Japanese equity quantitative strategy

Global Quantitative Investment Strategies Conference

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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
Performance of Japanese equity funds

Underperformance of traditional active funds in Japanese stock market

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 GSR 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.

Overview of changes to fund manager structure

As of March 2013

Passive investments (TOPIX)
78.8% (13.8 trillion yen)

Traditional active investment
21.2% (3.7 trillion yen)

As of March 2014

TOPIX
86.0% (17.9 trillion yen)

Traditional active investment
7.5% (1.5 trillion yen)

Smart beta
4.8% (1 trillion yen)

Source: Nomura, based on GPIF data
Estimated money flows:
Buying passive and selling active funds by public pension funds are expected

Effect of increase in domestic stock ratio

Estimated flow of funds into Japanese equities

<table>
<thead>
<tr>
<th>Source</th>
<th>Effect of Increase</th>
<th>Estimated flow of funds into Japanese equities (¥trn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPIF</td>
<td>+0.7</td>
<td>+0.9</td>
</tr>
<tr>
<td>Mutual aid associations</td>
<td>+2.7</td>
<td>+1.9</td>
</tr>
<tr>
<td>EPFs/Pension Fund Association</td>
<td>+3.2</td>
<td>+1.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>+4.3</strong></td>
<td></td>
</tr>
</tbody>
</table>

Net flow of funds

Effect of passive/smart beta shift

Estimated flow of funds for active and passive funds

<table>
<thead>
<tr>
<th>Source</th>
<th>Effect of Passive/Smart Beta</th>
<th>Estimated flow of funds for active and passive funds (¥trn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPIF</td>
<td>+0.1</td>
<td>+0.7</td>
</tr>
<tr>
<td>Mutual aid associations</td>
<td>-1.1</td>
<td></td>
</tr>
<tr>
<td>EPFs/Pension Fund Association</td>
<td>+3.2</td>
<td>+2.5</td>
</tr>
<tr>
<td><strong>Traditional active funds</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Passive funds</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Smart beta</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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)

Estimated change in value of assets under active/passive management

- **Passive/smart beta funds**
- **Traditional active funds**

<table>
<thead>
<tr>
<th>Year</th>
<th>Inflow</th>
<th>Outflow</th>
</tr>
</thead>
<tbody>
<tr>
<td>End of previous FY (2014/3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>After one year (2015/3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>After two years (2016/3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>After three years (2017/3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>After four years (2018/3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>After five years (2019/3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>After six years (2020/3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Nomura
The same phenomenon seen in global markets
Passive shift in global markets (Inigo(2014))


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

**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

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

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

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
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 (i.e., the most overweight stocks) and short on the stocks in the quintile with the lowest factor values (i.e., 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

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

Smart beta 4.8% (1.0 trillion yen)

Indexing Strategy

Passive investments

<Elsewhere’s Highly active funds>

<table>
<thead>
<tr>
<th>Active Share</th>
<th>Number of stocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fund A</td>
<td>0.99</td>
</tr>
<tr>
<td>Fund B</td>
<td>0.98</td>
</tr>
<tr>
<td>Fund C</td>
<td>0.96</td>
</tr>
<tr>
<td>Fund D</td>
<td>0.89</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>0.95</strong></td>
</tr>
</tbody>
</table>

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

Source: Nomura, based on GPIF and each fund’s data
“Active share” is defined as the percentage of a portfolio that differs from a benchmark to measure the degree of active management.

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

$w_{F,i}$ : 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%.

<table>
<thead>
<tr>
<th>Category</th>
<th>Active Share</th>
<th>Tracking Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Concentrated stock picker</td>
<td>11%</td>
<td>8.0</td>
</tr>
<tr>
<td>(b) Diversified stock picker</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>(c) Normal-type</td>
<td>52%</td>
<td></td>
</tr>
<tr>
<td>(d) Systematic factor bets</td>
<td>14%</td>
<td></td>
</tr>
<tr>
<td>(e) Quasi-index (closet indexer)</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>(f) Pure index fund</td>
<td>0%</td>
<td></td>
</tr>
</tbody>
</table>

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

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

Performance of Japanese equity traditional active funds

(End-Dec 2013 = 0%)

Cumulative return

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–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

Schematic diagram of how to increase active share

- **Process 1**
  - Underweight large caps (exclude from portfolio)

- **Process 2**
  - (Pattern 1) Aggressive investment in small caps
  - Allocate to small caps
  - (Pattern 2) Concentrated investment in large caps
  - Allocate to large caps

Source: Nomura
Another categories of active funds
High down side risk reflects concentrated positioning

Highly active funds sometimes engage in herding

(a) As of January 2014

(b) As of May 2015

Highly active funds sometimes engage in herding

Note: Using information available as of the beginning of January 2014 or May 2015 on active funds' portfolio holdings, we calculated overcrowded-stock share (i.e., 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.

In a universe comprising all stocks owned by funds with an Active Share of 0.8 or higher, we defined two groups: overcrowded stocks and non-overcrowded stocks. Overcrowded stocks were defined as being in the top quintile of stocks listed on the TSE-1 ranked by active fund ownership ratio. Non-overcrowded stocks were defined 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

Annualized performance: Cyclical factor effectiveness

**Statistics**

<table>
<thead>
<tr>
<th></th>
<th>Negative</th>
<th>Factor momentum</th>
<th>Positive</th>
<th>Negative - Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>0.76</td>
<td>10.73</td>
<td>9.96</td>
<td></td>
</tr>
<tr>
<td>#2</td>
<td>-3.77</td>
<td>15.11</td>
<td>15.55</td>
<td></td>
</tr>
<tr>
<td>#3</td>
<td>3.88</td>
<td>4.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#3-#1</td>
<td>2.34</td>
<td>2.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>0.28</td>
<td><strong>3.88</strong></td>
<td>2.34</td>
<td></td>
</tr>
<tr>
<td>Standard deviation</td>
<td>9.82</td>
<td>15.16</td>
<td>10.11</td>
<td>15.55</td>
</tr>
<tr>
<td>t-value</td>
<td>0.28</td>
<td><strong>3.88</strong></td>
<td>2.34</td>
<td></td>
</tr>
<tr>
<td>Return/risk</td>
<td>0.08</td>
<td>-0.25</td>
<td>1.06</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>-4.78</td>
<td>1.23</td>
<td>5.14</td>
<td></td>
</tr>
<tr>
<td>Standard deviation</td>
<td>10.85</td>
<td>9.09</td>
<td>10.15</td>
<td></td>
</tr>
<tr>
<td>t-value</td>
<td>-1.61</td>
<td>0.49</td>
<td>1.85</td>
<td></td>
</tr>
<tr>
<td>Return/risk</td>
<td>-0.44</td>
<td>0.13</td>
<td>0.51</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>-8.21</td>
<td>-3.66</td>
<td>-1.19</td>
<td></td>
</tr>
<tr>
<td>Standard deviation</td>
<td>11.80</td>
<td>10.71</td>
<td>8.63</td>
<td></td>
</tr>
<tr>
<td>t-value</td>
<td>-2.54</td>
<td>-1.25</td>
<td>-0.50</td>
<td></td>
</tr>
<tr>
<td>Return/risk</td>
<td>-0.70</td>
<td>-0.34</td>
<td>-0.14</td>
<td></td>
</tr>
</tbody>
</table>

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
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.


Appendix A-1

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A Target Price, if discussed, reflect in part the analyst's estimates for the company's earnings. The achievement of any target price may be impeded by general market and macroeconomic trends, and by other risks related to the company or market, and may not occur if the company's earnings differ from estimates.

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When Japanese government bonds (JGBs) for individual investors are purchased via public offerings, only the purchase price shall be paid, with no sales commission charged. As a rule, JGBs for individual investors may not be sold in the first 12 months after issuance. When JGBs for individual investors are sold before maturity, an amount calculated via the following formula will be subtracted from the par value of the bond plus accrued interest: (1) for 10-year variable rate bonds, an amount equal to the two preceding coupon payments (before tax) x 0.79685 will be used, (2) for 5-year and 3-year fixed rate bonds, an amount equal to the two preceding coupon payments (before tax) x 0.79685 will be used.

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 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 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 exceed the face amount.

Purchases of investment trusts (and sales of some investment trusts) are subject to a purchase or sales fee of up to 5.4% of the transaction amount. Also, a direct cost that may be incurred when selling investment trusts is a fee of up to 2.0% of the unit price at the time of redemption. Indirect costs that may be incurred during the course of holding investment trusts include, for domestic investment trusts, an asset management fee (trust fee) of up to 5.4% (annualized basis) of the net assets in trust, as well as fees based on investment performance. Other indirect costs may also be incurred. For foreign investment trusts, indirect fees may be incurred during the course of holding such investment company compensation.

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In interest rate swap transactions and USD/JPY basis swap transactions (“interest rate swap transactions, etc.”), only the agreed transaction payments shall be made on the settlement dates. Some interest rate swap transactions, etc. may require pledging of margin collateral. In some of these cases, transaction payments may exceed the amount of collateral. There shall be no advance notification of required collateral value or collateral ratios as they vary depending on the transaction. Interest rate swap transactions, etc. carry the risk of losses owing to fluctuations in market prices in the interest rate, currency and other markets, as well as reference indices. Losses incurred as such may exceed the value of margin collateral, in which case margin calls may be triggered. In the event that both parties agree to enter a replacement (or termination) transaction, the interest rates received (paid) under the new arrangement may differ from those in the original arrangement, even if terms other than the interest rates are identical to those in the original transaction. Risks vary by transaction. Please thoroughly read the written materials provided, such as documents delivered before making a contract and disclosure statements.

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