Nomura Securities Co Ltd, Tokyo
Japan Equity Quants Research

Current quant investment environment in Japan and our new quant idea for Japanese equities

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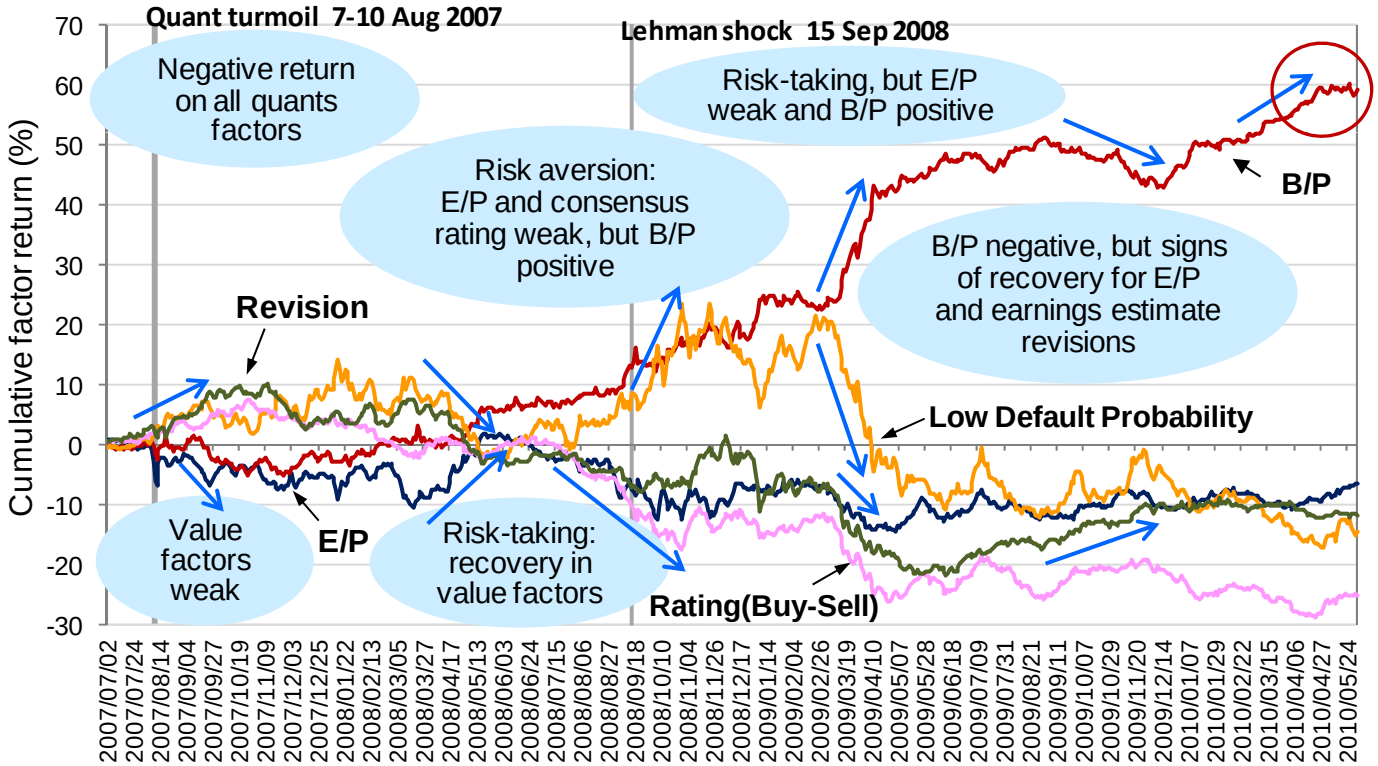
Summary

- Japan quant funds are struggling at the moment. Due to three years of underperformance, the quantitative approach is losing credibility inside the pension fund community. Quant investing is now in a “negative spiral”.
- To turn things around and head towards a “positive spiral”, the only way is to produce positive and stable performance. Here, we propose adding the following practical ideas for investment into the basic Japanese quant factors:
  - Value
    - EBO, or absolute valuation type factor
  - Estimate revision
    - Buying on positive earnings surprise, selling on the following estimate revision
  - Reversal/Momentum
    - Speed adjusted residual return for reversal strategy
  - New type quant factor
    - Skewness

Quant factor performance in Japanese equities

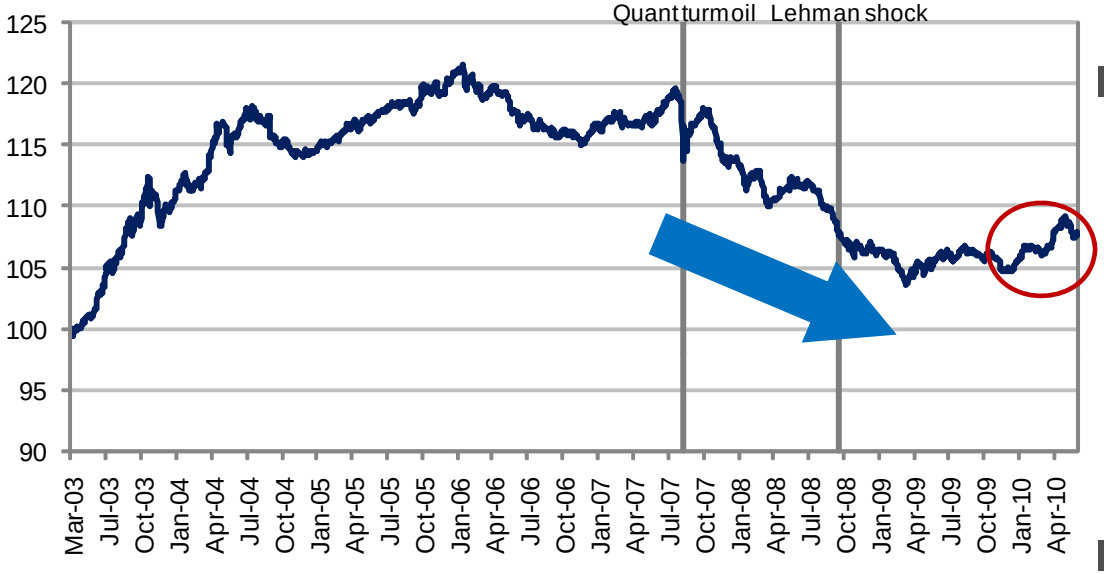
- B/P return has outperformed since 2008.
- However, popular quant factors such as E/P and estimate revision are not performing well.

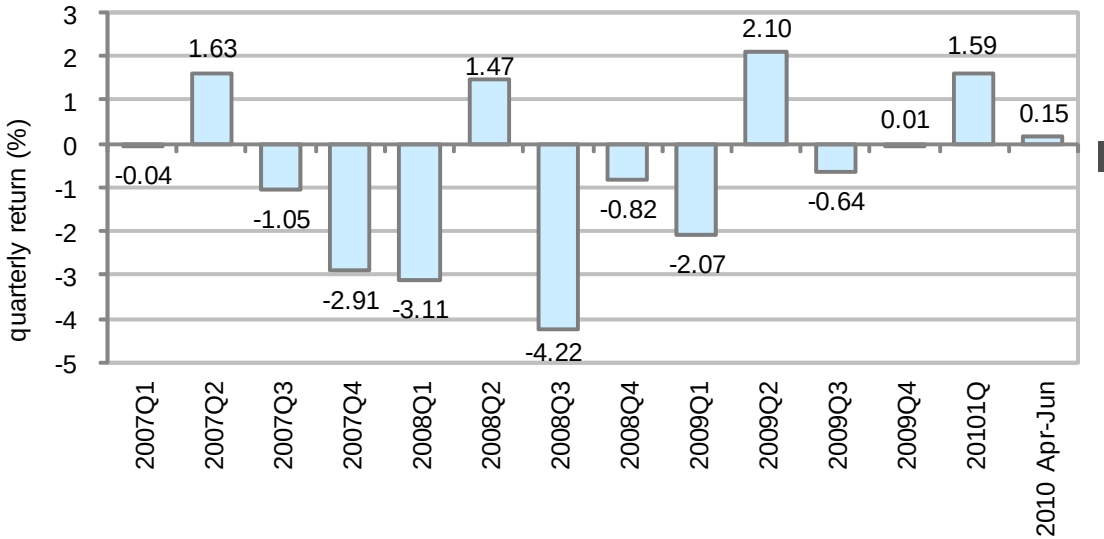


Note: (1) Universe of stocks in First Section of Tokyo Stock Exchange (TSE-1) covered by Nomura is divided into quintiles, with an equal number of stocks in each quintile, by factor value. (2) Portfolios are rebalanced at the beginning of each month. (3) Cumulative spread return (#5 – #1 for E/P, B/P and earnings estimate revisions and #1 – #5 for low default probability and consensus rating) is calculated on a daily basis, taking sector allocation (19 Nomura sectors) into account. (June 2007 = 0) (4) Sample period is 2 Jul 2007–1 June 2010.

Source: Nomura

Japanese quant funds are struggling…





- We selected 17 market-neutral Japanese mutual funds which seemingly use a quantitative approach, and calculated the simple average rate of return to emulate the performance of a typical quant fund.
- The average return has been underperforming for almost three years.
- We observe a positive trend more recently, however.

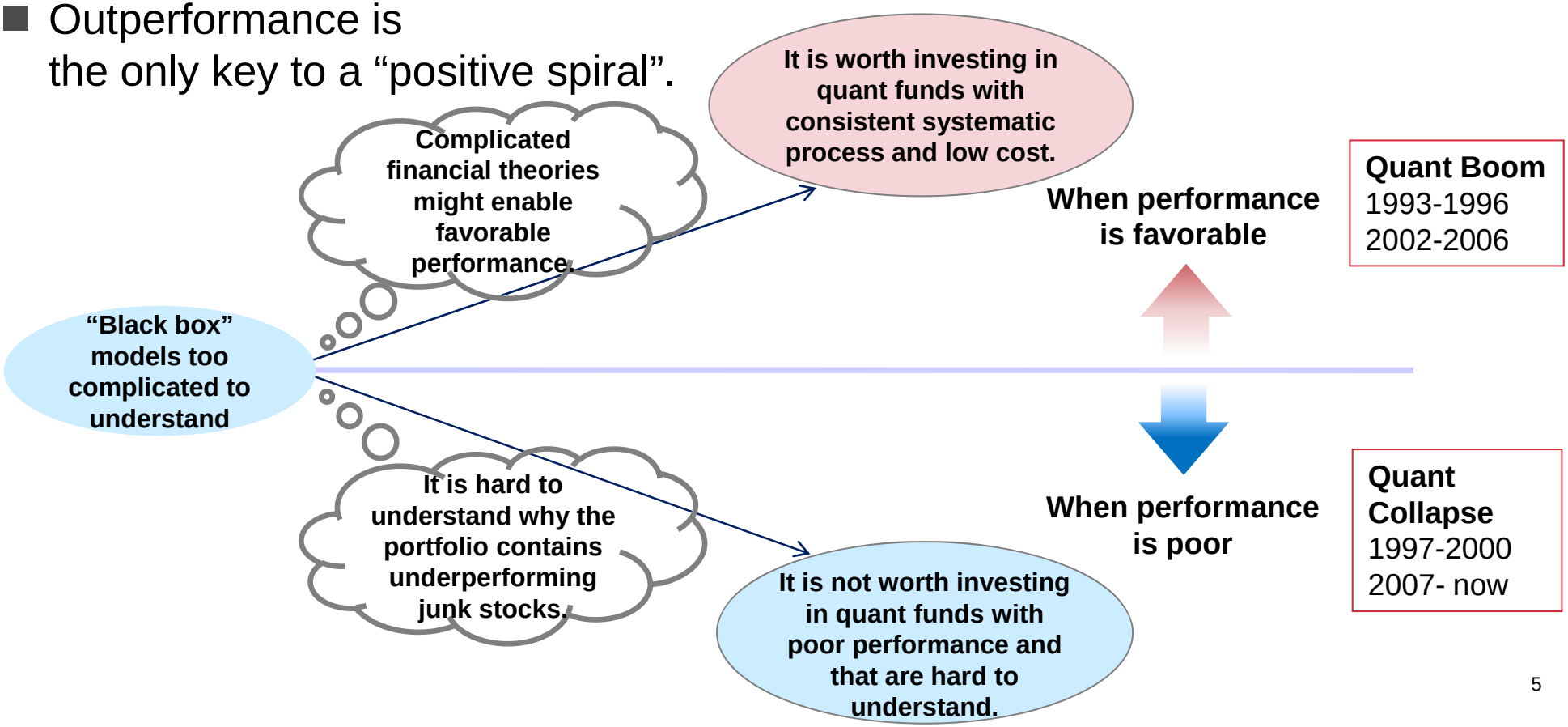
Note: Shows simple average return of 17 mutual funds which are believed by Nomura to be market-neutral using quantitative techniques. Sample period is from 1 April 2003 to 2 June 2010.
Source: Nomura

Current situation of Japan quant investments

- Two big triggers (quant turmoil 2007, Lehman shock 2008) contributed negatively to quant fund performance.
- We think the underlying problems behind these two events are no longer as pronounced as they were:
  - Quant turmoil in 2007
    - High leverage
    - Crowded strategies
  - Lehman shock in 2008
    - Negative correlation of quant factors to risk avoidance trend
- However, due to its underperformance over an extended period, the quant approach seems to be losing credibility inside the pension community.

Quant funds are in a negative spiral now

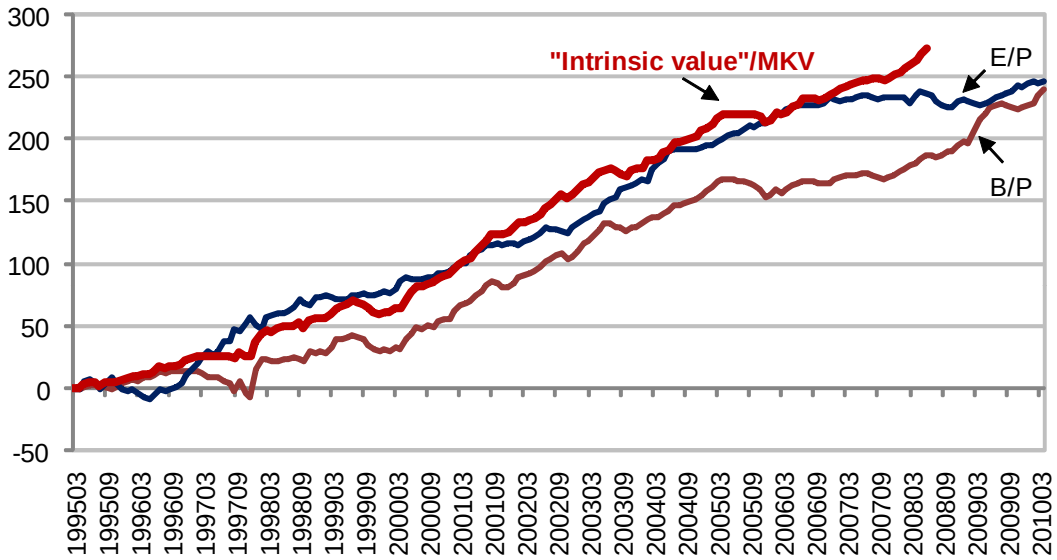
- It is often said that one of the problems of the quant approach is that it is a “black box”. This can accelerate the popularity of quants both positively and negatively, completely determined by the direction of the performance.
- Outperformance is the only key to a “positive spiral”.



Our view and ideas for basic quant factors

- Value
  - A simple value factor like E/P has not been effective recently, but we should not dismiss the "value effect" completely. It is hard to imagine that factors that can track the intrinsic value of the company will stop working eternally.
  - Our EBO model is tracking the performance of the "intrinsic value" to some extent.
- Estimate revision
  - Due to the advent of quarterly earning announcements, simple estimate revision has become less effective in the Japanese stock market.
  - We propose that estimate revision be replaced by quarterly earnings surprise, which has led to future estimate revisions recently.
- Reversal/Momentum
  - Because the speed in reverting to the mean is on average getting slower, the return reversal strategy has not been as effective. Therefore, we should focus on its speed for each stock and use a speed-adjusted reversal factor.
- New type quant factor
  - To avoid crowded strategies, it is also important to consider using a new type factor. We think that "skewness" is one of the candidates.

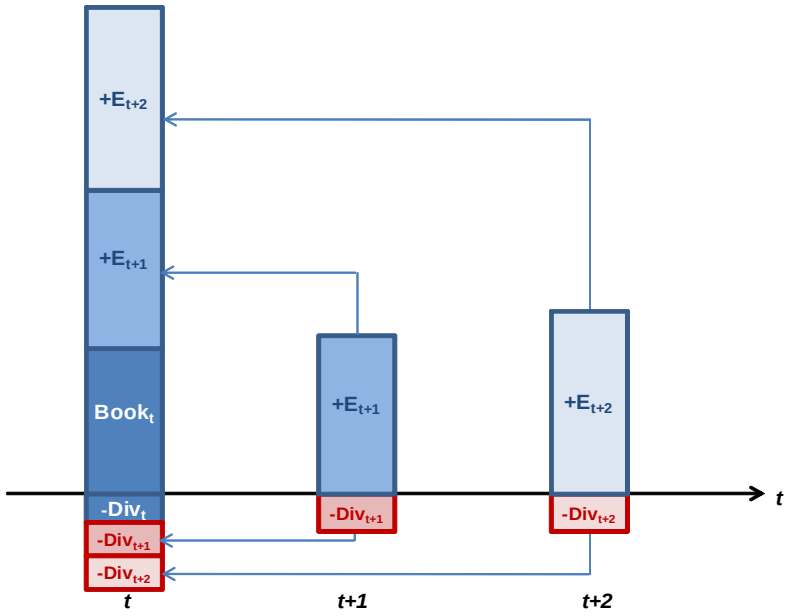
Value (1)



	"Intrinsic value"/MKV	B/P	E/P
Average return (annualized %)	**20.57**	15.88	16.33
Standard deviation (annualized %)	**8.41**	11.53	9.85
Return / risk (annualized)	**2.45**	1.38	1.66

Note: (1) Universe of stocks in First Section of Tokyo Stock Exchange (TSE-1) is divided into quintiles, with an equal number of stocks in each quintile, by factor value. (2) Portfolios are rebalanced at the beginning of each month. (3) Cumulative spread return (#5 – #1) is calculated on a monthly basis, taking sector allocation (19 Nomura sectors) into account. (March 1995 = 0) (4) Sample period is from April 1995 – April 2010.
Source: Nomura

- We should not be too pessimistic about the value effect because the intrinsic value of the company will “never die”.
- It is important to seek for the best proxy of intrinsic value.
- “Intrinsic value” here is equity value on a two-year forward perfect forecast basis.



Value (2)

- Introduction of our EBO model

$$V_0 = B_0 + \sum_{t=1}^{\infty} {}^{h}R^{-t} B_{t-1}\left(ROE'_t - {}^{h}r\right)$$

$$\approx B_0 + \sum_{t=1}^{3} {}^{h}R^{-t} B_{t-1}\left(ROE'^{a}_t - {}^{h}r\right) + \sum_{t=4}^{5} {}^{h}R^{-t} B_{t-1}\left(ROE'^{b}_t - {}^{h}r\right) + \sum_{t=6}^{15} {}^{h}R^{-t} B_{t-1}\left(ROE'^{c}_t - {}^{h}r\right)$$

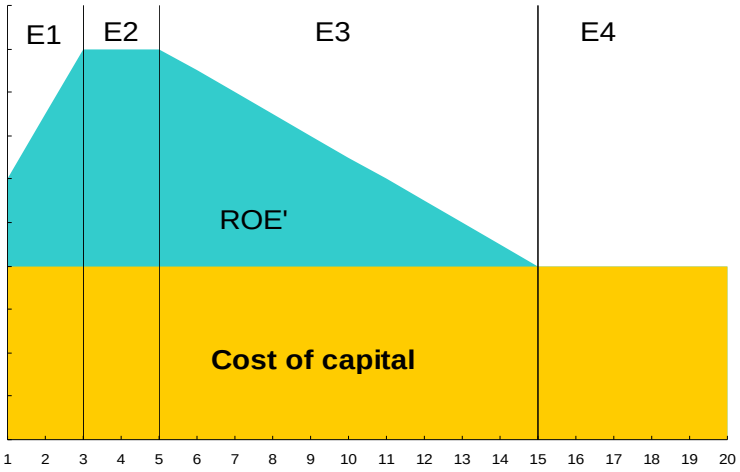
${}^{h}R$: Based on historical cost of capital

ROE'^{a}_t : Analyst estimation (Nomura estimate, or Toyo Keizai if N/A)

ROE'^{b}_t : sustainabl e growth

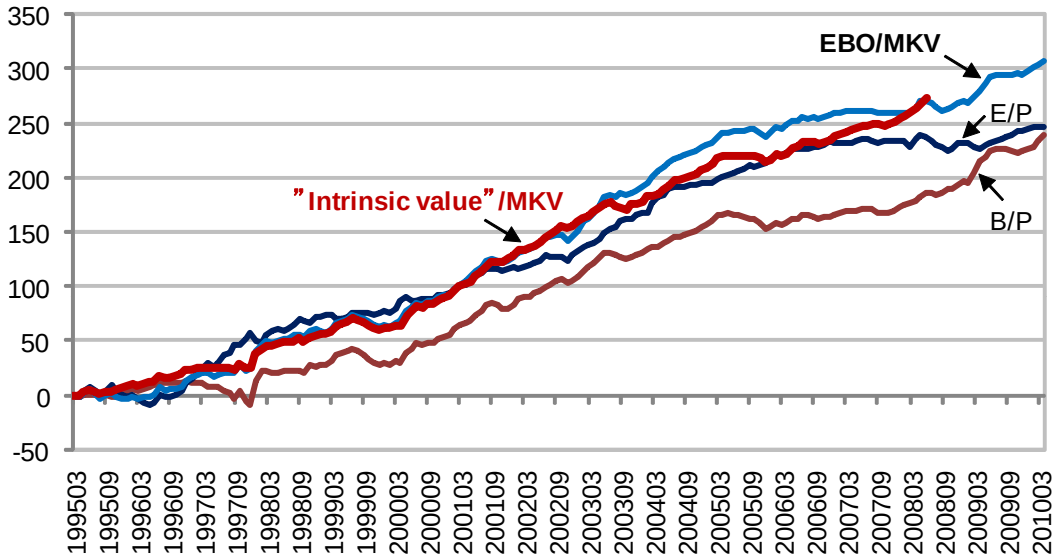
ROE'^{c}_t : Converged ROE'_t by cost of capital

- ROE is assumed to converge. In the model, ROE' grows through year 3, based on analysts' estimates, then goes into a sustainable growth phase at that level through year 5, and then converges toward the cost of capital in year 6 to year 15.



- The equity risk premium is calculated using historical data of TOPIX and 10-year par yield since 1970. The cost of capital is rf+RP*beta.

Value (3)



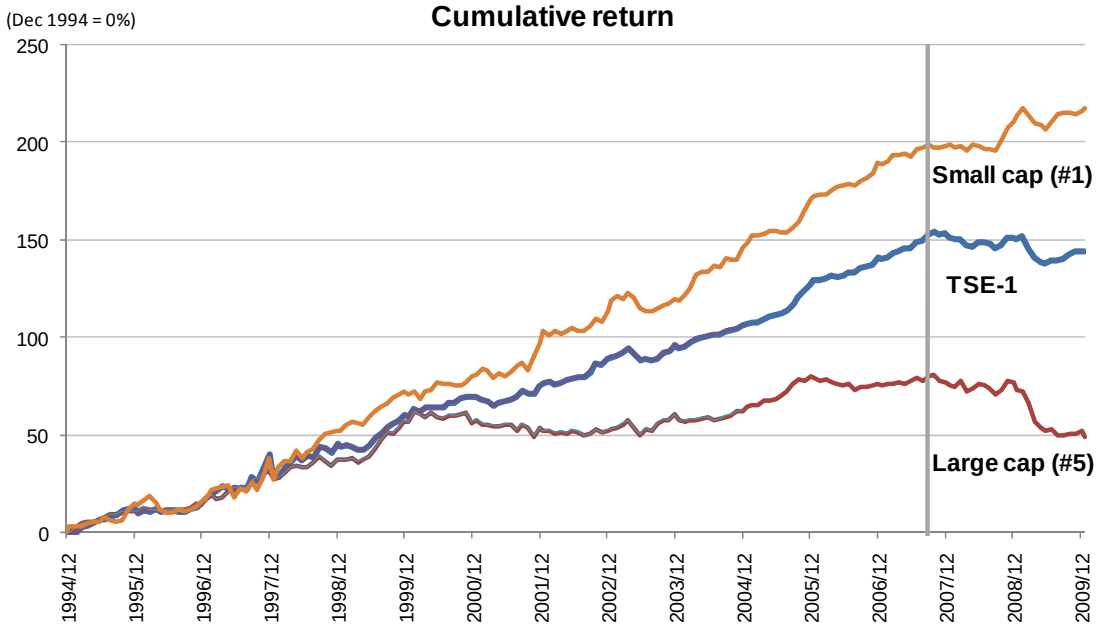
	"Intrinsic value"/MKV	B/P	E/P	EBO/MKV
Average return (annualized %)	**20.57**	15.88	16.33	**20.34**
Standard deviation (annualized %)	**8.41**	11.53	9.85	**10.35**
Return / risk (annualized)	**2.45**	1.38	1.66	**1.97**

Note: (1) Universe of stocks in First Section of Tokyo Stock Exchange (TSE-1) is divided into quintiles, with an equal number of stocks in each quintile, by factor value. (2) Portfolios are rebalanced at the beginning of each month. (3) Cumulative spread return (#5 – #1) is calculated on a monthly basis, taking sector allocation (19 Nomura sectors) into account. (March 1995 = 0) (4) Sample period is from April 1995 – April 2010.
Source: Nomura

- Our EBO model tracks performance of the “intrinsic value” factor to some extent.

Estimate revision (1)

Performance of revision strategy by size



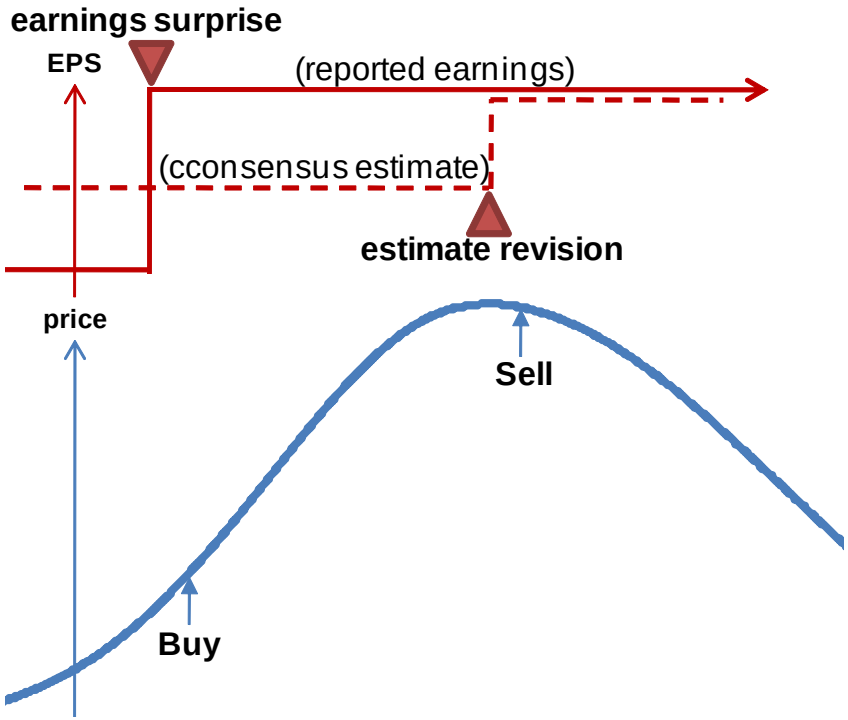
	Estimate sample period (95/1-09/12)						Latest two years (07/9-09/12)					
	By size						By size					
	Small cap				Large cap	TSE-1	Small cap				Large cap	TSE-1
	#1	#2	#3	#4	#5		#1	#2	#3	#4	#5	
Average (annualized)	14.40	10.11	10.91	5.24	3.50	9.63	7.97	3.78	0.77	-10.07	-10.85	-2.16
Standard deviation (annualized)	9.64	6.60	6.77	7.53	7.51	7.16	9.23	9.04	9.04	11.01	10.68	7.79
t-value	5.78***	5.93***	6.24***	2.69***	1.81*	5.21***	1.32	0.64	0.13	-1.40	-1.55	-0.42
Return/risk (annualized)	1.49	1.53	1.61	0.70	0.47	1.34	0.86	0.42	0.08	-0.91	-1.02	-0.28

- The consensus estimate revision factor hasn't been effective since 2007.
- In the large cap universe, we can even observe a negative estimate revision effect.

Note: (1) Universe of TSE-1 stocks sorted into 5 groups at start of each month based on market cap. For each group, monthly returns of long positions on subgroup (out of 5) with highest 3-month revision factor values (upward estimate revisions) and short positions on subgroup with lowest factor values (downward estimate revisions) are then measured. Returns and statistical data are shown for each group by size. (2) The t-values are for the null hypothesis that mean return is 0. (3) *** = statistical significance (with two-tailed test) at 1% level; ** = significance at 5% level; and * = significance at 10% level.

Source: Nomura

Estimate revision (2)

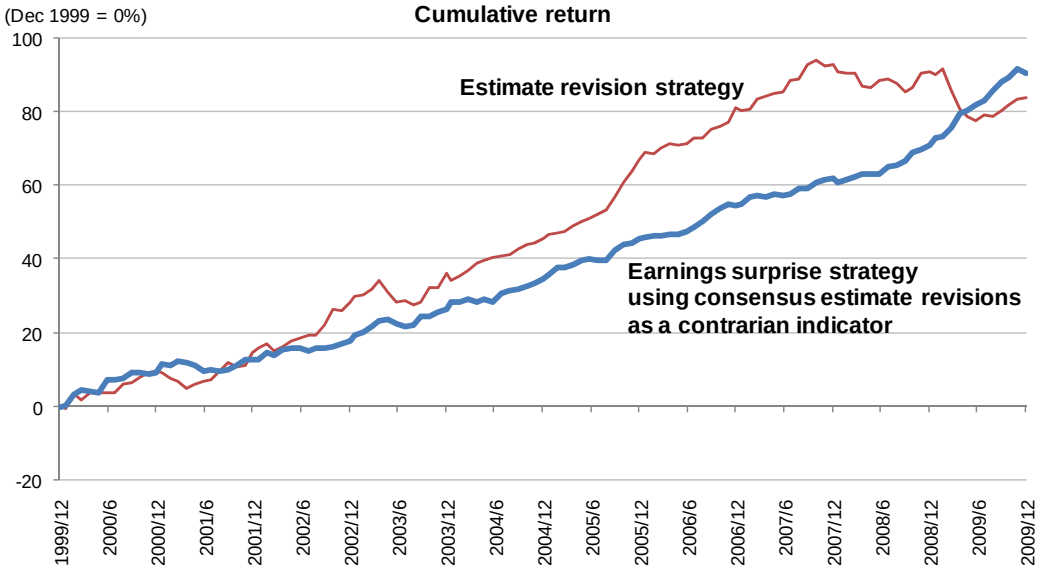


- Empirical analysis has shown that earnings surprises in quarterly announcements lead to future analyst estimate revisions.
- This suggests that estimate revision is a follower of earnings surprise. Actually, consensus estimate revisions do not appear to contain any additional information to the earnings surprise.
- Estimate revision can be used as a contrarian indicator.

$$Surp_q^i = \frac{cumulative\ earnings\ result\ through\ quarter\ q\ for\ stock\ i}{full\text{ - }year\ earnings\ estimate\ for\ stock\ i\ immediately\ prior\ to\ results\ announcement}$$

$$\underbrace{(y - y\,change)\ SurpDiff_{i,t}}_{\text{surprise factor}} = Surp_{i,t} - Surp_{i,t'}$$

Estimate revision (3)



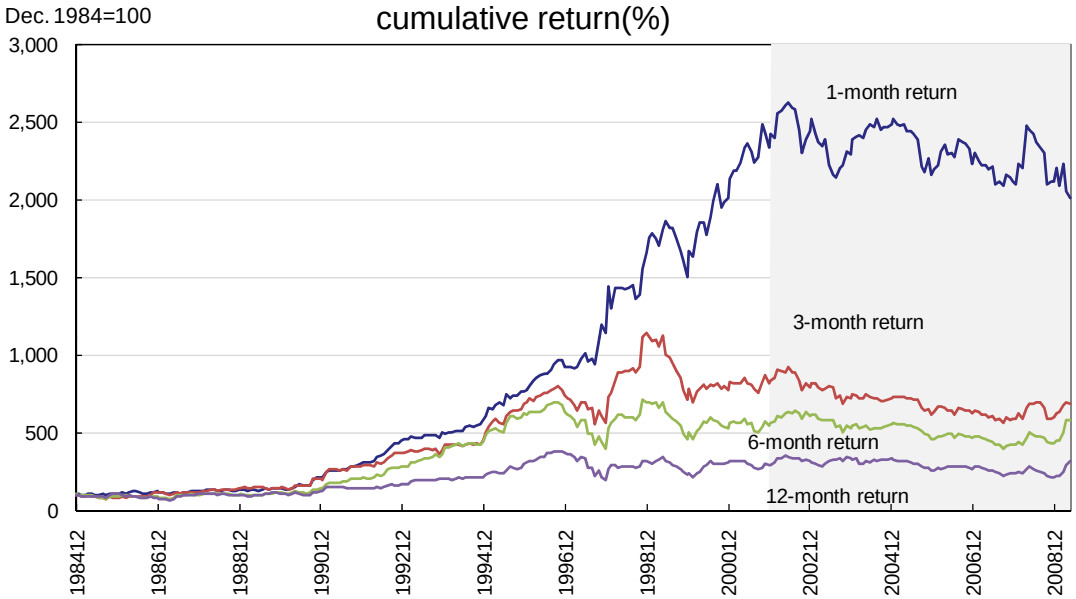
Earnings surprise			
(Annualized)	Average return	Standard deviation	Return/risk
04/6-09/12	10.97	3.32	3.30
07/9-09/12	13.39	3.90	3.43
Estimate revision			
(Annualized)	Average return	Standard deviation	Return/risk
04/6-09/12	7.91	6.33	1.25
07/9-09/12	-2.16	7.79	-0.28

Note: TSE-1 stocks (the universe; only those with March fiscal year-end in the case of the level of the surprise factor) are sorted into five groups at the start of each month based on market cap. The top two groups are further sorted into five subgroups based on the revised earnings surprise factor, and the bottom three groups are sorted into five subgroups based on the conventional earnings surprise factor. For the revised earnings surprise factor, the denominator full-year earnings estimate is updated every month. For the conventional earnings surprise factor, it is constant. The monthly returns of long positions on the subgroup with the highest factor values (positive surprises) and short positions on the subgroup with the lowest factor values (negative surprises) are then measured.

Source: Nomura

- We propose the idea of buying on positive earnings surprise, and selling on the following estimate revision.
- In this model, we use estimate revision as a contrarian indicator. Once a positive revision is observed for a stock, it is removed from the long position.

Reversal/Momentum (1)



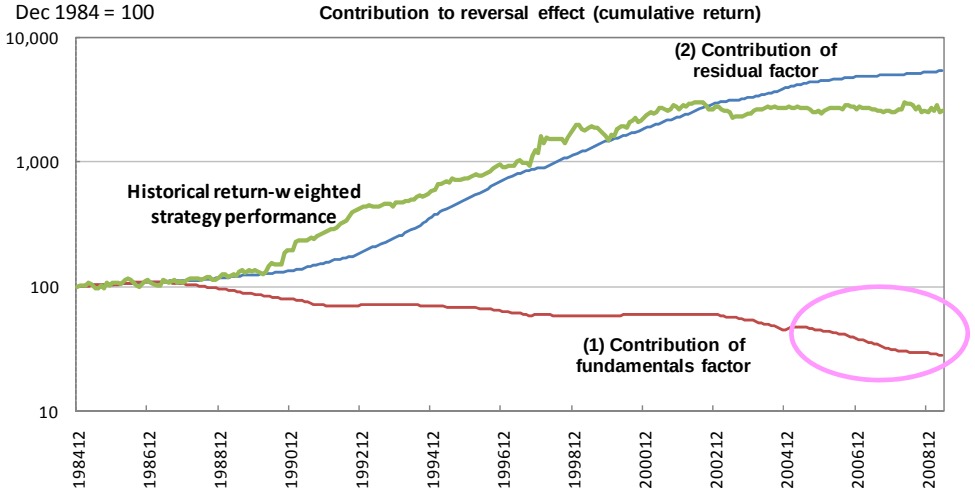
	Loser (#1) - Winner (#5) Average	Std Dev.	t value	
Whole Period : 198501-200905				
・1-month return	1.13	4.60	4.21	***
・3-month return	0.81	5.59	2.49	**
・6-month return	0.75	5.62	2.30	**
・12-month return	0.54	5.52	1.69	*
Last 8 years : 200201-200905				
・1-month return	-0.11	3.31	-0.32	
・3-month return	-0.11	3.83	-0.28	
・6-month return	0.17	4.11	0.38	
・12-month return	0.20	4.40	0.42	

- The return reversal strategy used to be more popular than momentum strategies in Japanese equities.
- However, its effectiveness has been decreasing since 2002.

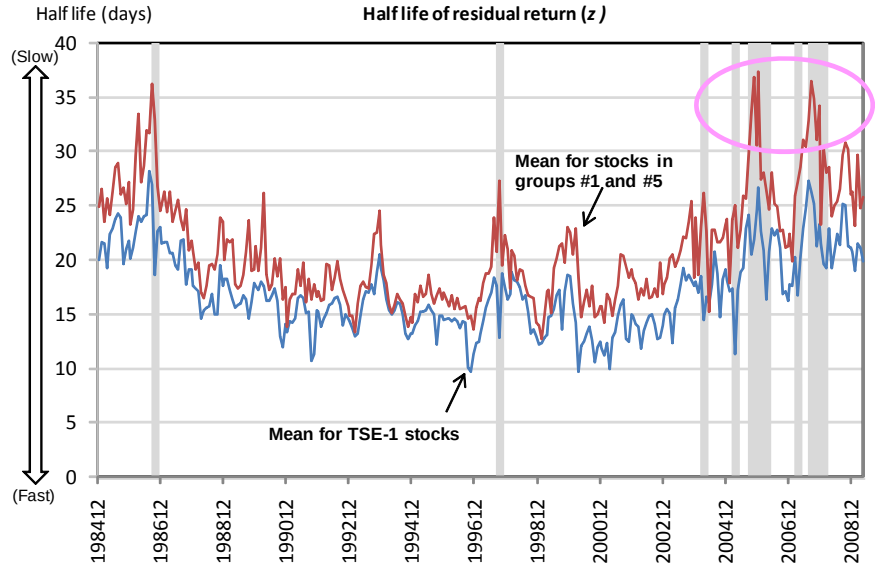
Note: The universe, TSE1 stocks excluding the bottom 10% in terms of market cap or the stocks less than 100 yen, is divided into 5 groups by each period factor. The monthly excess return relative to benchmark is shown by each period factor. t-values for null hypothesis that coefficient is 0. * indicates statistical significance at 10% level, ** at 5% level, and *** at 1% level (all with two-tailed test).
Source: Nomura

Reversal/Momentum (2)

Factor analysis of the Lo and MacKinlay (1990) return reversal strategy



Speed at which the group most divergent from fundamentals converged with fair value (half life)

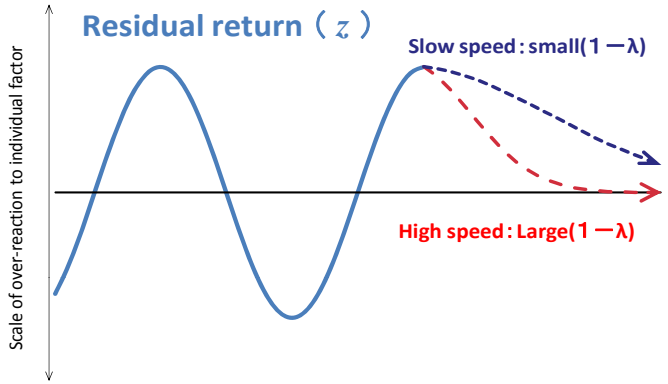


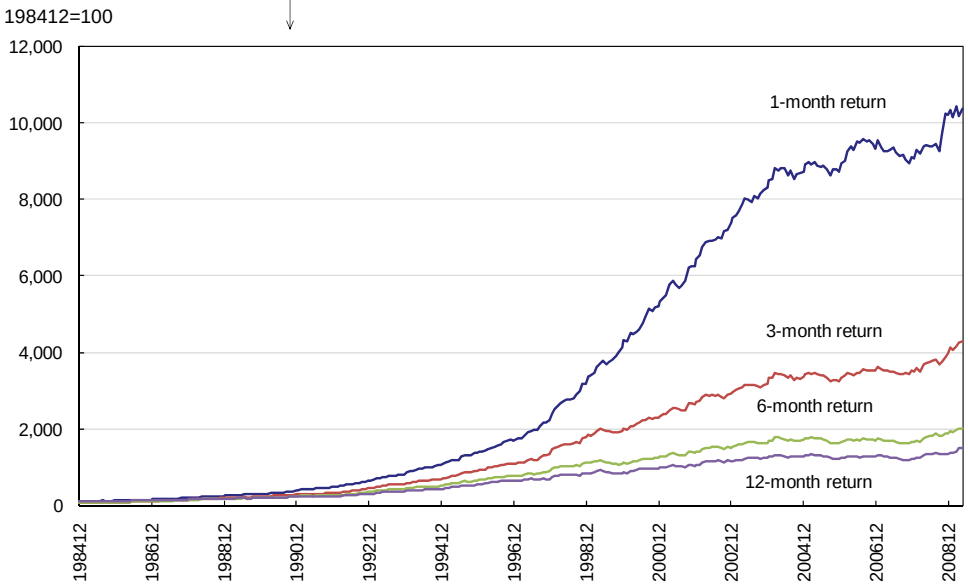
- We think there are two things behind this:
  - If we divide the stock return into FF3 fundamental factor attribution and residuals, we observe that the fundamental factor part has a momentum effect.
  - ➢ The residual return is more important for the reversal strategy.
  - The speed of reversion to the mean is getting slower.
  - ➢ The reversal strategy should consider the “speed” of each stock.

Note: A. Murakami 2009, “Speed-adjusted return reversal strategy”, Figure 3 and Figure 8
Source: Nomura

Reversal/Momentum (3)

- Concept of speed $(1-\lambda)$





Note: The universe, TSE1 stocks excluding the bottom 10% in terms of market cap or the stocks less than 100 yen, is divided into 5 groups by each period factor. The monthly excess return relative to benchmark is shown by each period factor.
Source: Nomura

- Instead of using ordinary past return, we propose to use “speed” adjusted residual return.
- Speed-adjusted residual return:

$$(1-\lambda_i)\left(z_{i,t-1}-\mu_i\right)$$

z_i **= cumulative residual return**

μ_i **= average of** z_i

Δz_i **= residual return**

$$= r_i - (r_f + \beta^{mkt}(r_m - r_f) + \beta^{HML}\, HML + \beta^{SMB}\, SMB)$$

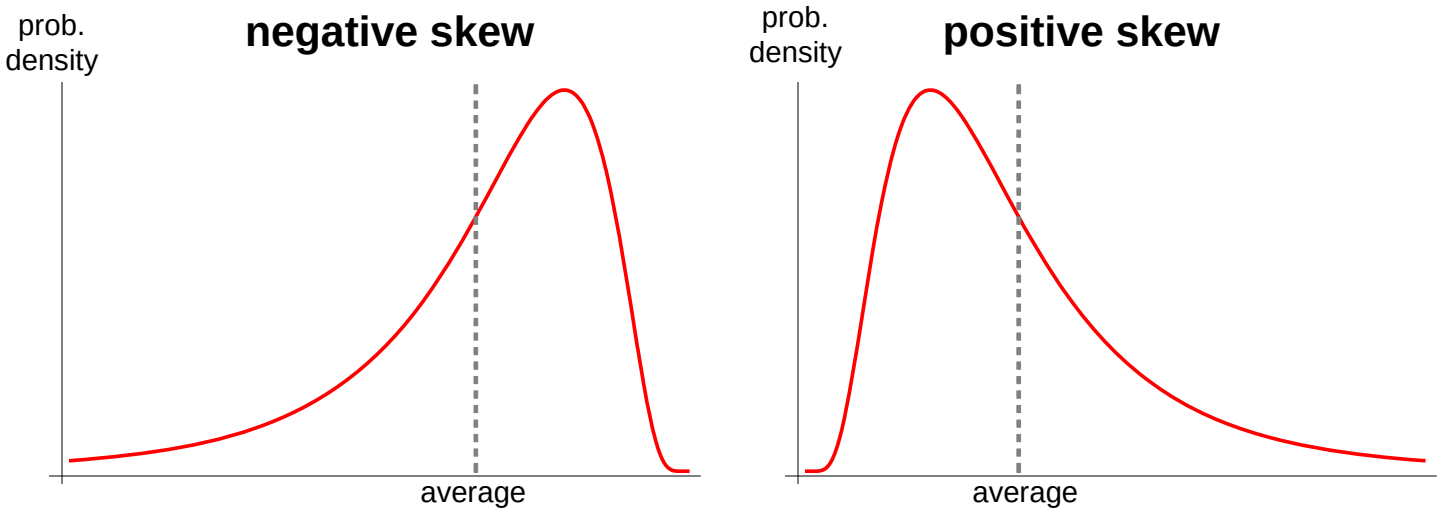
$(1-\lambda)$ **: speed reverting to the mean**

- We estimate the parameter $1-\lambda$ for each stock using daily residual return Δz and cumulative daily residual return z , for the past 12 months.

$$\Delta z_{i,t} = -(1-\lambda_i)\left(z_{i,t-1}-\mu_i\right) + \varepsilon_{i,t}$$

New Japanese quant factor – skewness (1)

- Less skewed stocks can generate a positive return.
  - Prospect theory
    - Based on Tversky and Kahneman's (1992) cumulative prospect theory, Barberis and Huang (2008) show that positively skewed securities can be "overpriced" leading to negative average excess returns.
    - This means investors prefer the positive skewed stocks, a phenomenon similar to people liking "lotteries".
    - Unsophisticated investors tend to prefer positively skewed stocks more than sophisticated investors (Mitton and Vorkink 2007; Kumar 2009; Goetzmann and Kumar 2008).



New Japanese quant factor – skewness (2)

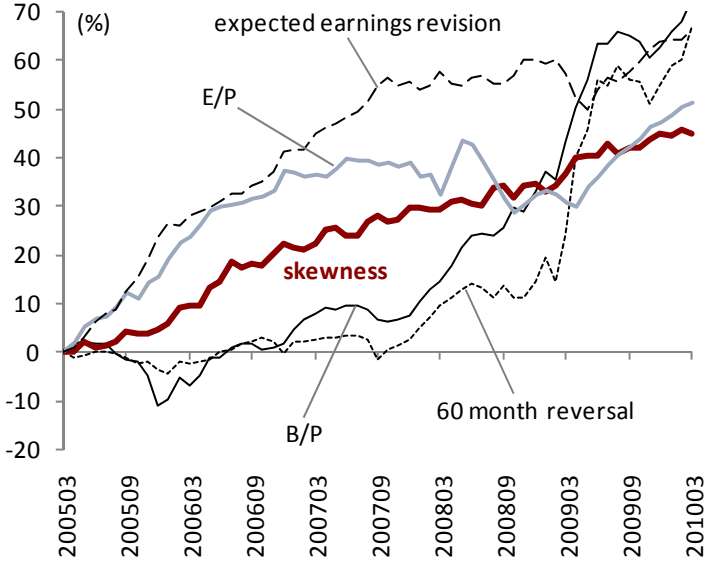
- Measure of skewness: the usual definition

$$SKEW_i = E\left[\left(\frac{r_i - \mu_i}{\sigma_i}\right)^3\right] = \frac{E\left[(r_i - \mu_i)^3\right]}{E\left[(r_i - \mu_i)^2\right]^{3/2}}$$

  - calculated from monthly data over the previous 60 months: *simple!*

- Performance: stable and independent from others

cumulative excess returns (difference between first quintile portfolio and fifth quintile portfolio)



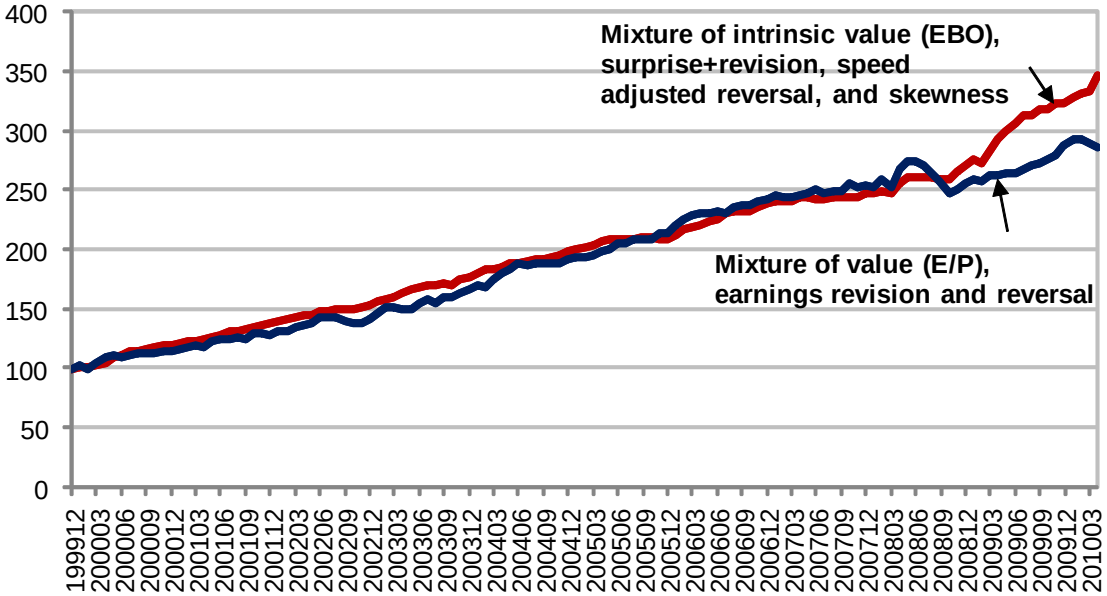
The last 5 years (Apr-2005 thru Mar-2010)

	Skew	B/P	E/P	Revision	60 mth reversal
Average (per annum %, a)	**8.9**	14.5	10.2	13.2	13.3
St. diviation (per annum %, b)	**5.3**	8.9	7.4	6.5	11.7
Ratio (a/b)	**1.67**	1.63	1.38	2.05	1.14
Maximum draw down (%)	**2.7**	13.1	14.9	10.6	7.8
Serial correl. (lag 1)	**-0.17**	0.39	0.32	0.30	0.24
Turnover (per mth %)	**21**	27	37	93	30

Note: Figures represent cumulative excess returns of difference between top and bottom quintile portfolios (for Skew and 60 mth reversal, bottom minus top is calculated) of Japanese stocks ranked by the measure at the beginning of each month respectively . Each measure is normalized within TSE-33 sectors. Universe is TOPIX; equally weighted; monthly rebalance.
Source: Nomura

How do these ideas improve performance?

- We compare the factor returns between
  - Mixture of E/P, estimate revision, and 3-month return reversal (traditional Japan quant strategy)
  - Mixture of intrinsic value (EBO), surprise+revision, speed-adjusted reversal (3 months), and skewness
- Stable and positive factor return is observed in the new factor



	mixture strategy	composite factor
Average return (annualized %)	12.15	10.42
Standard deviation (annualized %)	3.42	5.90
return / risk (annualized)	3.55	1.77

Note: Universe of stocks in the First Section of the Tokyo Stock Exchange (TSE-1)
Sample period is Jan 2000 – April 2010.

Source: Nomura

Conclusion

- Due to three years of underperformance, Japan quant investing is now in a “negative spiral”.
- To enhance the basic performance of Japanese quant factors, we propose the following ideas:
  - Value
    - EBO, or absolute valuation type factor
  - Estimate revision
    - Buying on positive earnings surprise, selling on the following estimate revision
  - Reversal/Momentum
    - Speed-adjusted residual return for reversal strategy
  - New type quant factor
    - Skewness
- By providing stable and positive performance, Japan quant investing will once again enter into a “positive spiral”.

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