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Connecting Markets East & West

Japanese equity quantitative strategy

Global Quantitative Investment Strategies Conference

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Summary

■ Three negative correlations of equity factors with macro variables

・ Oil prices, credit risk and interest rates have an impact on major Japanese equity factors, and this is significant and increases the correlation with global equity factors

・ Low interest rates and a fall in **"bond risk premium"** have continued to support **"bond-like stocks"**

■ Text analysis of FOMC minutes using a machine-learning approach

・ The tone of minutes is likely to have a predictive power for future **"bond risk premium"** and return of **"bond-like stocks"**

・ Our analysis of the latest minutes suggests a fall of **"bond risk premium"** and outperformance of **"bond-like stocks"**

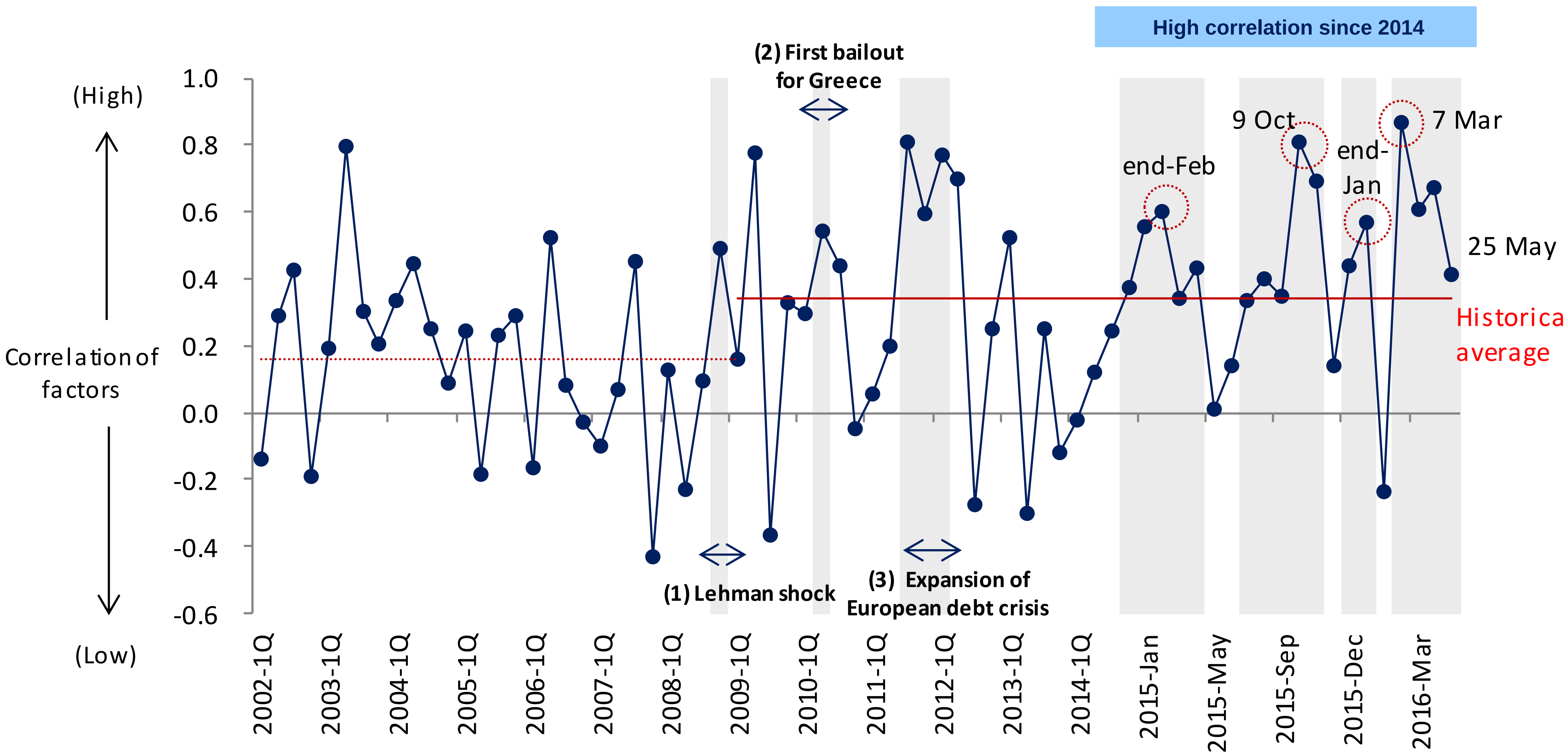
■ Strategies to avoid herding by "global bond funds", "smart beta funds" and "active funds"

・ Hold **"bond-like stocks"** the only alternative

・ Concentrated positions warrant concern

Continuing high correlation between global and Japanese equities

Correlation between factor returns on Japanese and global equities



Note: Figure shows time series data for the average rank correlation between returns on the main factors for Japanese equities and factor returns in developed and emerging economies in the Americas, developed and emerging EMEA economies, and developed and emerging Asia Pacific economies.
Source: Nomura

(1) Negative correlation between crude oil prices and momentum factor

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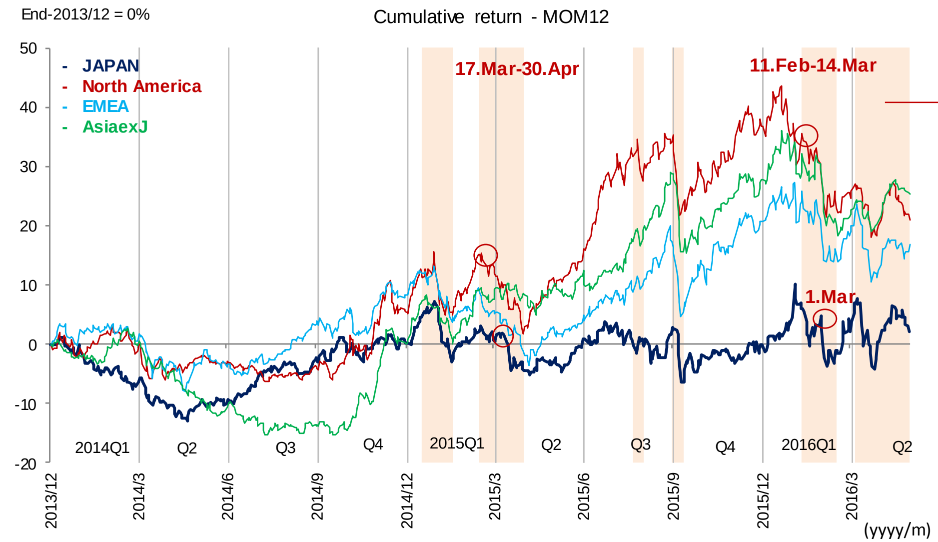
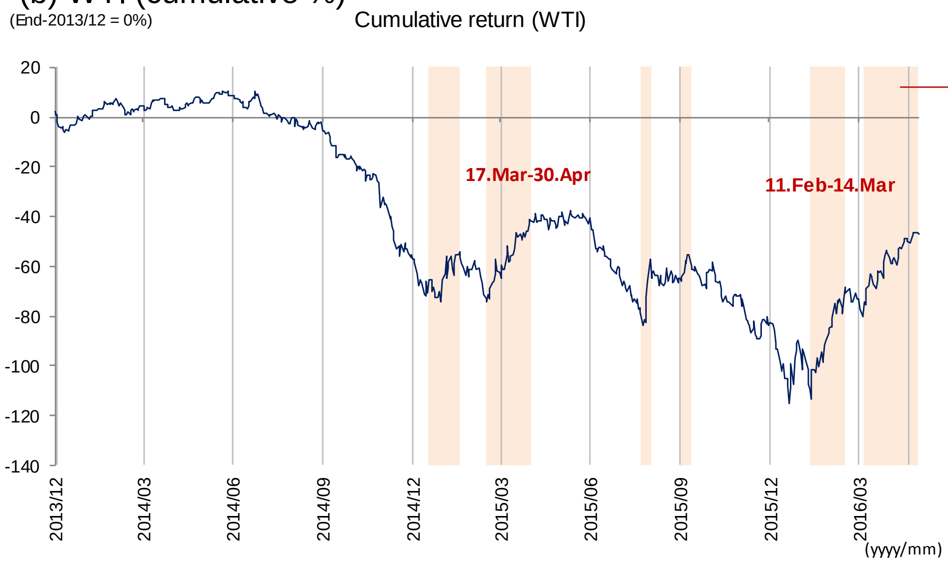
Negative correlation between crude oil prices and momentum continues: return reversals (negative share price momentum) when crude oil prices rise

(a) Share price momentum (historical 12-month return)



Momentum factors were negative during oil prices rebound

(b) WTI (cumulative %)



Oil prices rebound

Note: (a) Universe is MSCI World Index constituent stocks. We divided our universe into five groups based on factor values at the beginning of the month. We then formed a portfolio comprising long positions in the top quintile and short positions in the bottom quintile and measured its return (US dollar basis). We did not take trading costs into account. Analysis is based on historical share prices and does not guarantee future performance. (b) Crude oil price trend = cumulative return for West Texas Intermediate (WTI) and Cushing Crude Oil Spot Price. Sample period was Jan 2014 through 31 May 2016.

Source: Nomura

(2) Negative correlation between credit risk and value factors

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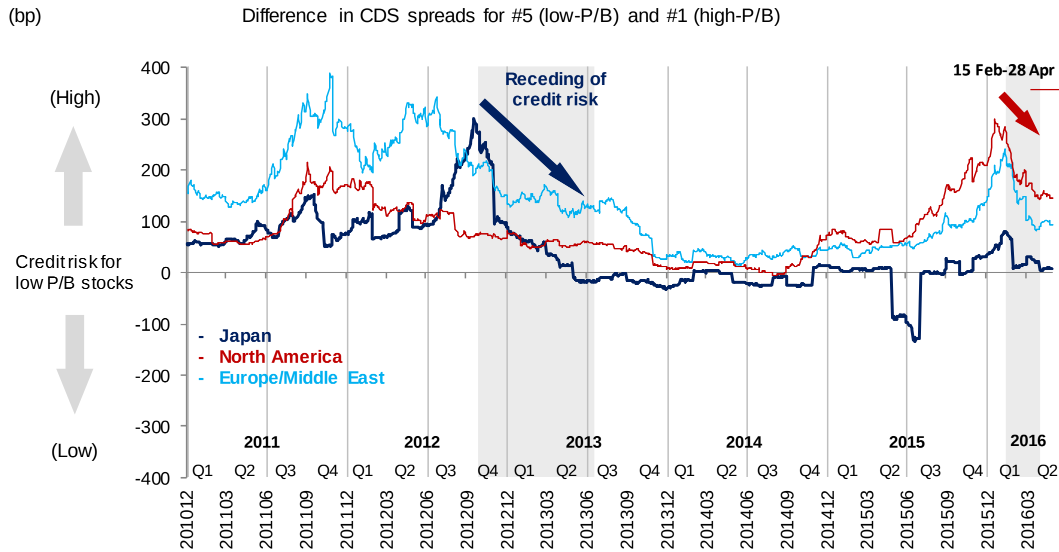
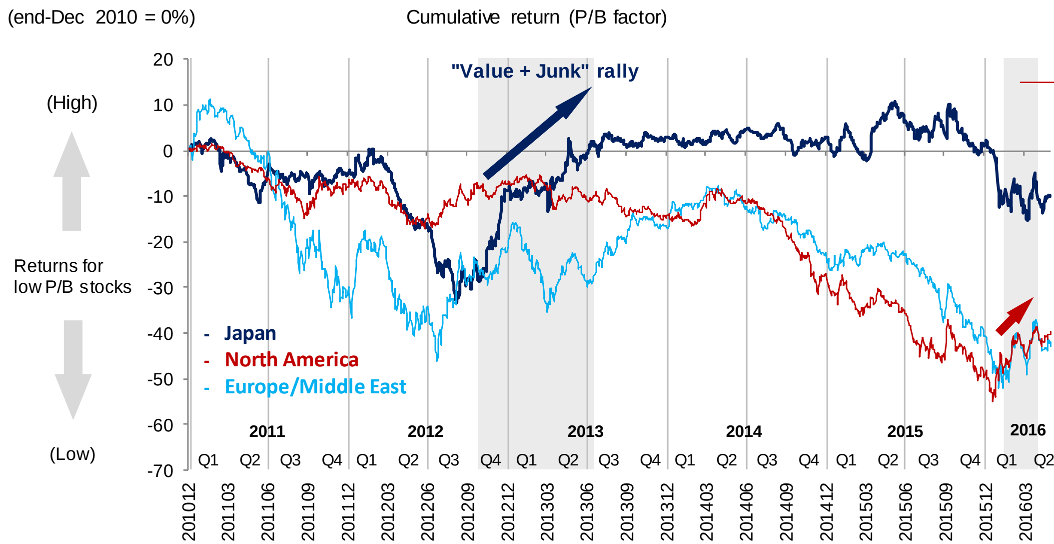
Difference in CDS spreads for low-P/B stocks and high-P/B stocks, and performance of the P/B factor



Convergence of the CDS spread since 15 Feb

Performance of the P/B factor



Revival of value

Note: Our universe was Japanese, North American, and EMEA stocks in the MSCI World Index, and for each region we divided the universe into five groups on the basis of the P/B factor. In the top figure, we show the difference between the medians of the 5-year CDS spreads for Group #5 (low-P/B) and Group #1 (high-P/B). In the bottom figure, we show cumulative daily returns for the long/short strategy in which we go long on the equally weighted portfolio of stocks in Group #5 (low-P/B) and short on that of stocks in Group #1 (high-P/Bs). Returns are all converted to dollars. Transaction costs are not included. Analysis is based on past share price performance and does not guarantee future performance. The analysis period is Jan 2011–31 May 2016.

Source: Nomura

(3) Negative correlation between interest rate and low-risk factor

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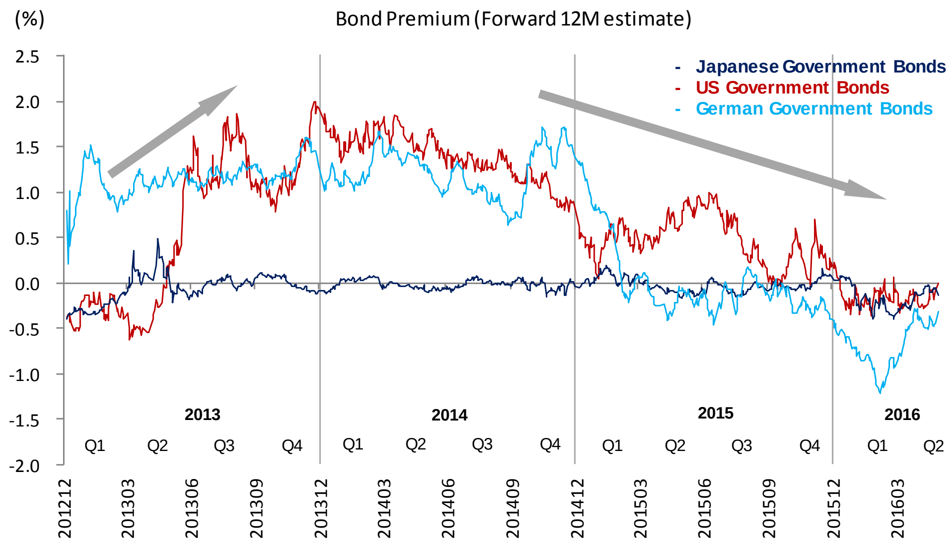
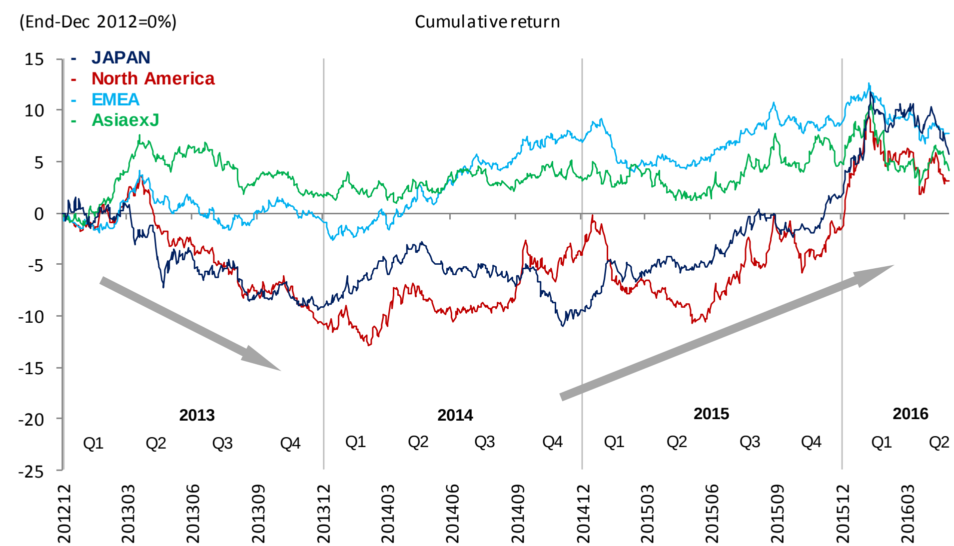
Historical bond risk premium based on Cochrane (2005)



Since 2015, bond risk premium has fallen

Performance of bond-like stocks (stocks with low risk & high dividend)



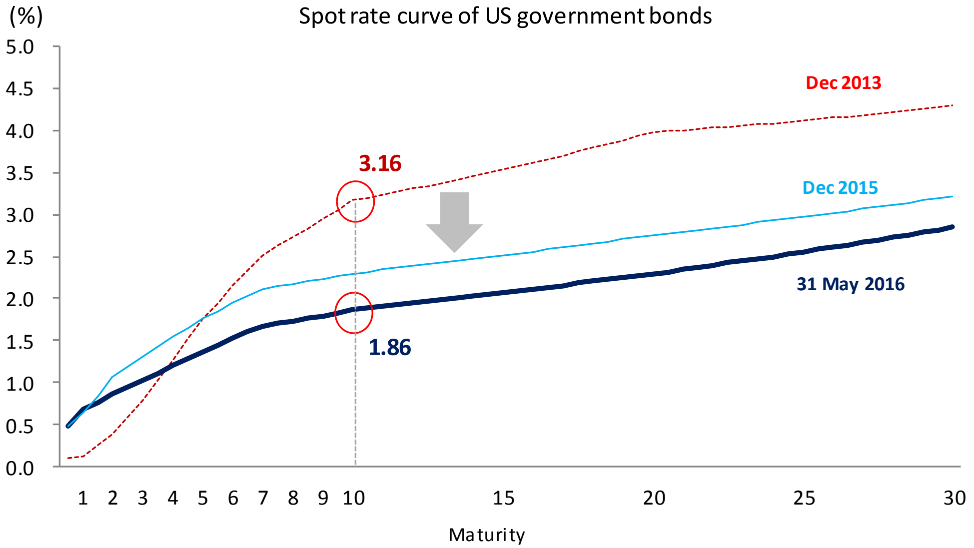
A fall in bond risk premiums tended to result in bond-like stocks outperforming

Note: Sample period was Jan 2013–31 May 2016. (Top chart) To calculate bond risk premiums, we estimated the expected excess return, at the beginning of each month, versus the yield on a 1-year bond achieved by investing in 2-year, 3-year, 4-year, and 5-year bonds and holding them over the following year. We used the slope of the forward curve to estimate expected returns. (Bottom chart) For the performance of bond-like stocks (stocks with low risk and high dividend yields), at the beginning of each month, and for each region, we calculated the daily returns (excess returns versus the universe average, dollar basis including dividends) on the stocks that were in both the bottom third in terms of historical beta and the top fifth in terms of expected dividend yield. We did not take transaction costs into account. Analysis is based on past share price performance and does not guarantee future performance.

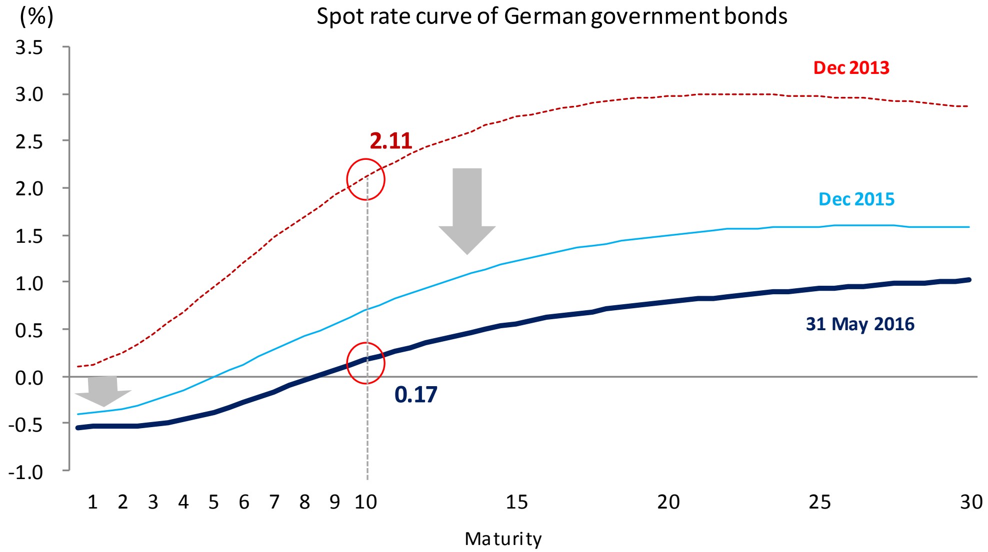
Source: Nomura, based on US Department of the Treasury, Japanese Ministry of Finance, and Deutsche Bundesbank data

Steepening of curve is necessary for a change in trends

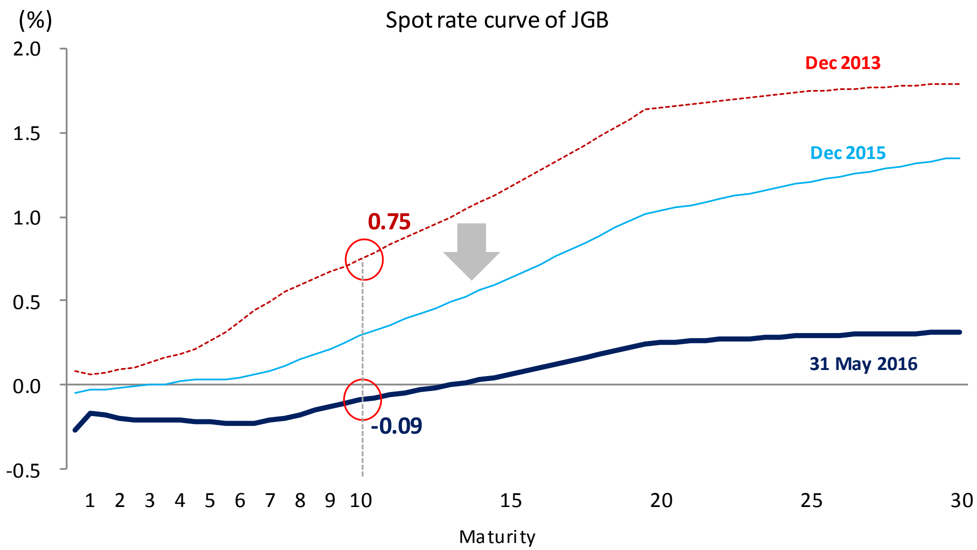
Spot rate curve of US government bonds



Spot rate curve of BUNDS - German government bonds



Spot rate curve of JGB

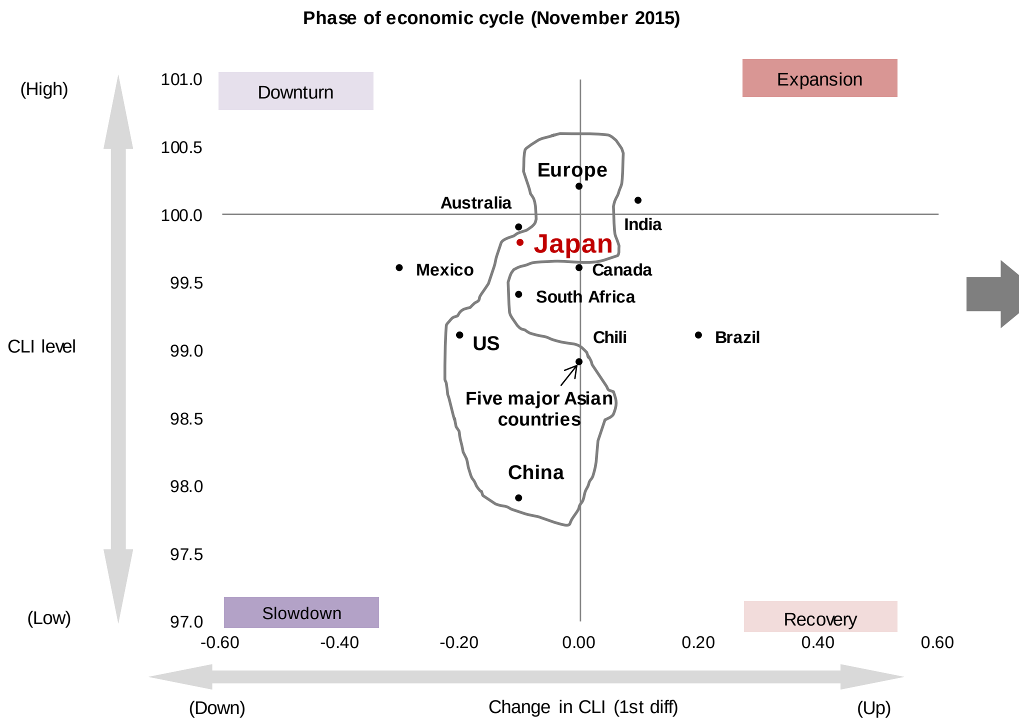


Source: Nomura, based on Department of the Treasury , Bundesbank, Ministry of Finance and other data

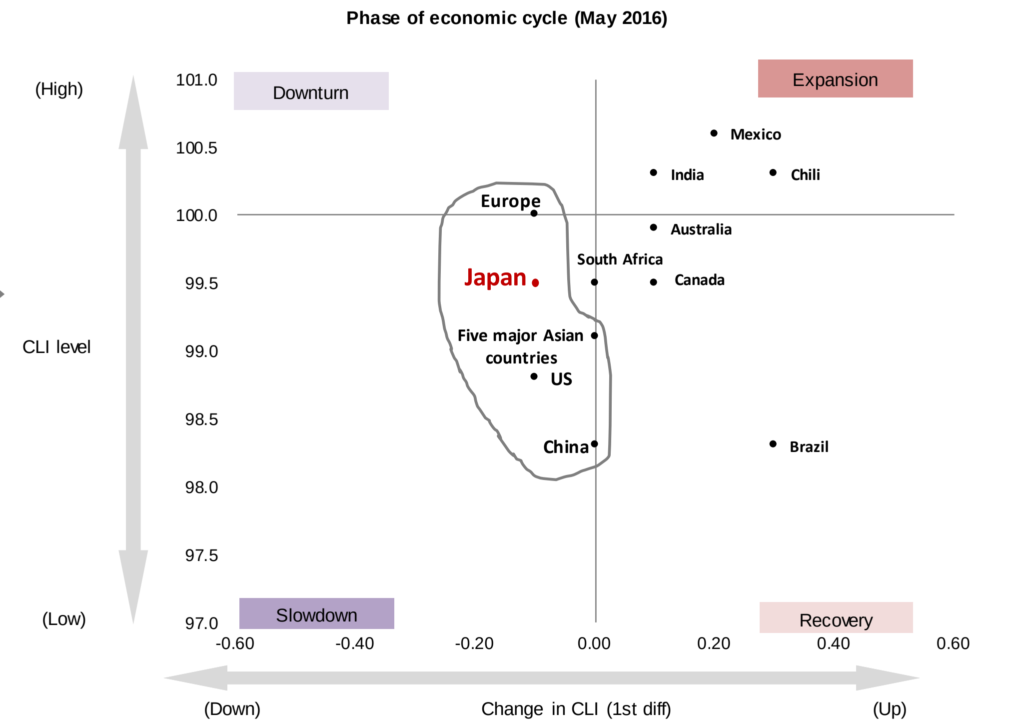
After all, boil down to global low growth

- Phases of US, Europe, and Asia have not changed compared with 6 month ago
- There are changes in resource-supplying countries and emerging countries

Phase of economic cycle (data released in Nov 2015)



Phase of economic cycle (data released in May 2016)



Note: Shows phase of economic cycle based on the OECD's amplitude-adjusted CLIs for Japan, China, India, five major Asian countries (Indonesia, Korea, Malaysia, the Philippines, and Thailand), the US, Canada, Brazil, Chile, Mexico, Australia, New Zealand, South Africa, and Europe (European OECD member countries). Based on the latest CLI data, released in May 2016 and data released in Nov 2015.
Source: OECD, Nomura

Calculation methodology of topic nuance in FOMC minutes based on Jegadeesh and Wu (2015)

Calculation methodology of topic tone in FOMC minutes

(a) Step1: Web-crawling & scraping

Break FOMC minutes into paragraphs

- (a) Lists of FOMC meeting participants' names
- (b) Briefings on specific open market operations
- (c) FRB Staff review of the financial/economic situation and outlook
- (d) FOMC participants' views on current conditions and the economic outlook
- (e) Committee Policy Action

(b) Step2: Machine learning

Topic mixture for each paragraphs

Paragraph 1 (p=1)	Financial markets	$\theta_{p=1,t=1} = 40\%$
	Inflation	$\theta_{p=1,t=2} = 60\%$
Paragraph 2 (p=2)	Growth	$\theta_{p=2,t=3} = 30\%$
	Inflation	$\theta_{p=2,t=2} = 40\%$
	Growth	$\theta_{p=2,t=3} = 30\%$
Paragraph 3 (p=3)	Policy	$\theta_{p=3,t=6} = 100\%$
. . .		
Paragraph P (p=P)	Financial markets	$\theta_{p=P,t=1} = 60\%$
	Policy	$\theta_{p=P,t=6} = 40\%$

(c) Step3: Text mining

Calculate topic nuance on document level

1. Score for "financial markets" topic

: $DocScore_{t=1} = \sum_{p=1}^{P} Score_p \times \theta_{p,t=1}$

2. Score for "inflation" topic

: $DocScore_{t=2} = \sum_{p=1}^{P} Score_p \times \theta_{p,t=2}$

3. Score for "growth" topic

: $DocScore_{t=3} = \sum_{p=1}^{P} Score_p \times \theta_{p,t=3}$

4. Score for "policy" topic

: $DocScore_{t=4} = \sum_{p=1}^{P} Score_p \times \theta_{p,t=4}$

Source: Nomura

Proportion of “inflation” is increasing recently and proportion of “financial markets” is decreasing

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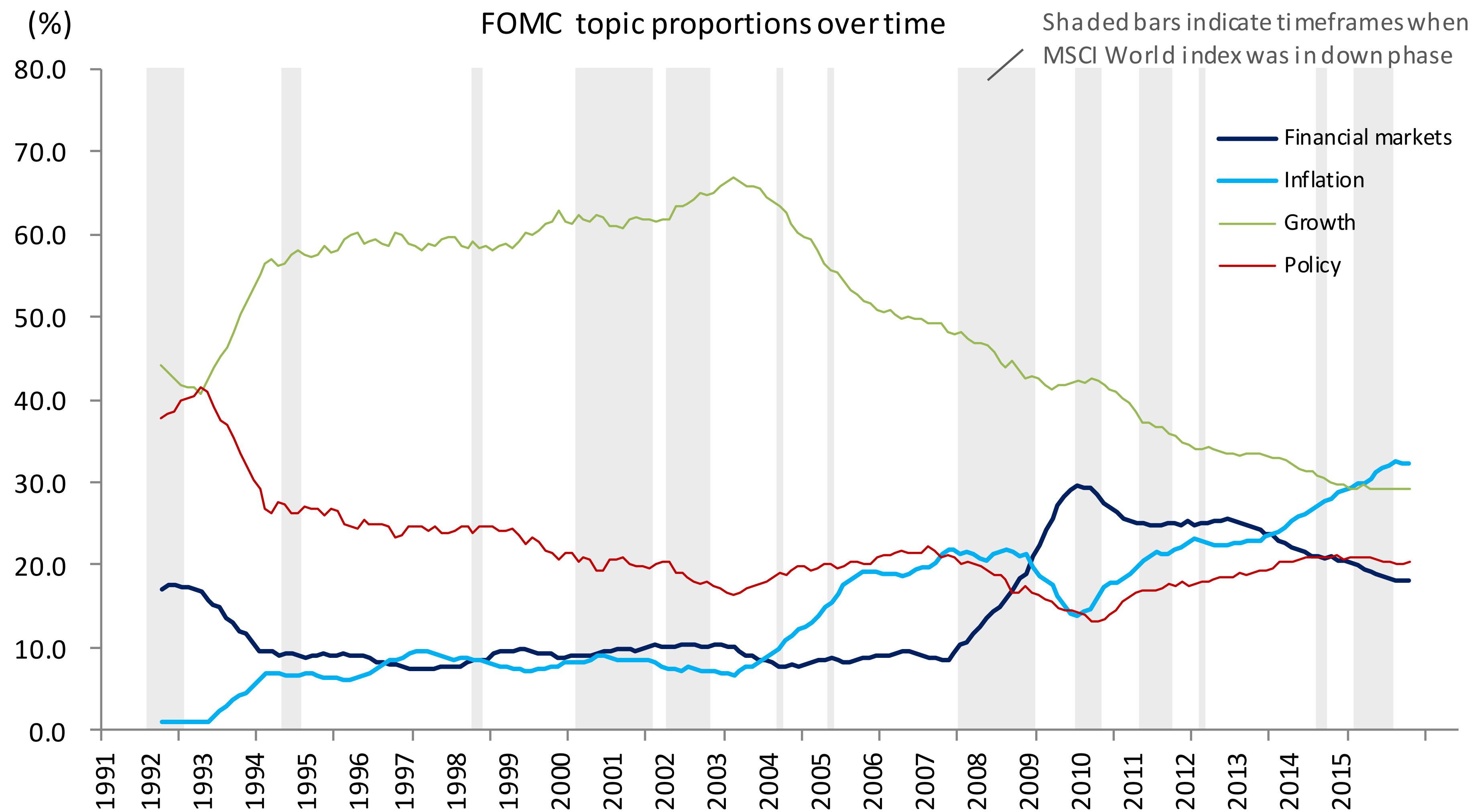
Time series of the proportion of each topic in FOMC meeting minutes



Note: We used FOMC meeting minutes between 1991 and April 2016 (total 202 meeting minutes). We calculated topic proportions based on posterior topic mixture (θ) for each paragraph estimated by LDA and plotted time series. Horizontal axis is announcement date of FOMC meeting minutes (not an event date of FOMC meeting) and vertical axis is the proportion of each topic in FOMC meeting minutes. Shaded bars indicate timeframes when MSCI World index was in down phase.

Source: Nomura

In fact, many topics were toned-down in the latest FOMC minutes (released on 18 May 2016)

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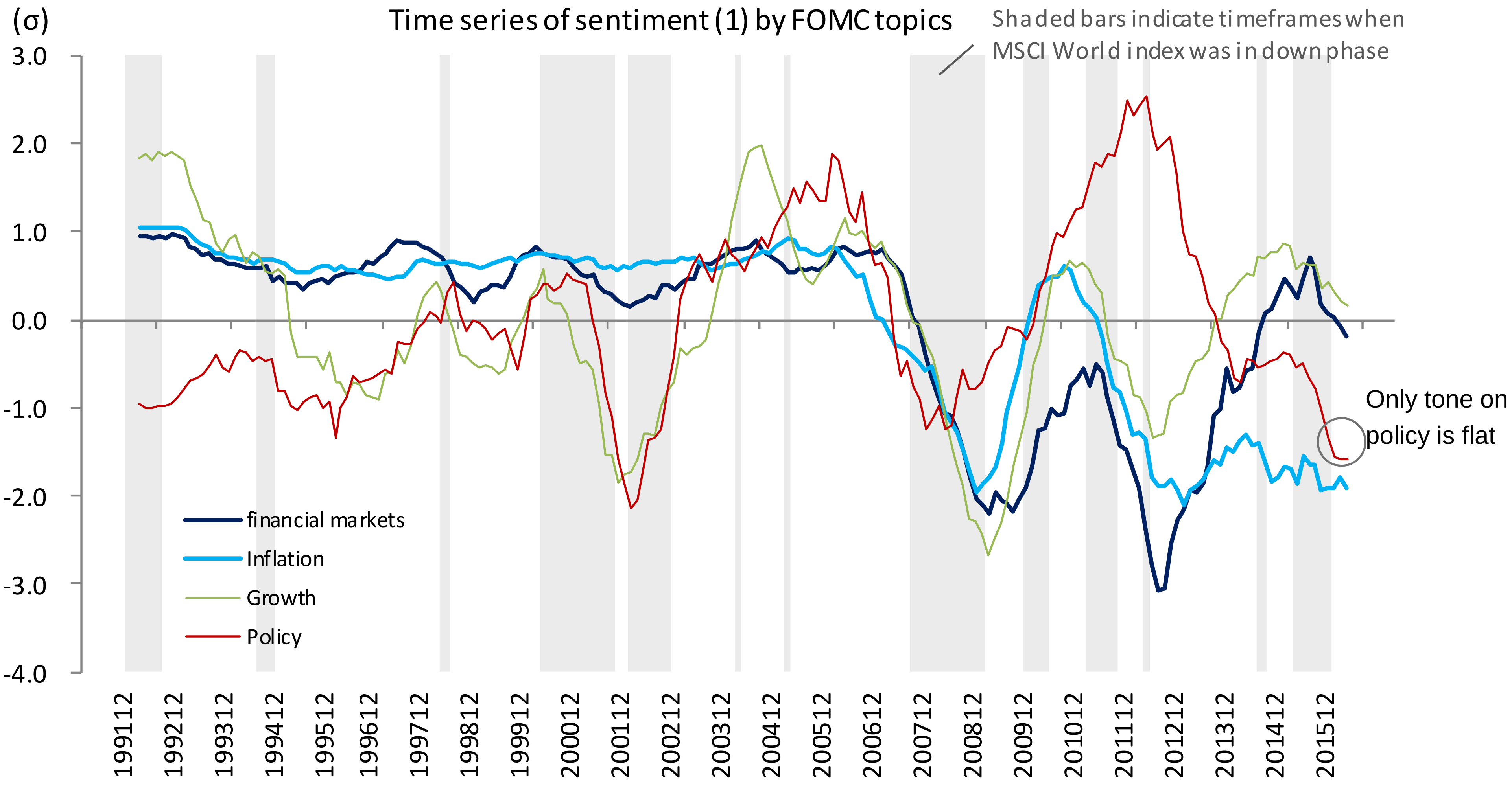
Time series of nuance for each topic in FOMC minutes (positive - negative)



Note: We used FOMC meeting minutes between 1991 and April 2016 (total 202 meeting minutes). We calculated nuance for each topic t(t=1,2,…,4) on document level (Score: $DocScore_t = \sum_{p=1}^{P} Score_p \times \theta_{p,t}$), and showed time series of difference between a frequency of positive words and negative words. Horizontal axis is announcement date of FOMC meeting minutes (not an event date of FOMC meeting) and vertical axis is the nuance for each topic in FOMC minutes (positive - negative). Shaded bars indicate timeframes when MSCI World index was in down phase.

Source: Nomura

In fact, uncertainty level is increasing in many topics in the latest FOMC minutes (released on 18 May 2016)

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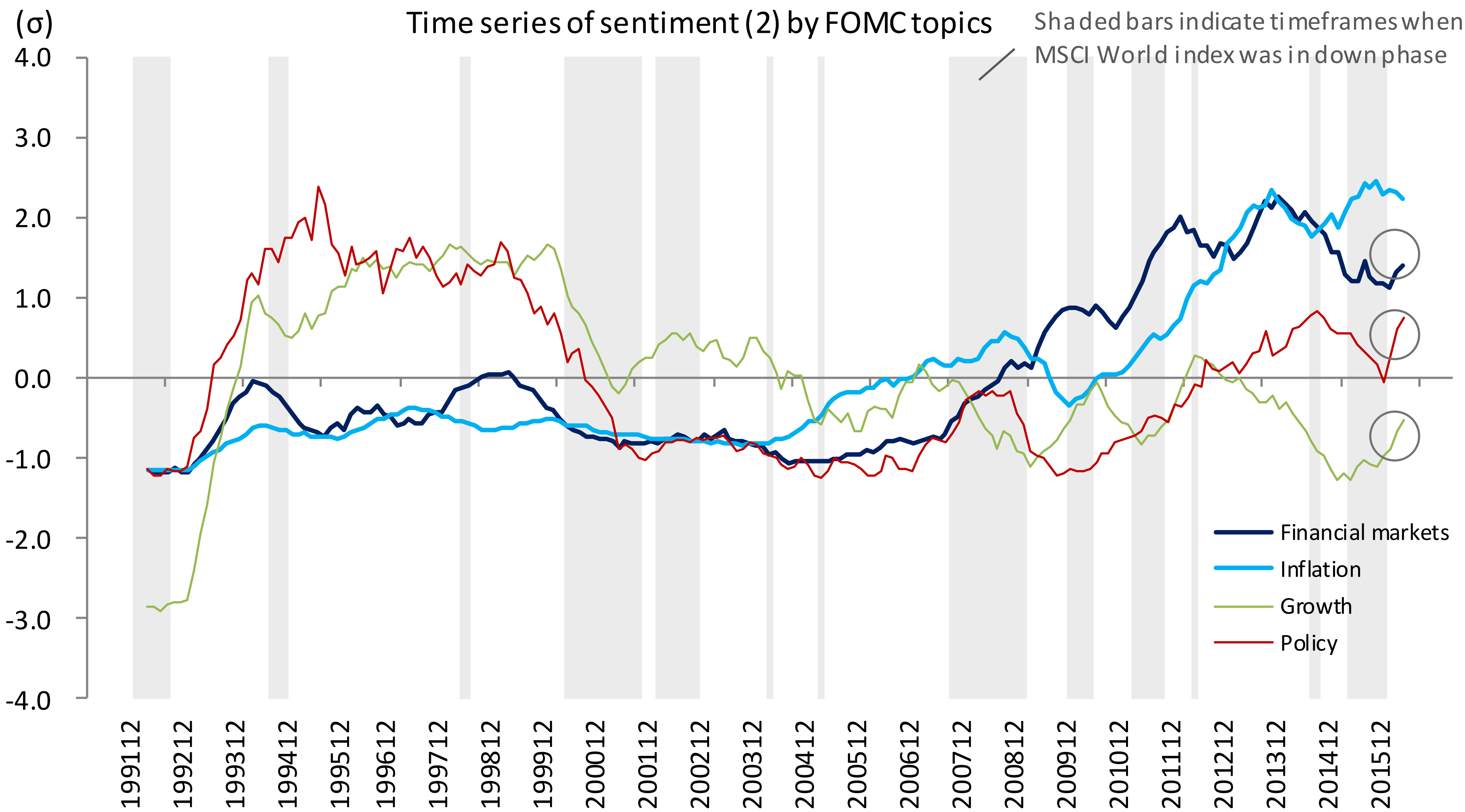
Time series of frequency of uncertainty-related words



Note: We used FOMC meeting minutes between 1991 and April 2016 (total 202 meeting minutes). We calculated nuance for each topic *t*(*t*=1,2,…,4) on document level (Score: $DocScore_t = \sum_{p=1}^{P} Score_p \times \theta_{p,t}$), and showed time series a frequency of uncertainty-related words. Horizontal axis is announcement date of FOMC meeting minutes (not an event date of FOMC meeting) and vertical axis is the frequency of uncertainty-related words in FOMC meeting minutes. Shaded bars indicate timeframes when MSCI World index was in down phase.

Source: Nomura

Example of paragraphs categorized into "policy" topic in the latest FOMC minutes (released on 18 May 2016)

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Example of paragraphs categorized into "policy" topic in FOMC minutes of April 2016

No	"Policy" topic proportion in each paragraph	Score (Contribution for score of "policy" topic)	Paragraphs
1	57.30%	0.71%	Some participants saw limited costs to maintaining a patient posture at this meeting but noted the risks--including potential risks to financial stability--of waiting too long to resume the process of removing policy accommodation, especially given the lags with which monetary policy affects the economy. A couple of participants were concerned that further postponement of action to raise the federal funds rate might confuse the public about the economic considerations that influence the Committees policy decisions and potentially erode the Committees credibility.
2	20.32%	0.58%	Consistent with its statutory mandate, the Committee seeks to foster maximum employment and price stability. The Committee currently expects that, with gradual adjustments in the stance of monetary policy, economic activity will expand at a moderate pace and labor market indicators will continue to strengthen. Inflation is expected to remain low in the near term, in part because of earlier declines in energy prices, but to rise to 2 percent over the medium term as the transitory effects of declines in energy and import prices dissipate and the labor market strengthens further. The Committee continues to closely monitor inflation indicators and global economic and financial developments.
3	49.32%	0.22%	Participants agreed that their ongoing assessments of the data and other incoming information, as well as the implications for the outlook, would determine the timing and pace of future adjustments to the stance of monetary policy. Most participants judged that if incoming data were consistent with economic growth picking up in the second quarter, labor market conditions continuing to strengthen, and inflation making progress toward the Committees 2 percent objective, then it likely would be appropriate for the Committee to increase the target range for the federal funds rate in June. Participants expressed a range of views about the likelihood that incoming information would make it appropriate to adjust the stance of policy at the time of the next meeting. Several participants were concerned that the incoming information might not provide sufficiently clear signals to determine by mid-June whether an increase in the target range for the federal funds rate would be warranted. Some participants expressed more confidence that incoming data would prove broadly consistent with economic conditions that would make an increase in the target range in June appropriate. Some participants were concerned that market participants may not have properly assessed the likelihood of an increase in the target range at the June meeting, and they emphasized the importance of communicating clearly over the intermeeting period how the Committee intends to respond to economic and financial developments.

Source: FOMC, Nomura

Tones by topics in the latest minutes suggest a fall of bond risk premium - “bond-like stocks” outperforming

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- **No improvement in tones of topics about “inflation” and “growth” will be positive for “bond-like stocks”**

Predictive power of FOMC minutes for bond risk premium

(a) A dependent variable: US government bond risk premium

No	Independent variables	Coefficient	t-value
1	Financial markets	7.22	1.40
2	Inflation	15.06	2.05
3	Growth		
	Investment	23.80	2.02
	Foreign trade	0.30	0.04
	Consumption/employment	21.31	2.55
4	Policy	-10.92	-0.46

Improvement in tones of topics about “inflation” and “growth” contributes for increase in future bond risk premium

There is little relationship between bond risk premium and improvement in tones of topic about “policy”

(b) A dependent variable: average of bond risk premium

No	Independent variables	Coefficient	t-value
1	Financial markets	11.19	1.41
2	Inflation	15.24	1.32
3	Growth		
	Investment	13.88	0.74
	Foreign trade	1.87	0.16
	Consumption/employment	27.71	2.12
4	Policy	2.24	0.06

Note: Explained variable is a change in bond risk premium in following month and explanation variable is a change in score for each document $DocScore_t = \sum_{p=1}^{P} Score_p \times \theta_{p,t} (t = 1,2,..4)$ (comparison between the most recent meeting minutes and previous meeting minutes). For explained variable, we use (a) US government bond risk premium and (b) average of bond risk premiums (US government bond, German government bonds and JGB). Sample period was from January 2013 through 13 May 2016.

Source: Nomura

Global bond funds continue to support “bond-like stocks”

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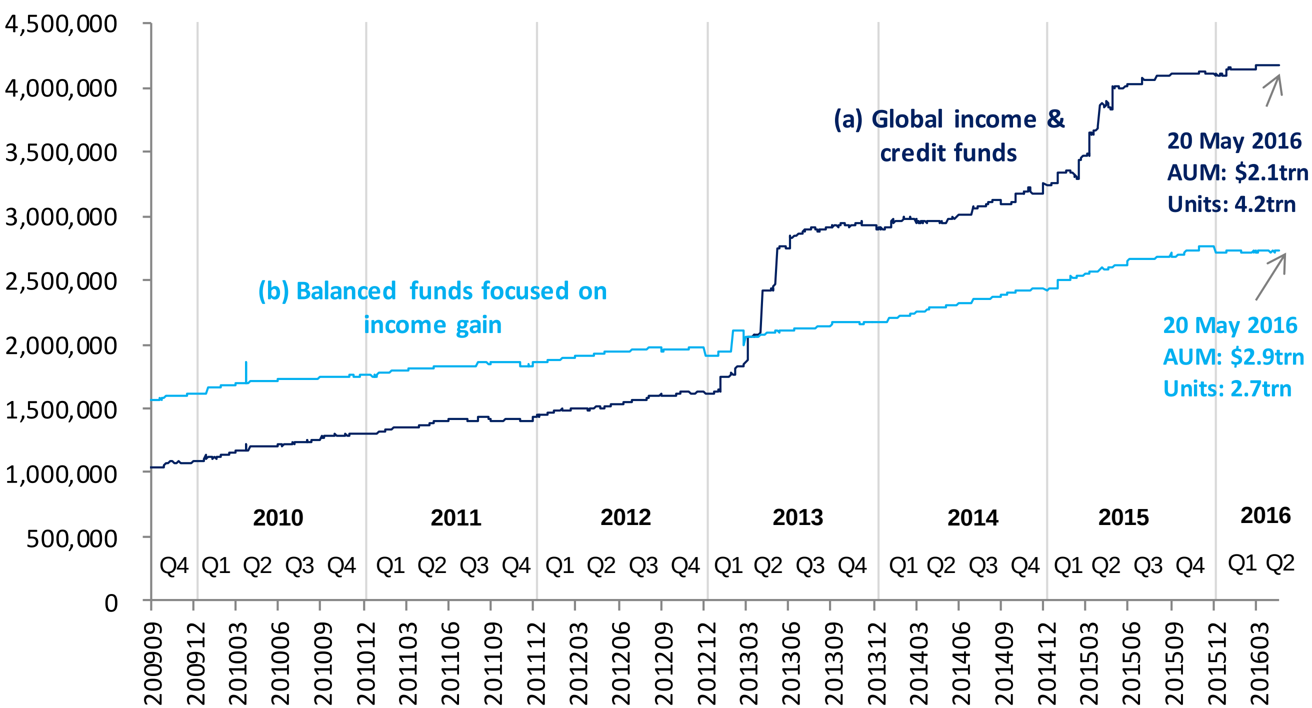
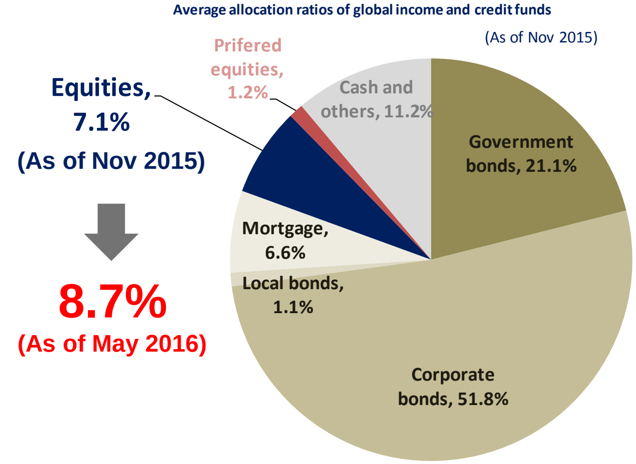
Adjusted no. of units in global income and credit funds

(mn units) Adjusted no. of units in global bond funds which are able to invest in equities

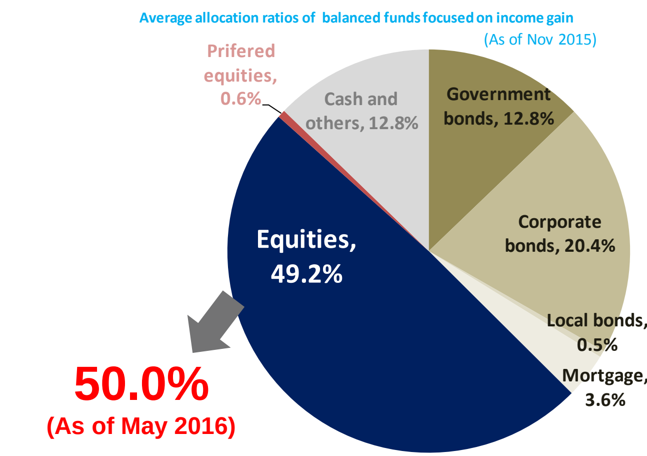


Average allocation ratio

(a) Global income & credit funds



(b) Balanced funds focused on income gains



Note: We looked at the adjusted number of units (standardized by equalizing initial net assets per unit at each fund) in global income and credit funds and in balanced funds that focus on income. For global income and credit funds and balanced funds that focus on income, we used funds coming under the Bloomberg asset class categories of fixed income and mixed allocation respectively and that also had equity weightings of more than 0% and AUM of at least $500,000 as of October 2015. Data are for end-Sep 2009 through 20 May 2016. Allocation ratio is based on average of whole sample (excluding leveraged funds).
Source: Nomura

In Japan, smart beta funds are focusing their investment on "bond-like stocks"

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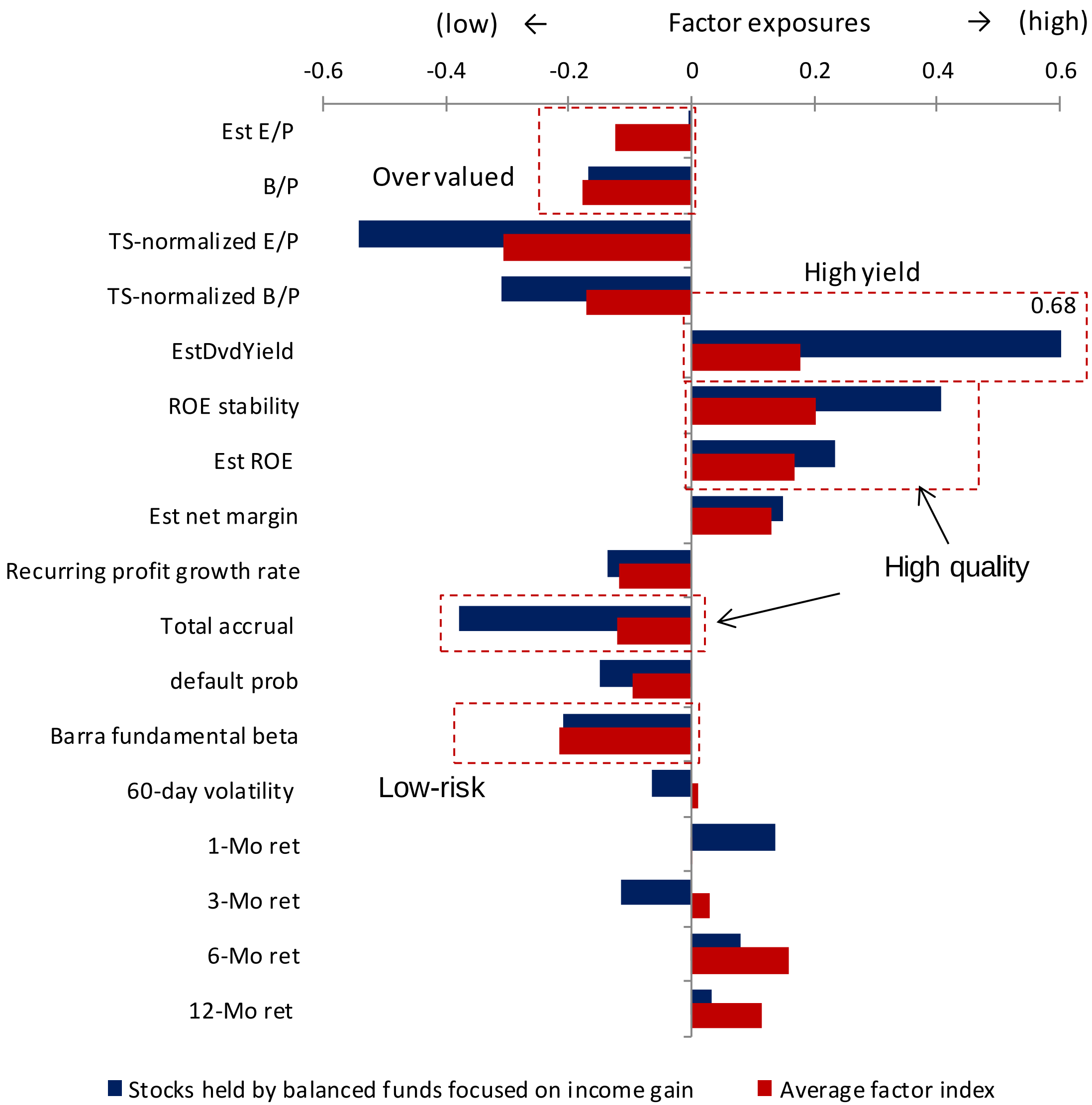
Stocks overcrowded by smart beta funds have risk characteristics that are similar to bond-like stocks



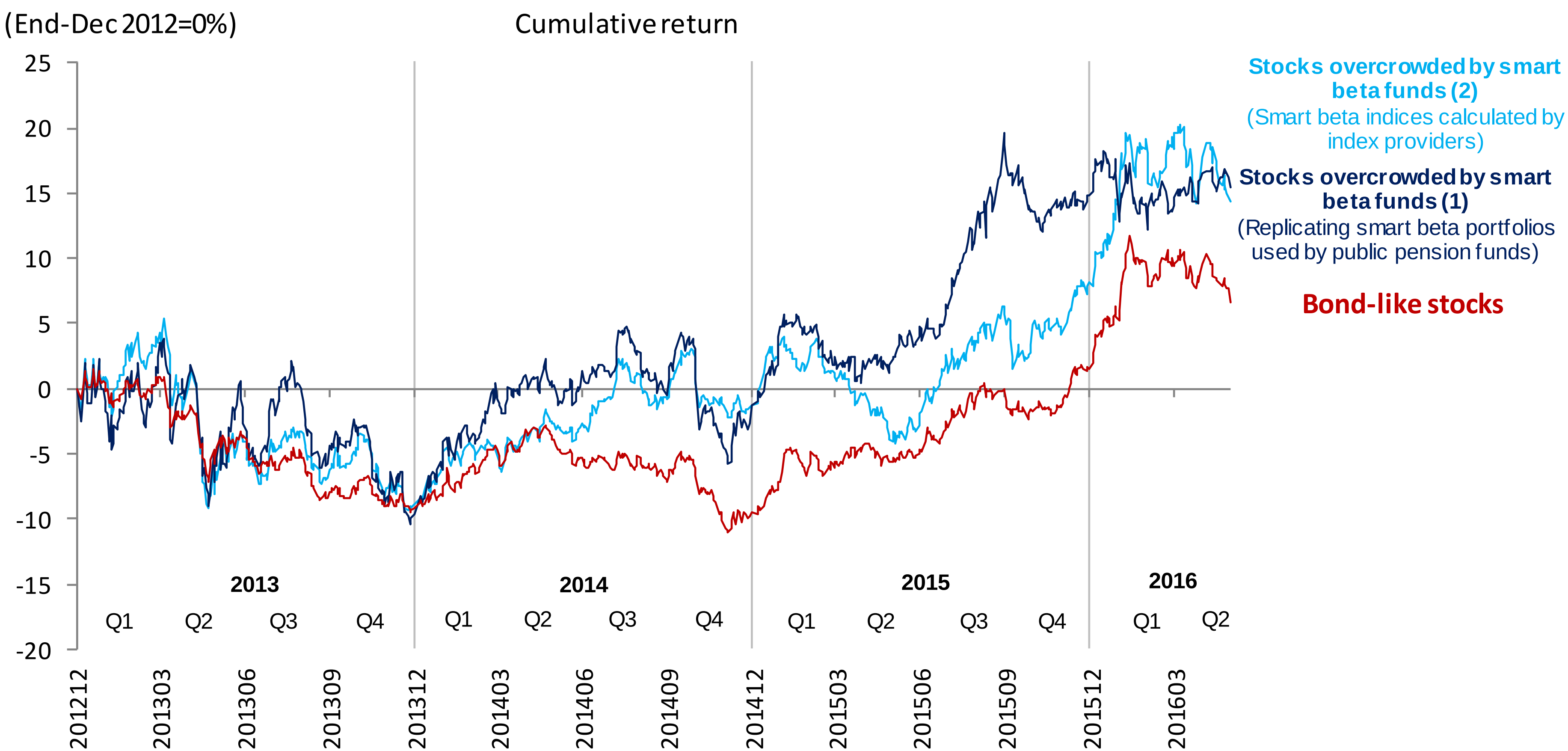
Note: Shows factor exposure for the Japanese stocks held by balanced funds that focus on income (the 14 funds for which we were able to confirm that they come under this category of fund, according to Bloomberg, and have holdings in Japanese equities) and a composite smart beta portfolio made up of the five types of smart beta indices calculated by index providers. We calculated the average exposure to each factor on a weighted-average basis, based on active weights relative to the TOPIX for each portfolio. We normalized exposure to each factor so that the market cap-weighted average was 0 and the standard deviation was 1 at the beginning of each month (with maximum and minimum of $\pm 3\sigma$). Data as of end-October 2015.

Source: Nomura

Stocks with high degree of herding by smart beta portfolio and “bond-like stocks”

- In Japan, performance of stocks with high degree of herding by smart beta portfolio is correlated with that of bond-like stocks

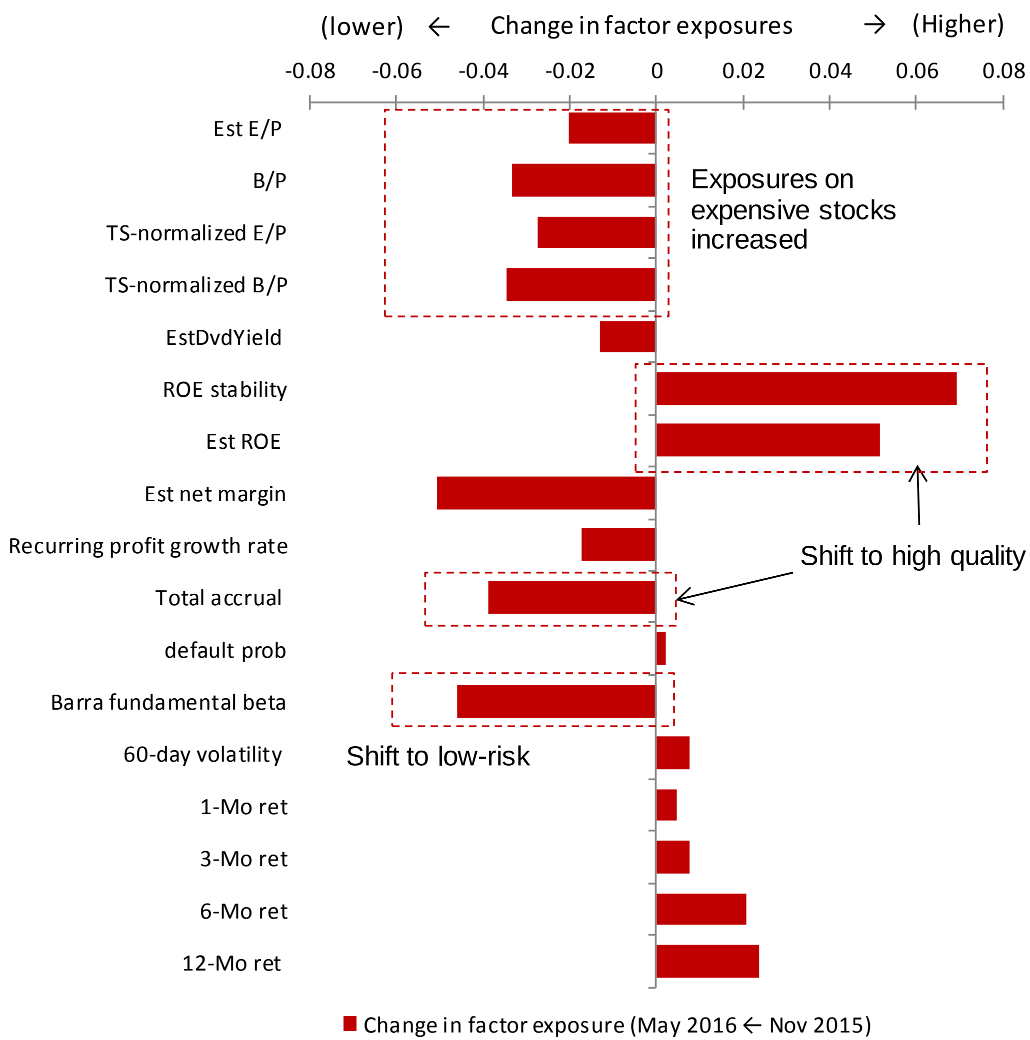
Performance of stocks with high degree of herding by smart beta portfolio and bond-like stocks



Note: Our universe was TOPIX 500 constituent stocks. We defined stocks overcrowded by smart beta funds (1) as the stocks in the top 10% of the universe in terms of their average active weight in the replicating smart beta portfolios used by domestic public pension funds. We defined stocks overcrowded by smart beta funds (2) as the stocks in the top 10% of the universe in terms of their average active weight in multiple smart beta indices calculated by index providers. We defined bond-like stocks as the stocks with the lowest risk and the highest dividends in the universe. Figure shows cumulative daily returns on equally weighted portfolios for each group. We did not take transaction costs into account. Analysis is based on past share price performance and does not guarantee future performance. Sample period was Jan 2013 through 31 May 2016.
Source: Nomura

Style of Japanese active funds is also close to "bond-like stocks"

Change in style of stocks with bullish bias on the part of fund managers (overweight and little dispersion of their views)

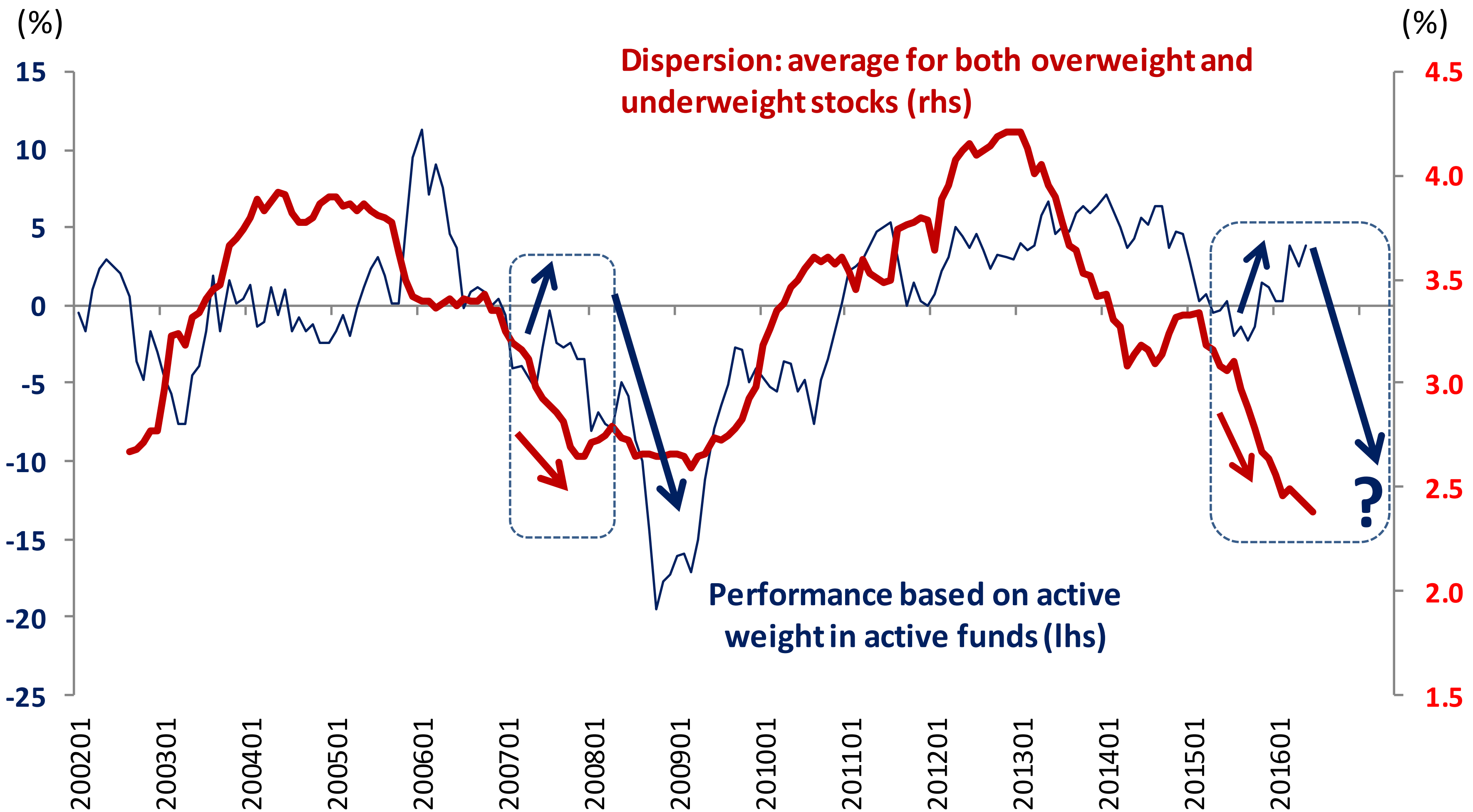


Note: We divided our universe of TSE-1 stocks into five groups based on our active fund bias factor at the beginning of each month. We then calculated the factor exposure for the group of stocks with the highest factor values (the bullish bias group). We calculated average exposure to each factor on a weighted-average basis, based on TOPIX weightings. We normalized exposure to each factor so that the market cap-weighted average was 0 and the standard deviation was 1 at the beginning of each month (with maximum and minimum of ±3σ). Shows difference between data as of the beginning of May 2016 and the beginning of November 2015.

Source: Nomura

Revival of Japanese active funds without clear environmental improvement… Just like a game of chicken

Relationship between portfolio dispersion and fund performance



Note: The universe is TSE-1 stocks and the sample period is Jan 2002 through 31 May 2016. We divided the universe into five groups based on each stock's average active weight in active funds at the beginning of each month. We then calculated cumulative monthly returns on a strategy of combining equally weighted long positions in the group of stocks with the highest average active weights (overweight stocks) and equally weighted short positions on the group of stocks with the lowest average active weights (underweight stocks). We did not take trading costs into account. Analysis is based on historical share prices and does not guarantee future performance. To calculate portfolio dispersion, we selected from our universe of TSE-1 stocks the top 20% and bottom 20% of stocks in terms of average active weight in active funds (ie, the stocks in which active funds were most overweight and underweight respectively). We then calculated the standard deviation of the active weights for each stock in each group and the average for all stocks. We define portfolio dispersion as the average of the values for the two groups.

Source: Nomura

Strategies to avoid herding by “smart beta” and “active funds” in Japan equities

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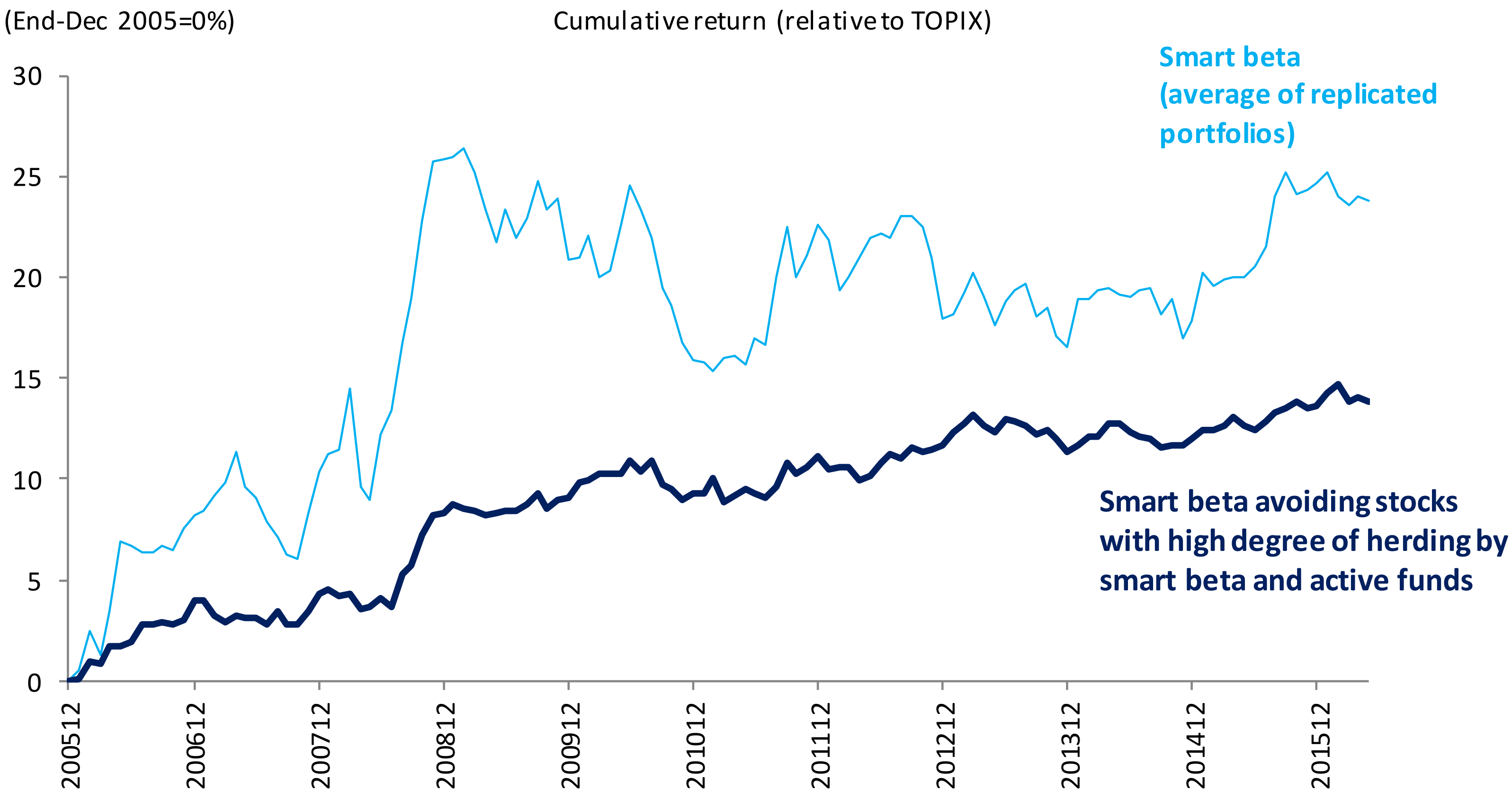
- Smart beta avoiding overcrowded stocks might be effective when concentrated positions unwind

Performance of smart beta including and avoiding stocks with high degree of herding by smart beta and active funds



Note: Our universe is TOPIX 500 constituents. Performance of smart beta (average replicated portfolios) is calculated using average weight in each replicated portfolio as weighting. Performance of smart beta avoiding stocks with high degree of herding by smart beta and active funds is also using average weight in replicated portfolios, but we put weight of 0% for stocks with high average active weight in replicated smart beta portfolios and stocks with high active funds ownership ratios. Figure shows cumulative return relative to TOPIX. We did not take transaction costs into account. Analysis is based on historical share prices and does not guarantee future performance. Sample period was Jan 2006 through 31 May 2016.

Source: Nomura

Appendix : Reference materials

- Cochrane J. H., and M. Piazzesi, 2005, Bond Risk Premia, American Economic Review, 95(1): 138-160.
- Jegadeesh, N., and D. Wu, 2015, Deciphering Fedspeak: The Information Content of FOMC Meetings, AFA 2016 San Francisco Meeting Paper
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- Zhiyuan Liu, Yuzhou Zhang, Edward Y. Chang, Maosong Sun, 2011, PLDA+: Parallel Latent Dirichlet Allocation with Data Placement and Pipeline Processing. ACM Transactions on Intelligent Systems and Technology, special issue on Large Scale Machine Learning
- “Japanese equity quantitative strategy: 2016 factor outlook for Japanese equities”, 7 December 2015

Appendix A-1

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STOCKS

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SECTORS

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

STOCKS

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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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