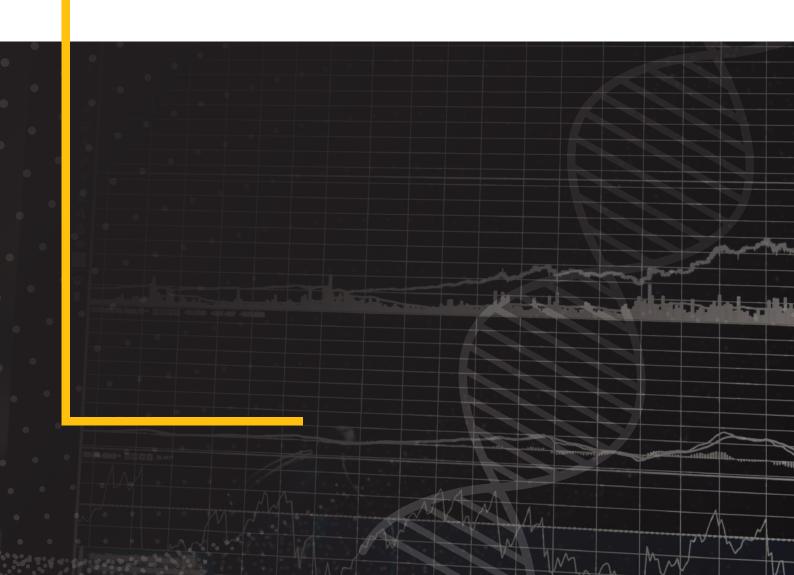# Clinical Trial-related News Shows Correlation with High Return Events on the Stock Exchange for Pharmaceutical & Biotechnology Companies

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INTRODUCTION

The cost to develop a new drug can reach as much as $2.6 billion[1], however the success and failure of particularly late-stage clinical studies can significantly impact any publicly-listed organization's stock movement, both positively and adversely.

Only 9.6 to 13.8% of all drug development programs progress to final FDA approval[2]. Unsurprisingly, Phase II and Phase III trials experience the lowest average approval rate across indications[3].

A deep understanding of the probability of success (POS) of a clinical trial plays a considerable role in the economic and scientific decision-making process of clinical researchers and, potentially, even the likelihood of participation of biopharmaceutical investors. Drug development, by definition, is a risky endeavor and there is no guarantee of a strong return on investment (ROI).

Innoplexus is attempting to provide value to life science investors, venture capitalists, and pharma companies by developing a robust Clinical Trial Prediction [CTP] engine that can predict clinical trials [CT] outcomes and help optimize CT operations. The CTP engine is built over the world's largest research graph in life sciences. As cited in Medium[4]: *"Although ontologies are generally regarded as smaller collections of assertions that are hand-curated, usually for solving a domain-specific problem. By comparison, knowledge graphs can include literally billions of assertions, just as often domain-specific as they are cross-domain."*[4]

By using such tools, one can potentially minimize risks and enhance the likelihood of success, by leveraging the sophisticated predictive modeling approaches with rich and relevant data inputs. Specifically, the CTP engine was developed in an effort to assist both pharmaceutical and biotechnology organizations, as well as their potential investors. The tool can expedite meaningful comparisons of thousands of relevant clinical studies and estimate the probability of a clinical trial achieving its set endpoints.

HYPOTHESES

This white paper examines the impact of company-specific news releases on the NYSE and NASDAQ stock price of publicly-traded pharmaceutical and biotechnology companies. In particular, it explores the feasibility and possible application of the CTP engine as an early indicator for future stock price movements within the pharma and biotech sector.

To explore the potential of the CTP engine within these sectors, Innoplexus investigated a broad range of industry sectors to ascertain which displayed the most daily high returns in stock movement, determine any linkage or relationship between the news announcements and such high returns, and whether the announcement of any clinical trial study developments also play a significant role in high returns movement.

High return events are defined as those exhibiting daily returns exceeding 25% with a minimum closing price of $1.00. The latter helped minimize the impact of frequent large movements generated by smaller "penny stocks". Further, if a stock produced high returns on consecutive days, we only considered the first day as a high return event as the ongoing, multi-day impact may have been triggered by the single event.

Innoplexus tested three hypotheses:

1 How does the frequency of high return events in the pharmaceutical and biotechnology sectors, compare to those of other industry sectors on the stock exchange.

2 Clinical trial-related news yields the largest number of high return events in the pharmaceutical and biotechnology sectors compared to other categories of news.

3 The average value of all high return events due to clinical trial-related news is higher than that of other categories of news.

APPROACH

Innoplexus conducted research on cross industry, high return events across 6,335 NASDAQ and NYSE listed stocks during the period between January 1, 2014 to June 30, 2019.

After performing a sector-agnostic, high return data analysis, a total of 7,084 instances were observed. Those instances were then categorized by industry sectors in order to compare the frequency of high return events and ascertain whether any cross-industry differences existed.

To better understand which news articles and press releases appear to impact high return events in the pharmaceutical and biotechnology sectors, we proceeded to collate and review over 107,000 news articles and press releases corresponding to all companies between January 1, 2014 until June 30, 2019. We categorized the news events based on typical news-generating activities within the pharma and biotech space. For example: clinical trial-related, strategic partnerships, financial and/or performance results, legal and management-related (Figure 1).
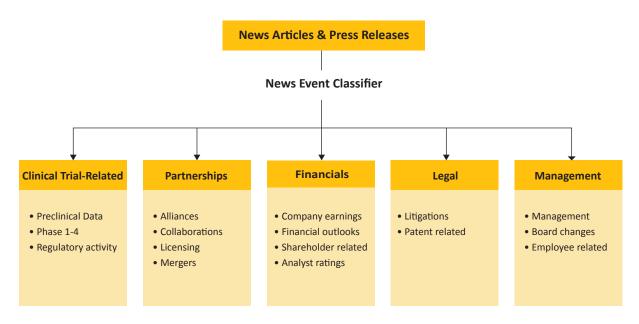
News Articles & Press Releases

News Event Classifier

Clinical Trial-Related	Partnerships	Financials	Legal	Management
• Preclinical Data • Phase 1-4 • Regulatory activity	• Alliances • Collaborations • Licensing • Mergers	• Company earnings • Financial outlooks • Shareholder related • Analyst ratings	• Litigations • Patent related	• Management • Board changes • Employee related

Figure 1

APPROACH

We used multiclass neural network models developed in-house, and quickly determined that Long Short Term Memory (LSTM) models are superior for text classification. This model permitted classification of the news articles into categories, which, in turn, helped us to distinguish between useful and irrelevant news articles.

The events were normalized based on the company name and news category over a 2-3 day time period. These steps were conducted to accurately assign specific news release categories to specific high return events, and minimize the chances of a specific news release being attributed incorrectly to any given high return event.

Approximately, 80,700 unique news events were identified. Two-thirds of identified high returns were 'mapped' or linked to the release of specific news articles. To further expand the accuracy of linkage to high return events, Innoplexus also manually searched for press releases postings of these relevant companies that were solely published on their company websites. Introduction of this additional process of mapping of high return events to company-specific news and press releases increased the correlation from two-thirds to 87%.

Next, we built a database of US-traded pharmaceutical and biotechnology companies trading in either one or both of the two mentioned US stock exchanges. The selection was limited only to companies actively engaged in performing clinical trials. After pooling and curating the data from the exchanges, we identified 827 pharmaceutical and biotechnology companies conducting clinical trials. From a total of 827 companies, 552 produced high returns, amounting to a total of 1,954 events in the period between January 1, 2014 and June 30, 2019.

FINDINGS

High Return Events per Sector

7,084 instances of high returns were observed across all market sectors from January 1, 2014 through June 30, 2019. Healthcare emerged as the leading sector with the highest number — 2,884 — or 40.7% of high return events; followed by the technology sector, other healthcare (non-pharma/biotech), and industrials.

The healthcare category originally included organizations such as hospitals, pharmacy chains, medical supply companies, etc.. We subsequently removed these from our analysis. It was determined that 1,954 instances or 27.6% of high event returns were attributable to only the pharmaceutical and biotechnology sectors - representing just over one quarter of all such events across the Jan 1, 2014 to June 2019 timeframe, (Figure 2).
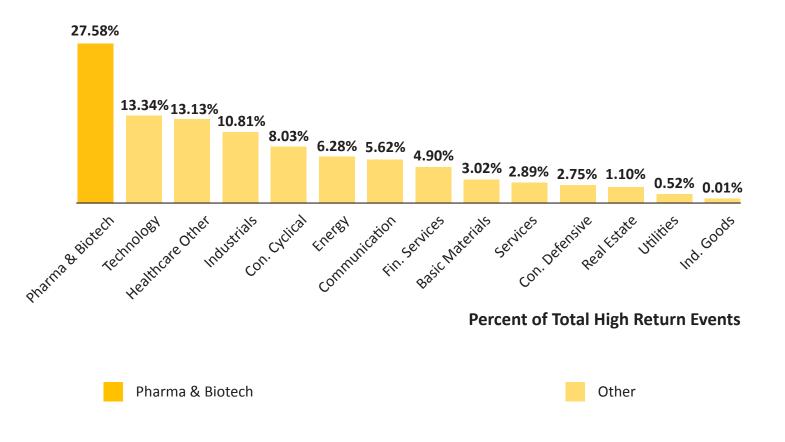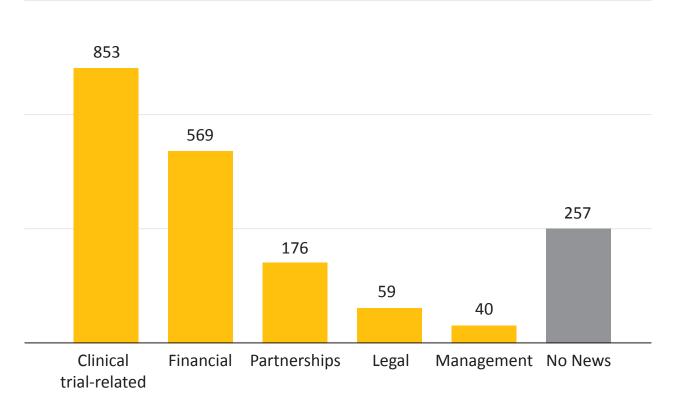

Percent of Total High Return Events

Pharma & Biotech   Other

Figure 2

High Returns Per News Category In The Pharma Sub-Sector

Our extensive analysis of the different news categories that positively mapped to high return events indicated that clinical trial-related news correlated most frequently with high return events: 853 or 44% of 1,954 identified events, with a further 569 or 29%, attributed to company news releases of a financial nature, (Figure 3).

Of all high return events in the pharma sector, no discernible news story was detected with 257 or 13% of the high return events. Perhaps not surprisingly, the vast majority of these, 197 of 257, corresponded to companies with low market cap values, i.e. below USD 100 Million, and potentially experienced fewer high returns at this stage of growth.
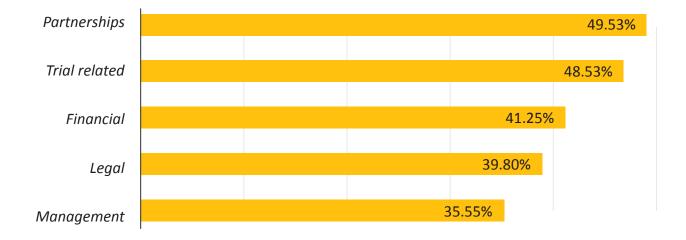

High Returns Per News Category

Figure 3

FINDINGS

Average of Absolute Returns Per News Category In The Pharma Sector

The average price move of high return events per news category was then calculated as the sum of all absolute high return price moves divided by the number of high return events. Partnership-related events produced the highest average of absolute high event returns with 49.53%, and clinical trial-related news in second place with 48.53%,(Figure 4).

Although the number of clinical trial-related high return events was highest of all categories, the average of the absolute returns was marginally below that of the "partnership" news category.

Category	Percent
Partnerships	49.53%
Trial related	48.53%
Financial	41.25%
Legal	39.80%
Management	35.55%

Percent of average of absolute returns

Figure 4

CONCLUSION

I. Amongst fourteen different industry sectors researched, the pharmaceutical and biotechnology sector secured first place with the highest number of high return events on the stock exchange with 27.58% of the 7,084 total events identified. In fact, it experienced more than double the amount observed by the second placed technology sector with 13.34%. Our findings revealed a higher than expected level of high return events associated with publicly listed pharmaceutical and biotechnology companies. In fact, these ranked the highest of all industry sectors investigated. Additional research will determine the level of statistical significance between the pharmaceutical and biotechnology sector and others researched.

II. A significant majority of the pharma/biotech sector high return events were attributable to company-specific, clinical trial-related news releases — 853 of 1,954. In fact, clinical trial-related news produced more high return events than all other news categories combined together.

III. Clinical trial-related news also generates the second highest average of absolute returns events within the pharma & biotech sector with an average of 48.53%, marginally behind the company-specific, partnership-related news with 49.53%.

SUMMARY

Clinical trial-related news clearly plays a vital role in stock exchange performance for all publicly listed pharmaceutical and biotechnology companies. In fact, of all the various news categories that companies release, this category generates the most stock exchange high return events than any other. In fact, more than all other categories combined. This sector also experiences more high event returns than 13 other sectors included in this study. Finally, clinical trial-related news and strategic partnership-news generated the highest average of absolute returns measured.

It is apparent that ensuring clinical trial optimization for its design and execution is vital for any pharmaceutical or biotechnology organization's ongoing positive performance on the stock exchange, and more importantly increasing the chances of garnering the right attention from potential investors.

Innoplexus plans further analysis of the research data generated and plan to release a subsequent volume with further detailed analysis in the near future.

Please reserve a copy which will be sent to you upon release: info@innoplexus.com.

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