



Use Cases

*Improving Equity Analysis
by Incorporating New Data
and Analytical Techniques*

Summary

This research report provides various use case examples of leveraging new forms of data for financial market equity analysis. Data sources presented include unstructured social media comments, Facebook Likes, and job postings. Analytical techniques include medium-term natural language processing (NLP) derived sentiment trend analysis, stock price mention extraction from social media text, relative Facebook like comparison of peer companies, and sector specific job posting trend analysis. Each technique is shown to offer improved insight into the relevant investment case. These analytical techniques tend to work well for holding periods in the multi-month to one year range and augment already established technical and fundamental tools. As is the case with other financial analysis tools, these are best leveraged when used in conjunction with other techniques and not in a vacuum.

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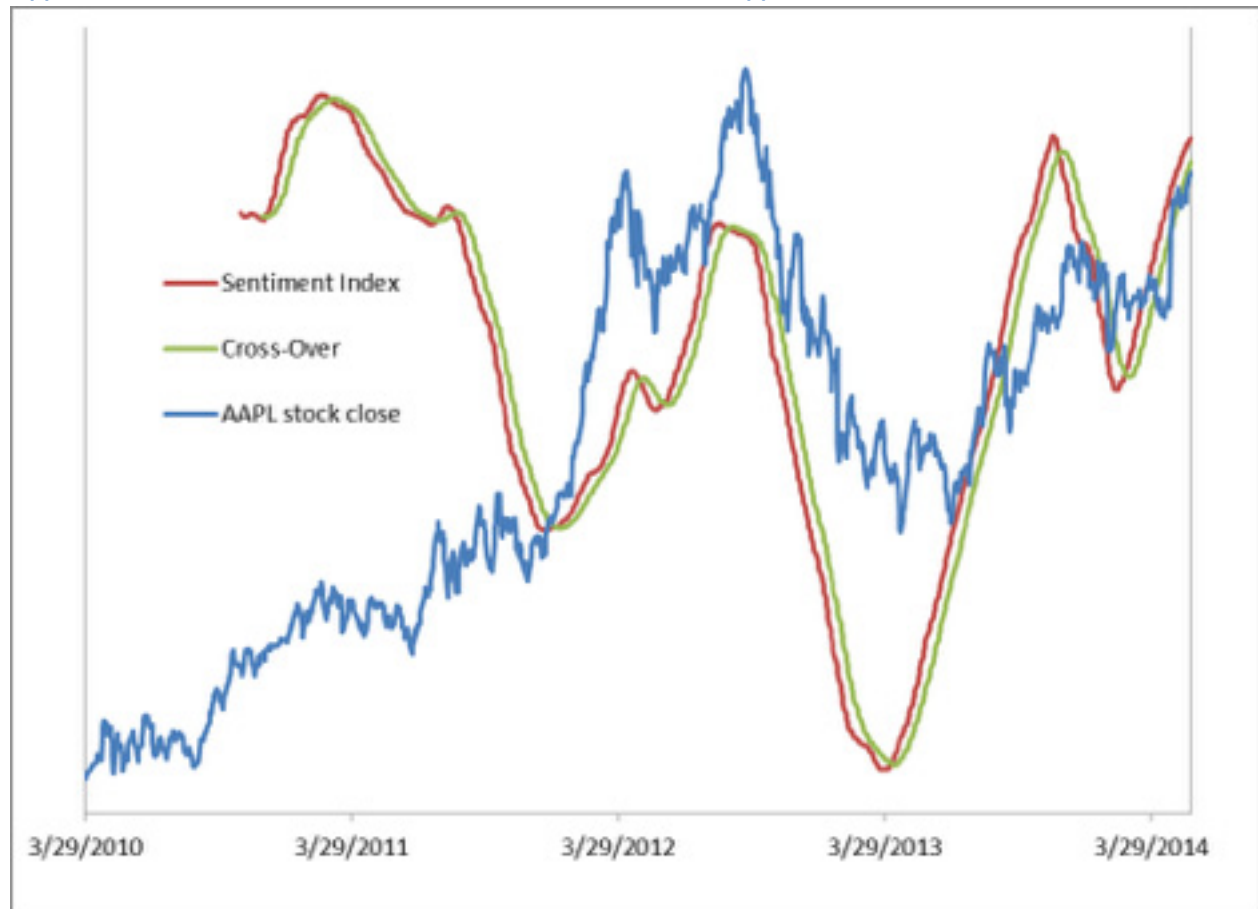
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Medium-Term Sentiment Trends vs. Stock Price

The importance of sentiment is fairly well understood in trading. The standard usage is for short-term trading – normally very short-term, such as for same day or multi-day holding periods. However, by de-trending longer term trends in sentiment for individual stocks, we can gain insights into directional trends and to the timing of overbought / oversold levels.

In the following example, we look at a medium-term sentiment indicator with a simple moving average cross over. The idea is that while the indicator is trending upwards the stock should be in a bullish trend. The inversion occurs when it crosses below its trailing cross-over moving average, starting a bearish trend. The levels of the inversions are also significant with a turn from an extreme level being of more importance.

Apple Stock Price versus Medium Term Sentiment Index for Apple



For AAPL stock, the trending sentiment works well at highlighting important turning points. Such an indicator is more indicated for medium-term investors, or those with a multi-month outlook.

Price Mentions vs. Stock Price

Another new and unique financial indicator is the trend and level of stock price mentions.

Stock price mentions often appear within social media and/or other commentary on stocks. Traders and investors habitually mention price levels – such as “(ticker) is going to (price level)” or “IBM is going to 200!”. Essentially, this process extracts the price mentions and creates time series of them for analysis.

Mentions can be specific price targets or general stock price levels of interest. They are very indicative of the expected directional movement and the magnitude of the movement. The analysis uses the same data sources as that used by the more popular and well-known NLP-based sentiment measure, but extracts new insights. Price mention time series tend to be significantly less volatile and more precise than the NLP-based alternative.

The basic idea is that when the markets are very positive on a stock, price mentions will generally be significantly above the then-current stock price. If the price mentions tend to hover around then-current actual stock price levels, the markets have a neutral outlook. And, if the price mentions are below the then-current levels, market participants are stating a generally bearish view on the stock.

A secondary interpretation to stock price mentions focuses on the implied holding period. The premise is that stock price mention levels will vary considerably depending on the commentator’s expected holding period. If the holding period is short (maybe a few days), the price mention level will likely be fairly close to the then-current stock price. On the other hand, if the expected holding period is longer (maybe a year), then the price mention level would necessarily have to be farther away from the then-current price to make it worth having capital tied up longer. Using this logic, we can then calculate the implied holding period which provides new insights into the types of investors paying attention to the stock.

Let’s take a look at two examples to see how leveraging price mentions can be useful. First, we will take Apple followed by Google.

In the following chart, the red line is the average price level of stock price mentions and the blue line is the actual stock price, both smoothed by 20 day moving averages (dma).

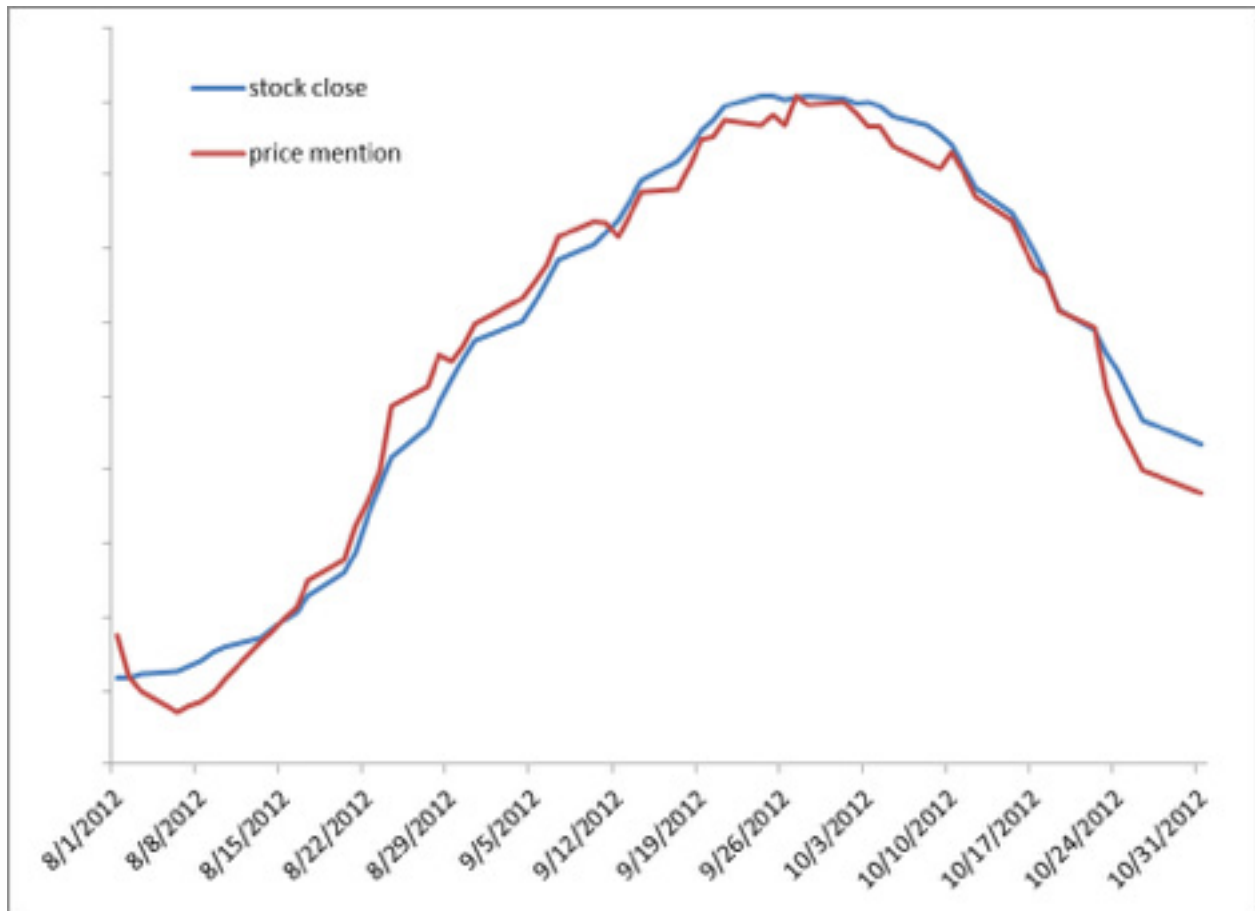
This single chart does a very good job of highlighting the usefulness of stock price mentions in relation to determining the direction of a stock. In 2010 and 2011, commentators on Apple stock mentioned stock price levels significantly above the then-prevailing stock price. With consistently higher price expectations, the stock price (we can assume) would converge towards those expectations.

Apple Stock Price (20 day moving average) versus Stock Price Mention (20 day moving average)



In the later stage of its bull market, Apple shot higher in late 2011 to late 2012. One of the most interesting observations from the chart is that at its all-time high, the stock price more or less coincided with the price mentions. In other words, commentators on average were neither bullish nor bearish on the stock. After such an amazing appreciation, such a neutral outlook would have been an obvious red-flag for investors. In fact, at the actual high, the stock price mention level actually fell below the then-current stock price, a highly unusual occurrence for Apple. In the following chart, we focus in on this important period.

Apple Stock Price (20 day moving average) versus Stock Price Mention (20 day moving average), around all-time high



The price mentions move below the actual stock price around its high. From the standpoint of the investor (or trader), such an occurrence would serve as a warning. After being consistently above the actual price for a number of years, the price mentions moving below the stock price should have been seen as a sea change in the perception of the stock. As we will see later, this can also be interpreted as signaling an influx of shorter term traders, which for many could mean lower implied upside.

Moving into 2013, we see the price mentions revert to being above the stock price. The fact that the stock was in the process of declining after a multi-year run-up, the continued optimism from the perspective of stock price mentions is impressive. Many at this time were also speculating as to if Apple was a bubble stock and had to deflate further. As it turned out, the stock found a bottom near mid-2013 and began to move higher with the price mention levels increasing but not to the same degree. In other words, the market (via the price mention indicator) saw the stock moving higher but as it did, its degree of implied bullishness declined.

The broad conclusions from the Apple example include:

1. Price mentions remained consistently higher than the stock price during the 2011 – 2012 period, or during the most consistent portion of the Apple bull market,
2. During the last portion of Apple's bull market in 2012, the price mentions tracked the stock price very closely, with price mentions actually moving below the stock price a few weeks before the all-time high, providing an interesting bearish signal,
3. As Apple stock deflated after a multi-year run-up, stock price mentions remained above the stock price signaling that the stock's decline would likely not be as bad as many were forecasting at the time,
4. In the later portion of 2013, as the stock price moved higher to retrace its previous decline, the price mentions moved higher in absolute terms but not in relative terms meaning that the price mentions remained bullish but became increasingly less bullish as Apple stock price rose implying a likely unsustainable nature of the run-up.

In general, trends in price mentions would have done an exceptional job in helping investors interpret movements of the stock and helping them improve their strategy.

Next, we take the same data and present it using a percent difference indicator, measuring the percent difference between the stock price level to the price mention level.

Apple Stock Price (20 dma) versus the Percent Difference between Stock Price and Price Mention (20 dma)

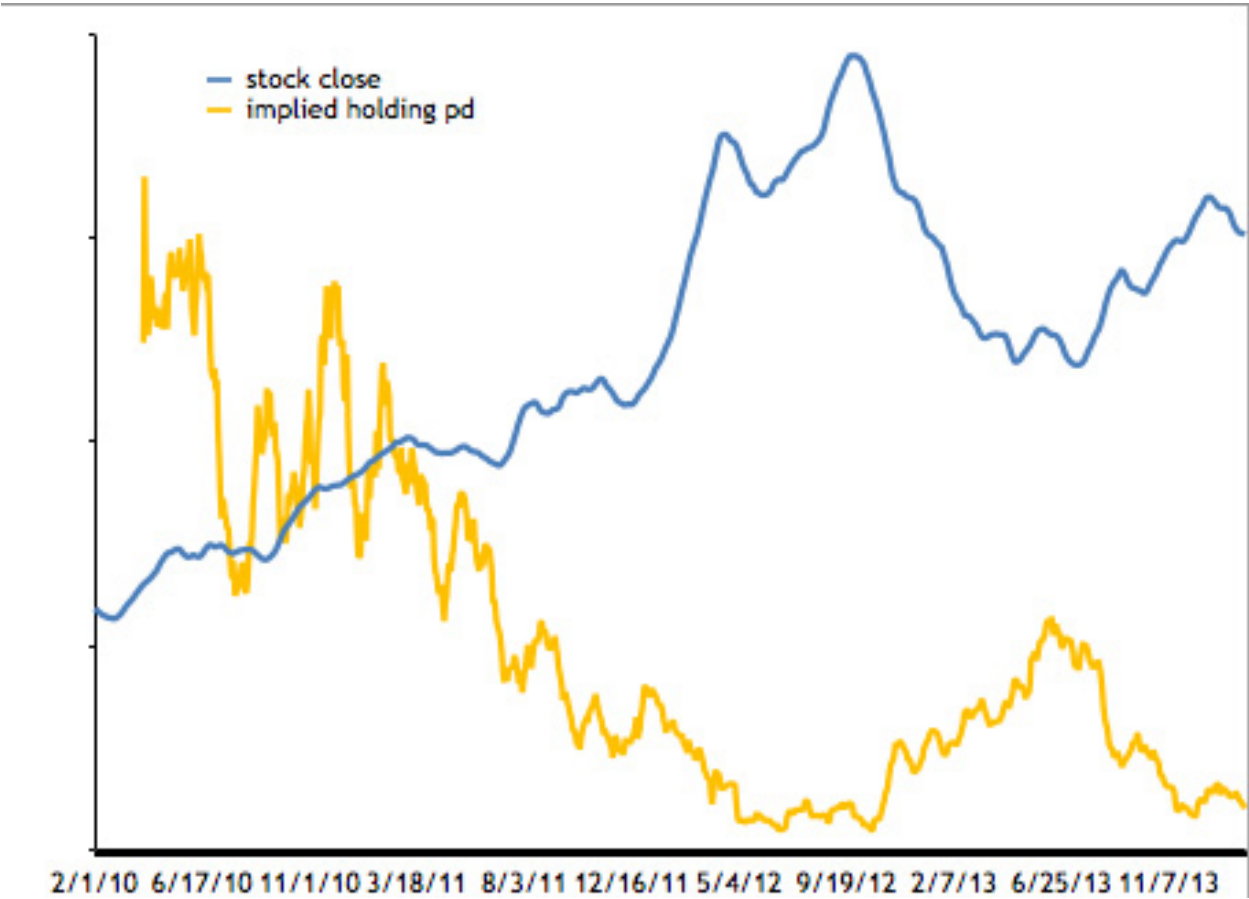


The most astonishing highlight from this chart is that the percent difference looks to trend down from the beginning of the observation period to the August to October 2012 period when it hovers around 0%. In other words, it appears as if market commentators, via their collective price mentions, became bearish at the appropriate time – at the all-time high. Such timing is astonishing in the overall context of this stock, which at the time was the market darling.

Lastly, let's interpret the average implied holding period. We take the percent difference from the last example and compare it to the volatility of the stock to create an implied holding period. This is clearly a rough estimate, and most investors do not have a predetermined holding period (though they likely have an estimated range), but this information is very useful nonetheless.

By incorporating volatility, we can more readily compare price mention implications of different stocks. For instance a price mention level that is 20% above its current stock price for a very volatile stock would not have the same significance as one with the same 20% but that is not very volatile. In this way, we could better compare disparate stocks, like comparing a utility stock to a speculative high-tech stock.

Apple Stock Price (20 dma) versus Apple Implied Holding Period (20 dma)



As expected, the trend of the Implied Holding Period is very similar to that of the Percent Difference. The red flag here appears to be the shrinking holding period, especially as it fell to a level implying that of less than one month, which occurred near the all-time high of the stock.

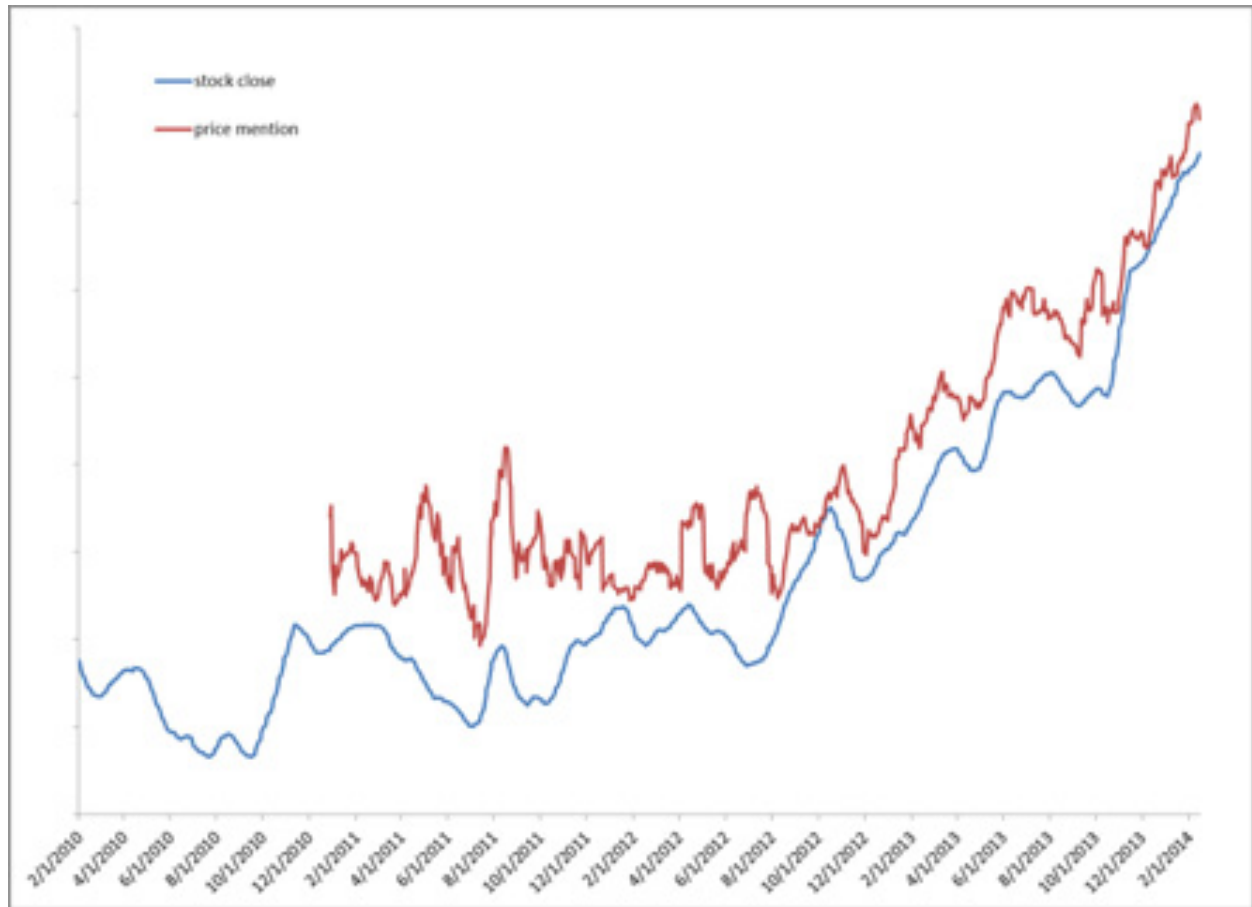
At that time, market participants had an implied outlook of very short-term duration—which most would see as a lack of faith in the longer term prospects for the stock.

As a general rule-of-thumb, it appears that when the implied holding period falls below two months, investors should take care. When it falls below one month, a significant change in general direction or a spike in volatility could be expected soon.

As a second use case for using price mentions to interpret stock price movement, we look at Google (\$GOOG). As with any indicator, when applied to different stocks in varied circumstances, it provides different highlights.

In the following chart, we show Google’s actual stock price versus its stock price mention level trend.

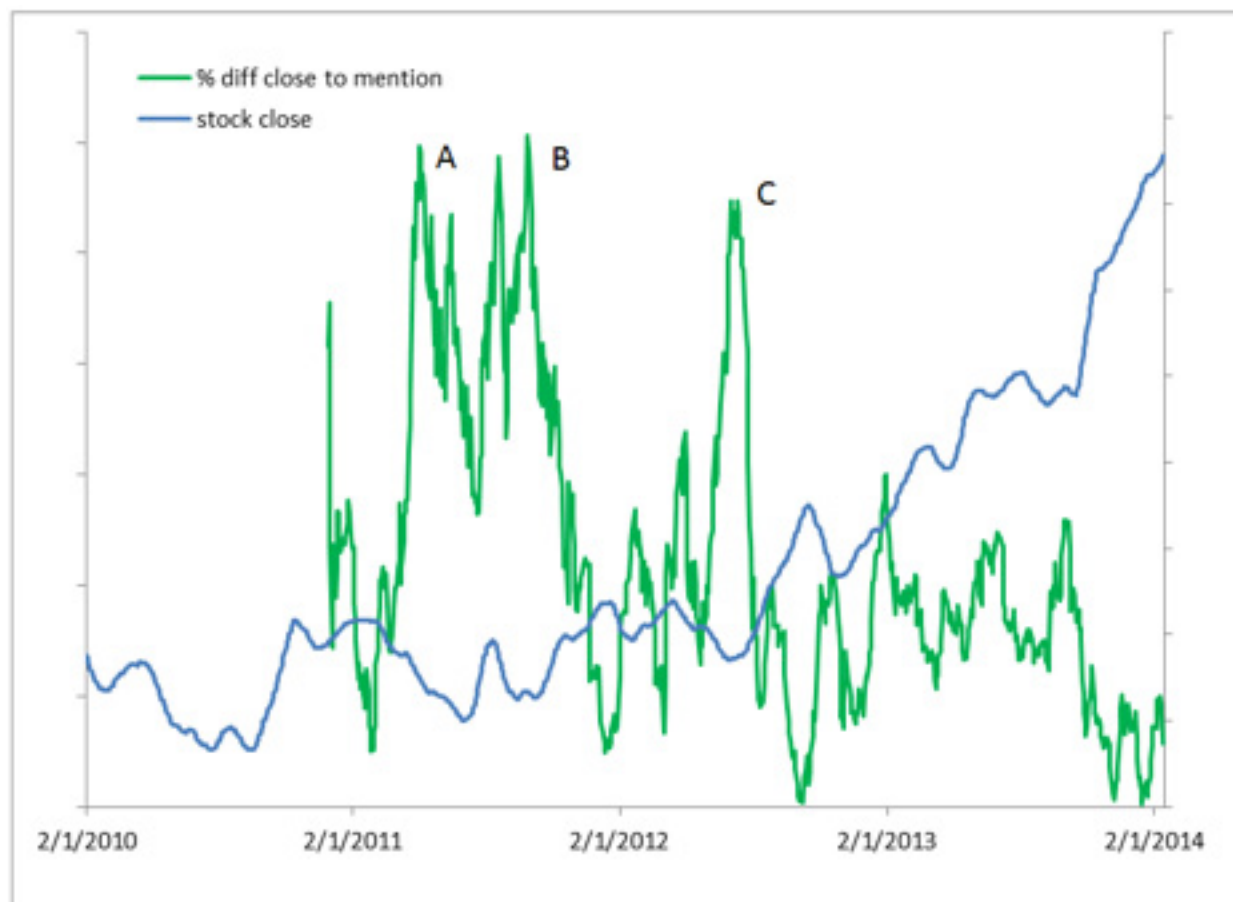
Google Stock Price (20 day moving average) versus Stock Price Mention (20 day moving average)



From early-2010 to mid-2012, Google stock moved generally sideways in a broad range. Price mention levels likewise moved in a sideways fashion. As the stock moved higher during 2013, the spread between the two became minimal, so much so that in 2014, stock price mentions almost went below the actual stock price. But unlike with Apple stock, Google's price mention did not fall below its actual stock price and the period that price mention levels remaining near the actual stock price was relatively short in duration. During this sample period, Google's stock remained relatively strong, unlike Apple's which declined fairly dramatically.

Google's relative trends can be seen in the next graph that charts the percent difference between the stock price and the price mention level, versus the actual stock price trends.

Google Stock Price (20 dma) versus the Percent Difference between Stock Price and Price Mention (20 dma)



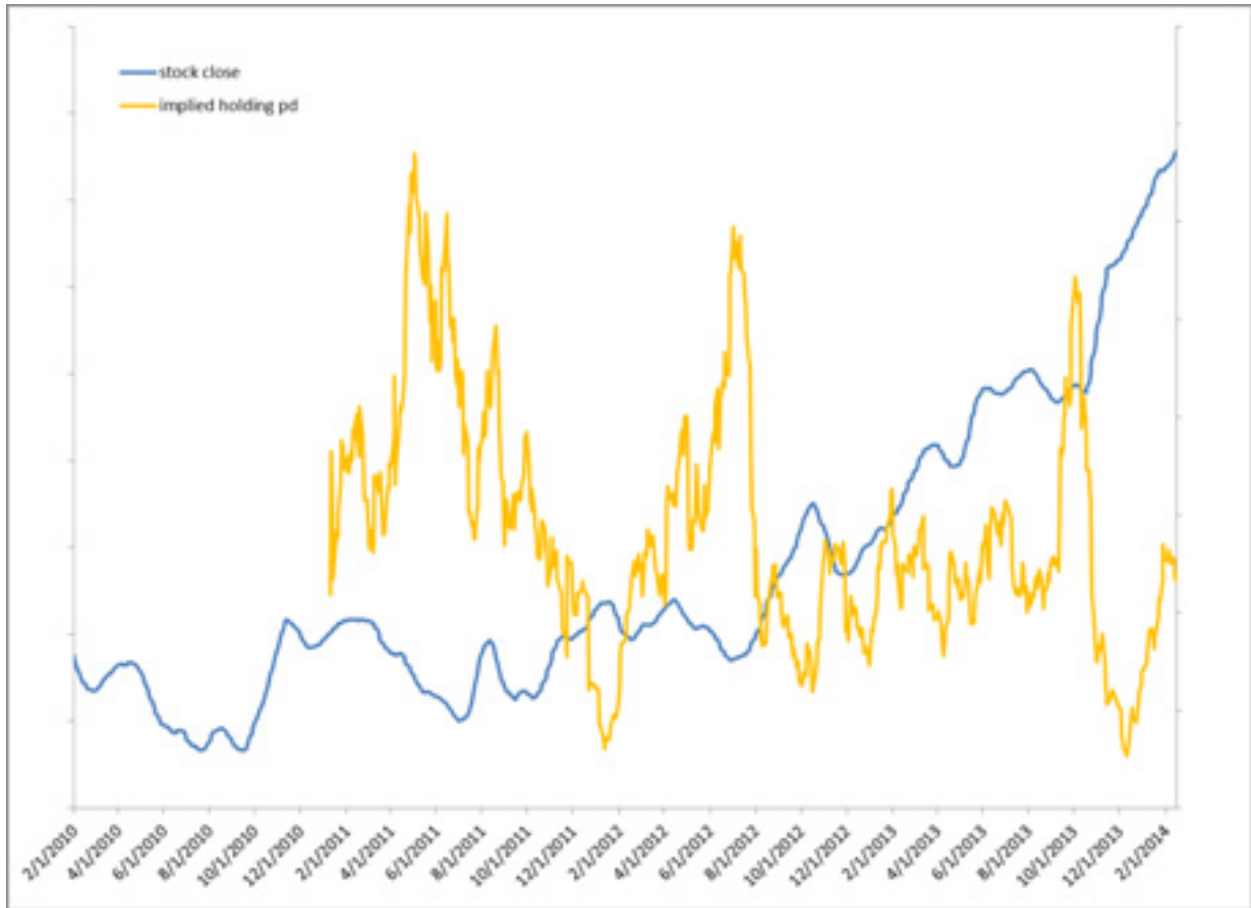
One of the more interesting observations from the percent difference chart is that the stock price mention levels actually went up at multiple periods as the stock price went down. These are marked by A, B, and C in the chart. This is of interest as it points out that the commentators on Google stock did not become bearish as the stock declined. In other words, the price mention levels, at least during these periods, appear to have worked independently of the short-term stock price movements. This is very encouraging for using this indicator to determine opinion in the market as it implies that those mentioning prices are doing more than simply reflecting what they see today in the market. Furthermore, the fact Google stock eventually broke out of its sideways movement upwards (confirming the trends of the price mention levels) provides more evidence that price mention appears to act independently of short-term stock price fluctuations.

We can also look at the implied holding period for Google. As with Apple stock, it tends to track the percent difference fairly closely. In Google's case, there is a significant difference in mid-to-late 2013. At that time the implied holding period spiked up right before the stock price bolted higher.

The boost in implied holding period is a combination of the percent difference increasing and the stock's volatility decreasing at the same time. The fact that the implied holding period

increased so much just prior to another stock price boom is encouraging for the prospects of utilizing this indicator in other situations.

Google Stock Price (20 dma) versus Google Implied Holding Period (20 dma)



At the same time, in mid-to-late 2013, that the implied holding period moved sharply higher, the price mention levels made a new all-time high in the face of a relatively weak actual stock price. This combination of lengthening implied holding period, new high for the price mention level, and a lagging stock price proved to be an excellent buy signal for Google stock as it experienced a multi-month rally soon afterwards.

Relative Facebook Likes vs. Stock Performance

Much of the focus of general market participants on utilizing new forms of data for investing has revolved around short-term trading. However, many of the new datasets emerging and generally being categorized as Big Data, actually help with fundamental analysis and are better suited for longer term holding periods.

One of the more interesting and intuitive examples is using Facebook Likes for investment analysis.

Some research has been done on Facebook Likes and stock performance. However, the focus has been on absolute number of Likes and on absolute trends. Multiple approaches use the number of Facebook Likes as a filter to qualify for the inclusion into a study or a fund. By doing so, these approaches are really just focusing on currently successful brands with a strong social media presence, and provide large biases to established consumer brands.

Another weakness with this approach is that Facebook Likes tend to be in the stage of continual increase. In other words, most brands and companies still have a natural trend of increasing Facebook Likes (and the same can be said about other social media metrics like LinkedIn followers or Twitter followers). Therefore, during bull markets for stock prices, trying to prove a relationship would appear fairly easy, as both metrics (stock price and Likes or social media follower metric) would be on the rise.

We correct for these weaknesses by comparing companies on a peer or sector basis (and not simply grabbing companies with the most Likes) and by looking at relative trends (and not depending on the natural inflation of Likes or other social media metrics).

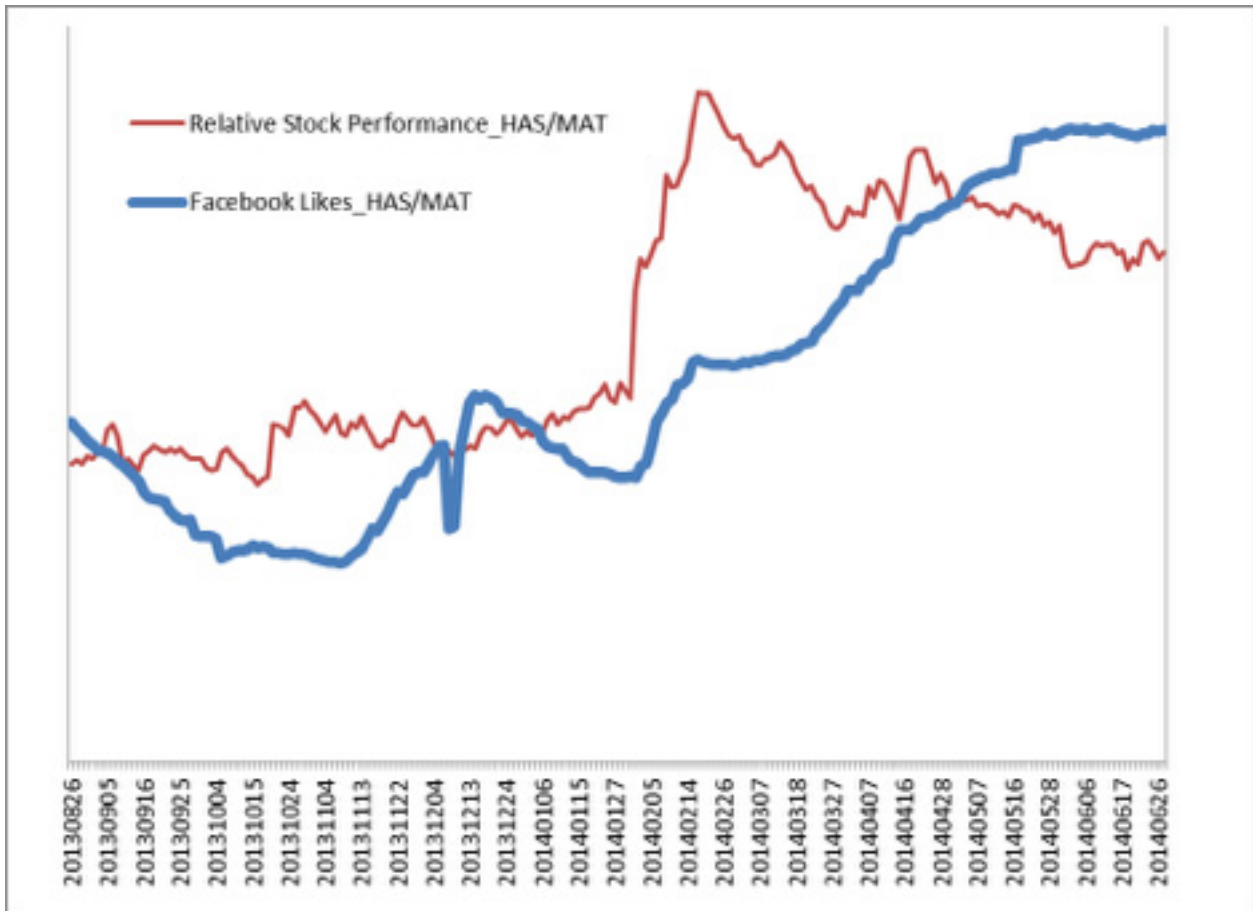
The logic is that relative stock performance of two competitors should relate to the relative Facebook Likes over time. We are not stating that there should be a short-term correlation. Over a longer period of time, however, the company with a more attractive trend of Facebook Likes should outperform. The argument is more fundamental in nature than most assume as the company posting superior growth of Facebook Likes should likewise produce better revenue growth over time, other variables remaining constant.

In the short-term, there could be an impact if the metric, such as Likes, focuses on a product launch or similar. But in general, the idea is that this metric, like other similar metrics are better for longer term analysis.

Here we compare multiple similar companies over an approximate one year time frame to test the theory.

First, we compare Hasbro (\$HAS) and Mattel (\$MAT), two of the principal global companies focusing on children's entertainment, toys, and games.

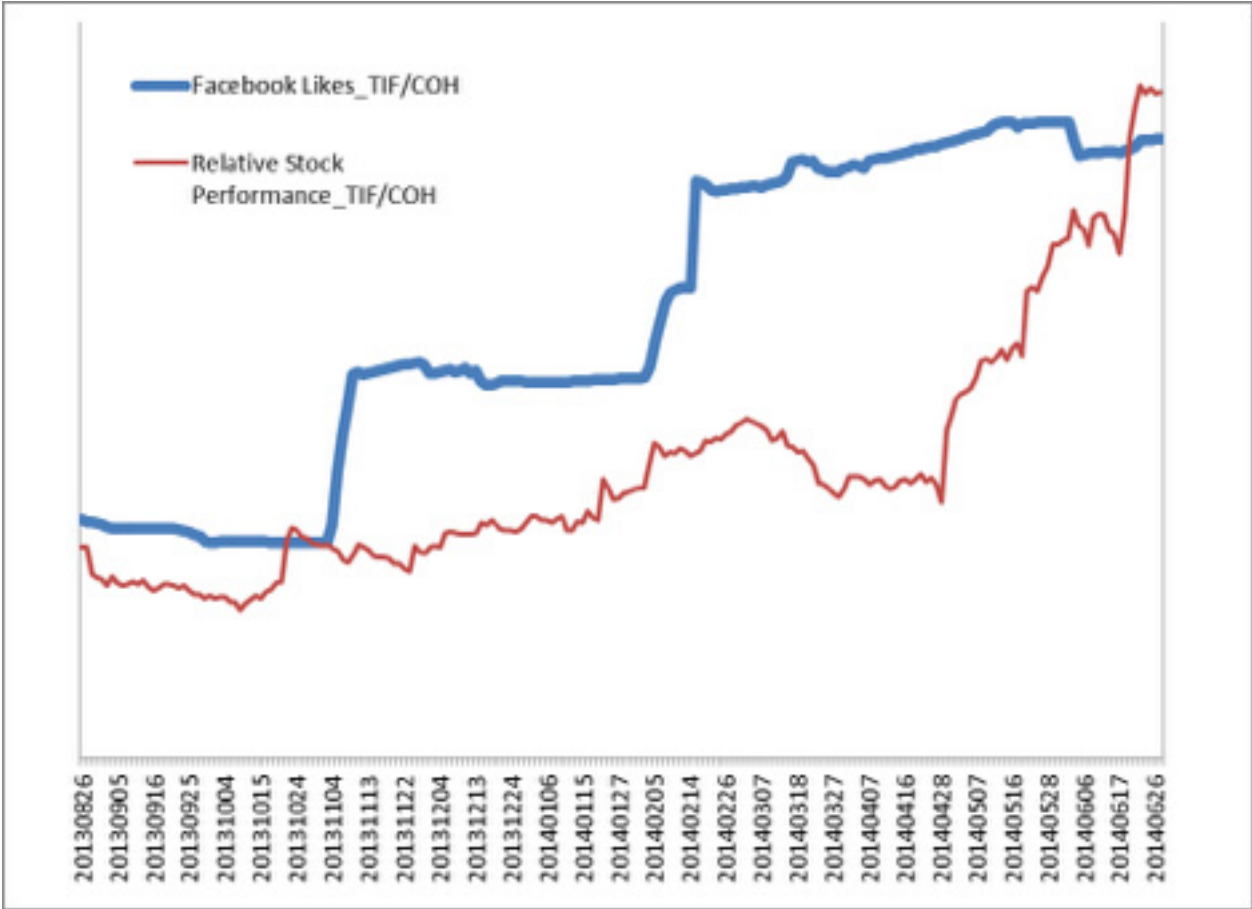
Hasbro and Mattel, relative stock price and relative Facebook Likes



In this longer term analysis, we can see that Hasbro's Facebook Likes have trended higher and so has its stock price in relation to its competitor Mattel. Note that the relationship during shorter periods tends to breakdown at various times. Facebook Like trends over days and weeks can be significantly influenced by promotions or campaigns and may or may not reflect longer term fundamentals. Over the longer term however, Hasbro's superior trend appears evident as does its stock outperformance.

A second example includes the luxury brand companies Tiffany (\$TIF) and Coach (\$COH). The companies' relative stock price and Facebook Likes are shown in the following chart.

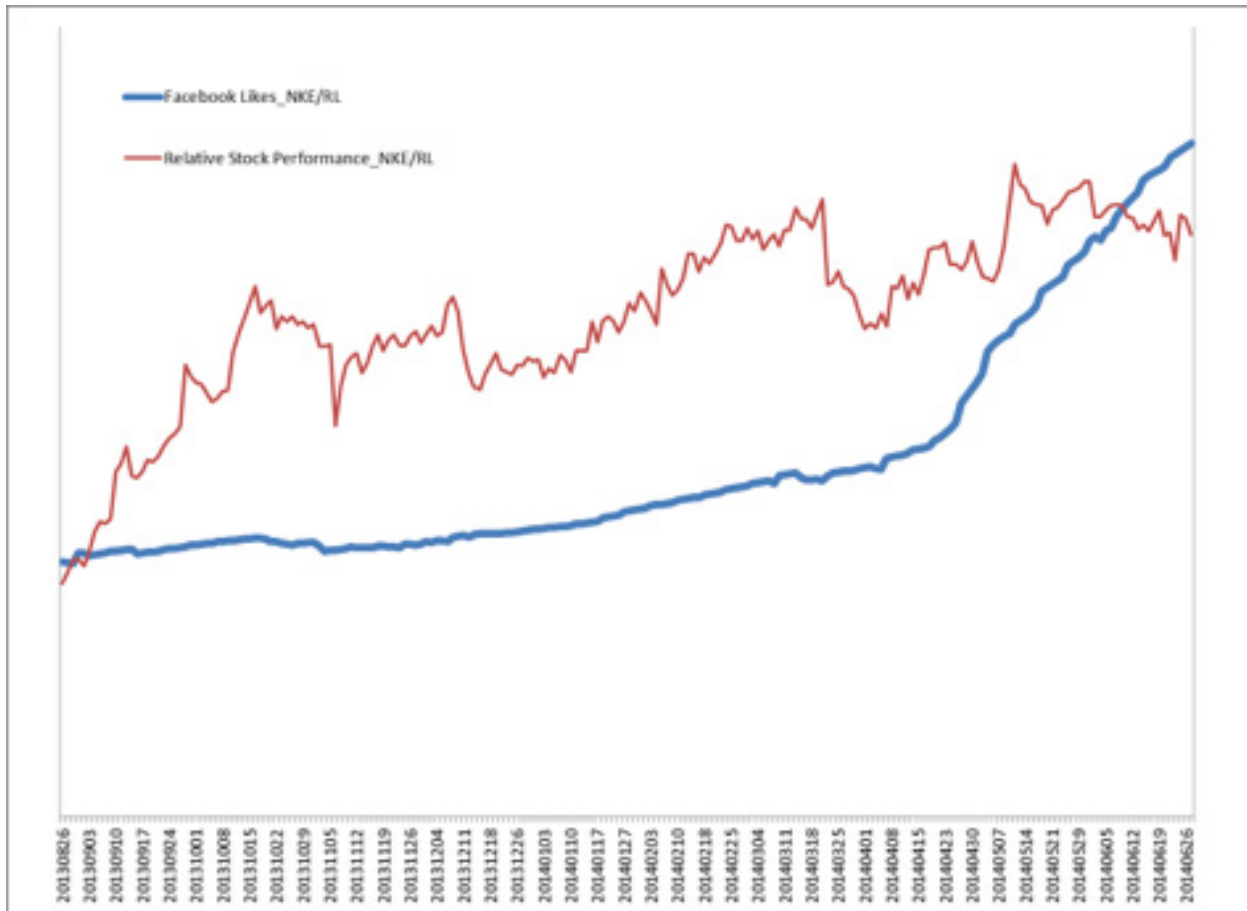
Tiffany and Coach, relative stock price and relative Facebook Likes



Tiffany outperforms on both measures. Again, as with other similar examples, short-term movements of Facebook Likes are not assumed to impact the stock trend. Longer term however, as fundamentals begin to take over, Facebook Likes and other metrics that tend to measure a degree of following / approval influence the stock price.

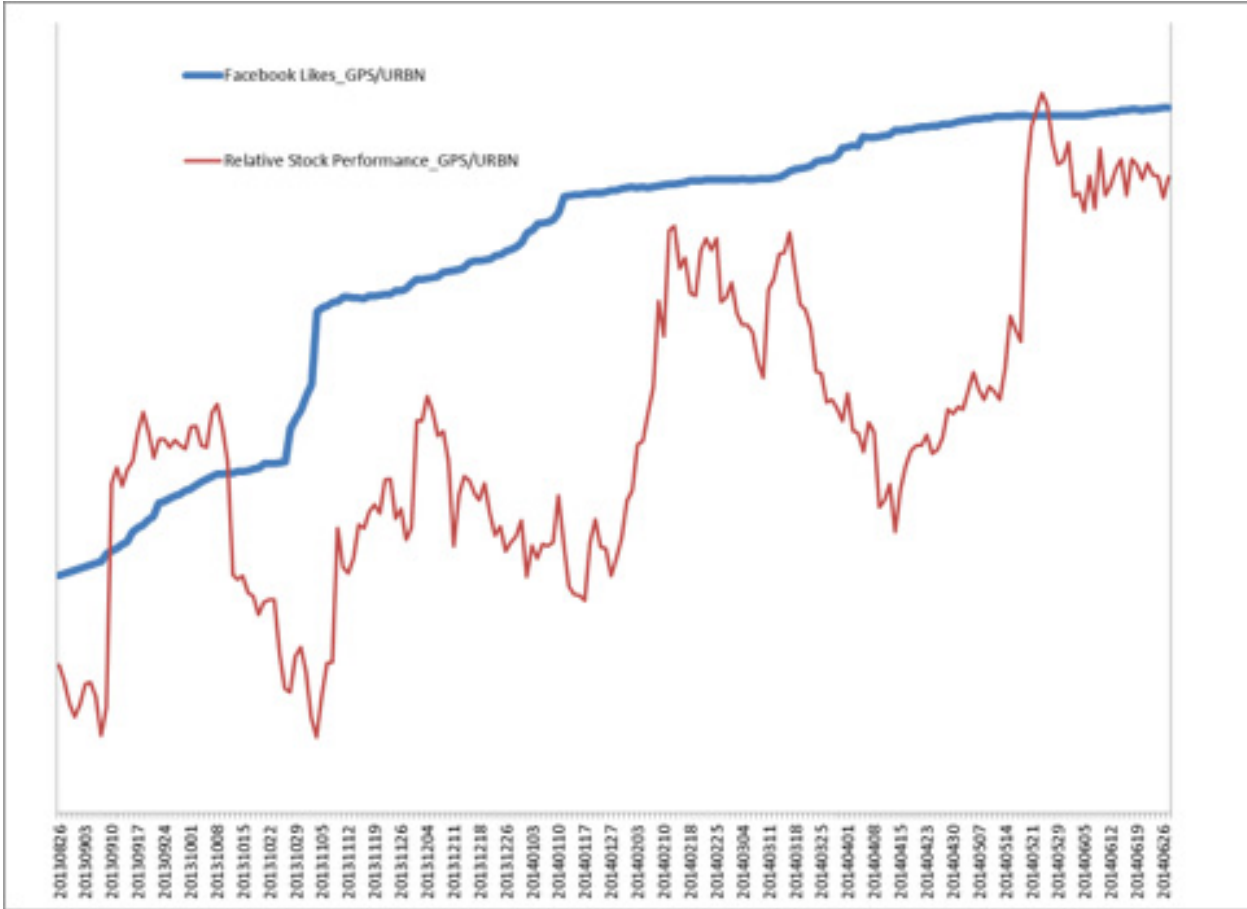
In the next example we compare two consumer products / clothing companies, Nike (\$NKE) and Ralph Lauren (\$RL). Nike fairly consistently outperforms in terms of Facebook Likes and likewise in relative stock performance.

Nike and Ralph Lauren, relative stock price and relative Facebook Likes



In another example, we look at two apparel retailers The Gap (\$GPS) and Urban Outfitters (\$URBN).

The Gap and Urban Outfitters, relative stock price and relative Facebook Likes



In this case, the relative performance of The Gap in terms of Facebook Likes is one of strong outperformance. Its pace is also fairly consistent. In contrast, The Gap’s stock outperforms but its outperformance is very volatile – making trading on such data still risky. On the other hand, using Facebook Likes as you would use fundamental data would have worked very well as it would have allowed for longer term analysis and provided better understanding of underlying trends.

Job Postings and Investment Analysis

Public companies regularly list their job openings (“Job Postings”) on-line. Such data has only become available on a market-wide scale recently. This data offers unique insights into a company’s plans as it provides a glimpse into management’s actual expectations concerning growth, among other metrics.

The basic rule-of-thumb for this metric is higher growth rates are more attractive than lower growth rates. This interpretation supposes companies with high and increasing Job Postings have more attractive growth plans. In contrast, a comparable company with fewer Job Postings or with a lower Job Postings growth rate can be seen as implying less confidence in the company’s prospects going forward.

Though rules-of-thumb work well for quick analysis, it is also important to utilize such metrics for better understanding as well.

In the following example, we look at the retail sector. Macy’s (\$M), Nordstrom (\$JWN), and Kohl’s (\$KSS) are three large department stores. Each serves slightly different market segments, but overall they sell similar items and are all well-known national brands.

Using the basic rule-of-thumb of higher Job Posting growth rates imply superior outlook works well in this case in that the companies with higher growth in Job Postings also produced better stock performance during the approximate year-long sample period.

	Job Posting Change	Stock Performance
M	47%	21%
JWN	7%	17%
KSS	-35%	3%

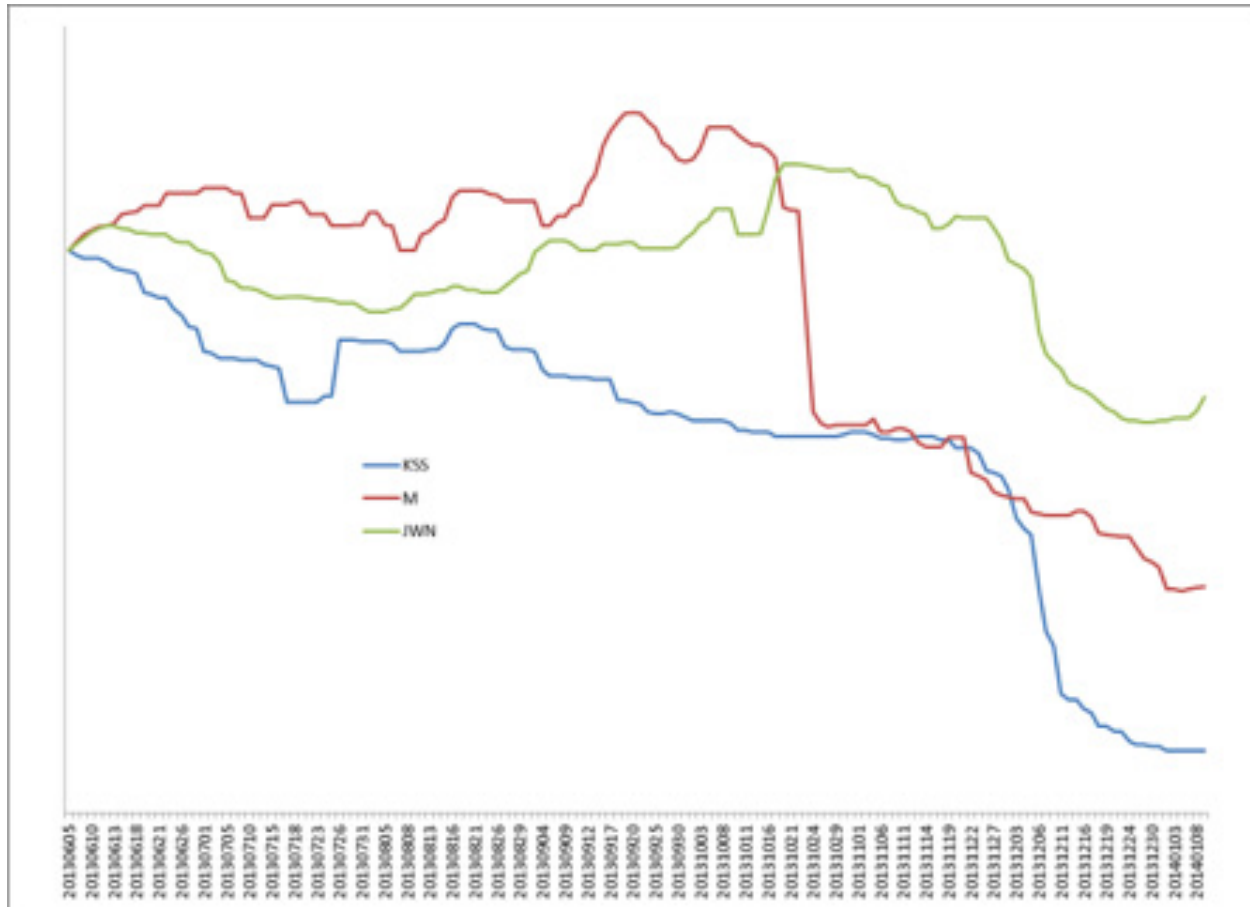
Macy’s had the highest growth rate in Job Postings, it also had the best performing stock. Kohl’s had the lowest (and negative) Job Postings growth rate and it returned the worst stock performance.

The same data can be used for improved understanding of the situation of the company and of the overall sector. Better understanding should on average result in better stock picking over time.

One of the first observations looking at the data more closely is that it appears very seasonal, which for department stores should be expected. Department stores tend to have a hiring push starting around July / August and generally going until very early December. The marginal increase

in general job postings for the sector is related to the expected increased foot traffic and sales for pre winter holiday season. After Thanksgiving, there is generally a sharp drop-off in Job Postings from department stores as the focus shifts from hiring to dealing with the spike of consumer traffic during December. The result is a steep decline in Job Postings in December.

Open Job Postings for Macy's (M), Nordstrom (JWN), and Kohl's (KSS)



Nordstrom's (JWN) trend of Job Postings appears fairly standard for the sector with a general increase in the Fall and then a dramatic drop-off post-Thanksgiving. Kohl's (KSS) appears to experience general malaise in hiring but its drop-off in postings has almost identical timing to that of Nordstrom.

The timing for Macy's (M) is different. Its seasonal decline occurs much sooner – so much so, that an analyst could see it as a red flag for the company. The analyst rightful could have asked, “why has the company’s postings declining so far ahead of its peers?”

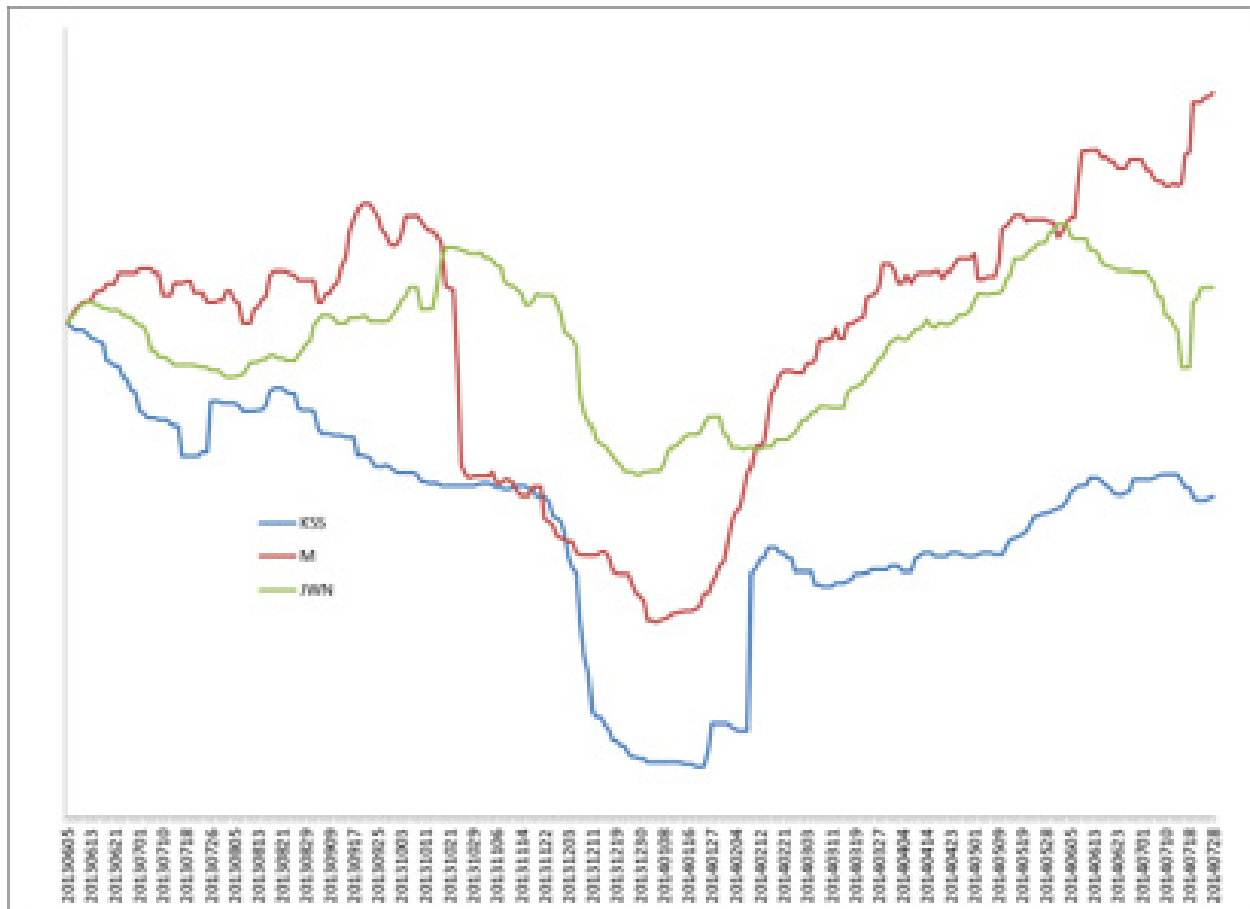
Macy's did in fact announce layoffs and store closings on January 9, 2014. It appears, judging from the trend of Job Postings, that company management made the decision for layoffs likely in October 2013, or a few months prior to the announcement. They certainly would not have wanted to make such an announcement before the biggest sales holiday of the year, so apparently waited

until early January to announce it.

In the interim, we can see the dramatic decline of Job Postings by Macy's. From an analyst's point of view, such data would have been a red flag – alerting him that something unusual was likely happening or about to happen. Such information at the very least would help him to direct more relevant questions to management and likely to improve his overall analysis of the situation.

Macy's announcement in January was a mix of positive and negative news. They did in fact announce store closings, but also announced plans to open other stores. The net result was positive for the company as they planned to shut down unprofitable stores while opening new ones in areas with more promise.

Open Job Postings for Macy's (M), Nordstrom (JWN), and Kohl's (KSS)



Job Postings rebounded sharply for the company as it prepared to expand. By February, Macy's Job Postings were growing dramatically. By the summer, Macy's was the only company in the sample having Job Postings higher than its 2013 peak.

Using Job Postings, an analyst would be better positioned to understand a company and sector, producing deeper insights. In this case, the analyst would have likely been able to identify an unusual decline in Job Postings for Macy's prior to the winter holiday season. Identifying such an abnormality he could have at least prepared more intelligent questions for management.

Conclusion

There are many new forms of data and analytical techniques available that are useful in equity analysis. To present, much of the focus of the market has been on NLP derived sentiment from social media used for very short-term trading. In contrast, this report covers new data and approaches more appropriate for multi-month holding periods.

Medium-term sentiment trends are shown to highlight directional trends of the underlying stock as well as to highlight extremes in the underlying price movement. This type of analysis is most useful for timing of multi-month entry/exit points.

Stock price mention level trends provide various insights regarding the directional trend of commentators' expectations, the magnitude of bullish/bearishness of commentators, and the implied holding period of the commentators (or in other words the type of investor dominating the discussion of the stock at that time). This information can be very useful in detecting underlying expectations for a stock. It compliments NLP-derived sentiment analysis as well as general technical analysis in determining timing of investments.

Facebook Likes, in a world where individuals regularly use social media to express their opinions (such as general support or interest), work well in comparative peer-based analysis of companies. Assuming that Facebook Likes of a company and/or of its brand are indicative of the company's future economic performance, we can also assume that Facebook Likes is a relevant fundamental indicator. Peer companies with superior relative Facebook Likes tend to also have better performing stocks over time. Facebook Likes would tend to improve fundamental analysis and improve an investor's understanding of the company's prospects.

Job postings is an exciting new variable that provides hereunto unknown insights. Analysts can, among other things, identify a company's growth prospects, potential for layoffs, as well as the potential for changes in strategic plans (that are yet to be officially announced). On a sector basis, comparative job posting analysis offers unique insights into fundamental analysis of company prospects.

The general conclusion is that new data and analytical techniques are very useful in medium term or multi-month to a year holding period equity analysis. They offer unique additions to technical analysis that provide insights into timing of investments. Additionally, they help fundamental analysts better understand the overall state of the company. In conjunction with already established equity analysis data and tools, these new additions will help to augment the quality and depth of equity analysis.

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