF's Highly active funds>

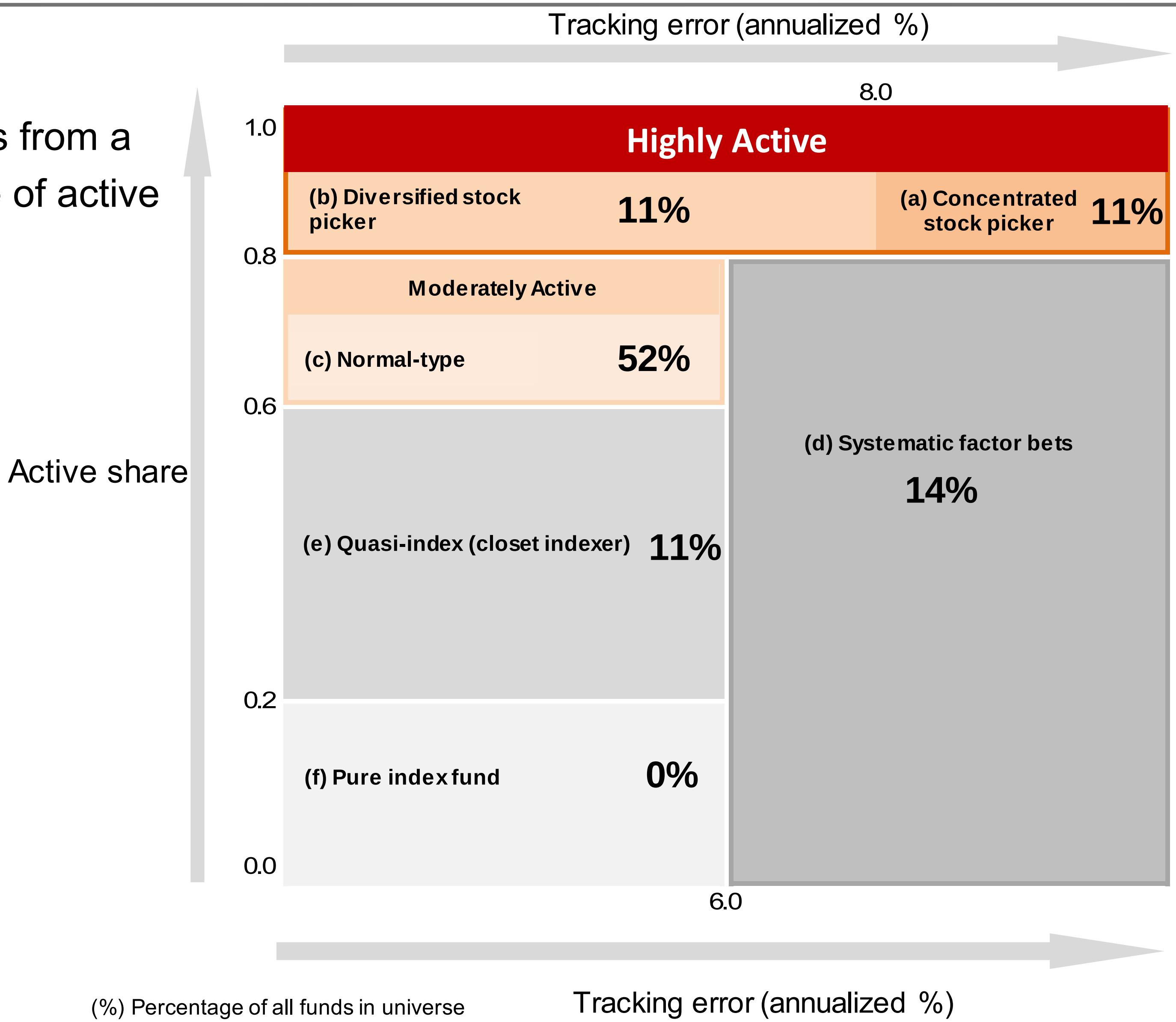
	Active Share	Number of stocks
Fund A	0.99	47
Fund B	0.98	18
Fund C	0.96	66
Fund D	0.89	42
Average	**0.95**	**43**

Source: Nomura, based on GPIF and each fund's data

Active fund categories based on active share and tracking error : Cremers and Petajisto (2009)

Share of all funds by active fund type in Japan mutual funds (as of end-April 2015)

■ "Active share" is defined as the percentage of a portfolio that differs from a benchmark to measure the degree of active management.



$$\text{Active share: } AS_F = \frac{1}{2}\sum_{i=1}^{N}\left|w_{F,i} - w_{F(B),i}\right|$$

$w_{F,i}$: The portfolio weighting of stock *i*

$w_{F(B),i}$: The benchmark weighting of stock *i*

Active share indicates the extent to which the portfolio weighting diverges from the benchmark. For long-only funds, it has a value ranging from 0% to 100%.

Note: We divided Japan equity active funds into six categories based on active share and tracking error sizes. For each fund, we calculated active share using the most recent data from management reports disclosed over a one-year period up to end-April 2015, and tracking error using historical returns for the 36-month period up to end-April 2015. The figure given to each category in the table represents a percentage (share) of all funds in our universe.

Source: Nomura

Highly active funds outperformed, but we should beware of downside risk

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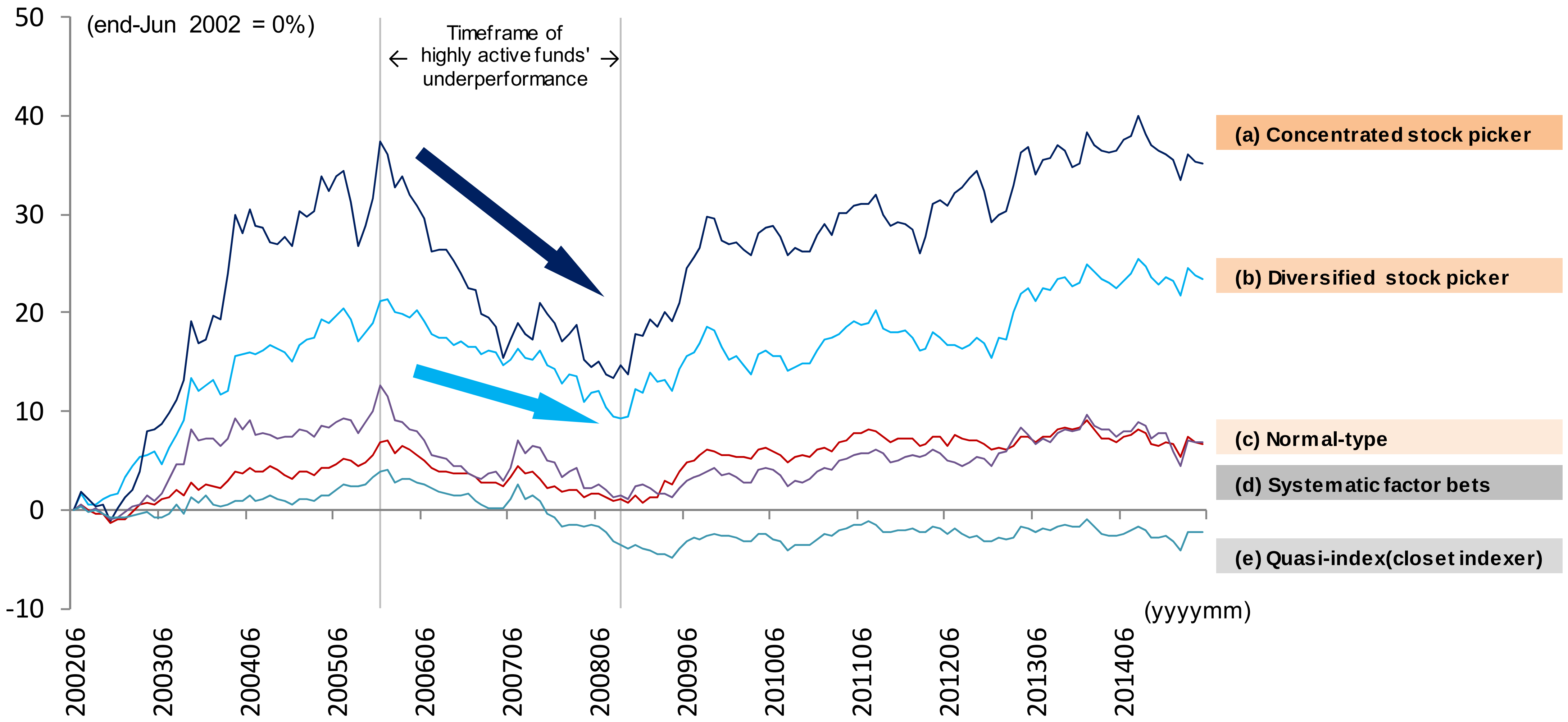
Performance by type of actively managed fund



Note: Our universe is Japan equity active funds. At the start of each month, we measured active share and tracking error for each fund based on the most recent management reports, and divided the funds into six categories. We calculated time-series cumulative and statistical monthly data for excess returns versus a benchmark for funds corresponding to each category. Benchmarks for each fund were selected based on the smallest active share from among the TOPIX and the Russell/Nomura Large, Small, Value and Growth indices. Analysis is based on historical data and does not guarantee future performance. Sample period was July 2002 through 1 May 2015.
Source: Nomura

Highly Active has been underperforming even after the second half of 2014

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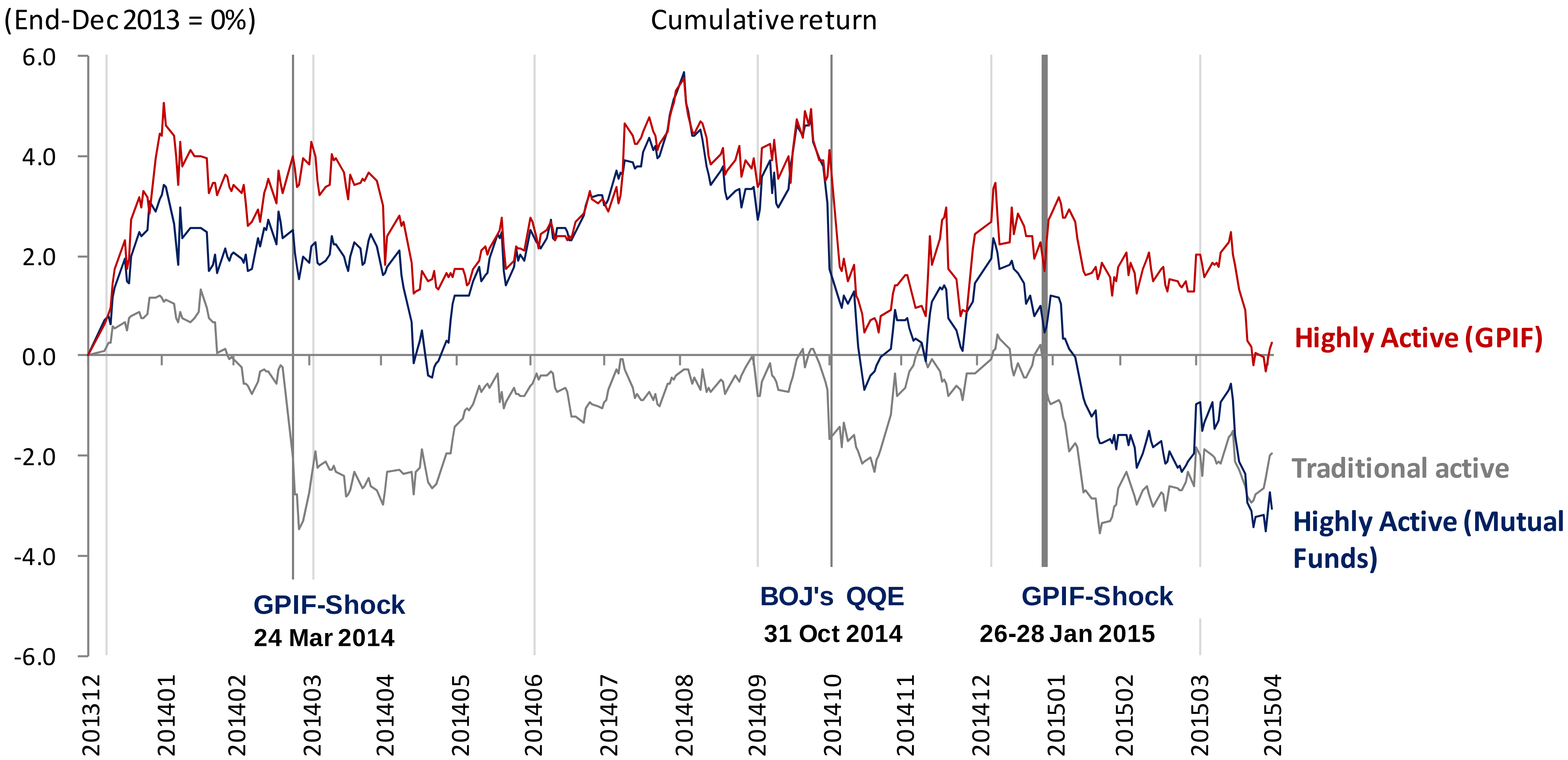
Performance of Japanese equity traditional active funds



Note: The performance of traditional active funds is shown as the difference in returns between stocks overweighted and underweighted by domestic investment trusts and pension funds. The performance of highly active funds is shown as the average excess return versus the benchmark of long-only publicly offered investment trusts with an active share of more than 0.8. The performance of highly active (GPIF) is shown as the average excess return versus the TOPIX on three funds (Eastspring Japan Smaller Companies Fund, MHAM Japan Small Cap Stock Open, and Invesco Japanese Equity Advantage Fund). Sample period was Jan 2014–1 May 2015. We did not take transaction costs into account, except in the case of funds that have closed. Analysis is based on historical data and does not guarantee future performance.

Source: Nomura

Sharpening up of active fund management: Concentrated investment in large caps or aggressive investment in small caps

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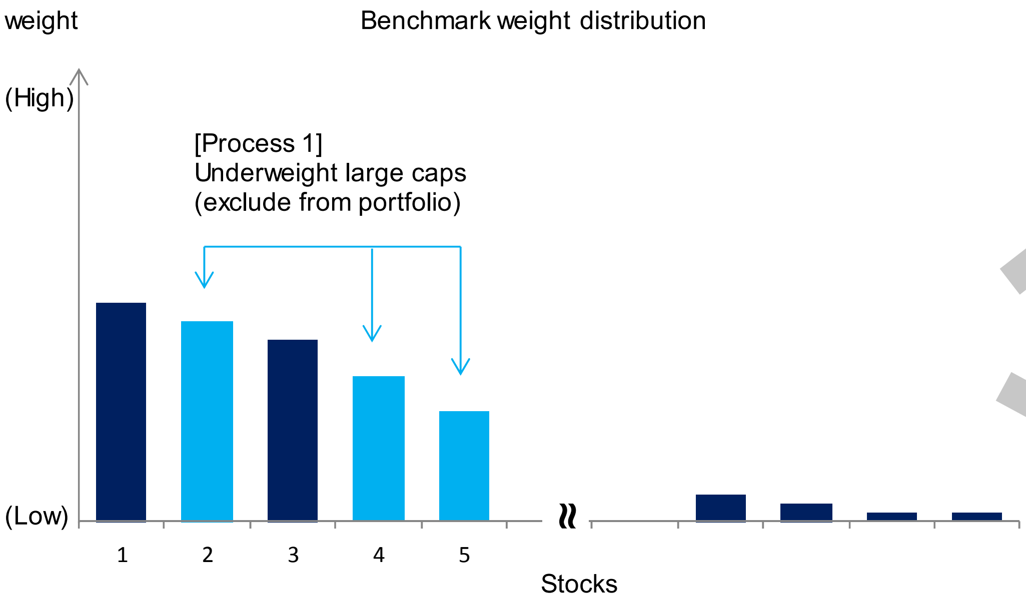
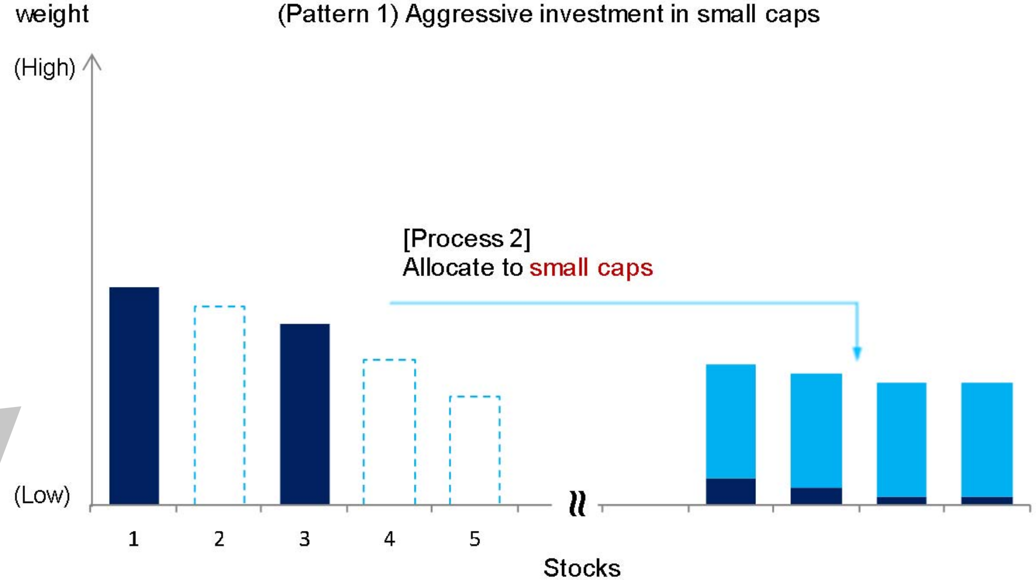
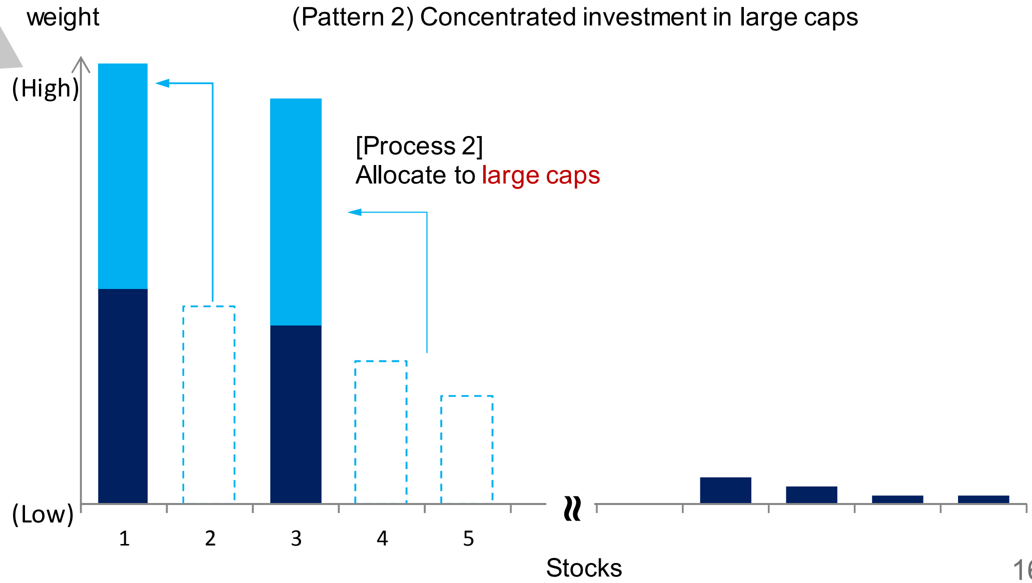
Schematic diagram of how to increase active share

- **Process 1**



- **Process 2**





Source: Nomura

Another categories of active funds
High downside risk reflects concentrated positioning

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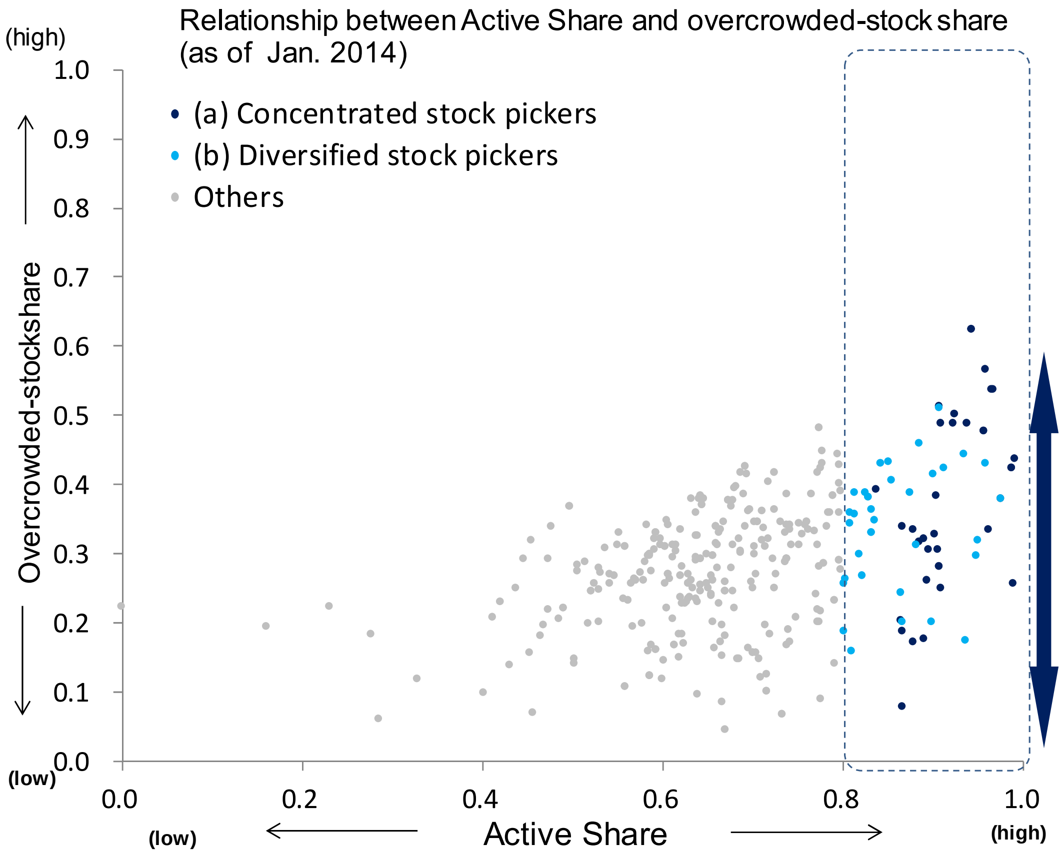
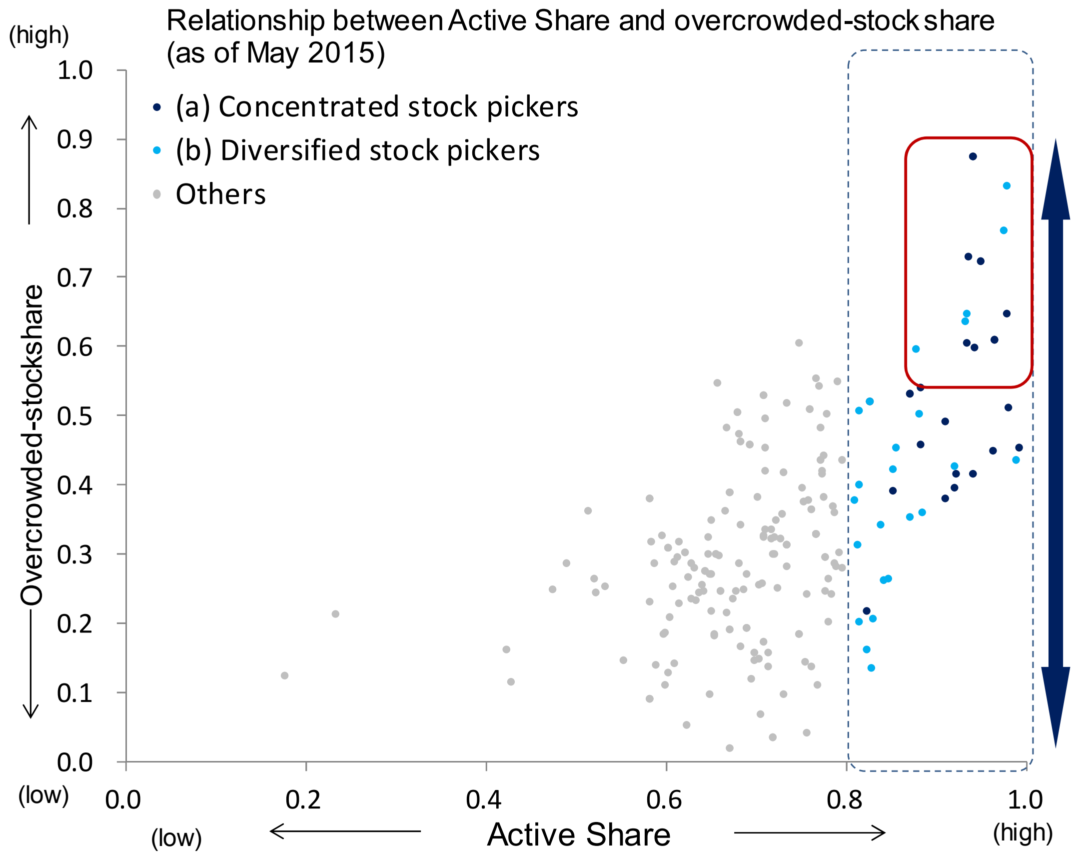
Highly active funds sometimes engage in herding

(a) As of January 2014



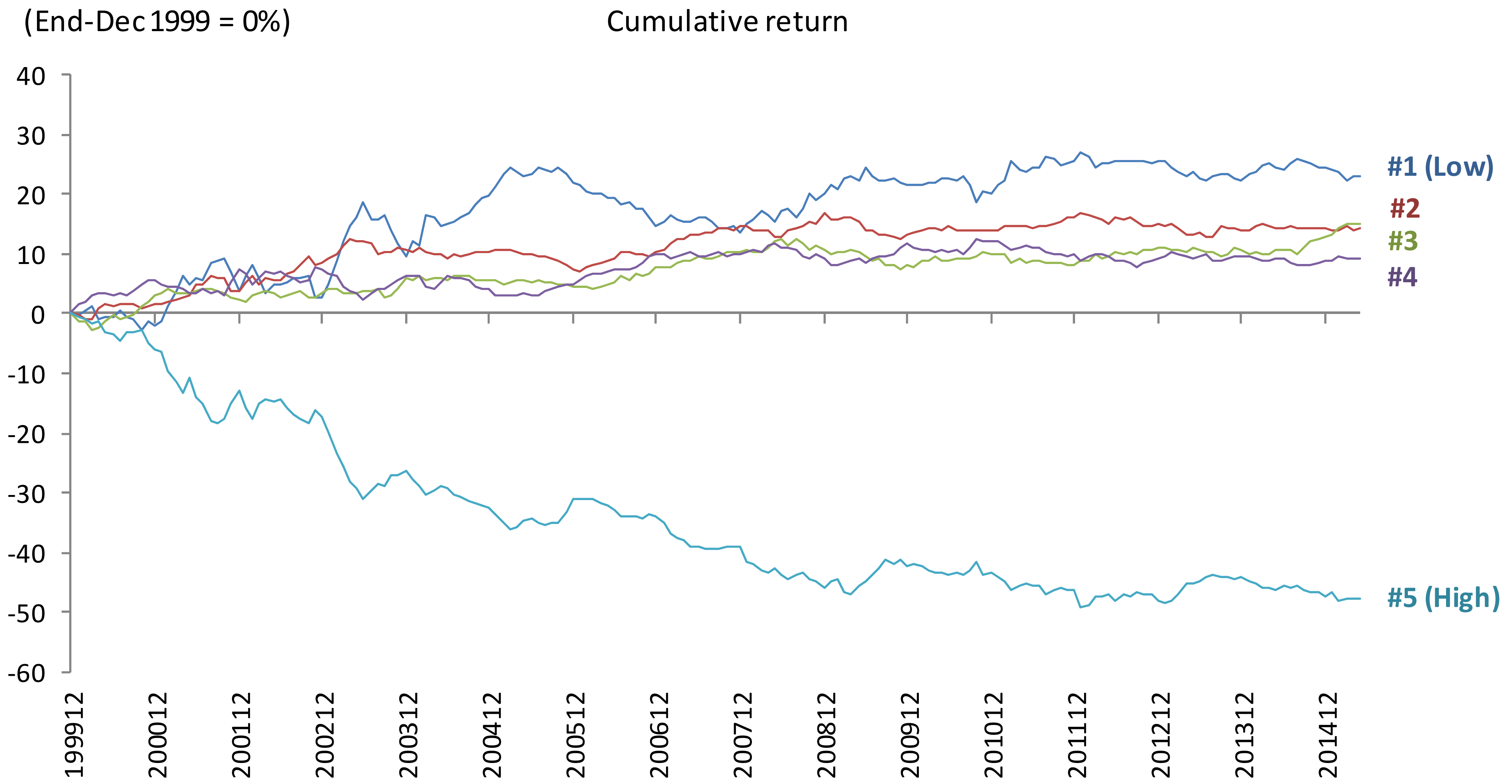
(b) As of May 2015



Note: Using information available as of the beginning of January 2014 or May 2015 on active funds' portfolio holdings, we calculated overcrowded-stock share (ie, ratio of overcrowded stocks to total portfolio-constituent stocks) for each fund. We plotted overcrowded-stock share against Active Share on a fund-by-fund basis to investigate the relationship between the two. To highlight (a) concentrated stock pickers (Active Share ≥0.8 and annualized tracking error ≥8%) and (b) diversified stock pickers (Active Share ≥0.8 and annualized tracking error <8%) in the graph above, we plotted the former with dark blue dots and the latter with light blue dots.
Source: Nomura

Poor performance of stocks with high active fund ownership ratio

Long-term performance of active fund ownership ratio

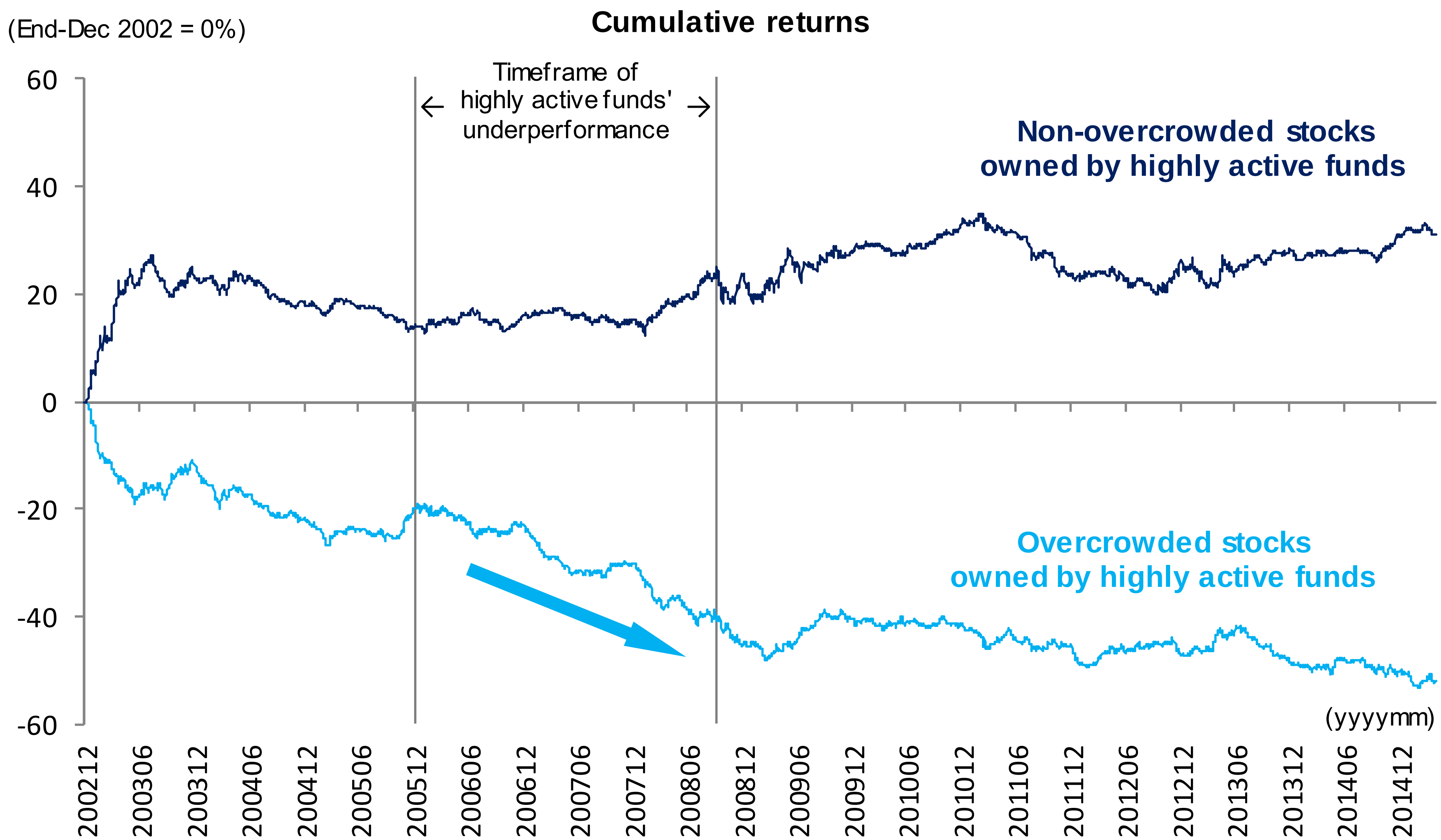


Note: We divided the universe of TSE-1 stocks into quintiles based on each stock's active funds' share ownership ratio, at the beginning of each month. We considered sector diversification using TSE 33 sectors. Figure shows the cumulative monthly excess returns (equally weighted basis) versus an equally weighted portfolio comprising all TSE-1 stocks for each group. We did not take trading costs into account. Analysis is based on historical share prices and does not guarantee future performance. Sample period was January 2000 through 1 May 2015.

Source: Nomura

Among highly active funds, the funds holding more overcrowded stocks tend to underperform the market

Performance of stocks owned by highly active funds

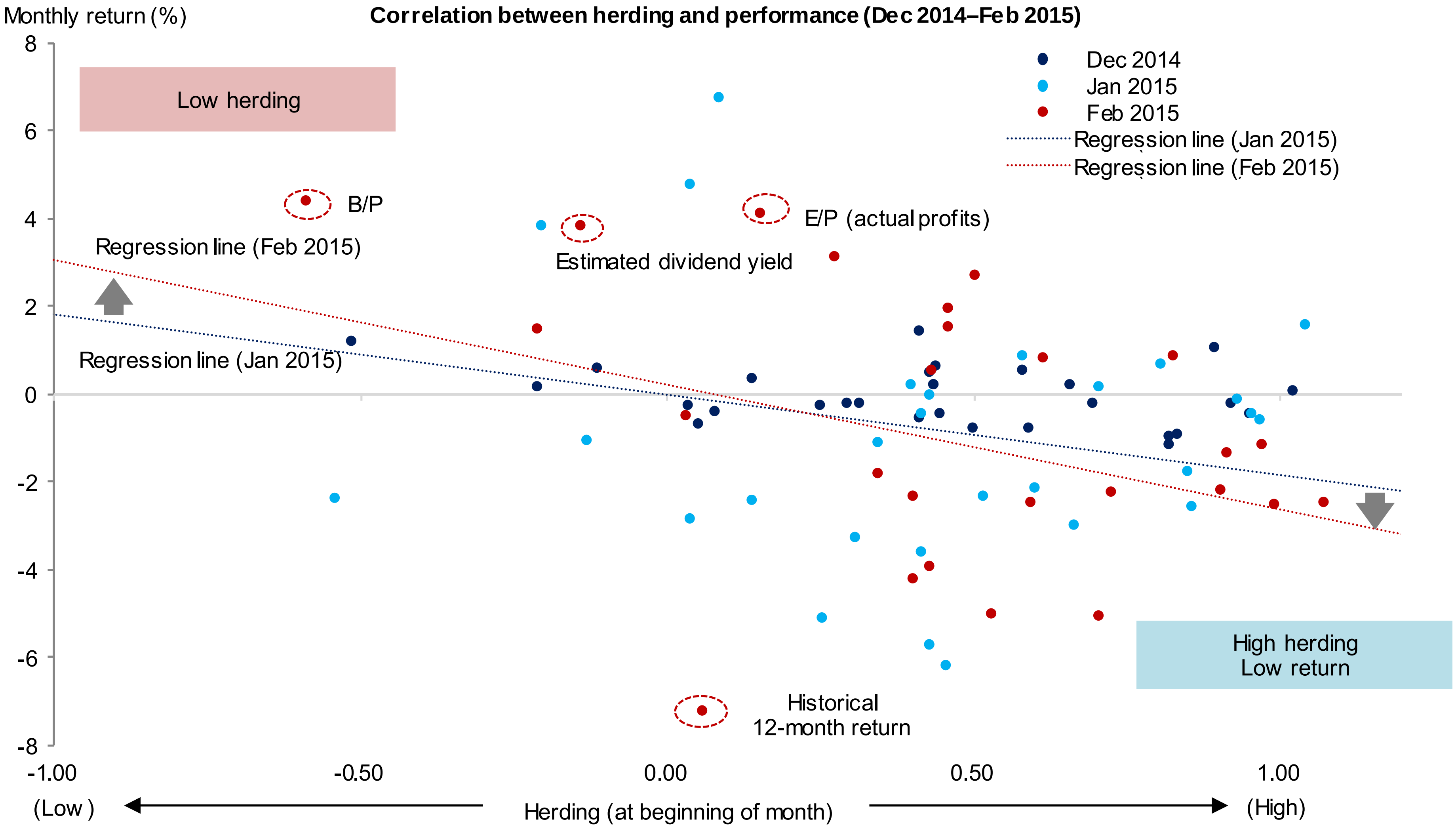


Note: We used a universe comprising all stocks owned by funds with an Active Share of 0.8 or higher. At the beginning of every month, we defined two groups: overcrowded stocks and non-overcrowded stocks. We defined overcrowded stocks as being in the top quintile of stocks listed on the TSE-1 ranked by active fund ownership ratio. We defined non- overcrowded stocks as stocks in the bottom three quintiles of the same. We constructed equal-weighted portfolios of each group of stocks and measured their returns over the course of every month as daily excess returns over benchmark (average return of stocks listed on the TSE-1). We disregarded transaction costs in calculating returns. The above returns were derived from backtesting and offer no assurance of future performance. Our sample period was July 2002 through 1 May 2015.

Source: Nomura

Avoiding herding is also crucial for factor strategy

Correlation between herding and performance



Note: We had three sample periods: Dec 2014, Jan 2015, and Feb 2015 (through 20 Feb). For each factor, we divided our universe of TOPIX 500 constituent stocks into quintiles based on factor values at the start of each month. To determine the degree of herding for each factor, we calculated the average active fund ownership ratio for the quintiles with the highest and lowest factor values, and standardized our data by dividing the difference between the two by the average active fund ownership ratio for the universe as a whole. We calculated the monthly factor return as the monthly return on a strategy of going long on the stocks in the top quintile and short on the stocks in the bottom quintile. Figure shows the relationship between herding and subsequent factor returns in our three periods, with the degree of herding at the beginning of each month shown on the x-axis and subsequent factor returns shown on the y-axis. We did not take transaction costs into account. Analysis is based on historical data and does not guarantee future performance.

Source: Nomura

Avoiding unwinding risk in factor level
Focus on cyclical factor effectiveness

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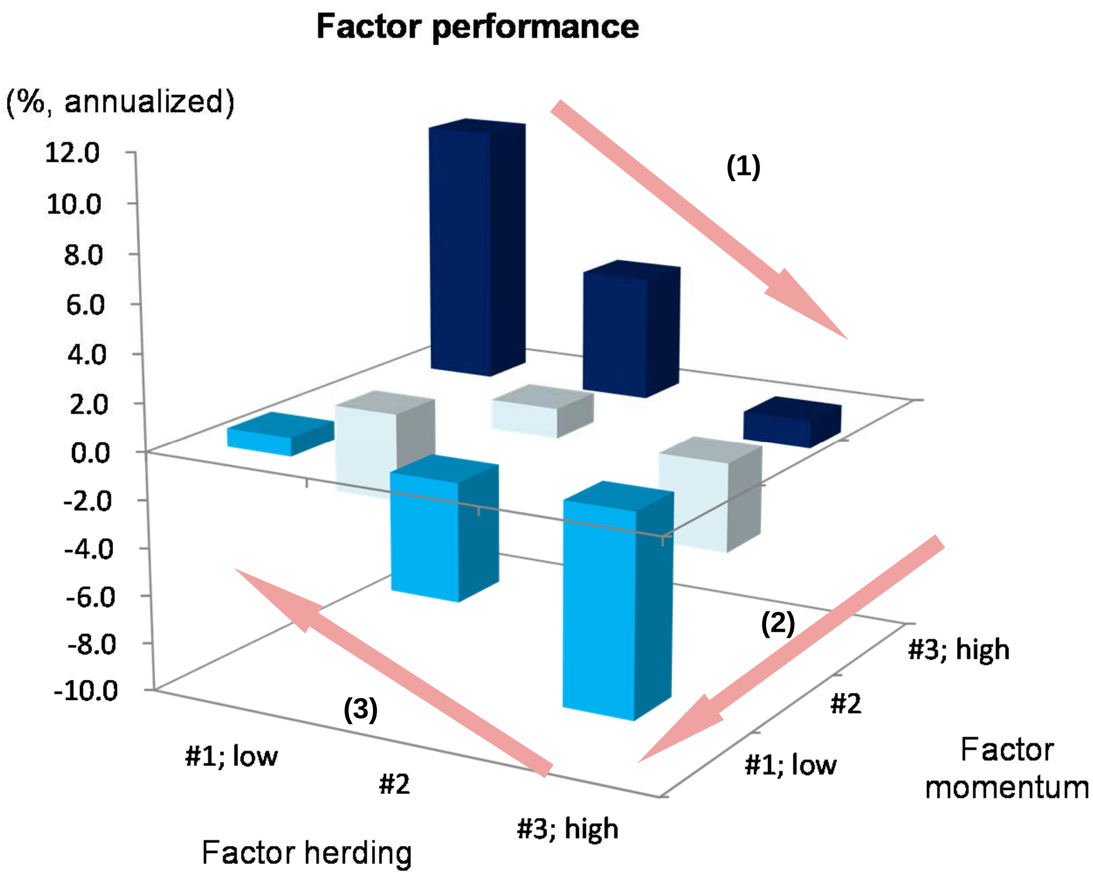
Annualized performance: Cyclical factor effectiveness



Statistics

	Factor momentum			
	Negative		Positive	
	#1	#2	#3	#3-#1
Average	0.76	-3.77	10.73	9.96
Standard deviation	9.82	15.16	10.11	15.55
t-value	0.28	-0.91	3.88	2.34
			****	**
Return/risk	0.08	-0.25	1.06	0.64
Average	-4.78	1.23	5.14	9.92
Standard deviation	10.85	9.09	10.15	16.22
t-value	-1.61	0.49	1.85	2.23
			*	**
Return/risk	-0.44	0.13	0.51	0.61
Average	-8.21	-3.66	-1.19	7.02
Standard deviation	11.80	10.71	8.63	11.79
t-value	-2.54	-1.25	-0.50	2.17
	**			**
Return/risk	-0.70	-0.34	-0.14	0.60

Note: Universe is 29 factors. We calculated factor herding level (Herding) and past 3-month return at the beginning of each month, for each factor. We create three groups based on factor herding levels, each of which we then divided into a further three groups by past 3-month returns, and calculated monthly equally-weighted returns for each group. t-values are based on the null hypothesis in which the average monthly return is zero. (*) indicates significance at 10% (both sides), (**) indicates significance at 5% (both sides), (***) indicates significance at 1% (both sides) and (****) indicates significance at 0.1% (both sides). We did not take transaction costs into account. Analysis is based on historical data and does not guarantee future performance.

Source: Nomura

Conclusion

- The fund flows into passive funds are likely to far exceed those into active funds, because of the expanding passive management by public pension funds and the QQE by BOJ.

- While the stocks preferred by passive/smart-beta management are expected to outperform, the overcrowded stocks held by active managers are likely to underperform the market .

- Active investment holding a small number of stocks has been also expanding, but has resulted in underperformance in recent years.

- Avoiding herding is crucial both for active and quantitative funds in Japan equities.

Reference materials

- Inigo Fraser-Jenkins, et al., 2014, *2015 European Strategy Outlook, Preparing for a low-return world*, 25 November 2014
- Akihiro Murakami, 2015, *Japanese equity quantitative strategy: Unwinding amid global correlation of factor trends*, Nomura Quantitative Research Report, 26 February, 2015
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- Akihiro Murakami, 2014, *Japanese equity quantitative strategy: Knock-on effect of increasing passive management*, Nomura Quantitative Research Report, 9 July 2014
- Akihiro Murakami, 2014, *Japanese equity quantitative strategy: Active funds still facing headwinds*, Nomura Quantitative Research Report, 30 April 2014

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A rating of **'Buy'**, indicates that the analyst expects the stock to outperform the Benchmark over the next 12 months. A rating of **'Neutral'**, indicates that the analyst expects the stock to perform in line with the Benchmark over the next 12 months. A rating of **'Reduce'**, indicates that the analyst expects the stock to underperform the Benchmark over the next 12 months. A rating of **'Suspended'**, indicates that the rating, target price and estimates have been suspended temporarily to comply with applicable regulations and/or firm policies. Securities and/or companies that are labelled as **'Not rated'** or shown as **'No rating'** are not in regular research coverage. Investors should not expect continuing or additional information from Nomura relating to such securities and/or companies. Benchmarks are as follows: **United States/Europe/Asia ex-Japan**: please see valuation methodologies for explanations of relevant benchmarks for stocks, which can be accessed at: http://go.nomuranow.com/research/globalresearchportal/pages/disclosures/disclosures.aspx; **Global Emerging Markets (ex-Asia)**: MSCI Emerging Markets ex-Asia, unless otherwise stated in the valuation methodology; **Japan:** Russell/Nomura Large Cap.

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Explanation of Nomura's equity research rating system in Japan and Asia ex-Japan prior to 21 October 2013

STOCKS

Stock recommendations are based on absolute valuation upside (downside), which is defined as (Target Price - Current Price) / Current Price, subject to limited management discretion. In most cases, the Target Price will equal the analyst's 12-month intrinsic valuation of the stock, based on an appropriate valuation methodology such as discounted cash flow, multiple analysis, etc. A **'Buy'** recommendation indicates that potential upside is 15% or more. A **'Neutral'** recommendation indicates that potential upside is less than 15% or downside is less than 5%. A **'Reduce'** recommendation indicates that potential downside is 5% or more. A rating of **'Suspended'** indicates that the rating and target price have been suspended temporarily to comply with applicable regulations and/or firm policies in certain circumstances including when Nomura is acting in an advisory capacity in a merger or strategic transaction involving the subject company. Securities and/or companies that are labelled as **'Not rated'** or shown as **'No rating'** are not in regular research coverage of the Nomura entity identified in the top banner. Investors should not expect continuing or additional information from Nomura relating to such securities and/or companies.

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Target Price

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When inflation-indexed JGBs are purchased via public offerings, secondary distributions (uridashi deals), or other OTC transactions with Nomura Securities, only the purchase price shall be paid, with no sales commission charged. Inflation-indexed JGBs carry the risk of losses, as prices fluctuate in line with changes in market interest rates and fluctuations in the nationwide consumer price index.The notional principal of inflation-indexed JGBs changes in line with the rate of change in nationwide CPI inflation from the time of its issuance. The amount of the coupon payment is calculated by multiplying the coupon rate by the notional principal at the time of payment. The maturity value is the amount of the notional principal when the issue becomes due. For JI17 and subsequent issues, the maturity value shall not undercut the face amount.
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