

What Do We Learn from a Machine Understanding News Content? Stock Market Reaction to Financial and ESG News*

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With the advances in natural language processing algorithms, it is now possible to extract relevant content from a large volume of textual data available in financial markets. Thanks to a partnership between Causality Link, Toulouse School of Economics and Amundi, we are able to study firms' fundamental information from news on a large scale. Indeed, the Causality Link Artificial Intelligence system can collect and analyze textual data from different sources including news stories, call transcripts, broker research, etc. This enables us to build an aggregate news signal that captures not only the positive or negative tone of news but also how popular such news is in the market on a given day. In our study (Brière et al. (2022)), we first explore the informational content of aggregate news signal. We then investigate how and when new fundamental information is incorporated into prices. Finally, we explore the possible heterogeneity of such price reactions across various firm and news characteristics: financial versus ESG news, tense of news (past, present, future), horizon of the news (short versus long), and firm size.

Given a news statement about a particular firm, the AI platform of Causality Link is able to identify the firm name, the associated Key Performance Indicator (KPI), the direction of change in this KPI and the tense of the statement. Below is an example of how these contents are extracted from a news statement:

“Despite the slowdown, both Google and Windows devices saw K-12 unit growth during the *fourth quarter*, while *Apple's iPad volumes declined year-over-year.*” (USA TODAY, at 11:30:00 PM March 25, 2018)

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From this sentence, the system identifies *Apple* as the company, associated with the KPI *transaction volume*. It also detects a *decrease* in Apple’s transaction (or sales) volume. As this KPI is positively related to the firm’s shareholder value, a decrease in its value is considered as bad news for Apple. Notably, the statement was made on March 25, 2018 but concerns the fourth quarter of the previous year. It is thus recognized as a movement in KPI that took place 83 days in the past. Similarly, for the same sentence, the system also identifies the company *Google* and the concerned KPI *unit growth*.

Our methodology is based on an aggregate news signal. Every day and for each listed firm in the US, we count the numbers of good and bad news statements either across all KPIs or a group of KPIs. We then construct a news signal that captures the proportion of good news relative to all news about that firm on the market. For each trading day, we sort all stocks according to their signal. We construct a long portfolio consisting of stocks whose aggregate signals are above the 90th percentile (firms experiencing good news) and a short portfolio consisting of stocks whose aggregate signals are below the 10th percentile (firms with bad news). Looking at the returns on such portfolios around the news publication days allows us to test the informational content of the aggregate signal and measure how news is incorporated into prices. We apply the same procedure on different subsets of data to study the influence of the various firm and news characteristics indicated above.

Our results are as follows. *First*, we show that the Artificial Intelligence platform of Causality Link is able to capture news content. On the day when news related to a particular firm become available on the market (day 0), we observe an average portfolio return of 1.29% (significant) for the long portfolio and of -0.98% (significant) for the short portfolio. This corresponds to an abnormal return (three-factor alpha) of 2.26% (significant) for the long-short strategy. After excluding news directly related to stock prices from the sample, we still document significant market reactions to fundamental news and alphas, although of smaller magnitudes.

Second, consistent with previous studies, we find evidence of return predictability for short horizons. The long portfolio generates 0.11% returns (significant) on day 1. Although the short portfolio experiences an average negative return of -0.07% (insignificant), the abnormal returns on day 1 for the long-short strategy is 0.18% and is statistically significant. This result suggests that it is possible to build a profitable long-short strategy that is based on the aggregate news signals albeit one needs to check that transaction costs do not erase these abnormal returns.

Third, we find positive and significant stock price reactions around day 0 to both good and bad news regarding environmental, social and corporate governance (ESG) issues. However, the magnitudes of such market reactions are much smaller compared to the ones of financial news. The surprising positive market reactions may be driven by investors’ preference for firms’ disclosure of ESG information, being good or bad.

Fourth, we document market reactions to news about the past, the present

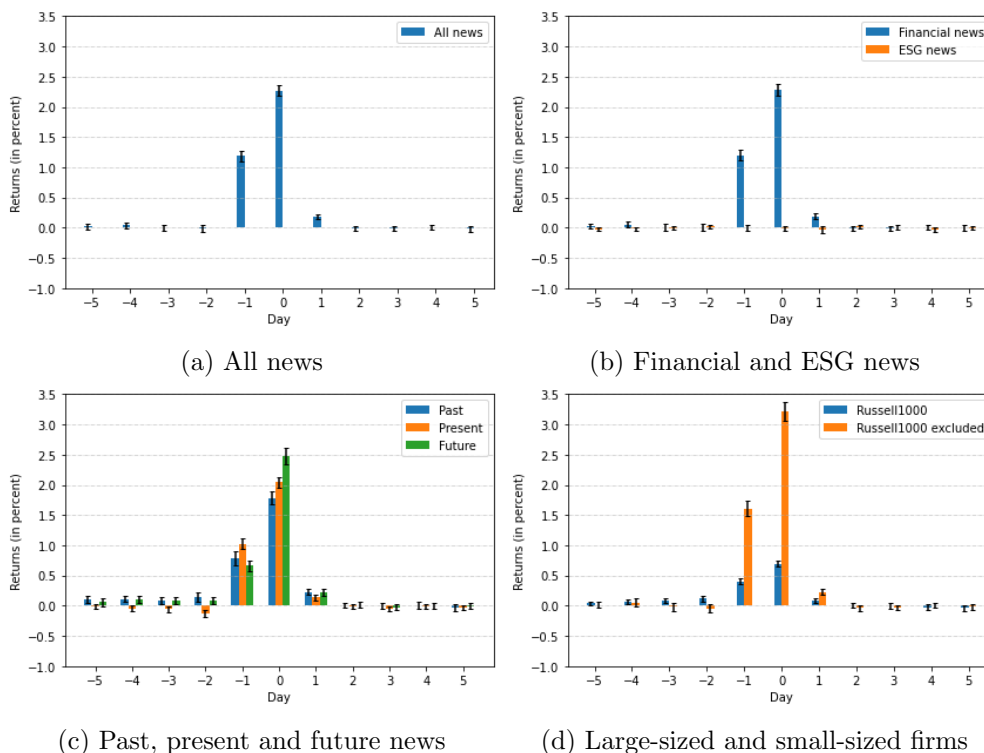
and the future at day 0. The magnitudes of such market reactions are the largest for news about the future: 2.45% abnormal returns on day 0 compared to 2.03% and 1.77% for news about the present and the past, respectively. This result is consistent with our expectation that news about the past or the present are more likely to be anticipated before the publication day. We also show that the market reaction to short-term future news is much larger than the market reaction to long-term future news.

Fifth, the magnitudes of market reaction to news also depends on firm size. Specifically, we show that a long-short strategy based on the universe of firms with large market capitalization generates positive and significant abnormal returns on day 0 of 0.69%. This is of much smaller magnitude than the abnormal return of 3.19% obtained on news regarding the rest of the market. The long-short strategy based on micro-cap firms and penny stocks gives day 0 returns of even larger magnitudes (5.96% and 6.54%, respectively). Information regarding smaller firms is less readily available as these firms tend to have less analyst coverage. This could explain why news are less anticipated by the market and thus have a larger impact on prices. Another possible explanation is that, for small firms, an information that makes it to the news is likely to be an important news, because these stocks are less the subject of attention.

Our analysis has two distinguishing features compared to previous studies (see, for example, Tetlock (2007), Tetlock et al. (2008), Loughran and McDonald (2011), Jegadeesh and Wu (2013), etc.). Instead of considering only one source of information at a time, we rely on the Causality Link Artificial Intelligence platform that enables us to aggregate daily news across different sources of information available in financial markets (news stories, broker reports, call transcripts, etc.). The advantage of an aggregate signal is that it can measure not only the positivity/negativity of the news content in a given document but also that it can capture how widespread such content is in the marketplace. We show that our signal is informative about firm-specific aspects and that a long-short strategy produces positive and significant abnormal returns one day after the publication date. Second, another valuable characteristic of the Causality Link platform is that it is able to identify the tense of the news (whether the news release concerns something happening in the past, present or future), a feature never been investigated before.

While our aggregate news signals appears useful to predict short-term stock price movements, further work is still needed to study whether a trading strategy could generate profits after taking into account transaction costs. Moreover, it could be interesting to study the informativeness of the various types of news (news stories, call transcripts, broker research, etc.) and the strength of the signal they generate.

Return on the long-short strategy



The bar charts present the average returns of the Long - Short strategy for the period $[-5, +5]$ days around the portfolio construction days, on the sample of all news (subplot (a)), the sub-samples of financial news and ESG news (subplot(b)), of past, present and future news (subplot (c)) and news regarding stocks that belong and do not belong to the Russell 1000 index (subplot (d)). The y-axis is in percentage points. The error bars are the 95% confidence interval computed using standard errors adjusted for auto-correlation in portfolio returns.

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