

Enhancing Reversals with News and Neutralization

With Tradable Systematic Strategies in Japan

Neutralizing unintended factor exposures in short-term reversals

It is intuitive that reversal strategies are largely exposed to systematic factors: If cheap stocks outperform expensive stocks, reversal strategies that buy losers (expensive stocks) and sell winners (cheap stocks) are betting against the Value factor. [Blitz et al \(2013\)](#) showed that systematic factor exposures negatively impact reversal returns, and neutralization could enhance returns and reduce volatilities by avoiding factor swings.

No news is good news? Yes for reversal players

News and media attention could drive short-term reversals. We find that stocks with lower news volume exhibit stronger reversals, which could be attributed to investors' overreaction to spurious price movements.

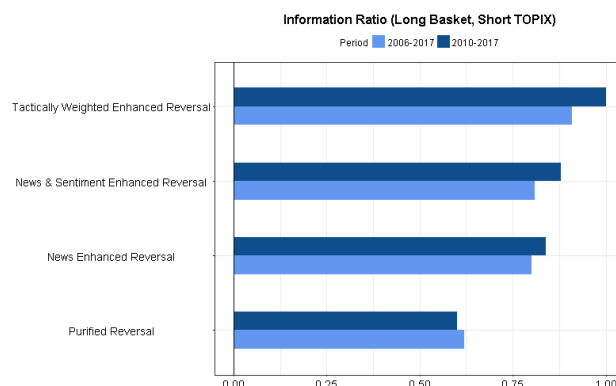
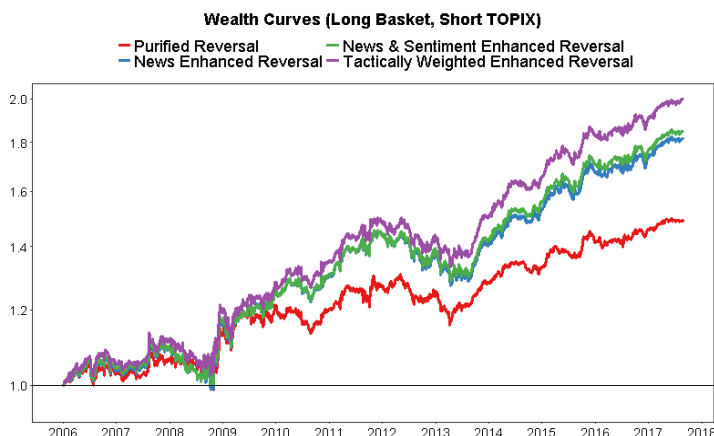
Anticipation of earnings news leads to stronger subsequent reversals

Upcoming earnings reports may lead to stronger subsequent reversals due to an increase in inventory risks bared by market makers prior to announcements ([So and Wang \(2014\)](#)). We find similar results in Japan.

Four tradable strategies in TOPIX 500

We put the above ideas into four tradable baskets that systematically long liquid stocks within TOPIX 500 with weekly rebalancing. We include a tactically weighted version that tilts towards stocks with upcoming earnings announcements to capture the stronger reversal patterns.

Tradable strategies at a minimum of 100 million USD in TOPIX 500, including 4 bps of t-cost



Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI

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Rationale for Short-Term Reversals

Since the seminal work of [Jegadeesh \(1990\)](#) on the reversal patterns in monthly stock returns¹, “contrarian” strategies that buy losers and sell winners in the recent past have become popular, especially among quantitative hedge funds that attempt to profit from temporary price dislocations.

There are three major competing explanations for the phenomenon of short-term reversals:

- **Sentiment based (i.e. behavioral):**

[Schiller \(1984\)](#) suggested that dividends and stock prices may be driven by social optimism or pessimism.

[Subrahmanyam \(2015\)](#) found that the reversal of monthly returns is related to market overreaction, rather than inventory effects or order flow innovations.

[De Bondt and Thaler \(1985\)](#) applied statistical tests to quantify market overreaction, and found that the effect of overreaction is larger for losers than for winners, leading to reversal effects

- **Liquidity based (i.e. market microstructure):**

In this school of thought, short-term reversals are driven by price pressure generated from the demand for liquidity, which will be reverted when liquidity providers react to profit opportunities arise from price deviations from fundamentals.

[Jegadeesh and Titman \(1995\)](#) provided evidence that return reversals are explained by dealers' inventory imbalances and the microstructure dynamics of bid-ask spreads. [Avramov et al \(2006\)](#) showed that illiquid stocks exhibit stronger reversals than liquid stocks, as proxied by the Amihud measure².

[Kaul and Nimalendran \(1990\)](#) looked at NASDAQ stock returns and claimed that short-term price reversals is due to bid-ask spread, rather than market overreaction.

- **Cross-correlations based (i.e. non-synchronous trading):**

[Lo and MacKinlay \(1990\)](#) pointed out that whilst negative serial correlations of stock returns leads to a profitable reversal strategy, it is not the only condition. In fact, even if prices are not negatively auto-correlated, a reversal strategy can still have positive returns if cross-auto-covariances are positive, i.e. a higher return of stock *A* today implies a higher return for stock *B* tomorrow, i.e. stock *A* leads stock *B*.

¹ Jegadeesh (1990) used a cross-sectional regression model to forecast 1-month ahead stock returns in the US over the period 1934-1987, and found significant negative first-order serial correlations in the returns, i.e. a reversal pattern. This poses a serious challenge to the Efficient Market Hypothesis, where stock prices are unpredictable and follow random walks.

² Amihud measure is defined as the absolute daily return per daily trading value ([Amihud \(2002\)](#))

In this note, we look at weekly reversals in Japan. The Japanese market tends to exhibit a more mean-reverting behavior, rather than being momentum-driven³. Whilst simple reversal strategies have worked decently in Japan, we attempt to understand drivers of such reversal patterns. In particular, we study how news volume, news sentiment and earnings announcements could affect reversal patterns. We obtain news sentiment data from a vendor called [RavenPack](#), which we introduced the details in [“Value Strategies based on Machine Learning”](#).

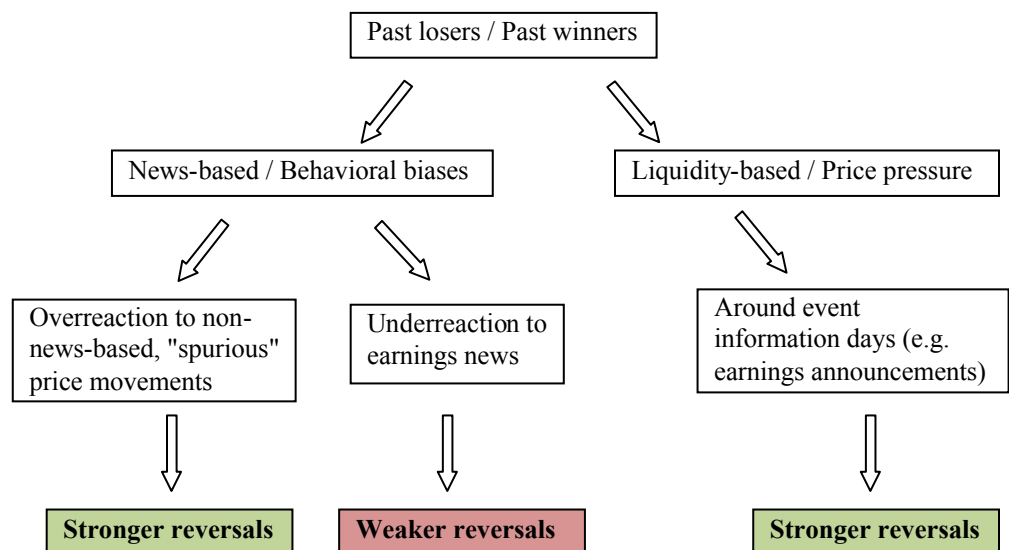
What have we learnt about Reversals?

Our major findings on reversal patterns are as follows:

- “Purifying” reversal returns by removing its systematic exposures to conventional risk factors help to enhance the returns whilst significantly reduce risk
- Stocks without news coverage show a stronger reversal pattern than stocks with news coverage, especially for recent losers. This suggests that investors overreact to spurious price movements
- Earnings-related sentiment is a more promising signal than overall sentiment for strategies at a weekly horizon. This may be due to investors’ under-reaction to earnings news, leading to return continuation
- Reversals are stronger around earnings announcement periods, which could be driven by higher expected returns demanded by liquidity providers for compensating inventory risk

Figure 1 summarizes some of the patterns that we analyze in this report.

Figure 1: Reversal patterns in Japan



Source: J.P. Morgan Quantitative and Derivatives Strategy

³ Fama and French (2011) examined momentum (together with size and value) for stocks in four regions: North America, Europe, Japan and Asia Pacific. There is evidence of return momentum in all regions except Japan.

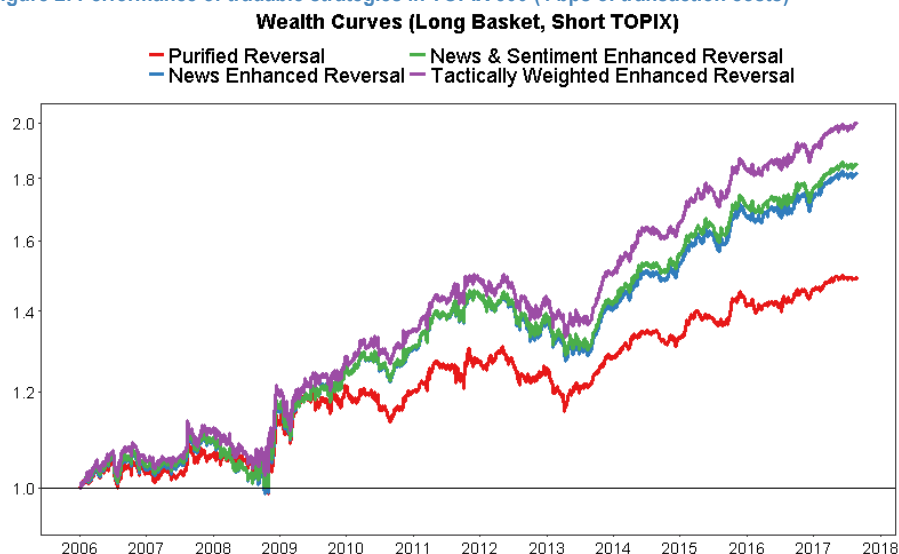
From Theory to Practice: Tradable Strategies

In the last section on page 29, we devise strategies (tradable at about 100 million USD minimum) that buy stocks in TOPIX 500 and short the TOPIX total return index. We propose four tradable strategies based on analysis in this report. They form a hierarchy (Figure 26) as each strategy is modified from the strategy above by including extra signals:

- **Purified Reversal:** Buy past week losers based on sector-neutral residual returns
- **News Enhanced Reversal:** Purified Reversal without stocks with medium to high news volume
- **News and Sentiment Enhanced Reversal:** News Enhanced Reversal without stocks with poor earnings sentiment
- **Tactically Weighted Enhanced Reversal:** News and Sentiment Enhanced Reversal, and tactically tilt towards stocks that will report earnings in the next week

Figure 2 shows the wealth curves of these strategies. The “Purified Reversal” strategy, albeit giving lower returns, contains the largest number of stocks and is more liquid (tradable at 300 million USD as of latest) than the other strategies.

Figure 2: Performance of tradable strategies in TOPIX 500 (4 bps of transaction costs)



Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI

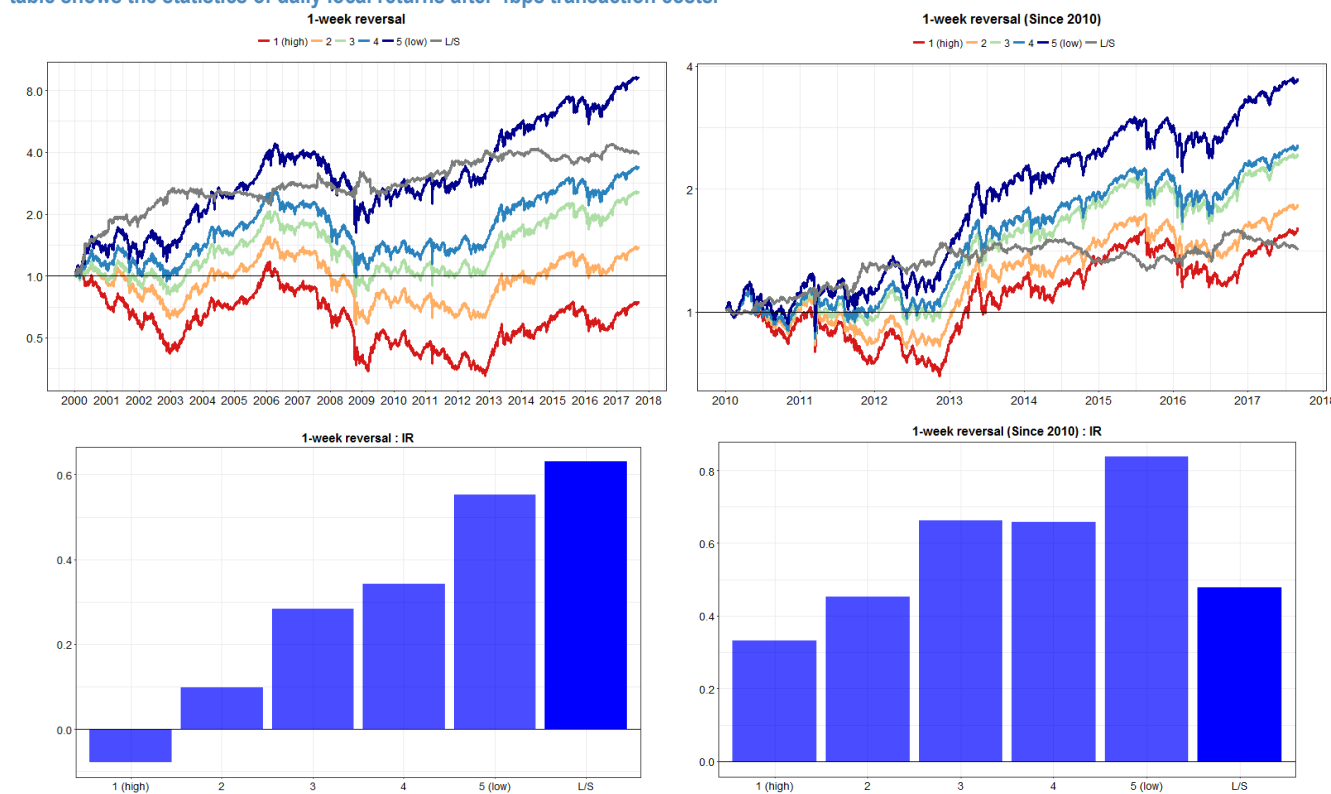
Past Winners and Losers...of What?

In a reversal strategy, we first need to define past winners and past losers. This sounds simple: past winners are of course stocks with highest returns, and past losers the lowest. But we can as well define past winners and losers based on other measures, such as sector-neutral returns: It just means that winners are defined relative to their peers. In this section, we attempt to obtain better reversal signals via neutralization.

Weekly Reversals in Japan

We first look at a simple short-term reversal strategy for stocks in TOPIX. Figure 3 shows the wealth curves of the quintile portfolios sorted by past 1-week local returns since 2000 and 2010, as well as the information ratios of the quintile portfolios. Such a simple reversal strategy works decently in Japan – systematically buying losers and selling winners in the past 1 week has led to an annualized return of 4.7% since 2010, with an information ratio of 0.48. Of course, as reversal signals decay quickly, this strategy requires high turnover. To ensure our backtests are more realistic, we impose 4 bps of transaction costs in the weekly rebalancing.

Figure 3: Wealth curves and information ratios of the quintile portfolios sorted by the past 1-week local returns for the TOPIX universe. The table shows the statistics of daily local returns after 4bps transaction costs.



L/S 1-week Reversal (Quintiles)	Median # of stocks (Long or Short)	Mean IC	Risk-adj. IC	t-stat	Skewness	Excess kurtosis	2-way Turnover	Ann. Returns	Ann. Vol.	IR	Max. Draw-down	Hit Ratio
Since 2000	282	3.5%	0.29	2.82	0.62	14.07	318.7%	8.1%	12.8%	0.63	25.2%	50.9%
Since 2010	290	3.0%	0.25	1.43	-0.24	8.43	318.4%	4.7%	9.9%	0.48	16.5%	50.5%

Source: J.P. Morgan Quantitative and Derivatives Strategy, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI

Disentangling Reversal from Industry Momentum

Are there any simple conditions that could help to improve the short-term reversal strategy? We look at some possibilities below, with the first being the removal of industry effects.

Decomposing Reversal Returns

Since a short-term reversal strategy is purely return-based, it can be expressed analytically if we assume that the weights are proportional to the past returns:

$$w_{i,t} = -\frac{1}{N}(r_{i,t-1} - r_{t-1}^{Market})$$

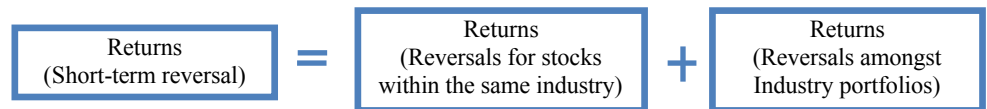
where N is the number of stocks in the portfolio. The returns of this strategy is

$$\pi_t = \sum_{i=1}^N w_{i,t} r_{i,t} = -\frac{1}{N} \sum_{i=1}^N (r_{i,t-1} - r_{t-1}^{Market}) r_{i,t}$$

Following [Da et al \(2011\)](#) and [Hameed and Mian \(2015\)](#), with some algebra, we can decompose the strategy returns into two components (Figure 4):

1. Return reversals within industry
2. Return reversals across industry portfolios

Figure 4: Decomposing returns in a short-term reversal strategy



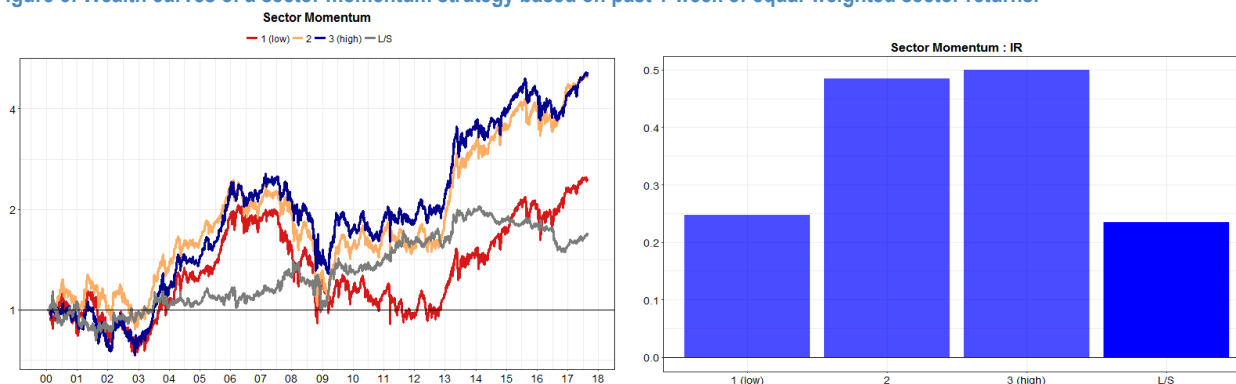
Source: J.P. Morgan Quantitative and Derivatives Strategy

Since it is well-known that industry momentum is prevalent ([Moskowitz and Grinblatt \(1999\)](#)), the expected returns from the 2nd component will likely be negative. Hence, we expect that strategy returns only based on the 1st component, i.e. intra-industry returns, outperform the “naïve” reversal strategy. In other words, comparing stock returns with their peers in the same industry can better identify short-term reversals⁴.

⁴ Intra-industry reversal strategy is closely related to pairs-trading, where we select pairs of similar stocks (i.e. within the same industry) which prices temporary diverge

We confirm that the above argument also holds in Japan, i.e. sectors do exhibit some extent of momentum. In Figure 5, we look at the strategy that buys the sectors in the top tercile of weekly returns, and short those in the bottom.

Figure 5: Wealth curves of a sector momentum strategy based on past 1-week of equal-weighted sector returns.

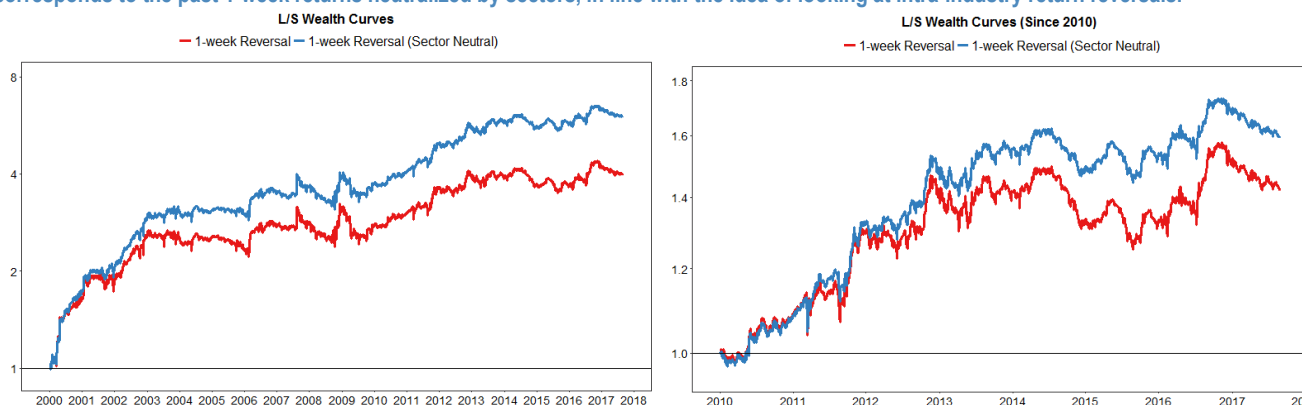


Source: J.P. Morgan Quantitative and Derivatives Strategy, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI

A sector-neutral reversal strategy

Figure 6 shows a comparison of the strategy with and without sector neutralization, which is simply done by z-scoring the past 1-week returns within the 11 GICS sectors. We find a significant improvement in the returns, as well as lower drawdowns.

Figure 6: Wealth curves of the long/short strategy based on past 1-week returns since 2000 (left) and since 2010 (right). The blue line corresponds to the past 1-week returns neutralized by sectors, in line with the idea of looking at intra-industry return reversals.



L/S 1-week Reversal (Sector Neutral) (Quintiles)	Median # of stocks (Long or Short)	Mean IC	Risk- adj. IC	t-stat	Skew- ness	Excess kurtosis	2-way Turnover	Ann. Returns	Ann. Vol.	IR	Max. Draw- down	Hit Ratio
Since 2000	275	3.8%	0.37	4.08	1.06	18.96	319.6%	10.6%	11.0%	0.96	22.7%	51.6%
Since 2010	290	3.2%	0.32	2.16	-0.11	7.93	318.8%	6.4%	8.4%	0.76	11.1%	51.0%

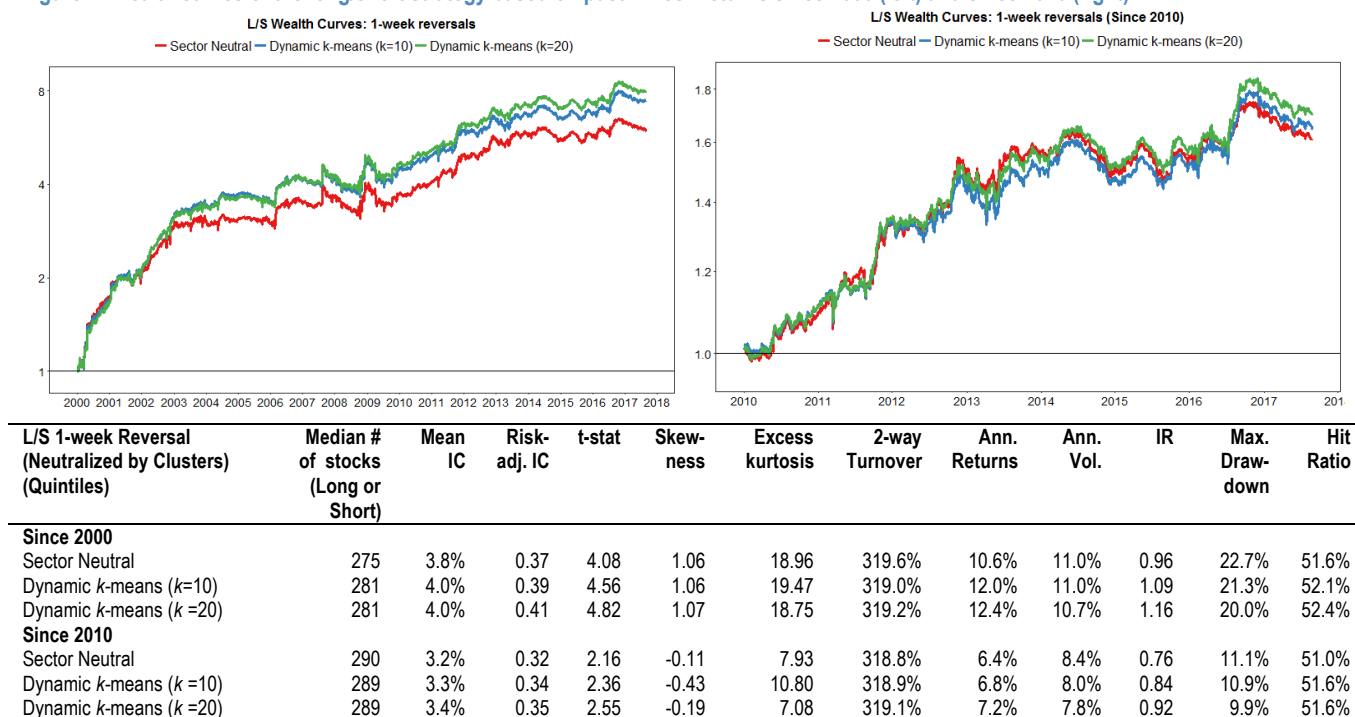
Source: J.P. Morgan Quantitative and Derivatives Strategy, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI

From Industries to Dynamic Clusters?

Another interesting idea beyond sector neutralization is to perform a more ‘data-driven’ and dynamic process to identify peer groups, instead of simply using sectors. The algorithms to identify clusters of observations with similar behavior fall under the umbrella of unsupervised machine learning. Different algorithms exist depending on whether we group observations from a bottom-up (i.e. agglomerative) approach (e.g. hierarchical clustering⁵), or top-down (i.e. divisive) approach. We can also use different distance metrics to define how close the observations are. For an overview of unsupervised machine learning, please refer to “[Big Data & AI Strategies](#)”.

In “[Dynamic Cluster Neutralization in Global Equity Markets](#)”, we study a large number of clustering algorithms and apply the techniques to neutralize risk in our Q-Scores model. We find that using a dynamic k -means clustering helps to significantly improve the risk-adjusted returns for the model in Global Developed Markets⁶. Can we apply this technique to short-term reversals as well? To test the idea, we choose the k -means algorithm due to its popularity and speed. Figure 7 compares the wealth curves of the 1-week reversal strategies, neutralized by different approaches: 1). sectors, 2). dynamic k -means with 10 clusters, and 3). dynamic k -means with 20 clusters.

Figure 7: Wealth curves of the long/short strategy based on past 1-week returns since 2000 (left) and since 2010 (right).



Source: J.P. Morgan Quantitative and Derivatives Strategy, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI

⁵ We have an application of hierarchical clustering on portfolio construction in “[Cross Asset Portfolios of Tradable Risk Premia Indices: Hierarchical Risk Parity: Enhancing Returns at Target Volatility](#)”

⁶ We have also studied dynamic clustering for Asia ex-Japan. For details please refer to “[Do Dynamic Peer Groups Make Sense?](#)”

Purifying Reversals

Can we decompose reversal returns more generally into factors, rather than just industries? Indeed, similar to our arguments in "[Purifying Momentum](#)", price momentum has varying risk exposures over time and is dangerous during market inflection points. This is of no exception for price reversals.

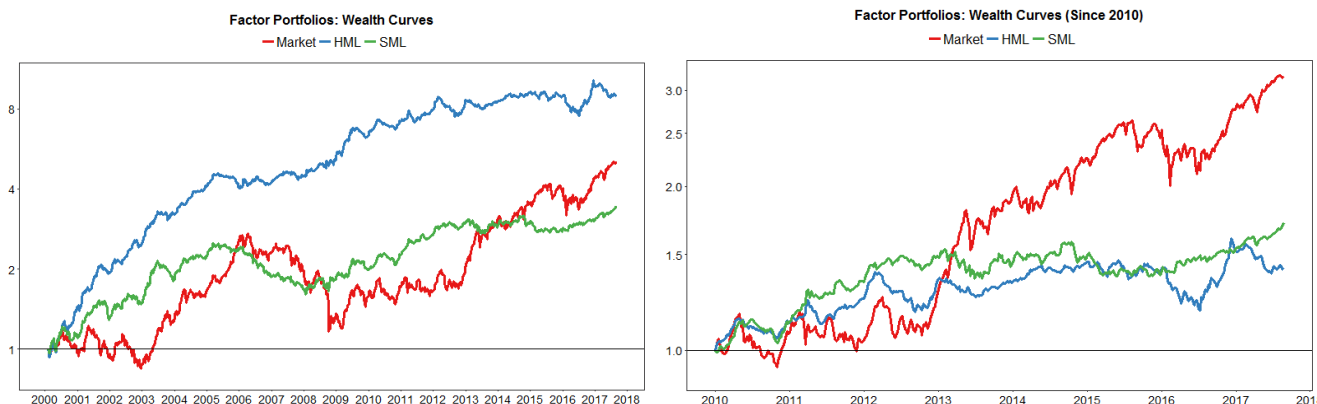
In particular, [Blitz et al \(2013\)](#) showed that the expected returns of a reversal strategy are negatively exposed to factors with positive expected returns, i.e. factor exposures decrease the profitability of a conventional reversal strategy. This makes sense intuitively: If cheap stocks outperform expensive stocks, a reversal strategy buys losers (expensive stocks) and sells winners (cheap stocks), and hence it must be negatively exposed to the Value factor. Such exposure hurts performance if Value delivers a positive premia over the period.

As such, we consider a simple linear regression to remove the proportion of weekly returns due to exposures to the Fama-French factors (Market, Value and Size):

$$r_{i,t} = \alpha_i + \beta_{i,1}r_t^{Market} + \beta_{i,2}r_t^{HML} + \beta_{i,3}r_t^{SMB} + \epsilon_{i,t}$$

The residual returns, $\epsilon_{i,t}$, is regarded as "purified" returns, which better capture stock-specific reversals that are not due to systematic drivers. The factor returns r_t^{Market} , r_t^{HML} and r_t^{SMB} are obtained from factor-mimicking portfolios, with performances being shown in Figure 8.

Figure 8: Factors in the Fama-French model: Market, Value (High minus Low) and Size (Small minus Big).

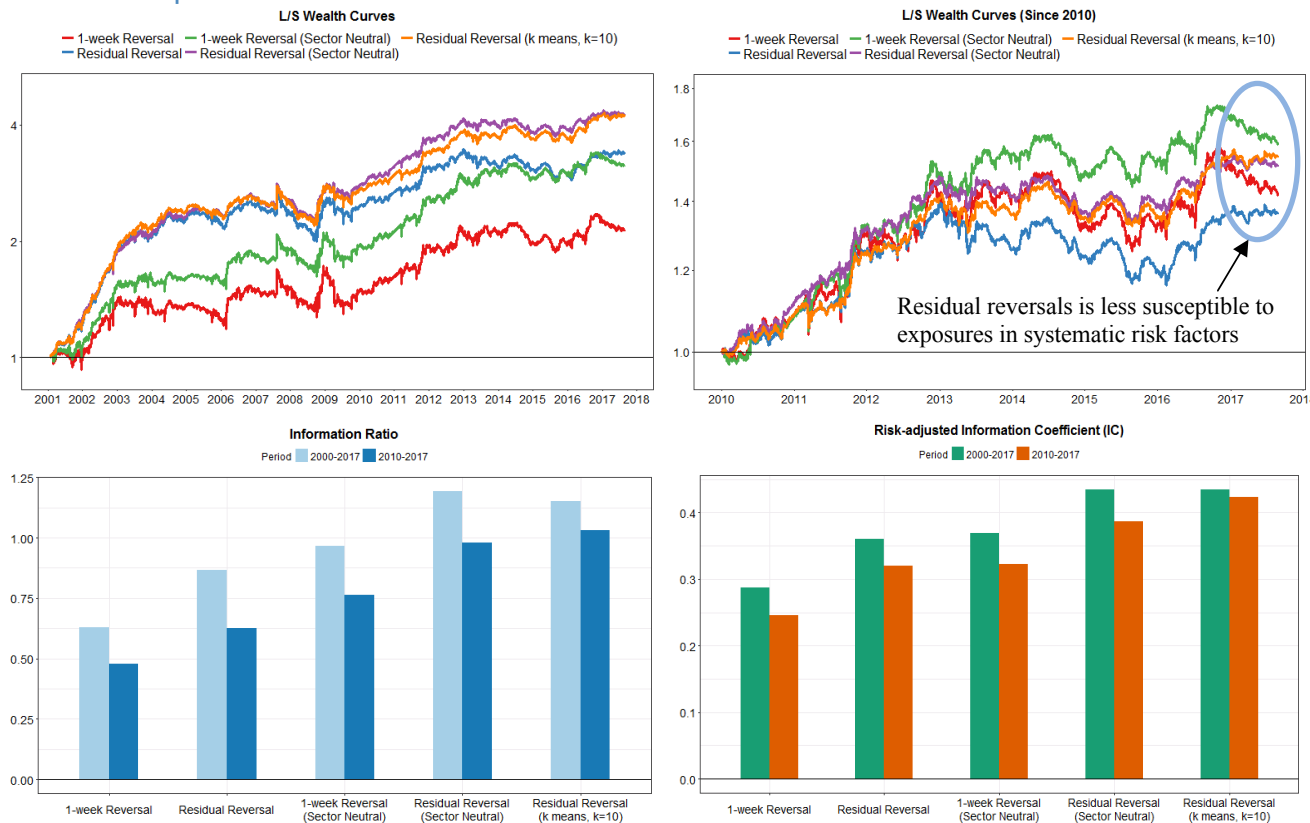


Source: J.P. Morgan Quantitative and Derivatives Strategy, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI

We estimate the residual returns by running the above regression for each stock, using past 52 weekly returns (and ensure there are at least 26 observations). Following our discussions on page 7 on the effect of industry momentum, we also look at whether neutralizing the residual returns by sector (as well as dynamic clusters) could help to improve performance.

In Figure 9, we find that using residual returns indeed help to reduce volatilities, thus increasing information ratios. Using sectors or dynamic clusters to neutralize the returns gives similar results. In the next sections, we will focus on the signal based on residual returns neutralized by sectors.

Figure 9: Wealth curves of the long/short strategies since 2000 (left) and since 2010 (right). We compare the reversal strategies based on raw returns as well as “purified” residual returns.



L/S Signals (Quintiles)	Median # of stocks (Long or Short)	Mean IC	Risk-adj. IC	t-stat	Skew-ness	Excess kurtosis	2-way Turnover	Ann. Returns	Ann. Vol.	IR	Max. Draw-down	Hit Ratio
Since 2000 / 2001*												
1-week Reversal	282	3.5%	0.29	2.82	0.62	14.07	318.7%	8.1%	12.8%	0.63	25.2%	50.9%
Residual Reversal	270	3.2%	0.36	3.58	0.88	22.53	316.0%	7.6%	8.8%	0.87	25.7%	50.6%
Sectors/Clusters Neutralized												
1-week Reversal (Sector)	275	3.8%	0.37	4.08	1.06	18.96	319.6%	10.6%	11.0%	0.96	22.7%	51.6%
Residual Reversal (Sector)	270	3.4%	0.43	4.81	1.52	32.25	317.3%	9.1%	7.6%	1.19	21.3%	51.8%
Residual Reversal (k -means)	278	3.4%	0.43	4.65	1.17	29.76	317.1%	9.1%	7.9%	1.15	21.0%	51.9%
Since 2010												
1-week Reversal	290	3.0%	0.25	1.43	-0.24	8.43	318.4%	4.7%	9.9%	0.48	16.5%	50.5%
Residual Reversal	281	2.7%	0.32	1.79	-0.28	5.21	315.9%	4.2%	6.7%	0.63	16.9%	49.3%
Sectors/Clusters Neutralized												
1-week Reversal (Sector)	290	3.2%	0.32	2.16	-0.11	7.93	318.8%	6.4%	8.4%	0.76	11.1%	51.0%
Residual Reversal (Sector)	281	2.9%	0.39	2.72	-0.02	3.19	317.5%	5.7%	5.8%	0.98	10.2%	51.3%
Residual Reversal (k -means)	281	3.0%	0.42	2.86	-0.62	9.17	317.6%	5.9%	5.7%	1.03	10.0%	51.4%

Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

* For Residual Reversal, performance starts in 2001 due to the regression

News Coverage and Reversals

As behavioral bias and overreaction to information is one of the popular explanations for short-term reversals, we would like to better understand the interactions between news and reversals, and come up with conditions that enhance upon a simple reversal strategy.

Our news sentiment data is obtained from [RavenPack](#), which is a sentiment data and analytics provider that sources news stories via a wide range of newswires (e.g. Dow Jones), online press and blogs (e.g. Seeking Alpha). News stories can be associated with particular events (e.g. earnings, lawsuit etc), and a proprietary NLP algorithm will estimate a sentiment score based on the events detected in the story. For more details on the database and RavenPack's event taxonomy, please refer to the report "[Value Strategies based on Machine Learning](#)".

Sentiment Signals in Japan

Before delving into the strategies, let us examine the sentiment data for stocks in Japan. We find that for Japanese stocks:

- News stories are mainly business-related, and fall into the category of earnings or stock prices
- Dow Jones Newswires and FactSet Earnings Comparisons dominate the sources of the stories
- As almost 25% of news stories come from FactSet Earnings Comparisons, the number of news stories (and hence sentiment scores) exhibit a strong seasonality. The number of signal peaks around quarterly announcements in February, May, August and November

In the following, we provide a more granular picture on the above observations. Readers may skip the below and directly look at the analysis on page 17.

Type of stories

Almost all news stories for Japanese stocks are business-related. Among those stories, over 30% are related to earnings (Table 1).

Table 1: Most stories in Japan are business-related, and the major groups are earnings, stock prices and products-services

		Topic		
		business	economy	society
% of stories in Japan (Median)		99.2%	0.1%	0.6%

Proportion of stories by GROUP (Median)					
earnings	31.6%	equity-actions	2.3%	credit-ratings	0.5%
stock-prices	22.5%	assets	1.5%	investor-relations	0.2%
products-services	10.1%	labor-issues	1.3%	price-targets	0.2%
revenues	8.0%	analyst-ratings	1.0%	credit	0.2%
acquisitions-mergers	4.1%	dividends	1.0%	marketing	0.2%
partnerships	2.3%	legal	0.5%		

Source: RavenPack, J.P. Morgan Quantitative and Derivatives Strategy, RavenPack

Source of stories

Among the 5.7 million stories for Japanese companies in 2000-2017, the major sources are Dow Jones Newswires (39.5%) and FactSet Earnings Comparisons (24.4%). Table 2 shows the top sources of news stories for Japanese stocks.

We note that RavenPack only considers stories in English, and hence there could be some bias in the data source. Nevertheless, we can see that there are sources from local publishers, e.g. Japan Today, Japan Times and the Nikkei. In addition, Dow Jones Newswires also publish news articles in local language, and then translate them into English which RavenPack can analyze the sentiment.

Table 2: Sources of news stories for companies in Japan. Most stories are from Dow Jones Newswires and FactSet, but there are also local media such as Japan Today and Japan Times.

Sources (All stories)	% of stories	Sources	% of stories	Sources	% of stories
Dow Jones Newswires	39.5%	LSE Regulatory News Service	0.7%	Economic Times	0.4%
RavenPack - Factset Earnings Comparisons	24.4%	Bloomberg News	0.7%	La Repubblica	0.4%
Reuters	3.7%	Bloomberg Businessweek	0.7%	Wall Street Journal (online)	0.4%
CNBC	1.3%	Business Wire	0.7%	Morningstar	0.3%
Yahoo! Finance	1.2%	Individual.com	0.6%	Japan Today	0.3%
PR Newswire	1.0%	The Washington Post	0.6%	MarketWatch	0.3%
TMC Net	0.9%	RTTNews	0.6%	Japan Times	0.3%
Benzinga	0.8%	Associated Press - LexisNexis	0.5%	FlyOnTheWall	0.3%
Yahoo! News	0.7%	MarketWatch (Online)	0.5%	The Nikkei Online Edition	0.3%
Forbes.com	0.7%	Wall Street Journal	0.4%		

Source: RavenPack, J.P. Morgan Quantitative and Derivatives Strategy, RavenPack

If we dig further into the sources for earning-related news, we find that those stories basically come from either FactSet Earnings Comparison or Dow Jones Newswires. Interestingly, we find that earnings-related sentiment provide a more useful stock-selection signal than the broader sentiment score. We will provide more details in the section “Strategies Based on Sentiment”.

Table 3: Sources of news stories for stocks in Japan, with further focus on earnings-related stories

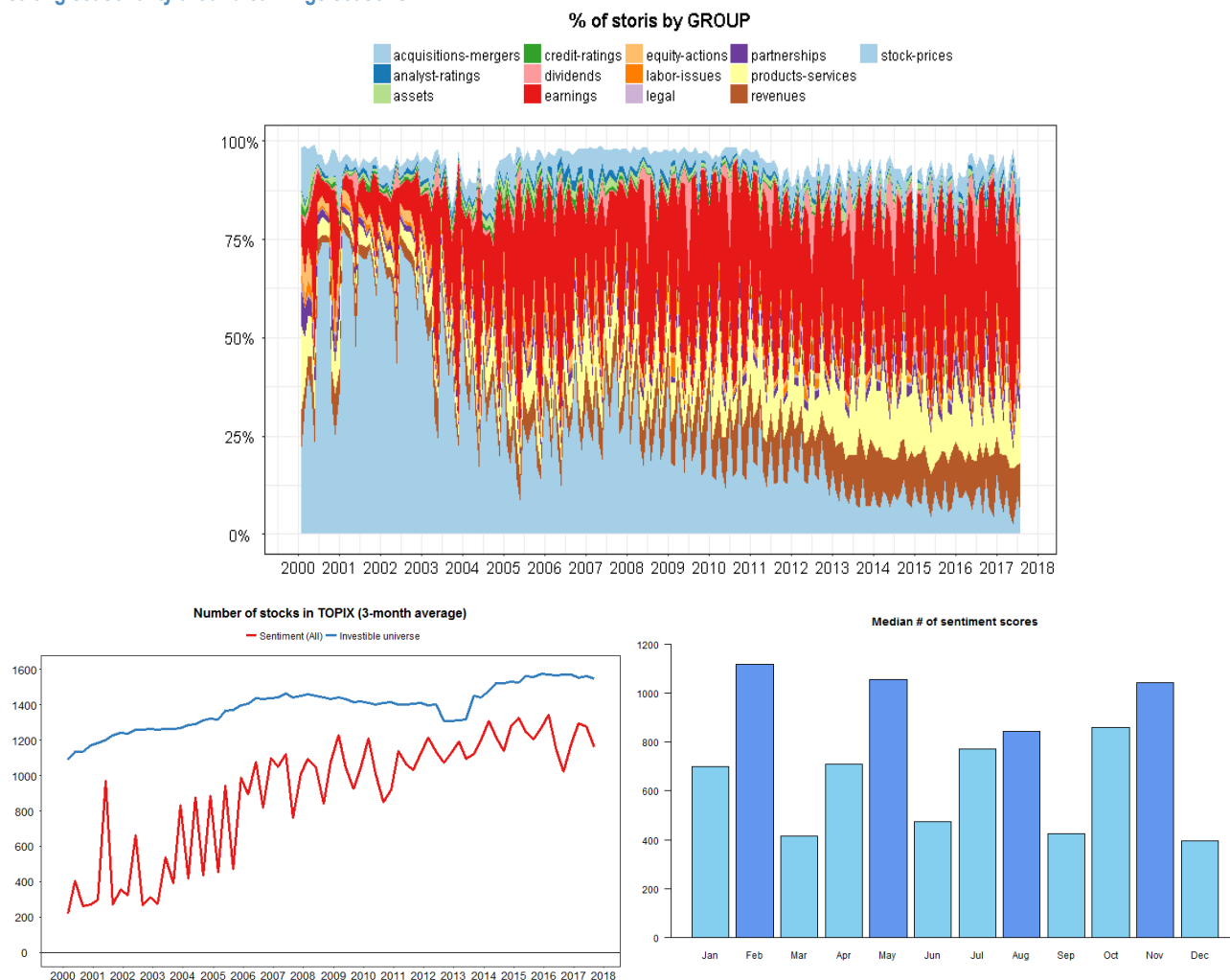
Sources	All stories	Proportion	
		Group = Earnings	Group = Earnings, Fact = Forecast
RavenPack - Factset Earnings Comparisons	24.4%	49.1%	62.8%
Dow Jones Newswires	39.5%	42.1%	31.3%
Reuters	3.7%	1.5%	2.1%
LSE Regulatory News Service (RNS)	0.7%	0.6%	0.1%
Associated Press - LexisNexis	0.5%	0.3%	0.1%
CNBC	1.3%	0.2%	0.2%
Yahoo! Finance	1.2%	0.2%	0.1%
Yahoo! News	0.7%	0.2%	0.2%
Bloomberg News	0.7%	0.2%	0.2%
Forbes.com	0.7%	0.2%	0.1%
Business Wire	0.7%	0.2%	0.0%
Wall Street Journal (online)	0.4%	0.2%	0.1%
The Washington Post	0.6%	0.2%	0.1%
Bloomberg Businessweek	0.7%	0.2%	0.1%

Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack

Number of news stories over the year

As we have seen that the major sources of news stories in Japan are related to earnings, it is of no surprise that the number of sentiment signals vary significantly throughout the year. To have a sentiment score, a stock must be mentioned in at least one relevant news story. Figure 10 clearly shows that the number of sentiment signals peaks around February, May, August and November, when quarterly reports are announced.

Figure 10: Proportion of stories over time (top), and the number of sentiment signals covered in TOPIX throughout the year (bottom). There is a strong seasonality around earnings seasons.

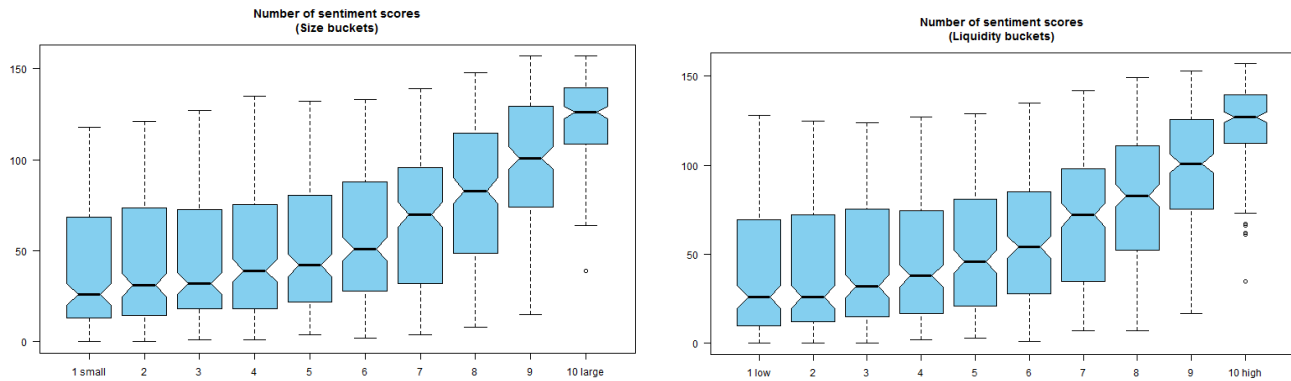


Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack

More coverage for large, liquid stocks

It is probably not too surprising to see that there are more news stories and sentiment signals for large caps and stocks that are more liquid (in terms of average daily trading value). In Figure 11, we divide all stocks into 10 buckets either by market cap (left) or liquidity (right). For each bucket, we show the distribution of the number of stocks that have a sentiment score (the number varies over time).

Figure 11: Large caps and liquid stocks tend to have more news stories, and hence more sentiment signals

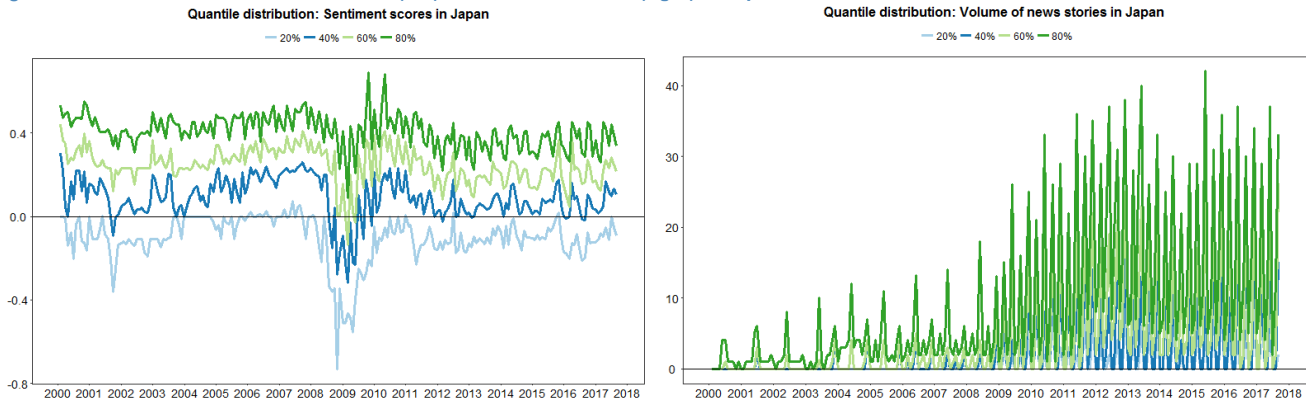


Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

Sentiment and Volume distribution

Figure 12 shows the distribution of sentiment scores and the number of news stories for each stock over time. We notice the seasonality as a large proportion of the news stories is earnings-related.

Figure 12: Distribution of sentiment scores (left) and volume of news (right) in Japan



Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack

Beware of look-ahead bias

As we work with RavenPack's data which are UTC timestamped, we need to be careful about the look-ahead bias when we calculate sentiment scores for stocks in Japan (9 hours ahead). In this study, we actually take a conservative approach by lagging the data by 2 days. On each Friday, we estimate the weekly sentiment score for a stock based on all news stories occurred between Wednesdays of the previous week to Wednesday of the current week, all in terms of UTC. In other words, the latest news stories included in our signal occur at 9am Thursday Japan local time.

No News is Good News...for Reversal Players

With the increasing availability of news analytics, there have been many studies surrounding the effect of news on the predictability of returns. The literature can be divided into the following streams:

- **Under-reaction to news, leading to momentum:**

[Huynh and Smith \(2017\)](#) found that investors underreact to positive news more than negative news, especially when the positive news are of "high attention", i.e. many stories are on that piece of news. This leads to a strong return continuation. On the contrary, [Chan \(2003\)](#) claimed that bad news lead to large negative drift and investors underreact to bad news more than good news.

[Hong and Stein \(2000\)](#) found evidence that momentum is strongest among stocks without analyst coverage, which supports the hypothesis that momentum arises from under-reaction to news since analysts help to disseminate information.

[Jiang et al \(2017\)](#) decomposed daily returns into news-driven and non-news-driven components, and showed that news-driven returns lead to strong return continuation.

- **Overreaction to news, leading to reversal:**

[De Bondt and Thaler \(1985\)](#) applies statistical tests to quantify market overreaction, and found that the effect of overreaction is larger for losers than for winners. They also noticed that reversals tend to be strongest in January, coinciding with the well-known "January effect" where losers in December (or the 4th quarter) tend to outperform in January⁷.

Despite the intuitive argument that overreaction could lead to reversals, [Lo and MacKinlay \(1990\)](#) pointed out that one should be careful about the argument: profits from reversal strategies are not always due to overreactions⁸.

- **Overreaction to spurious (i.e. non-news based) price movements, leading to reversal:**

[Hong and Stein \(1999\)](#) claimed that reversals should be more pronounced in stocks with slower information diffusion, e.g. smaller volume of news or less analyst coverage. This phenomenon is confirmed in [Chan \(2003\)](#) for US stocks based on newswires from the Dow Jones Interactive Publications Library.

[Tetlock \(2011\)](#) showed that investors overreact to stale information⁹, which results in temporary movements in stock prices that subsequently mean revert.

[Fang and Peress \(2008\)](#) found that stocks without media coverage earn higher returns after controlling for risk factors, and [Jiang et al \(2017\)](#) also found that non-news driven returns precede reversals.

⁷ The "January effect" is mainly explained from the perspective of tax-loss selling

⁸ Whilst overreactions are associated with negative autocorrelations in prices, reversal strategies can be profitable even if prices are not negatively autocorrelated. This happens if cross-auto-covariances are positive, i.e. a higher return of stock A today implies a higher return for stock B tomorrow, i.e. stock A leads stock B. [Lo and MacKinlay \(1990\)](#) found that large caps usually leads small caps, resulting in positive cross-auto-covariances.

⁹ The author define stale news based on textual similarity to the previous 10 stories on the same firm

Stronger reversals for stocks without news

In the following, we take a look at the third idea above: Do investors overreact to non-information based price movements? In other words, do we expect to see larger reversals for stocks without news coverage, as prices revert back to fundamental? To quantify news coverage, we measure “news volume” by counting the total number of relevant news stories¹⁰ concerning a stock in the past 1 week.

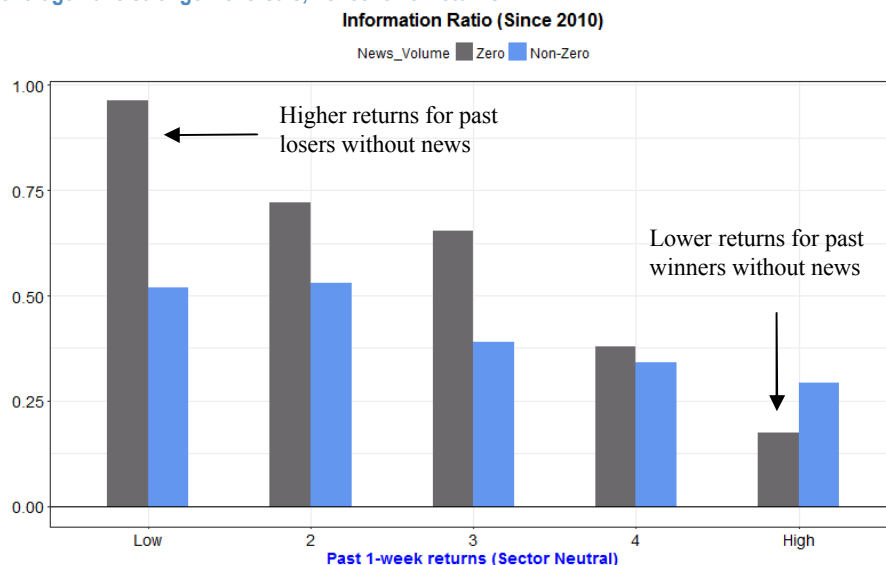
Figure 13 shows the information ratios of 10 long-only portfolios: For each quintile portfolio sorted by past 1-week returns (sector neutral)¹¹, we sub-divide it into two portfolios, one containing stocks without news (grey), and the other with stocks that have at least one news story in the past 1 week (blue).

We observe stronger reversals for stocks without news coverage:

- Among past *losers*, those without news have *higher* returns
- Among past *winners*, those without news have *lower* returns

These results confirm the hypothesis that investors maybe overreacting to non-news-based information or spurious price movements, for instance, due to liquidity shocks when an uninformed trader rebalances a large portfolio. In addition, recent losers without news seem to exhibit stronger reversals than recent winners without news.

Figure 13: Information ratios of portfolios sorted by past 1-week returns (sector neutral). Amongst past losers (stocks with lowest 1-week returns), those without news coverage have higher returns, hence stronger reversals. Similarly, amongst past winners, those without news coverage have stronger reversals, hence lower returns.



Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

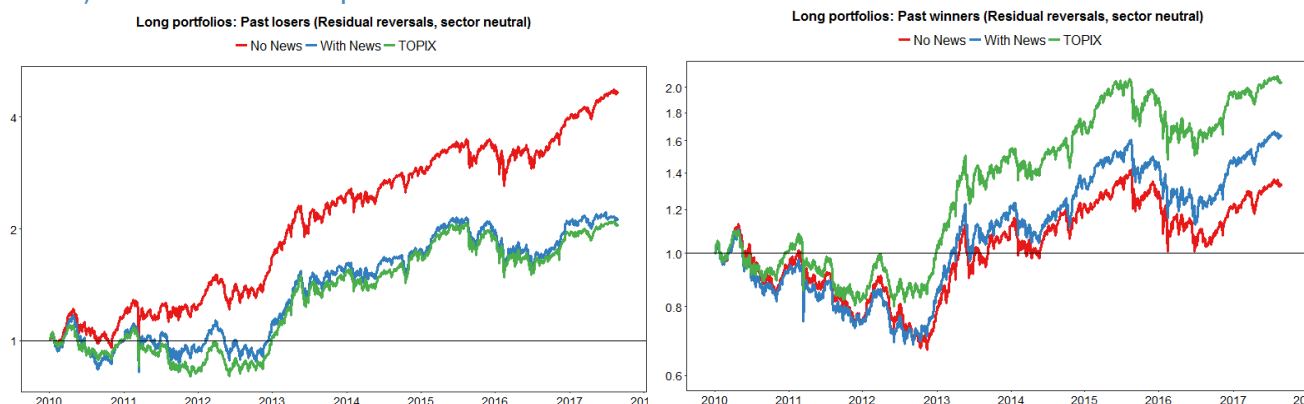
¹⁰ There is a relevance score from 0-100 in the RavenPack data, indicating how relevant the news story is to the stock. We only consider stories with a relevance score above 70.

¹¹ We also repeat using sector-neutral residual returns, and results are qualitatively similar

In Figure 14, we show the wealth curves of 2 long portfolios of recent losers (defined by past 1-week sector-neutral residual returns), together with the TOPIX total return index. The stocks in the long portfolios are conditioned on either no news or with news in the past 1 week.

Amongst past losers (left chart), reversals are largely driven by stocks that do not have any news, where they have much higher returns than their peers that are covered by news stories (a possible reason is that their underperformances may have been supported by bad news). We observe a similar effect for past winners (right chart): stocks without news exhibit stronger reversals.

Figure 14: Wealth curves of buying past losers (based on past 1-week sector-neutral residual returns), conditional on whether there is 1). No news or 2). some news stories in the past 1 week.



Portfolios (Since 2010)	Median # of stocks (Long or Short)	t-stat	Skew- ness	Excess kurtosis	2-way Turnover	Ann. Returns	Ann. Vol.	IR	Max. Draw- down	Hit Ratio
Benchmark						10.5%	20.3%	0.52	28.6%	53.5%
Past losers										
No News	195	2.92	-0.89	10.69	115.1%	22.4%	21.4%	1.05	26.8%	55.4%
With News	88	1.61	-0.53	8.77	122.7%	10.9%	21.8%	0.50	29.6%	52.3%
Past winners										
No News	190	0.81	-0.96	9.52	115.1%	3.9%	19.8%	0.20	40.8%	54.5%
With News	94	1.18	-0.69	6.33	121.5%	6.8%	20.1%	0.34	38.4%	51.9%

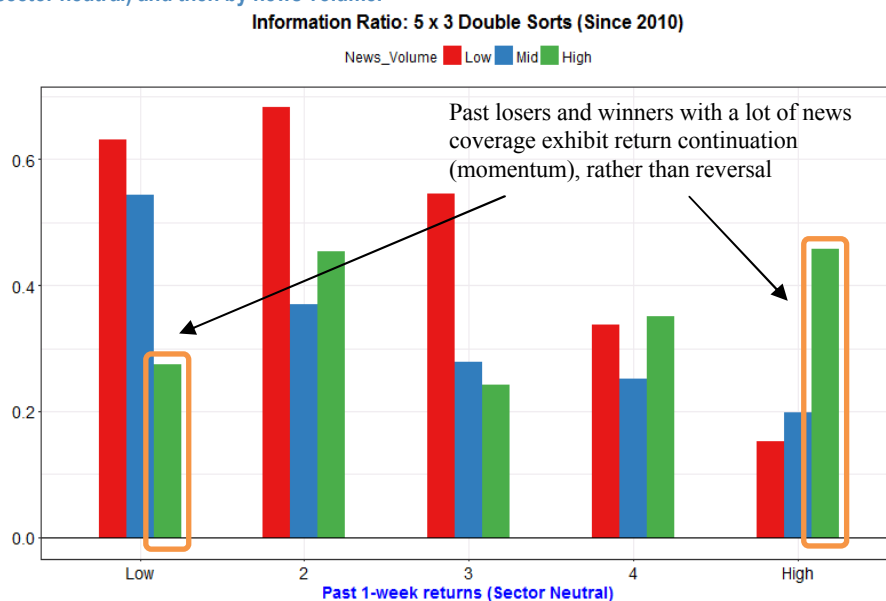
Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

Momentum could be driven by buzz

We also take a more granular look at news volume by performing a double sort. We first sort stocks into quintile portfolios based on past 1-week returns (sector neutral)¹². Within each quintile, we further sort the stocks into terciles based on news volume (where we do not consider stocks without news).

Again, Figure 15 shows the information ratios of the double sort. Interestingly, we find past losers with high news volume give significantly lower returns, i.e. they exhibit return continuation rather than reversal. The same is observed for past winners, where stocks with the most news give the highest returns.

Figure 15: Information ratios of the double-sorted portfolios, first sorted by past 1-week returns (sector neutral) and then by news volume.



Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

¹² We also run the double sorts based on past 1-week of sector-neutral residual returns, and results are similar

Enhancing Reversals with News Volume

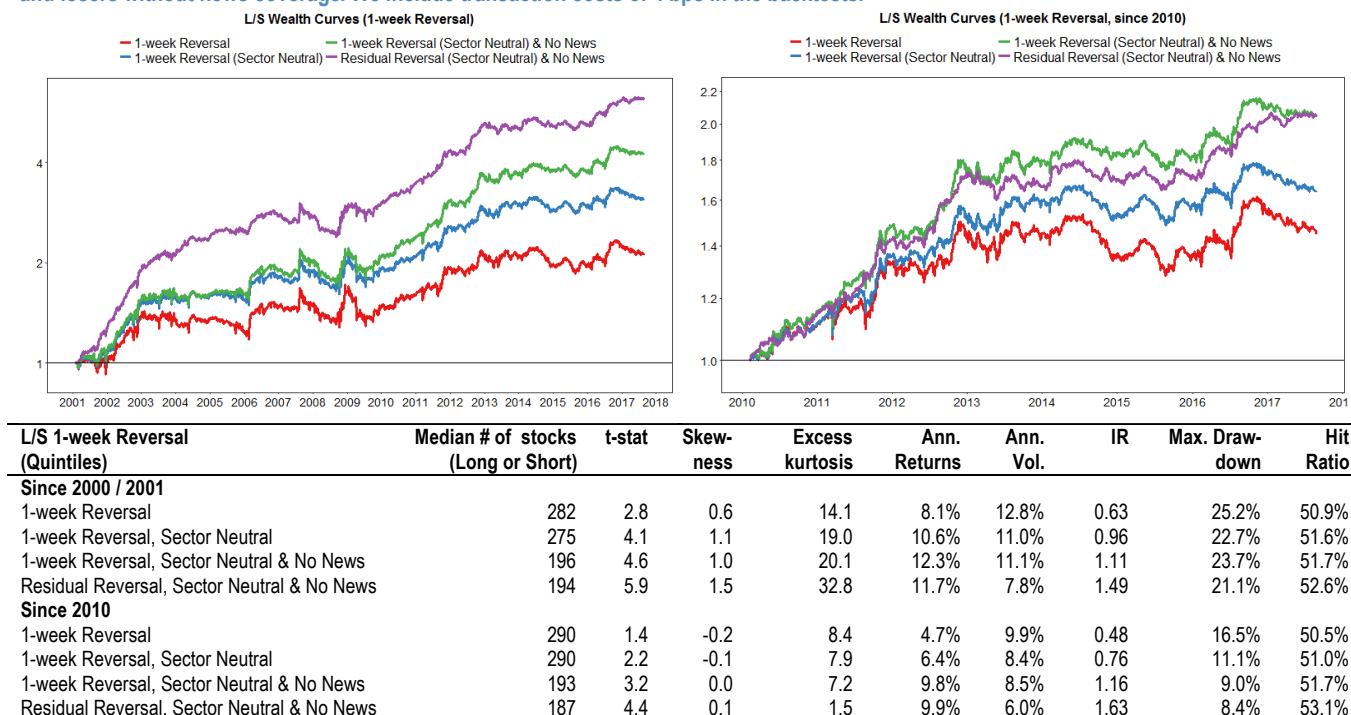
From the analysis of the above double sort, we can implement the following enhancement into a 1-week reversal strategy below:

- Buy losers in the past 1 week which do not have news coverage
- Sell winners in the past 1 week which do not have news coverage

Here losers and winners are defined by their past 1-week local returns, neutralized by sector. We also look at residual returns neutralized by sector, as we have seen in Figure 9 that residual returns can better capture reversal patterns and improve performance.

Figure 16 compares the wealth curves with and without the enhancement based on news volume¹³. We see that by focusing on the sub-universe of stocks without news, the annualized returns of a simple reversal strategy can be improved significantly from 6.4% to 9.8% since 2010, whilst remaining at a similar level of volatility (8%). Even better, if we use the purified reversals (see Page 10) that are immune to variations in risk factor exposures, strategy returns remain similar whilst volatility is largely reduced to 6%.

Figure 16: Wealth curves from 2000 (left) and 2010 (right) of the enhanced 1-week reversal strategy in Japan, where we only consider winners and losers without news coverage. We include transaction costs of 4 bps in the backtests.



Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

¹³ We also tried to only remove stocks with a large volume of news, instead of all stocks with news in the loser / winner portfolios. Backtest returns are slightly lower (7.5% since 2010) than the case when we remove all stocks with news.

A Tale of Two Sentiments

As we have seen, a significant proportion of sentiment signals for stocks in Japan fall into the category of earnings-related news. For this reason, we take a deeper look into the sentiment data in Japan, and compare two sentiment signals:

- **Earnings Sentiment:** Sentiment only based on earnings-related news
- **Overall Sentiment:** Sentiment based on all relevant news stories

Digging into Stories on Earnings

First, let us peep into a snapshot of news stories in Japan in Table 4. For completeness, we include some examples from non-business topics, but we should recall that most stories are earnings-related.

Amongst the news on earnings, almost 50% actually comes from Factset. RavenPack receives intraday updates on actual earnings and consensus earnings estimates from Factset, and estimate sentiment scores by computing the percentage difference between the disclosed actual figure versus the street consensus (or other benchmark disclosed in the story).

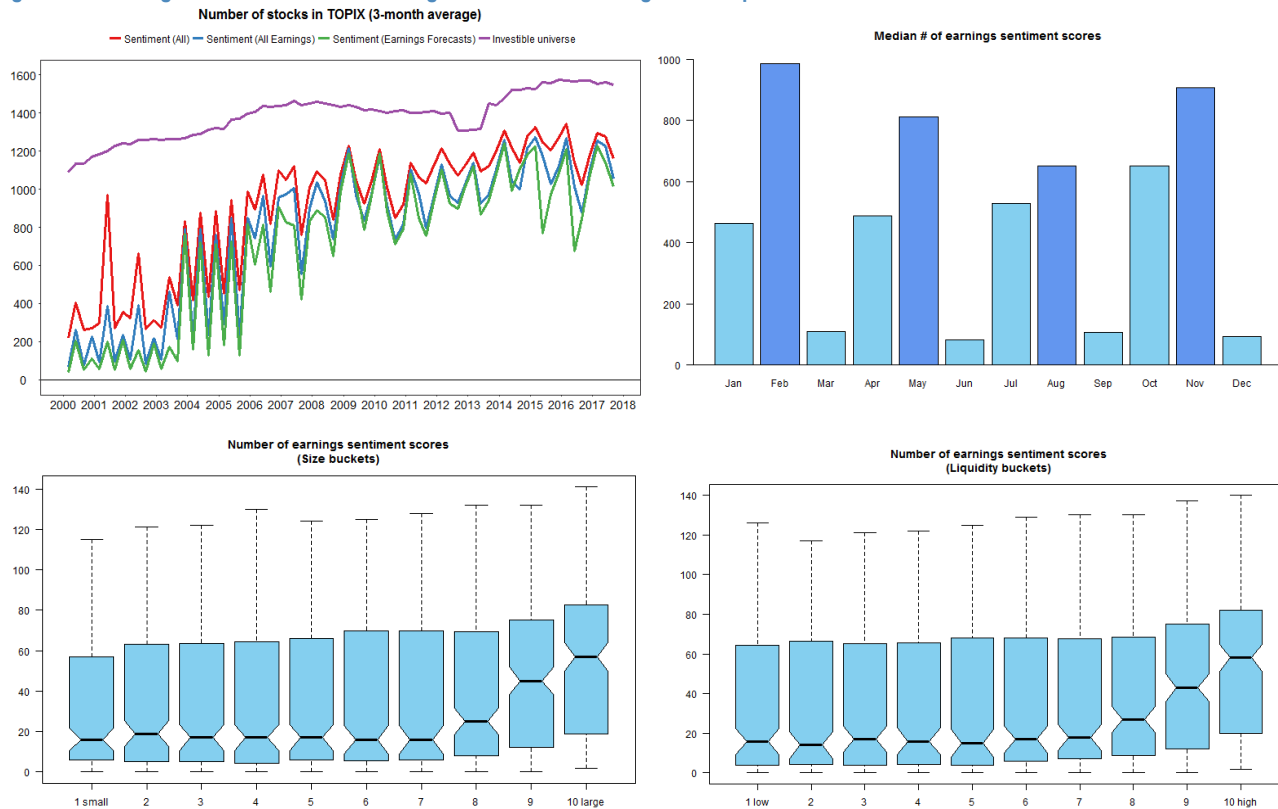
Table 4: A snapshot of news stories for stocks in Japan. Most of the stories in the full data set are earnings-related, and amongst those earnings stories, almost 50% come from Factset's intraday feed

Time Stamp UTC	Entity Name	Relevance	Event Sentiment Score	Topic	Group	Fact Level	Source Name	Headline
Earnings-related news								
2017-08-01 3:20:39 AM	Nitto Denko Corp.	69	0.84	business	earnings	fact	Nikkei Asian Review	Asia's smartphone suppliers see bright light with new iPhone
2017-08-04 7:29:52 AM	Toyota Motor Corp.	100	0.7	business	earnings	forecast	Reuters	Toyota lifts profit outlook on weaker yen prospects
2017-08-05 4:06:27 AM	Toyota Motor Corp.	100	0.46	business	earnings	fact	Factset Earnings Comparisons	Toyota Motor Corp. Reports Q1 Consolidated Net Income JPY 613.06B Vs Consensus JPY 476.58B
2017-08-05 4:10:17 AM	Nippon Telegraph & Telephone Corp.	100	-0.31	business	earnings	forecast	Factset Earnings Comparisons	Nippon Telegraph & Telephone Corp. Forecasts FY2018 Consolidated EBIT JPY 1590.00B Vs Consensus JPY 1613.68B
2017-08-11 3:59:53 AM	Japan Post Bank Co. Ltd.	100	0.48	business	earnings	fact	Factset Earnings Comparisons	Japan Post Bank Co. Ltd. Q1 Reported EPS JPY 23.83 Vs JPY 18.10
Business-related news, but not related to earnings								
2017-08-08 6:41:30 PM	Nintendo Co. Ltd.	100	0.72	business	stock-picks	opinion	Nasdaq	Here's Why Nintendo (NTDOY) Is A Strong Buy Stock
2017-08-08 10:24:23 PM	Takata Corp.	99	-0.64	business	bankruptcy	fact	Nasdaq	Takata seeks to suspend air bag victims' lawsuits against carmakers
2017-08-09 10:06:46 PM	Japan Display Inc.	100	-0.78	business	labor-issues	fact	Japan Today	Smartphone screen maker Japan Display to cut 30% of workforce
Non-business-related news								
2017-08-01 6:59:17 AM	Sony Corp.	8	-0.58	society	security	fact	The Statesman	Hackers steal 1.5TB HBO data, 'Game of Thrones' leaked
2017-08-14 6:42:27 AM	Honda Motor Co. Ltd.	8	0.46	economy	balance-of-payments	fact	Nikkei Asian Review	Turkish auto exports expected to hit record high in 2017
2017-08-16 9:50:29 AM	Toyota Motor Corp.	99	0	economy	balance-of-payments	fact	4-Traders	Toyota sees bigger market for eco-cars
2017-08-31 10:38:34 PM	Nintendo Co. Ltd.	100	-0.57	society	legal	fact	Yahoo! Finance	Nintendo ordered to pay \$10 million in Wii patent lawsuit

Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack.

In Figure 17, we show the coverage and distributions of the sentiment signals based on earnings-related stories. The quarterly seasonality is more pronounced for earnings sentiment, which is as expected.

Figure 17: Coverage and distribution of earnings-related sentiment signals in Japan



Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack.

Strategies Based on Sentiment

Do we find any differences in the information content of earnings-related sentiment, compared with the overall sentiment? We look at a simple strategy which buys stocks with the highest sentiment scores and shorts stocks with the lowest sentiment scores¹⁴.

Figure 18 shows the portfolio wealth of the weekly-rebalancing strategies based on two different versions of sentiment signals:

- Overall sentiment based on all stories, and
- Earnings sentiment based on all earnings-related stories.

As sentiment is a 'fast' signal, we almost completely renew both the long and the short portfolios every week (turnover is close to a maximum of 400%). We impose transaction costs of 4 bps to give a more realistic picture. The median number of stocks in each portfolio can be quite low, but the number increases by 4-5 times around quarterly announcements.

Interestingly, sentiment only based on earnings turn out to be a more powerful signal than sentiment base on all news stories. This could due to longer horizons of price reactions for non-earnings news. For instance, stories concerning product developments or legal issues could lead to price impacts further into the future.

In Figure 18, we also look at the performance where we long stocks with good earnings sentiment and short the TOPIX (instead of stocks with poor earnings sentiment). This strategy largely reduces volatility and drawdown, and the comparisons also show that some large positive returns of the original long/short strategy comes from the shorting stocks with poor earnings sentiment.

Figure 18: Wealth curves of portfolios that long stocks with highest weekly sentiment and short stocks with lowest weekly sentiment scores, since 2000 (left) and since 2010 (right), with 4 bps of transaction costs. The table shows the statistics of daily local returns.

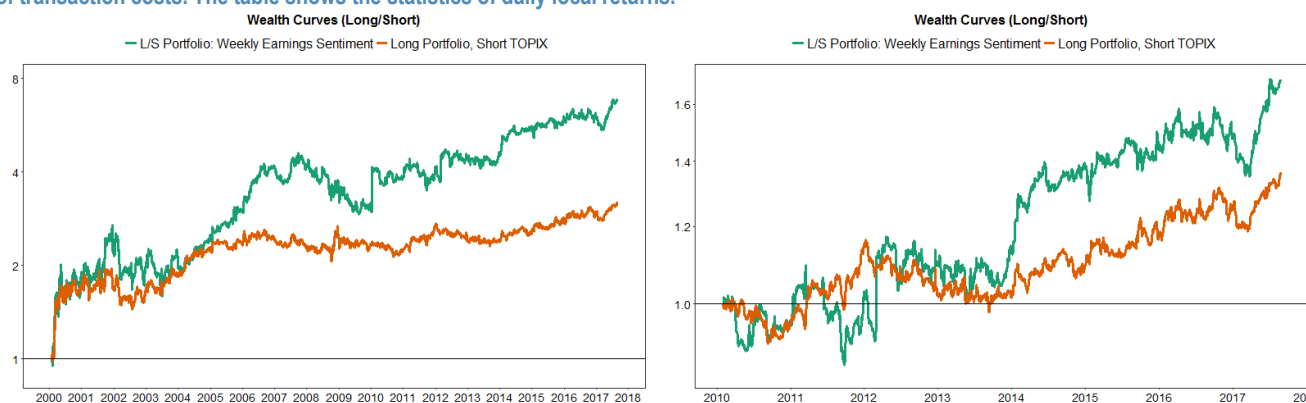


Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

¹⁴ We could also look at strategies which use earnings sentiment as an alternative (and a more timely) signal of earnings surprises. [Hafez et al \(2016\)](#) studied sentiment based on earnings, revenue or dividend, and found that earnings sentiment outperforms IBES earnings surprises.

Figure 19 compares the strategy where we short the TOPIX total return index, instead of stocks with poor earnings sentiment.

Figure 19: Comparing the wealth curves of the long/short portfolios that either shorts stocks or the TOPIX total return index. We impose 4 bps of transaction costs. The table shows the statistics of daily local returns.



L/S Weekly Sentiment (Quintiles, Weekly rebalance)	Median # of stocks (Long or Short)	Mean IC	Risk- adj. IC	t-stat	Skew- ness	Excess kurtosis	2-way Turnover	Ann. Returns	Ann. Vol.	IR	Max. Draw- down	Hit Ratio
Long high earnings sentiment, Short low earnings sentiment												
Since 2000												
Overall Sentiment	47	0.8%	0.09	0.11	-0.47	7.48	354.6%	-0.2%	10.2%	-0.02	48.2%	49.3%
Earnings Sentiment	9	3.3%	0.17	2.55	1.41	21.09	382.1%	11.5%	21.9%	0.53	41.0%	50.4%
Since 2010												
Overall Sentiment	94	0.0%	0.01	-3.09	0.06	3.64	323.4%	-6.7%	6.1%	-1.11	47.5%	46.5%
Earnings Sentiment	12	3.1%	0.20	1.94	4.87	76.50	373.5%	10.9%	16.7%	0.65	21.0%	50.3%
Long Earnings Sentiment, Short TOPIX												
Since 2000								6.6%	15.8%	0.42	26.4%	51.2%
Since 2010								4.3%	10.4%	0.42	15.6%	51.0%

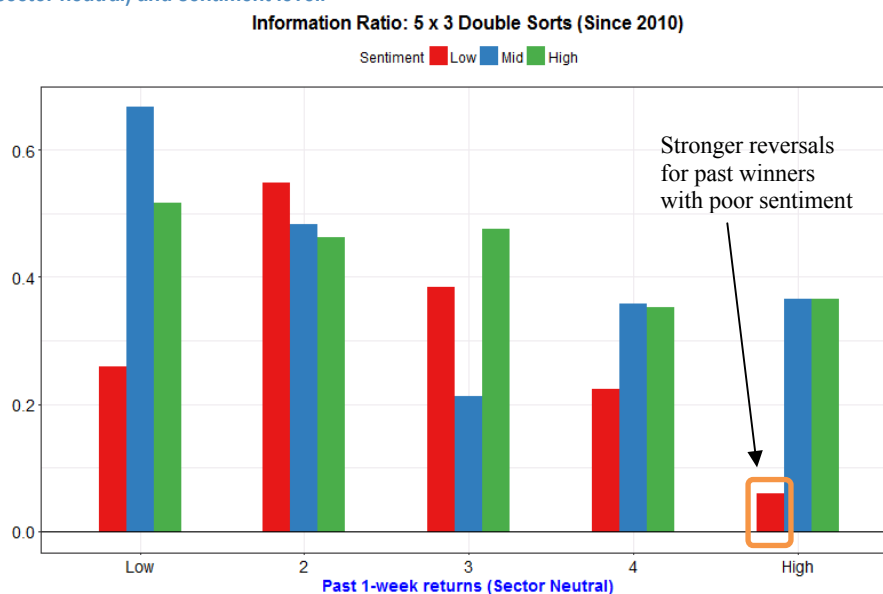
Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

Do Investors Under-react to News?

Apart from buzz and attention, the direction of sentiment is also important. For instance, [Hafez and Xie \(2013\)](#) found strong reversal effects of past winners with negative sentiment, i.e. reversals supported by news.

We perform double sorts similar to that in Figure 15, but this time on sentiment scores instead of news volume. In Figure 20, we see evidence that there are stronger reversals for past winners if it is supported by poor sentiment. On the other hand, it is less clear if highly positive sentiment for past losers lead to stronger reversals too.

Figure 20: Information ratios of 5x3 double-sorted portfolios, based on past 1-week returns (sector neutral) and sentiment level.



Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

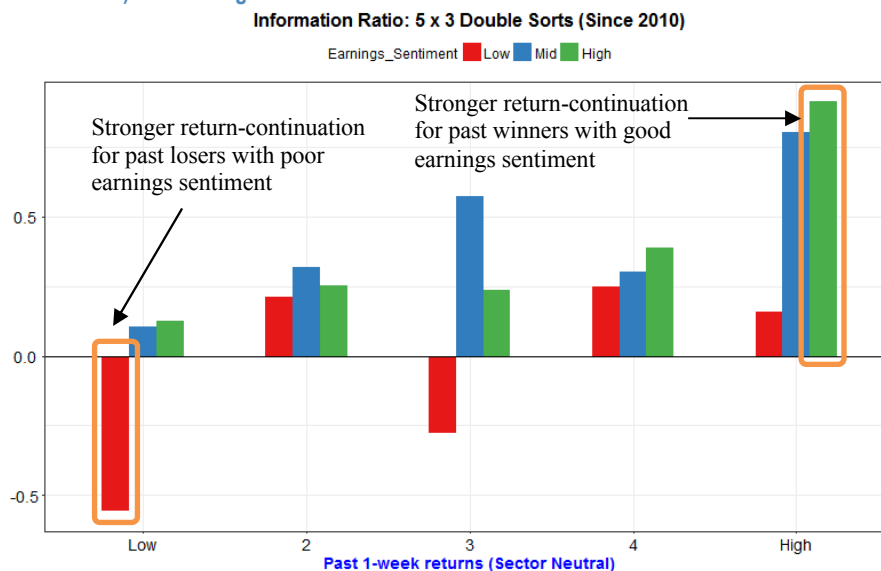
Are there stronger under-reactions to earnings news?

Maybe investors have different reactions to different types of news? Investors will likely pay more attention to earnings-related news, rather than news on intangible matters such as labor or R&D. As such, we repeat the analysis in Figure 20, and perform a double sort using earnings sentiment instead of overall sentiment.

In Figure 21, we find that past losers with poor earnings sentiment perform significantly worse than their peers, which exhibit a continuation of negative performance in the next week. On the other side, past winners with very positive earnings sentiment continue to perform well.

These effects point towards a possible phenomenon that investors underreact to earnings news. When information on earnings news drifts forward, price momentum follows.

Figure 21: Information ratios of 5x3 double-sorted portfolios, based on past 1-week returns (sector neutral) and earnings sentiment level.



Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

Reversals around Earnings News

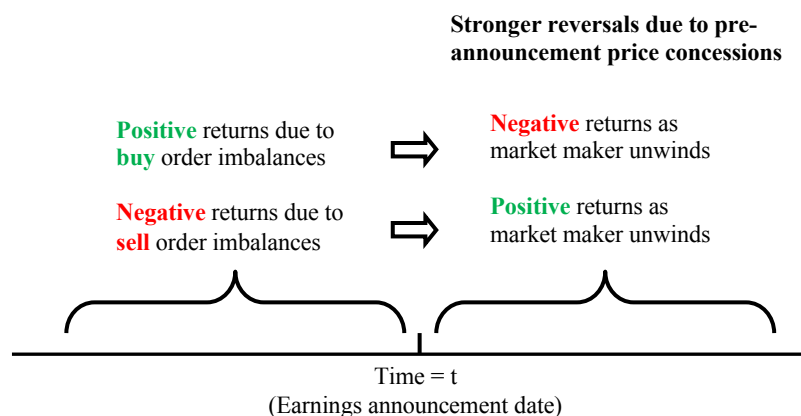
Up till now, our analysis on reversal patterns has been focused on its interactions with news volume and sentiment, i.e. we have placed our attention to behavioral biases that drives price reversals. For instance, we show evidences of over-reaction to non-news-based price movements, or under-reaction to earnings news. Recall that another explanation for price reversals is based on liquidity provision (page 3), where market makers demand higher expected returns for providing liquidity when there are order imbalances and high inventory risks. Do we see any evidence that support this argument for price reversals?

A Liquidity-based Argument

As shown in [Nagel \(2012\)](#), returns from short-term reversal strategies can be interpreted as a proxy for the expected returns that market makers demand for providing liquidity and incurring inventory risk. Based on this model, [So and Wang \(2014\)](#) made an interesting hypothesis that greater anticipated volatility associated with upcoming earnings announcements should lead to stronger reversals, and found that the spreads on reversals are six times higher around earnings announcements in the US, compared to non-announcement periods.

For instance, suppose there is a strong sell order imbalances prior to earnings announcements. Market makers will respond by lowering prices, as they have to bear higher inventory risk through the announcement period. As they unwind the net positions, we expect to observe positive returns due to the reversal of pre-announcement price concessions ([So and Wang \(2014\)](#)). Figure 22 illustrates the situation around earnings announcements in the above hypothesis.

Figure 22: Reversal returns driven by liquidity provision and price pressures before earnings announcement days, as market makers demand higher expected returns for incurring inventory risk

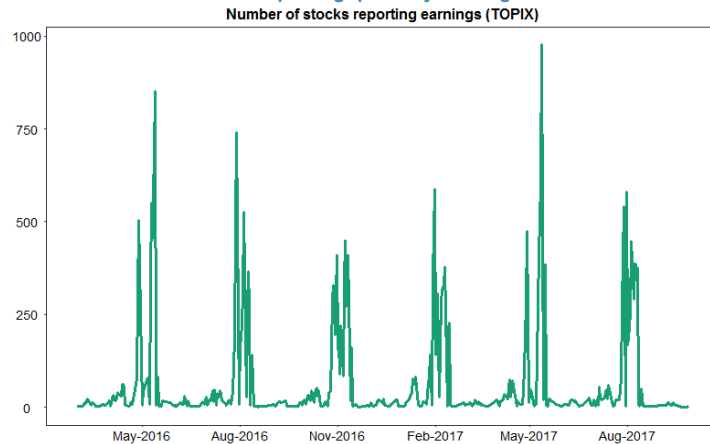


Source: J.P. Morgan Quantitative and Derivatives Strategy

Stronger Reversals around Earnings Announcements?

Motivated by the above rationale, we focus on the reversal patterns around quarterly announcements for stocks in the TOPIX universe. Figure 23 shows the number of stocks that report earnings over time, where we see that most stocks have their quarterly announcements in February, May, August and November.

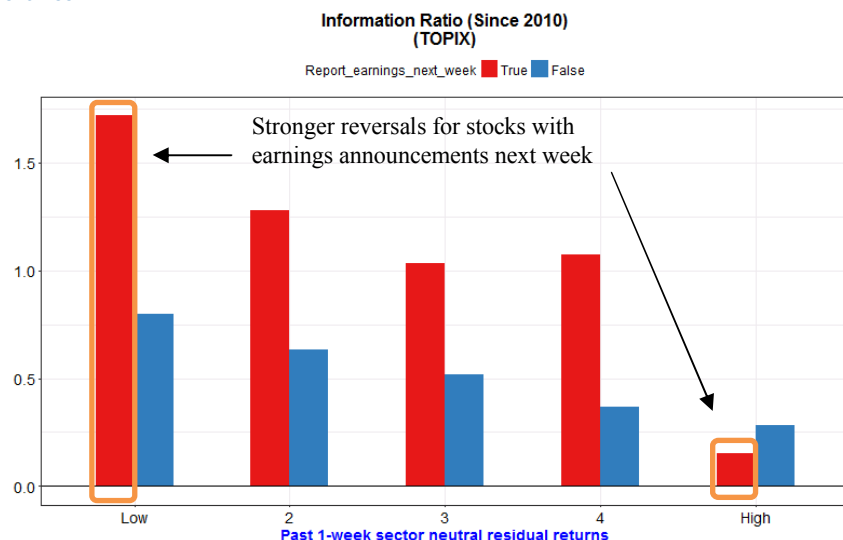
Figure 23: Number of stocks in TOPIX reporting quarterly earnings



Source: J.P. Morgan Quantitative and Derivatives Strategy, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

To understand if reversals are indeed stronger around earnings announcement days, instead of performing a proper event study as in [So and Wang \(2014\)](#), we construct portfolios of past winners and past losers with conditions that either the stocks will have earnings announcements in the next week or not. Of course, portfolios that only contain stocks with earnings announcements in the coming week may have no stocks during some periods. Figure 24 shows the information ratios of these portfolios, where we see substantial differences between stocks with and without earnings anticipation, especially for past losers.

Figure 24: Information ratios of portfolios with stocks that will or will not report earnings in the next week



Source: J.P. Morgan Quantitative and Derivatives Strategy, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

Tradable Strategies in TOPIX 500

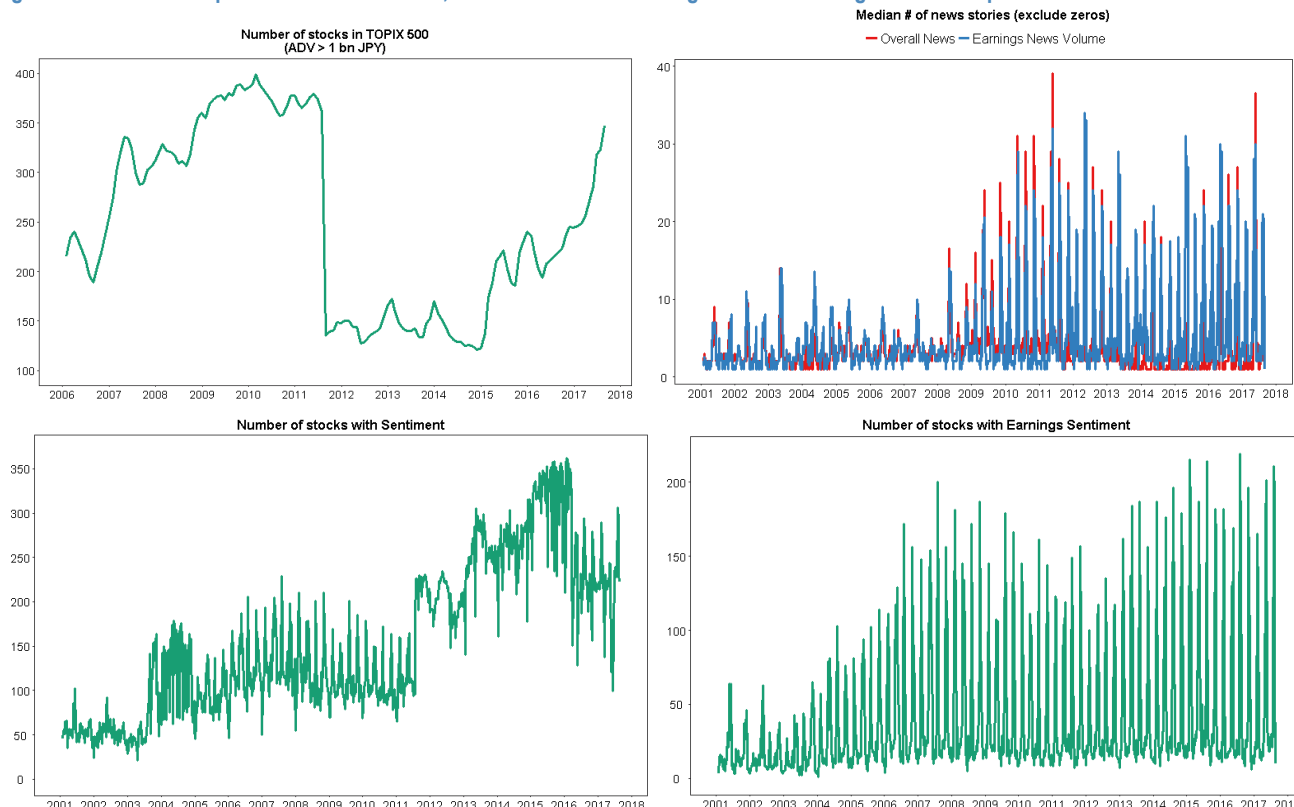
Liquid stocks within TOPIX 500

Based on our analysis in this report, we devise tradable strategies using liquid stocks in TOPIX 500. We consider TOPIX 500 instead of the broader TOPIX universe because of liquidity issues¹⁵. The baskets are equal-weighted unless specified. We impose the following constraints to ensure a tradable basket of at least 6 billion JPY historically, whilst the latest tradable value is about 10-20 billion JPY (about 100-200 million USD):

- Only include stocks with an average daily trading value above 1 billion JPY
- Trading limit of a stock is set at 30% of its average daily trading value
- Maximum weight of a stock is 5% (and we have a minimum of 20 stocks)

We have around 150-400 stocks in our universe since 2006 that satisfy the liquidity constraint (Figure 25). As of latest, almost 350 stocks in the TOPIX 500 trade above 1 billion JPY per day. The baskets are rebalanced weekly based on Friday's close.

Figure 25: Number of liquid stocks in TOPIX 500, news volume and coverage of sentiment signals in the liquid universe within TOPIX 500



Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

¹⁵ As of latest, 50% of stocks in the TOPIX trade below 200 million JPY a day. On the other hand, almost 80% of stocks in the TOPIX 500 have an average daily trading value above 1 billion JPY.

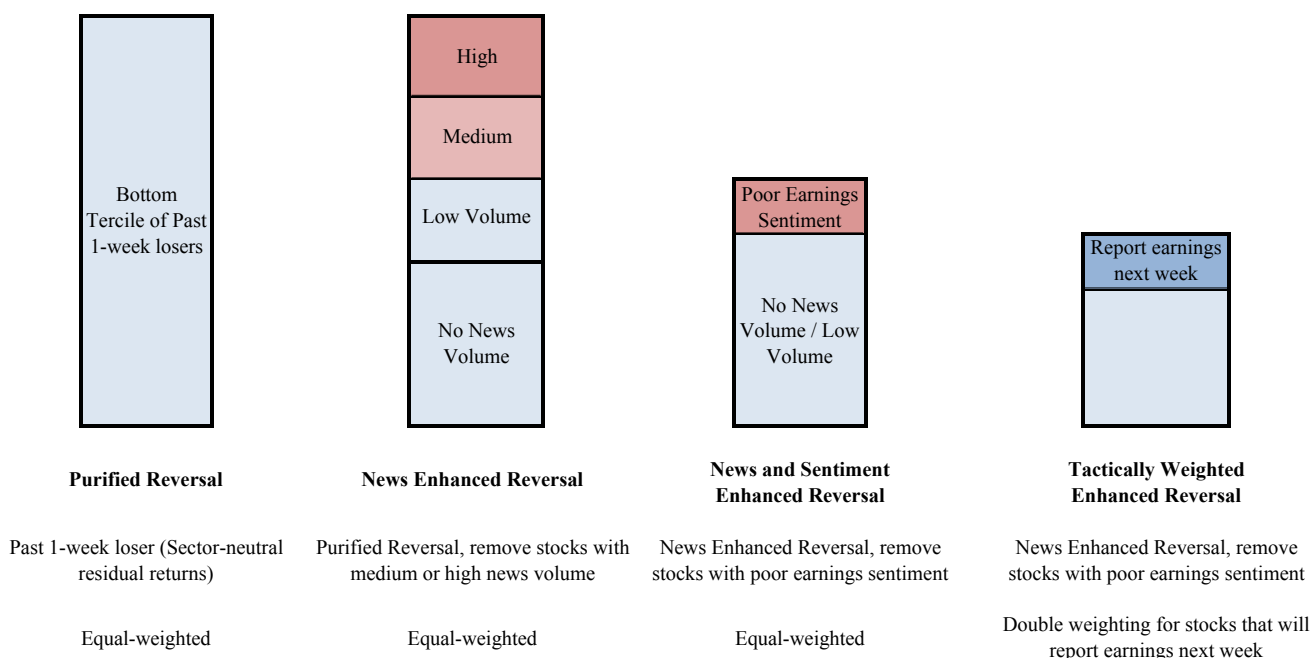
Four tradable systematic strategies

We propose four strategies with an increasing number of signals being considered. Below give an overview of the long baskets:

- **Purified Reversal:** Buy past week losers based on sector-neutral residual returns
- **News Enhanced Reversal:** Purified Reversal without stocks with medium to high news volume
- **News and Sentiment Enhanced Reversal:** News Enhanced Reversal without stocks with poor earnings sentiment
- **Tactically Weighted Enhanced Reversal:** News and Sentiment Enhanced Reversal, and tactically tilt towards stocks that will report earnings in the next week

Note that each strategy is modified from the strategy above by considering extra signals. The additional signals are either used to remove stocks that are likely to have weaker reversals, or tactically tilt towards stocks that are likely to have stronger reversals. Figure 26 illustrates the long baskets in each of the strategy, highlighting the relations between them.

Figure 26: Long baskets of the four strategies (in blue), stocks that we remove (in red), and stocks that we increase the weights in the baskets (in dark blue).



Source: J.P. Morgan Quantitative and Derivatives Strategy

Purified Reversal

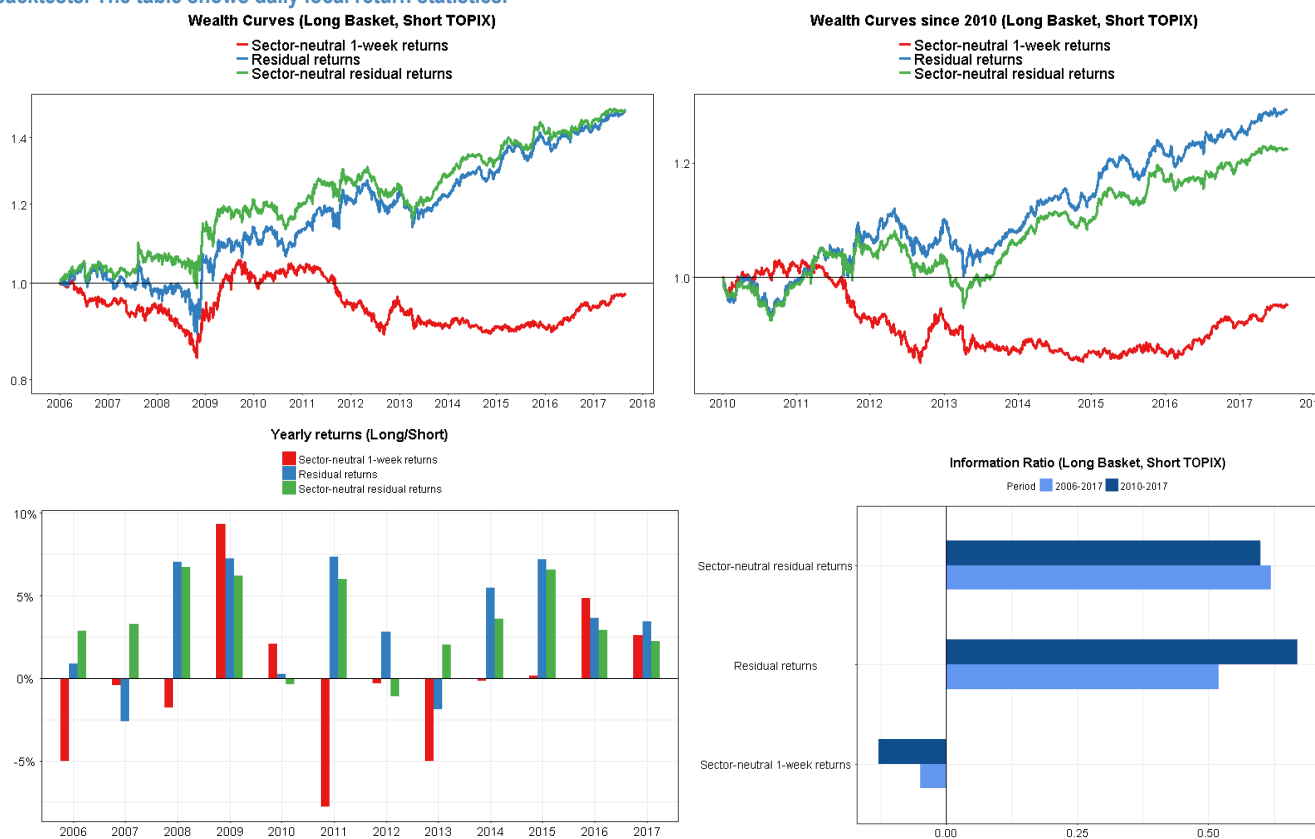
A basic tradable strategy is as follows:

Buy past 1-week losers defined as the bottom tercile of sector neutral residual returns

This idea is supported by the rationale discussed in the second section, and in particular the results in Figure 9 for the TOPIX universe.

We find similar results within TOPIX 500, i.e. it is better to neutralize sector as well as Fama-French factor exposures in weekly returns. Figure 27 shows the results of the strategies, where the “Purified Reversal” strategy is shown in green.

Figure 27: Wealth curves, yearly returns and information ratio of the “Purified Reversal” strategy. We impose 4 bps of transaction costs in our backtests. The table shows daily local return statistics.



Long Basket, Short TOPIX Total Return Index	Ann. Returns	Ann. Vol.	IR	Max. Draw-down	Hit Ratio	Returns (YTD)	Volatility (YTD)	IR (YTD)
Since 2006								
Sector-neutral 1-week returns	-0.2	5.1	-0.05	16.6	49.3	2.6	2.5	1.04
Residual returns	3.5	6.8	0.52	16.1	53.1	3.4	2.8	1.2
Sector-neutral residual returns	3.6	5.8	0.62	11.7	52.7	2.2	2.4	0.93
Since 2010								
Sector-neutral 1-week returns	-0.6	4.2	-0.13	15.2	49.1	2.6	2.5	1.04
Residual returns	3.8	5.6	0.67	10.3	53.3	3.4	2.8	1.2
Sector-neutral residual returns	2.9	4.8	0.6	11.7	53.1	2.2	2.4	0.93

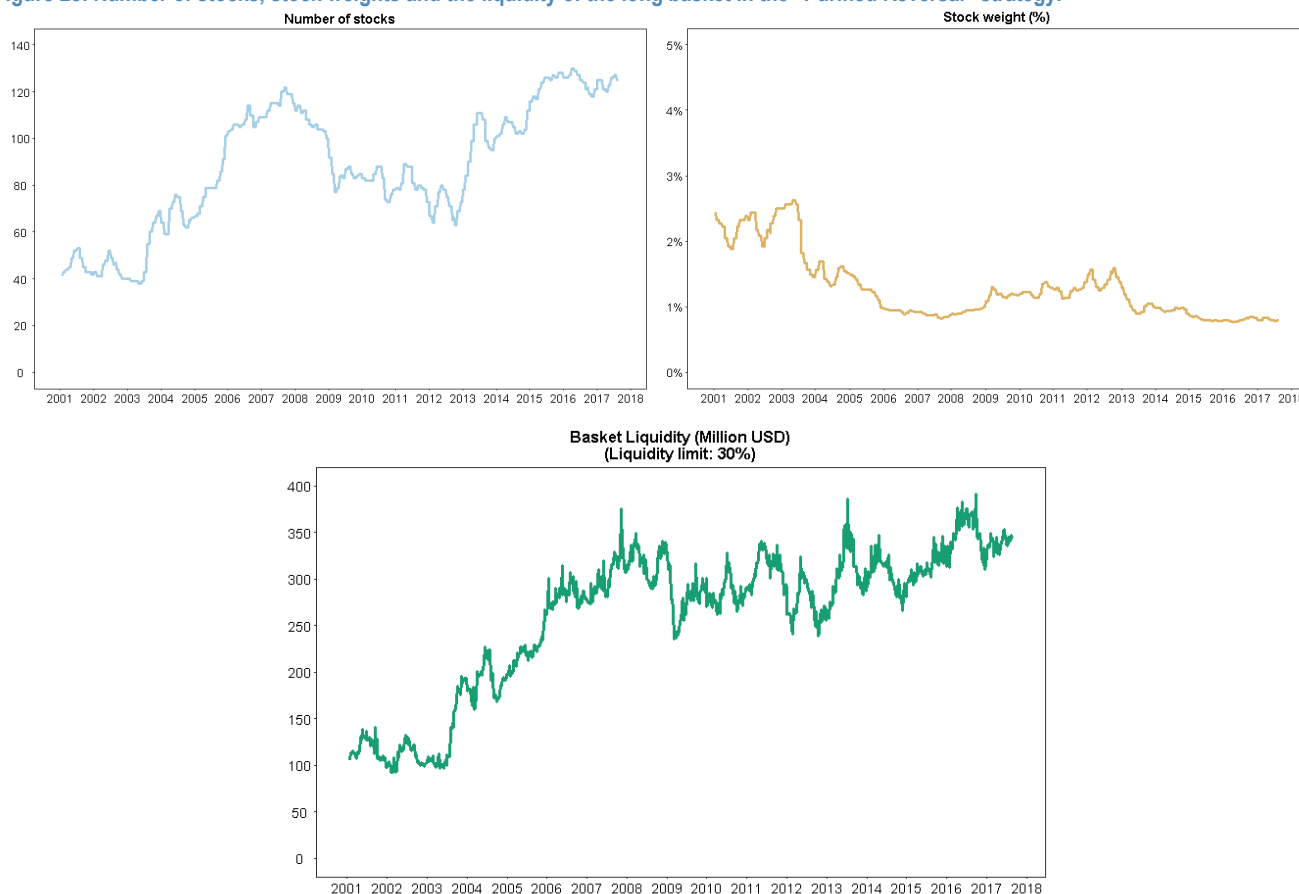
Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

Historical Liquidity

We also analyze the liquidity of the long basket of the “Purified Reversal” strategy in Figure 28. We show the number of stocks and stock weights, as well as the minimum tradable value of the basket, defined as the minimum tradable value of the stocks within the basket, assuming that we can trade 30% of the average daily trading value.

This equal-weighted long basket is quite liquid, which consists of over 100 stocks with a tradable value over 300 million USD as of latest.

Figure 28: Number of stocks, stock weights and the liquidity of the long basket in the “Purified Reversal” strategy.

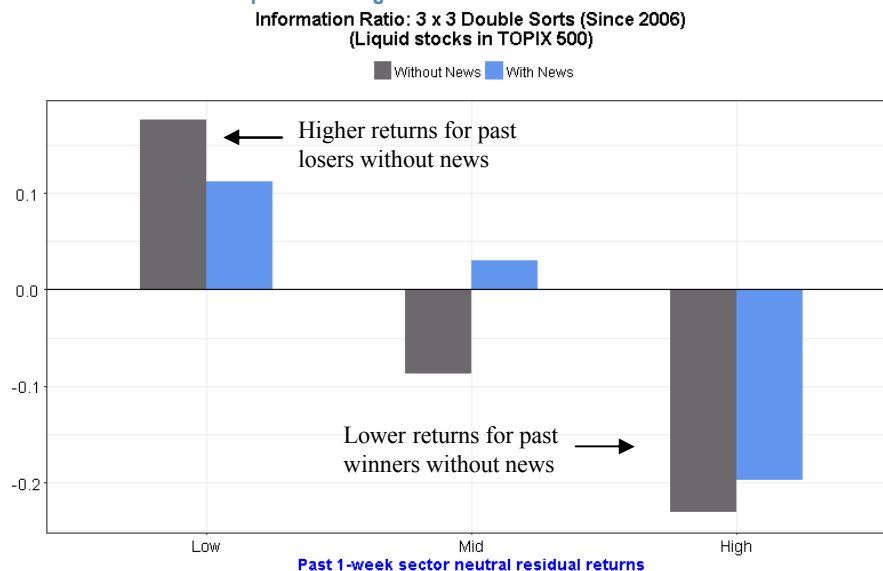


Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

News Enhanced Reversal

Next, we attempt to improve the “Purified Reversal” strategy using news data. As shown in Figure 13 to Figure 15, we see that stocks without news or those with lower volume of news exhibit stronger reversals. To ensure that the results still hold amongst liquid stocks in TOPIX 500, we re-run a similar double sort to understand the interaction between reversal and news volume in Figure 29. As before, we find that stocks without news tend to have stronger reversals.

Figure 29: Stronger reversals for stocks without news, showing similar results for liquid stocks in TOPIX 500. This can be compared with Figure 13 for stocks in TOPIX



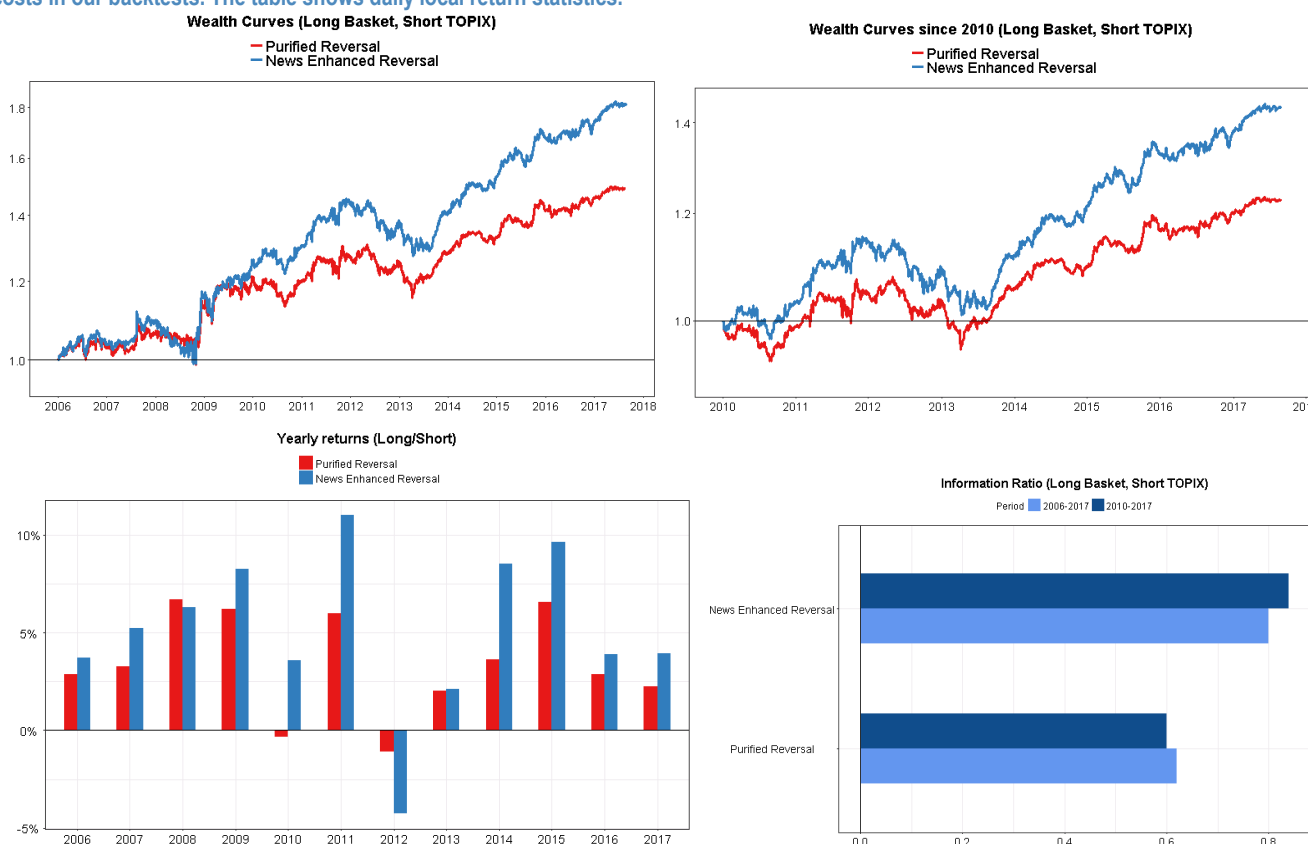
Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

Hence, our “News Enhanced Reversal” strategy is as follows:

Buy past 1-week losers defined as the bottom tercile of sector neutral residual returns, conditioning on low news coverage (either no news or in the bottom 30% of non-zero news volume)

Figure 30 shows the performance of the “News Enhanced Reversal” strategy, which has significantly higher returns than the original “Purified Reversal” strategy. This demonstrates some value of overlaying big data (news volume here) into traditional strategies.

Figure 30: Wealth curves, yearly returns and information ratio of the “News Enhanced Reversal” strategy. We impose 4 bps of transaction costs in our backtests. The table shows daily local return statistics.



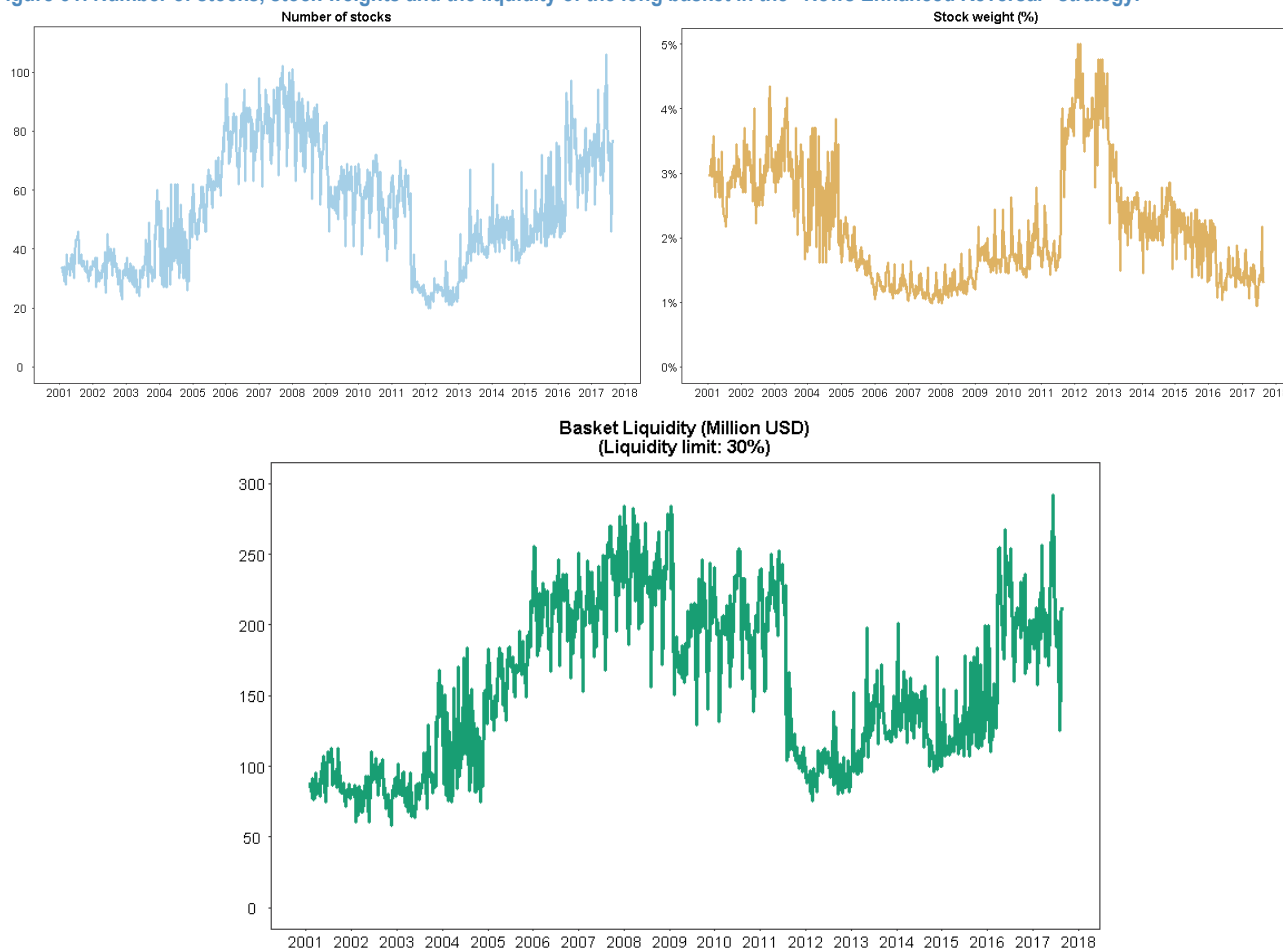
Long Basket, Short TOPIX Total Return Index	Ann. Returns	Ann. Vol.	IR	Max. Draw-down	Hit Ratio	Returns (YTD)	Volatility (YTD)	IR (YTD)
Since 2006								
Residual Reversal, Sector Neutral	3.6	5.8	0.62	11.7	52.7	2.2	2.4	0.93
Core Strategy	5.4	6.8	0.8	12.6	52.2	3.9	3.3	1.2
Since 2010								
Residual Reversal, Sector Neutral	2.9	4.8	0.6	11.7	53.1	2.2	2.4	0.93
Core Strategy	5.1	6	0.84	12.6	52.9	3.9	3.3	1.2

Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

Historical Liquidity

The liquidity of the long basket in the “News Enhanced Reversal” strategy is lower than the “Purified Reversal” strategy, since we remove a notable number of stocks from the portfolio. Stock weights in the basket vary from 1% to a maximum of 5%, as the number of stocks ranges from 20-100. As of latest, the “News Enhanced Reversal” basket is tradable at about 150-200 million USD.

Figure 31: Number of stocks, stock weights and the liquidity of the long basket in the “News Enhanced Reversal” strategy.

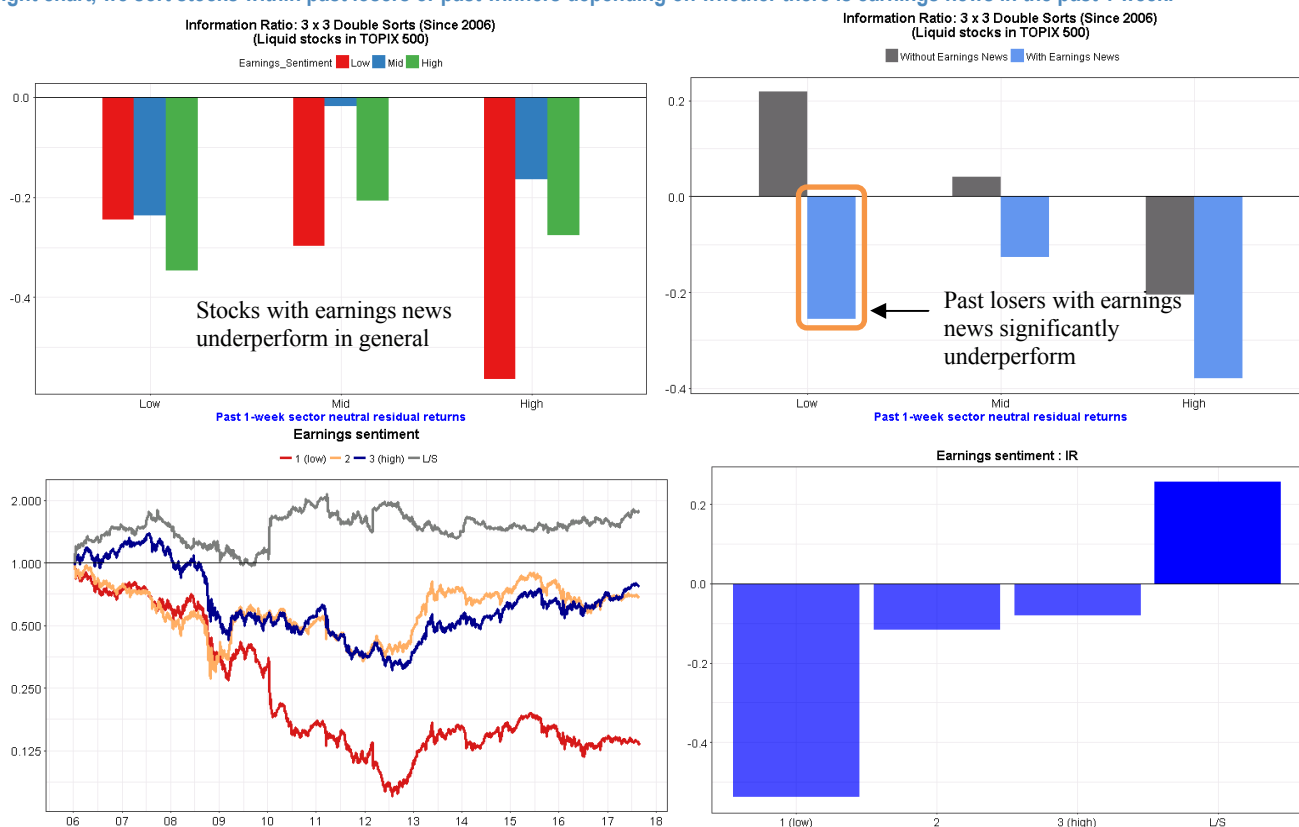


Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

News and Sentiment Enhanced Reversal

Next, we try another enhancement to remove stocks with poor earnings sentiment, as supported by the analysis in Figure 21. Whilst the rationale is intuitive, we double check if similar results hold for liquid stocks within TOPIX 500. A bit surprisingly, we find quite a different pattern compared to the broader TOPIX universe. The downward pointing bars in Figure 32 show that in general stocks with earnings news in the past 1-week perform poorly, although those with better earnings sentiment still outperform, as shown in the backtests with tercile portfolios sorted by earnings sentiment.

Figure 32: Double sorted portfolios based on past 1-week sector-neutral residual returns and non-zero earnings sentiment (top left). In the top right chart, we sort stocks within past losers or past winners depending on whether there is earnings news in the past 1 week.



Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

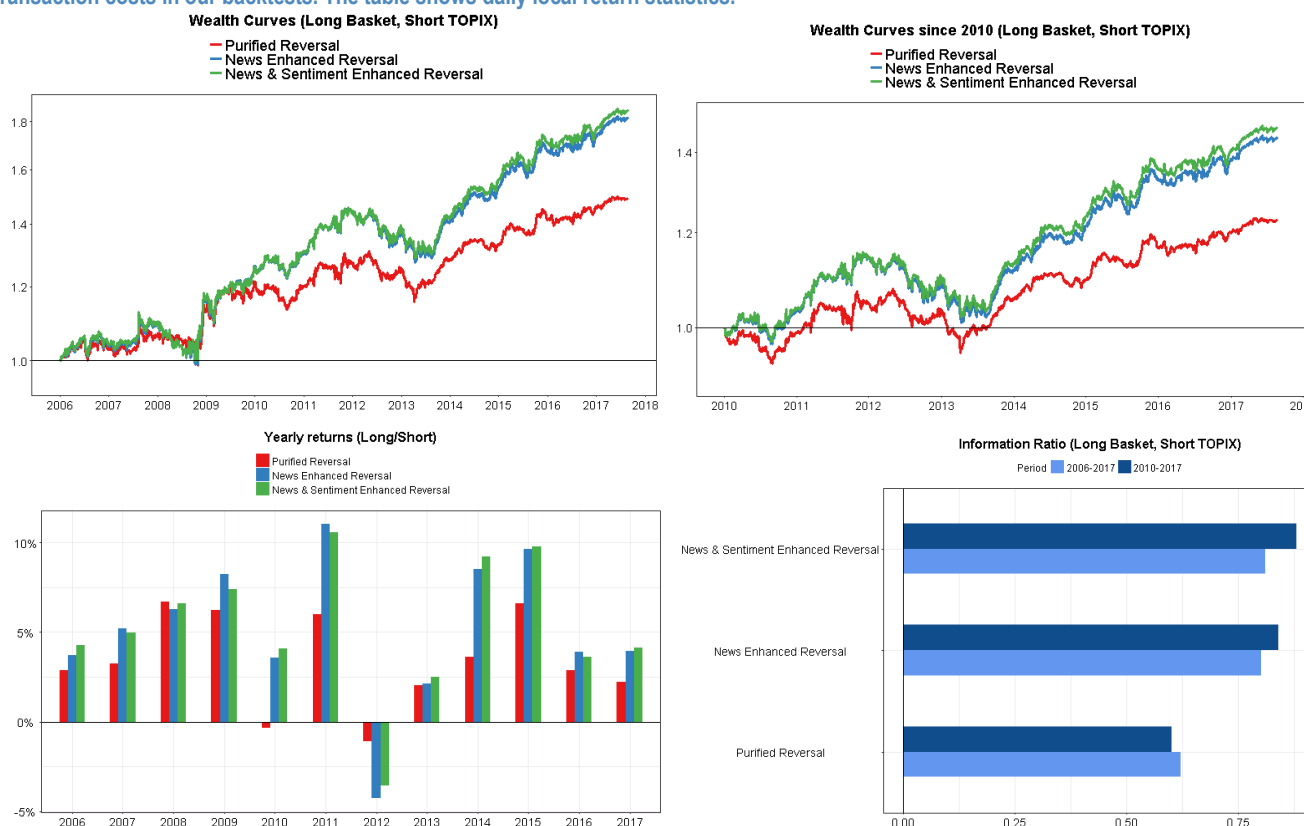
Having seen that stocks with poor earnings sentiment particularly hurt performance, we further remove stocks from our basket if they have low earnings sentiment. Hence our “News and Sentiment Enhanced Reversal” strategy is as follows:

Buy past 1-week losers defined as the bottom tercile of sector neutral residual returns, with low news coverage (no news or bottom 30% of non-zero news volume), and not in the bottom 60% of earnings sentiment scores.

The reason of choosing a 60% threshold is to ensure the basket has at least 20 stocks over history.

Note that as most stocks do not even have earnings sentiment scores, we are not removing a lot of stocks (see Figure 34). Hence, the performance is similar to the original “New Enhanced Reversal” strategy, where the enhancement improves returns slightly and reduces drawdown (for instance in 2012).

Figure 33: Wealth curves, yearly returns and information ratio of the “News and Sentiment Enhanced Reversal” strategy. We impose 4 bps of transaction costs in our backtests. The table shows daily local return statistics.



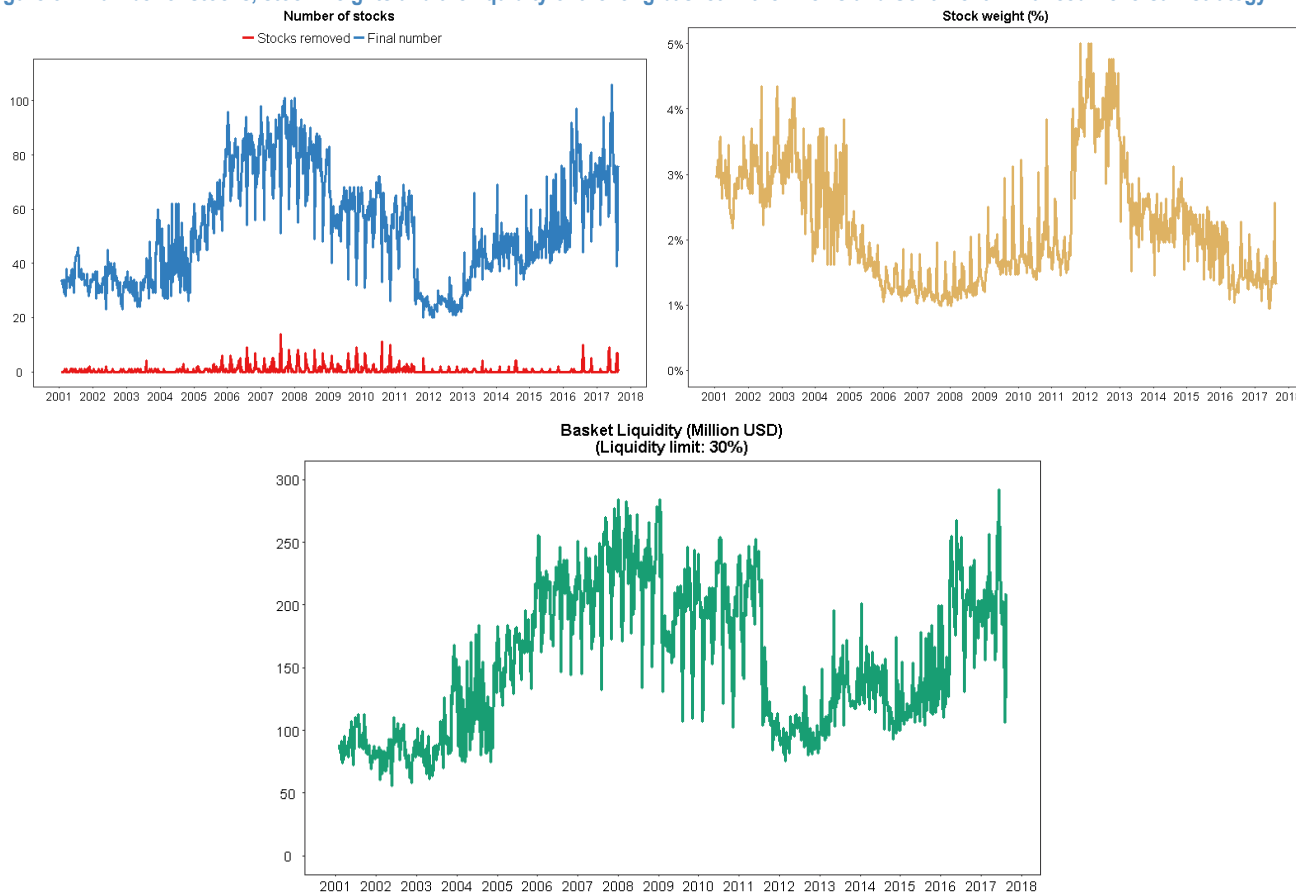
Long Basket, Short TOPIX Total Return Index	Ann. Returns	Ann. Vol.	IR	Max. Draw-down	Hit Ratio	Returns (YTD)	Volatility (YTD)	IR (YTD)
Since 2006								
Purified Reversal	3.6	5.8	0.62	11.7	52.7	2.2	2.4	0.93
News Enhanced Reversal	5.4	6.8	0.8	12.6	52.2	3.9	3.3	1.2
News & Sentiment Enhanced Reversal	5.6	6.8	0.81	11.7	52.4	4.1	3.3	1.26
Since 2010								
Purified Reversal	2.9	4.8	0.6	11.7	53.1	2.2	2.4	0.93
News Enhanced Reversal	5.1	6	0.84	12.6	52.9	3.9	3.3	1.2
News & Sentiment Enhanced Reversal	5.3	6.1	0.88	11.7	53.2	4.1	3.3	1.26

Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

Historical Liquidity

In Figure 34, we show the number of stocks being removed from the basket due to poor earnings sentiment. As the number is small (below 10), the “New and Sentiment Enhanced Reversal” basket is very similar to the “New Enhanced Reversal” basket, and hence with similar stock weights and basket liquidity.

Figure 34: Number of stocks, stock weights and the liquidity of the long basket in the “News and Sentiment Enhanced Reversal” strategy.

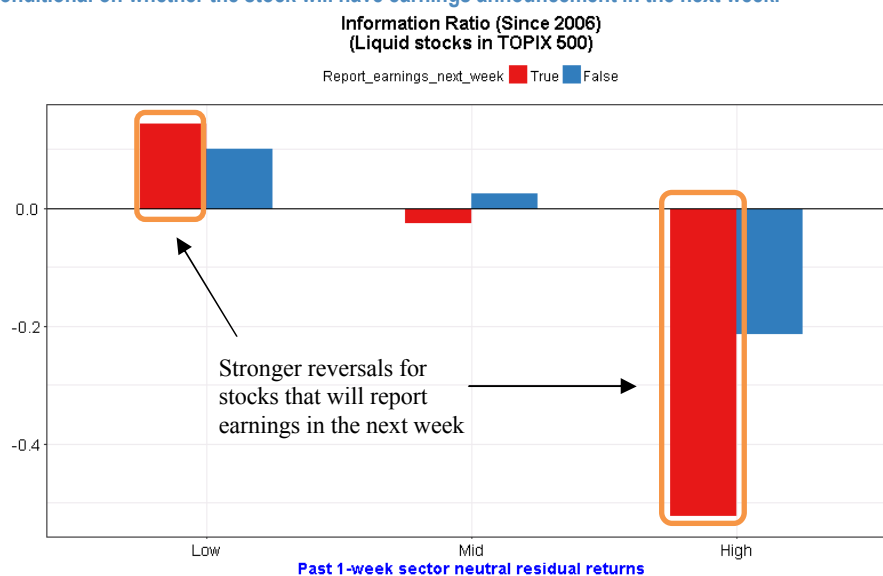


Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

Tactically Weighted Enhanced Reversal

As we see in Figure 24, there is also strong evidence that reversals are stronger for stocks that are anticipating earnings announcements in the next week. We repeat the analysis to check if this phenomenon holds for liquid stocks within TOPIX 500. Figure 35 shows the information ratios of portfolios of past losers and past winners, conditional on whether the stock will report earnings in the coming week. Again, we see stronger reversals for stocks that are anticipating earnings announcement, albeit that the effect is stronger for past winners in this liquid universe.

Figure 35: Information ratios of past losers and past winners amongst liquid stocks in TOPIX 500, conditional on whether the stock will have earnings announcement in the next week.



Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

Tactically adjusting the weights

To take advantage of the stronger reversals around earnings announcements, it is best to overlay this “event-driven” idea with our enhanced reversal strategy, since the number of stocks that will report earnings in a week fluctuates largely depending on the earnings season (it could be an empty set for some periods).

As such, we tactically tilt towards stocks that are anticipating earnings announcements. In particular, we double the weights of the stock (with a cap of 5%) if it will report earnings in the coming week, since we expect a stronger reversal pattern. We then renormalize the weights so that we maintain a 100% long exposure.

Our “Tactically Weighted Enhanced Reversal” strategy is as follows:

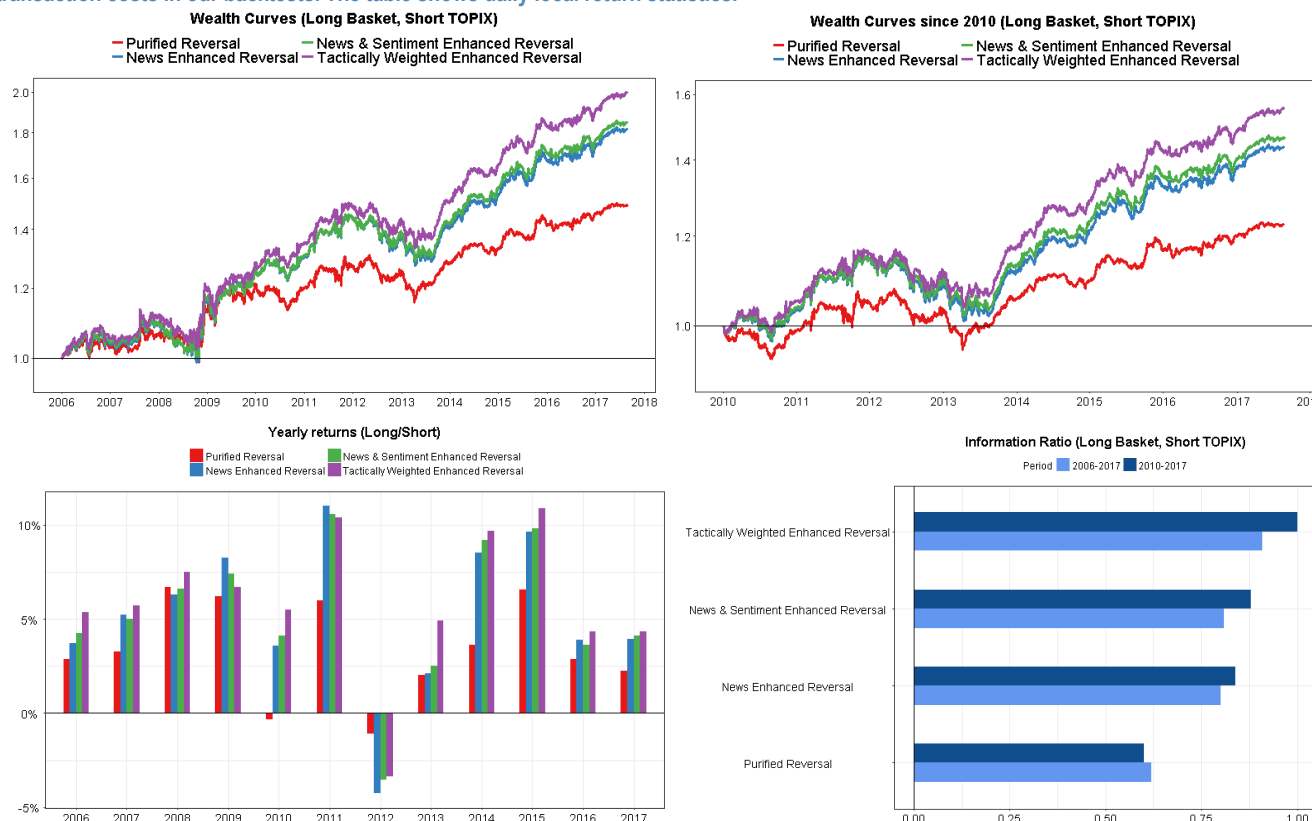
Buy past 1-week losers defined as the bottom tercile of sector neutral residual returns, with low news coverage (no news or bottom 30% of non-zero news volume), and not in the bottom 60% of earnings sentiment scores.

Double the weight (capped at 5%) of the stocks that will report earnings in the next week.

In Figure 36, we find some notable improvements in returns when we tactically increase the weights of past losers that anticipate earnings announcements. This strategy is almost outperforming the equal-weighted “New and Sentiment Enhanced Reversal” strategy every year in a consistent manner.

Of course, one can also tactically tilt the weights in the “Purified Reversal” strategy which do not rely on sources of news data. We find that tilting still adds value, and we show the results in Figure 39 of the Appendix.

Figure 36: Wealth curves, yearly returns and information ratio of the “Tactically Weighted Enhanced Reversal” strategy. We impose 4 bps of transaction costs in our backtests. The table shows daily local return statistics.



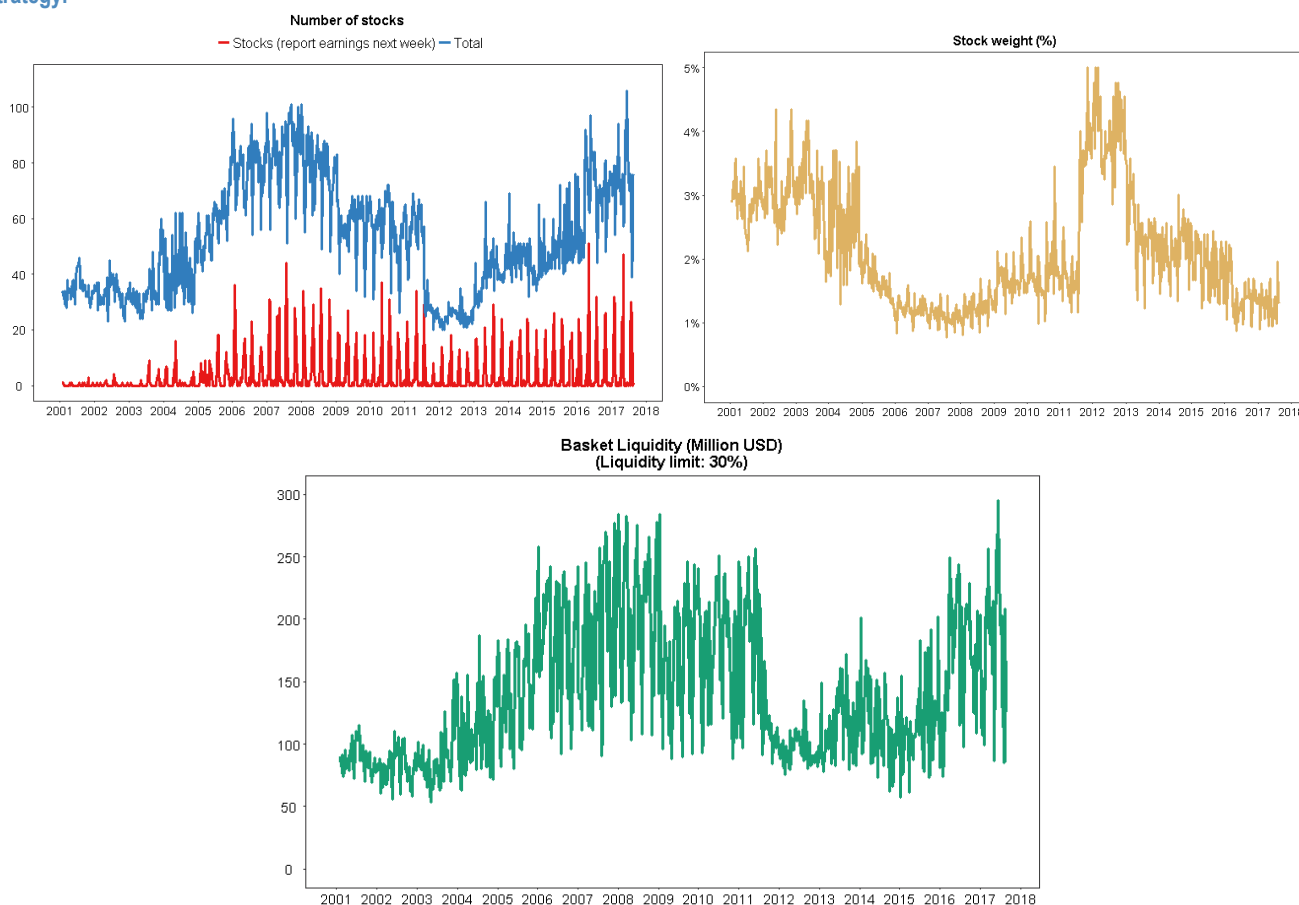
Long Basket, Short TOPIX Total Return Index	Ann. Returns	Ann. Vol.	IR	Max. Draw-down	Hit Ratio	Returns (YTD)	Volatility (YTD)	IR (YTD)
Since 2006								
Purified Reversal	3.6	5.8	0.62	11.7	52.7	2.2	2.4	0.93
News Enhanced Reversal	5.4	6.8	0.8	12.6	52.2	3.9	3.3	1.2
News & Sentiment Enhanced Reversal	5.6	6.8	0.81	11.7	52.4	4.1	3.3	1.26
Tactically Weighted Enhanced Reversal	6.3	6.9	0.91	11.2	52.6	4.3	3.5	1.25
Since 2010								
Purified Reversal	2.9	4.8	0.6	11.7	53.1	2.2	2.4	0.93
News Enhanced Reversal	5.1	6	0.84	12.6	52.9	3.9	3.3	1.2
News & Sentiment Enhanced Reversal	5.3	6.1	0.88	11.7	53.2	4.1	3.3	1.26
Tactically Weighted Enhanced Reversal	6.2	6.2	1	11.2	53.8	4.3	3.5	1.25

Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

Historical Liquidity

In Figure 37, we show the number of stocks that will report earnings in the next week, i.e. the stocks in which we double the weights in the basket. Such an increase in some of the stock weights lead to a slightly lower basket liquidity than the equal-weighted “News and Sentiment Enhanced Reversal” basket. Yet, this basket is still tradable at a minimum of around 100 million USD as of latest.

Figure 37: Number of stocks, maximum stock weights and the liquidity of the long basket in the “Tactically Weighted Enhanced Reversal” strategy.



Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

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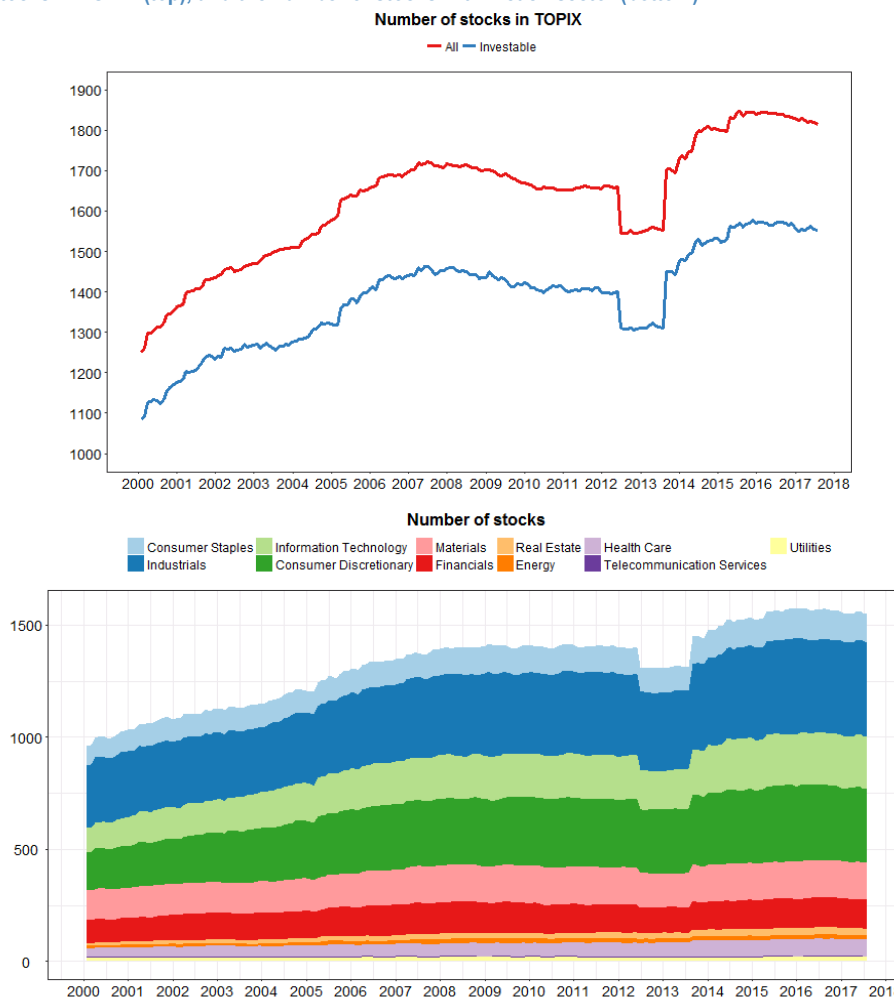
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Appendix

TOPIX Universe

Figure 38 shows the number of stocks in the TOPIX universe, and the number of stocks in each sector. We consider the “investable” universe in our backtests, which is obtained by removing stocks that are either in the bottom 10th percentile of float market cap or average daily trading value.

Figure 38: Number of stocks in TOPIX (top), and the number of stocks within each sector (bottom)

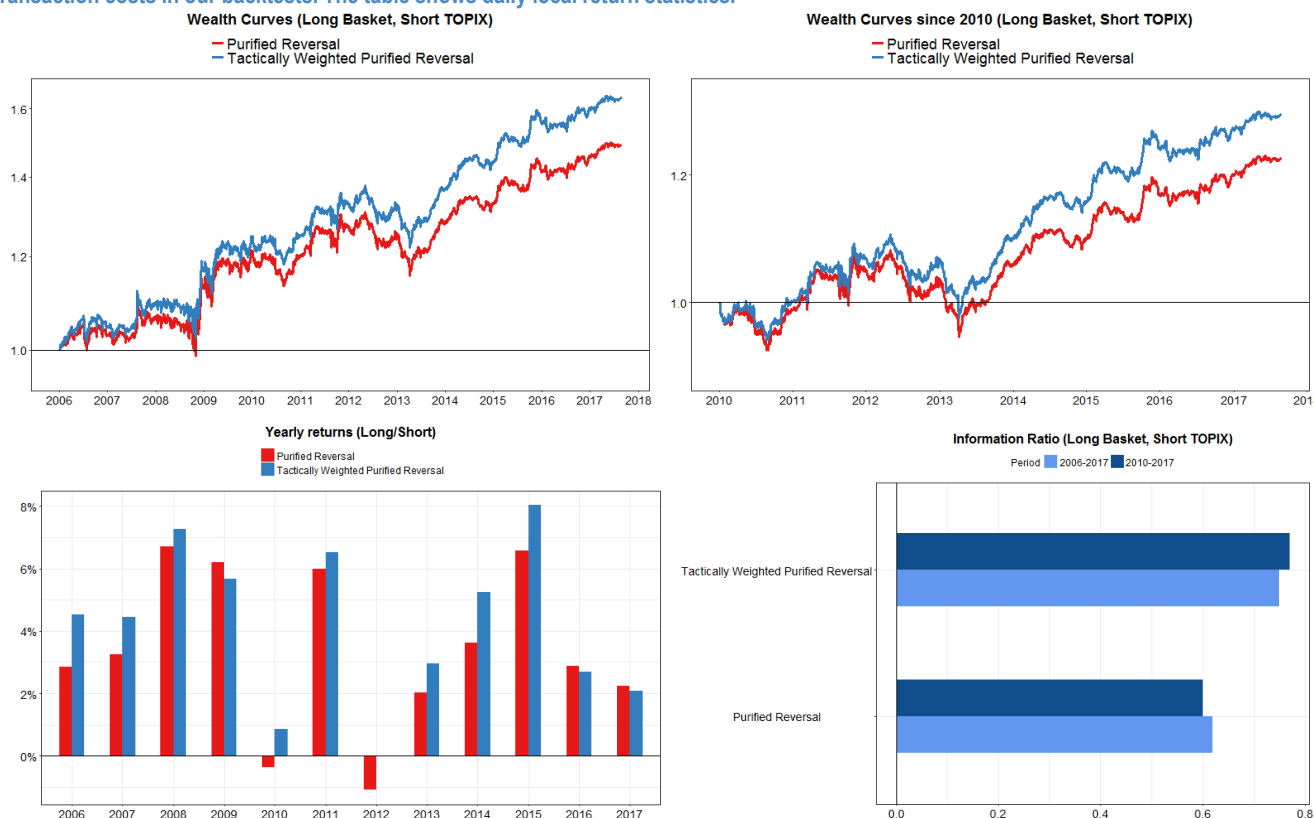


Source: J.P. Morgan Quantitative and Derivatives Strategy

Tactically Weighted Purified Reversal

In our tradable strategies, we include a tactically weighted version (Figure 36) which increases the weight of a stock if it will report earnings next week. This tilting can also be applied to a basket that is constructed only based on sector-neutral residual returns (i.e. purified reversal), without any news enhancement.

Figure 39: Wealth curves, yearly returns and information ratio of the “Tactically Weighted Purified Reversal” strategy. We impose 4 bps of transaction costs in our backtests. The table shows daily local return statistics.



Long Basket, Short TOPIX Total Return Index	Ann. Returns	Ann. Vol.	IR	Max. Draw-down	Hit Ratio	Returns (YTD)	Volatility (YTD)	IR (YTD)
Since 2006								
Purified Reversal	3.6	5.8	0.62	11.7	52.7	2.2	2.4	0.93
Tactically Weighted Purified Reversal	4.4	5.9	0.75	11.3	52.7	2.1	2.5	0.81
Since 2010								
Purified Reversal	2.9	4.8	0.6	11.7	53.1	2.2	2.4	0.93
Tactically Weighted Purified Reversal	3.8	4.9	0.77	11.3	53.5	2.1	2.5	0.81

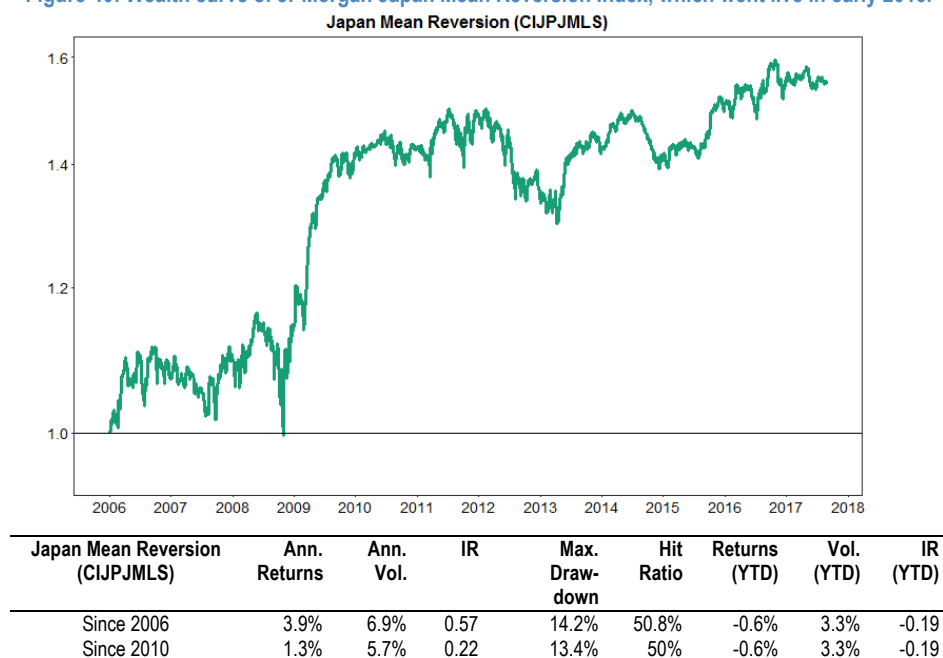
Source: J.P. Morgan Quantitative and Derivatives Strategy, RavenPack, Thomson Reuters, FactSet, Bloomberg, IBES, MSCI.

JPM Japan Mean Reversion Index

For investors interested in mean reversion strategies in Japan, J.P. Morgan provides an investable index (CIJPJMLS) which longs stocks in the TOPIX 500 universe and shorts the TOPIX, rebalanced on a daily basis. In line with the arguments on page 7, the strategy also considers sector-normalized signals.

Figure 40 shows the Japan Mean Reversion index, together with some return statistics. For more details, please contact our structuring desk at Investble_Index_Equities@jpmorgan.com.

Figure 40: Wealth curve of JPMorgan Japan Mean Reversion Index, which went live in early 2016.



Source: J.P. Morgan Quantitative and Derivatives Strategy

Risks of Common Option Strategies

Risks to Strategies: Not all option strategies are suitable for investors; certain strategies may expose investors to significant potential losses. We have summarized the risks of selected derivative strategies. For additional risk information, please call your sales representative for a copy of “Characteristics and Risks of Standardized Options.” We advise investors to consult their tax advisors and legal counsel about the tax implications of these strategies. Please also refer to option risk disclosure documents.

Put Sale: Investors who sell put options will own the underlying asset if the asset’s price falls below the strike price of the put option. Investors, therefore, will be exposed to any decline in the underlying asset’s price below the strike potentially to zero, and they will not participate in any price appreciation in the underlying asset if the option expires unexercised.

Call Sale: Investors who sell uncovered call options have exposure on the upside that is theoretically unlimited.

Call Overwrite or Buywrite: Investors who sell call options against a long position in the underlying asset give up any appreciation in the underlying asset’s price above the strike price of the call option, and they remain exposed to the downside of the underlying asset in the return for the receipt of the option premium.

Booster : In a sell-off, the maximum realized downside potential of a double-up booster is the net premium paid. In a rally, option losses are potentially unlimited as the investor is net short a call. When overlaid onto a long position in the underlying asset, upside losses are capped (as for a covered call), but downside losses are not.

Collar: Locks in the amount that can be realized at maturity to a range defined by the put and call strike. If the collar is not costless, investors risk losing 100% of the premium paid. Since investors are selling a call option, they give up any price appreciation in the underlying asset above the strike price of the call option.

Call Purchase: Options are a decaying asset, and investors risk losing 100% of the premium paid if the underlying asset’s price is below the strike price of the call option.

Put Purchase: Options are a decaying asset, and investors risk losing 100% of the premium paid if the underlying asset’s price is above the strike price of the put option.

Straddle or Strangle: The seller of a straddle or strangle is exposed to increases in the underlying asset’s price above the call strike and declines in the underlying asset’s price below the put strike. Since exposure on the upside is theoretically unlimited, investors who also own the underlying asset would have limited losses should the underlying asset rally. Covered writers are exposed to declines in the underlying asset position as well as any additional exposure should the underlying asset decline below the strike price of the put option. Having sold a covered call option, the investor gives up all appreciation in the underlying asset above the strike price of the call option.

Put Spread: The buyer of a put spread risks losing 100% of the premium paid. The buyer of higher-ratio put spread has unlimited downside below the lower strike (down to zero), dependent on the number of lower-struck puts sold. The maximum gain is limited to the spread between the two put strikes, when the underlying is at the lower strike. Investors who own the underlying asset will have downside protection between the higher-strike put and the lower-strike put. However, should the underlying asset’s price fall below the strike price of the lower-strike put, investors regain exposure to the underlying asset, and this exposure is multiplied by the number of puts sold.

Call Spread: The buyer risks losing 100% of the premium paid. The gain is limited to the spread between the two strike prices. The seller of a call spread risks losing an amount equal to the spread between the two call strikes less the net premium received. By selling a covered call spread, the investor remains exposed to the downside of the underlying asset and gives up the spread between the two call strikes should the underlying asset rally.

Butterfly Spread: A butterfly spread consists of two spreads established simultaneously – one a bull spread and the other a bear spread. The resulting position is neutral, that is, the investor will profit if the underlying is stable. Butterfly spreads are established at a net debit. The maximum profit will occur at the middle strike price; the maximum loss is the net debit.

Pricing Is Illustrative Only: Prices quoted in the above trade ideas are our estimate of current market levels, and are not indicative trading levels.

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