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Comovement and Sentiment-based Trading

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Abstract: We propose a novel directional comovement indicator, the proportion of stocks whose prices have gone up together over a certain time interval, to identify time periods of high sentiment-based trading. To demonstrate that such an indicator could have value for investors. We define a simple trading strategy that involves entering the stock market only in periods of higher than normal comovement. This strategy produces significant abnormal returns. Our findings suggest that high comovement identifies episodes of return-chasing investors directing fund into the market and lifting the prices of all stocks.

Keywords: Comovement, Investor Sentiment, Sentiment-Based Trading, Trading Strategies

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1. Introduction

Price comovement patterns among asset groups are a documented phenomenon. Efficient market theory attributes these patterns to correlated fundamentals for individual assets. Alternatively, behavioral theories attribute these patterns to trading behaviors that can be roughly characterized as correlated choices. Examples include investors who allocate funds across asset groups rather than choosing among individual assets (Barberis and Shleifer, 2003), so-called noise traders who follow each other into assets with high past returns (Shiller, 1984; De Long, et al., 1990a), and arbitrages who profit by trading with rather than against noise traders under certain circumstances (Abreu and Brunnermeier, 2002). The correlated choices suggest a pattern of elevated comovement in asset prices at times of high "sentiment": prices of the affected asset groups go up together as investors direct funds into those assets, generating temporary superior performance. We thereafter refer to this correlated trading behavior as *sentiment-trading*.

We hypothesize that the pattern of asset prices moving up together among an asset group serves as an indicator of when a new round of sentiment-trading is building up. To test this hypothesis, we propose a novel directional comovement indicator (*Comove*), the

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proportion of stocks whose prices have gone up together over a certain time interval, to capture times of high sentiment-trading. We explore whether incorporating this indicator into trading strategies yields improved financial returns. As a demonstration, a simple strategy of investing in the value-weighted NYSE market index when *Comove* is high and investing in three-month U.S. Treasury bills otherwise, produces a 5.22% annualized abnormal return from 1954 to 2014.

The abnormal returns of the strategy based on comovement cannot be fully explained by market index returns. A cluster of positive market returns can reflect good fundamental news about certain stocks or sectors, whereas a sequential cluster of the many stocks rising together accords better with stock market as a whole becomes a favored type of investment. *Comove* thus better identifies episodes of return-chasing investors moving money into the market and lifting the prices of all stocks.

These findings suggest that times of prevalent sentiment-trading, identified by *Comove*, create potential profit opportunities. High comovement may reflect correlated demands of noise trades that elevate systematic risk (Shiller, 1984; Delong, et al., 1990a). It may also reflect risk averse arbitrageurs being ineffective at correcting mispricing in the short term. Arbitrageurs may be hesitant to bet against noise traders because mispricing may deepen further before being corrected (De Long, et al., 1990b). Under certain circumstances, it may even be optimal for arbitrageurs to trade with the market trend (Abreu and Brunnermeier, 2002), especially in the presence of information cascades (Bikhchandani, Hirshleifer, and Welch, 1998).

Our comovement indicator complements other measures of sentiment-trading. For instance, Baker and Wurgler (2006) construct their monthly sentiment index based on six proxies of investor sentiment. *Investor Intelligence Survey* defines and reports on the intensity of sentiment-trading based on the survey results regarding investors' opinions about the near-term future stock market outlook. Our *Comove* indicator differs from survey-based measures in that it is based on the collective trading outcomes of all investors, rather than the opinions of the surveyed investors. Compared with the lower-frequency measures of sentiment-trading, *Comove* can be updated instantly based on recent stock price movement and can be easily calculated using different time windows and across different markets. Future research on applications of our comovement indicator is needed to map out when and where it can be most helpful for traders of different sorts.

2. The Comovement Indicator and A Simply Trading Strategy

$Comove_{k,\tau}$ is defined as the number of stocks with positive cumulative returns over a window of k calendar weeks ending on trading day τ, as a percentage of all stocks traded over that time interval:[2]

$$Comove_{\tau,k} = \frac{N_{\tau,k}^{up}}{N_{\tau,k}^{up} + N_{\tau,k}^{down}} \quad (1)$$

where $N_{\tau,k}^{up}$ and $N_{\tau,k}^{down}$ denote, respectively, the number of stocks with positive and negative cumulative returns over the k weeks ending on day τ. Stocks that are not traded over the k-week window are excluded. In this initial study, we choose k = 1, 2, 3, or 4 to allow for *Comove* to reflect recent market conditions while avoiding non-synchronous trading problem over short windows.

We define a simple trading strategy using the *Comove* indicator (hereafter the *Comove* strategy). Our first implementation of the strategy is for NYSE common stock from January 1, 1954 to December 31, 2014:

On each trading day τ, hold the value-weighted NYSE index if $Comove_{\tau-1}$ *is above the median value of previous values for Comove, and otherwise hold three-month U.S. Treasury bills. The position is rebalanced daily.*

In this first implementation, the median values of prior *Comove* values that are used are for the time periods from January 1, 1926 (the start of CRSP) through $Comove_{\tau-2.}$ This strategy is designed to identify times of high sentiment-trading (indicated by high *Comove*) and to avoid times of low sentiment-trading. The purpose of this simple strategy is to demonstrate that *Comove* can be used to identify sentiment-trading-related profit opportunities. Investors presumably would apply *Comove* in their own specially tailored trading strategies, which potentially could enable them to realize larger profits from this innovation.

3. Performance of the Comovement-based Strategy

Table 1 compares the NYSE value-weighted index returns on trading days when the *commove* indicator was, versus was not, above median. The index return exhibits a significantly higher mean and lower standard deviation on trading days with high

[2]A non-directional comovement measure is proposed by Morck, Yeung, and Yu (2000) as $Max(N^{up}, N^{down})/(N^{up} + N^{down})$. Morck et al. (2000) use the non-directional measure to proxy the informativeness of stock prices, whereas our directional measure captures the intensity of sentiment-trading in the market.

comovement. For instance, the mean market returns on trading days with high comovement in the prior week is 0.069%, or 3.65% per annum (p-value < 0.01), higher than that of trading days with low comovement in the prior week; whereas the standard deviation is 0.266 (or 21%) lower. These findings are consistent with *Comove* being able to identify times of superior market performance with high investor sentiment.

Table 1: Summary Statistics of Market Index Return, High vs. Low Comovement

Reference Window	Above median *Comove*	Mean (%)	Std. Dev.	N	Mean Diff.
1 week	Yes	0.079	0.793	7,914	**0.069**
	No	0.010	1.059	7,442	(0.00)
2 week	Yes	0.063	0.771	7,907	**0.036**
	No	0.027	1.077	7,449	(0.02)
3 week	Yes	0.060	0.746	7,990	**0.030**
	No	0.030	1.099	7,366	(0.04)
4 week	Yes	0.067	0.726	7,877	**0.043**
	No	0.024	1.108	7,479	(0.00)

Note: This table contrasts the daily NYSE value-weighted market index return on trading days when *Comove* in the prior 1 to 4 weeks is above and below its historical median, respectively. Numbers in bold indicate statistical significance at least at the 10% level (p-values shown in parentheses).

We next use the Carhart (1997) four-factor model to evaluate the risk-adjusted performance of the *Comove* strategy:

$$R_{p,t} - R_{f,t} = \alpha_p + \beta_{1p}(R_{m,t} - R_{f,t}) + \beta_{2p}SMB_t + \beta_{3p}HML_t + \beta_{4p}UMD_t + \epsilon_{p,t}, \quad (2)$$

where $R_{p,t}$ denotes the cumulative return of the *Comove* strategy in month *t;* $R_{m,t}$-$R_{f,t}$ is the excess market return in month *t*; and SMB_t, HML_t and UMD_t denote, respectively, the returns on the size, growth, and momentum factors, respectively, in month *t*.

Panel A of Table 2 reports significantly positive alphas for the *Comove* strategy. The highest alpha is produced when *Comove* is defined with weekly returns (i.e. *k*=1), yielding an abnormal return of 0.425% per month (p-value less than 0.01), or 5.22% per year. The abnormal returns appear large enough that they are unlikely to be fully absorbed by transaction costs. For instance, Wermers (1999) estimates 0.07% transaction costs per year for the Vanguard Index fund. And Kacperczyk, Sialm, and Zheng (2006) calculate the average trading costs of actively managed mutual funds to be 0.58% per year.

Table 2: Performance of the *Comove* Strategy on NYSE

	k			
	1-week	**2-week**	**3-week**	**4-week**
Panel A. Four-Factor Alphas				
	0.425	**0.196**	**0.223**	**0.301**
	(0.00)	(0.01)	(0.00)	(0.00)
Panel B. Incremental Alpha Relative to the Index Momentum Strategy				
	0.087	**0.228**	**0.160**	**0.255**
	(0.00)	(0.00)	(0.00)	(0.00)
Alphas of the Index Momentum Strategy				
	0.344	**-0.031**	**0.062**	**0.037**
	(0.00)	(0.06)	(0.00)	(0.03)

Note: This table reports the alphas (as percentages) from the four-factor model for the *Comove* strategy. The *Comove* strategy invests in the value-weighted NYSE market index if the *Comove* indicator is above the median in the prior *k* weeks and invests in three-month T-bills otherwise. The index momentum strategy invests in the NYSE index when observing a cluster of positive index returns in the prior *k* weeks and invests in T-bills otherwise. P-values are reported in parentheses. Numbers in bold indicate statistical significance at the 10% level or higher.

We conduct additional tests of the robustness of the results. The positive and significant alphas are robust to using the equal-weighted NYSE index to implement the *Comove* strategy, identifying times of high sentiment-trading with the 4^{th} or 6^{th} decile prior *Comove* values, and using the market model instead of four-factor model to estimate alpha.

We next investigate whether the profits of the *Comove* strategy might be explained by short-term momentum in market index returns. To do this, we define a short-term index return momentum strategy (thereafter momentum strategy) that holds the value-weighted NYSE index when observing a cluster of positive index returns over the *k*-week window up to τ-1 and holds T-bills otherwise. We use a binomial test to determine whether the cluster of positive index returns is more than a pure chance binomial distribution model predicts.[3]

Panel B of Table 2 reports the "*incremental*" alphas of the *Comove* strategy relative to the momentum strategy.[4] The alphas of the *Comove* strategy remain positive and significant, suggesting that the superior performance of the *Comove* strategy cannot be fully explained

[3] For example, the binomial distribution, with a 0.5 probability of positive market returns on a trading day, puts the probability of having three or more positive returns over five trading days at 0.5 and puts the probability of having four or five positive returns over five trading days at 0.2. We consider observing four or five positive market returns over a week as a cluster of positive returns.

[4]The incremental alphas are estimated by using the return difference between the two strategies as the left-hand-side variable in the asset pricing models.

by short-term momentum in the market index. The bottom half of Panel B reports the positive alphas for the momentum strategy, which are in line with the results of prior studies (Campbell, Lo, and MacKinlay, 1997).

Lastly, we implement and test the Comove strategy for two other stock exchanges: Nasdaq and the Tokyo Stock Exchange (TSE). In contrast to the NYSE, both Nasdaq and the TSE have large numbers of high growth, small, and young stocks, many of which are actively traded by retail investors. The Nasdaq stock return data are from CRSP and the TSE stock return data are from DataStream. Panel A and Panel B of Table 3 report positive and significant alphas of the *Comove* strategy on Nasdaq over the years of 1993 to 2014[5] and on TSE over the years of 1990 to 2014. Thus the *Comove* strategy outperforms the risk-adjusted market indices and the momentum strategy on both exchanges.

Table 3: Performance of the *Comove* Strategy on Nasdaq and the TSE

	k			
	1-week	**2-week**	**3-week**	**4-week**
Panel A. Nasdaq				
Four-Factor Alpha	**0.636**	0.294	**0.511**	**0.371**
	(0.00)	(0.11)	(0.01)	(0.08)
Incremental Alpha	**0.301**	-0.050	**0.298**	0.172
	(0.10)	(0.76)	(0.10)	(0.28)
Panel B. Tokyo Stock Exchange				
Four-Factor Alpha	**0.965**	**0.869**	**0.706**	**0.681**
	(0.00)	(0.00)	(0.00)	(0.00)
Incremental Alpha	**0.316**	**0.390**	0.229	**0.273**
	(0.01)	(0.01)	(0.12)	(0.00)

Note: This table reports the alphas (as percentages) for the *Comove* strategy implemented on Nasdaq and the Tokyo Stock Exchange (TSE) parallel to that implemented on NYSE.

4. Conclusions

We propose a novel directional comovement indicator to identify times of intensive sentiment-trading. A simple trading strategy incorporating this indicator produces positive abnormal returns. The abnormal returns cannot be fully explained by the market index returns which can reflect good fundamental news about certain stocks and sectors. High comovement identifies times when investors collectively direct funds into the equity market, lifting prices of many stocks all together. Investors may find it profitable to incorporate our comovement indicator into their own investment strategies to enable

[5]Only a small proportion of Nasdaq stocks were actively traded before 1993.

capture of profit opportunities created by high sentiment-trading. Our results are an initial indication that the proposed comovement indicator merits more in-depth analysis.

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