Alternative Data:
Applications & Case Studies

Version 2

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enquiries@eaglealpha.com

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enquiries@eaglealpha.com

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enquiries@eaglealpha.com

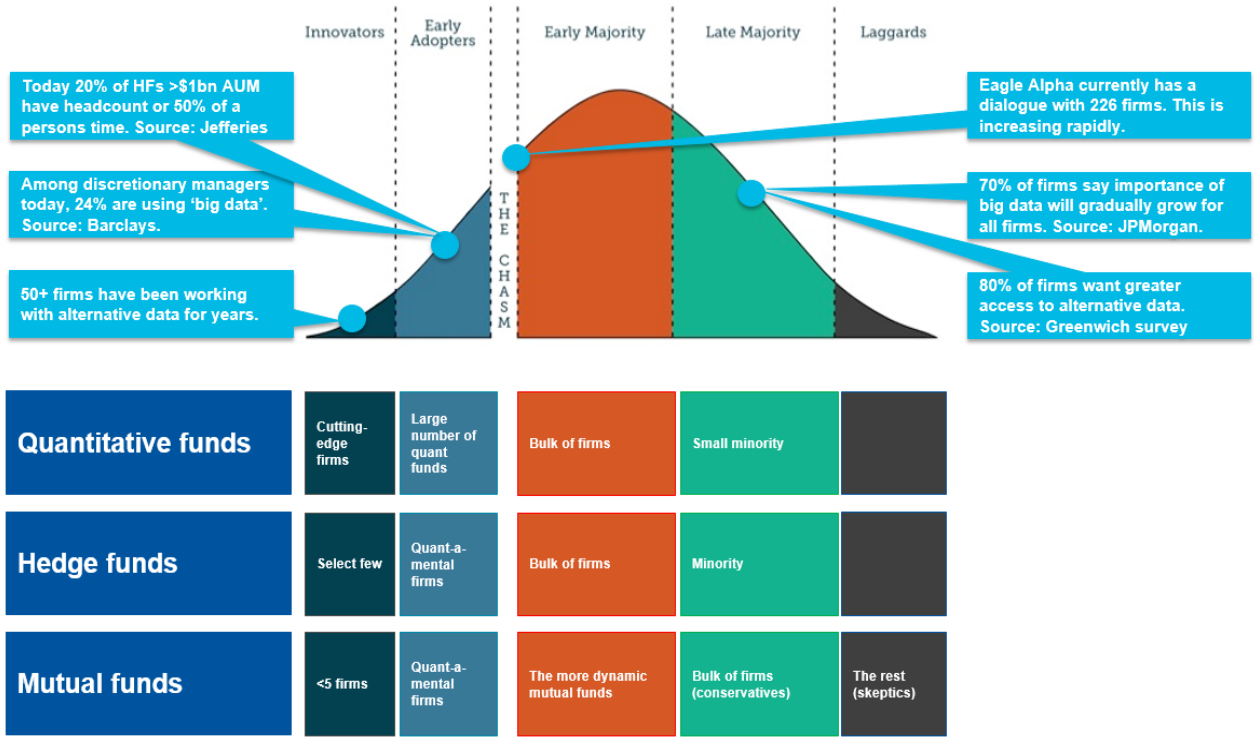
Section 1: Introduction

Like expert networks in the late 1990s, alternative data may revolutionize the investment process. This is evidenced by a JPMorgan survey of 237 investors at its quant conference in May 2017. It asked "what is your opinion of big data / machine learning"? 22% of respondents said "Revolution - will lead to rapid changes to investment landscape" and 70% of respondents said "Evolution - it's importance will gradually grow for all investors".

Alternative data is not new. 50+ innovative asset management firms have been working with alternative data for several years. These firms are primarily the larger quantitative or 'quantamental' firms. Jefferies, in its June 2017 white paper, stated that 20% of hedge funds with over $1bn in AUM have a person dedicated to alternative data or a person is spending 50% of their time on alternative data. In our opinion, there are currently 150-200 firms in the early adoption phase – see Figure 1.

Adoption is increasing rapidly in 2017. At the beginning of 2017, Eagle Alpha had dialogue with approximately 125 firms. As of September 2017 the number is 226 and increasing rapidly. In our opinion asset managers will 'cross the chasm' of Alternative Data Adoption by the end of 2018 – see Figure 1.

Figure 1: Alternative Data Adoption

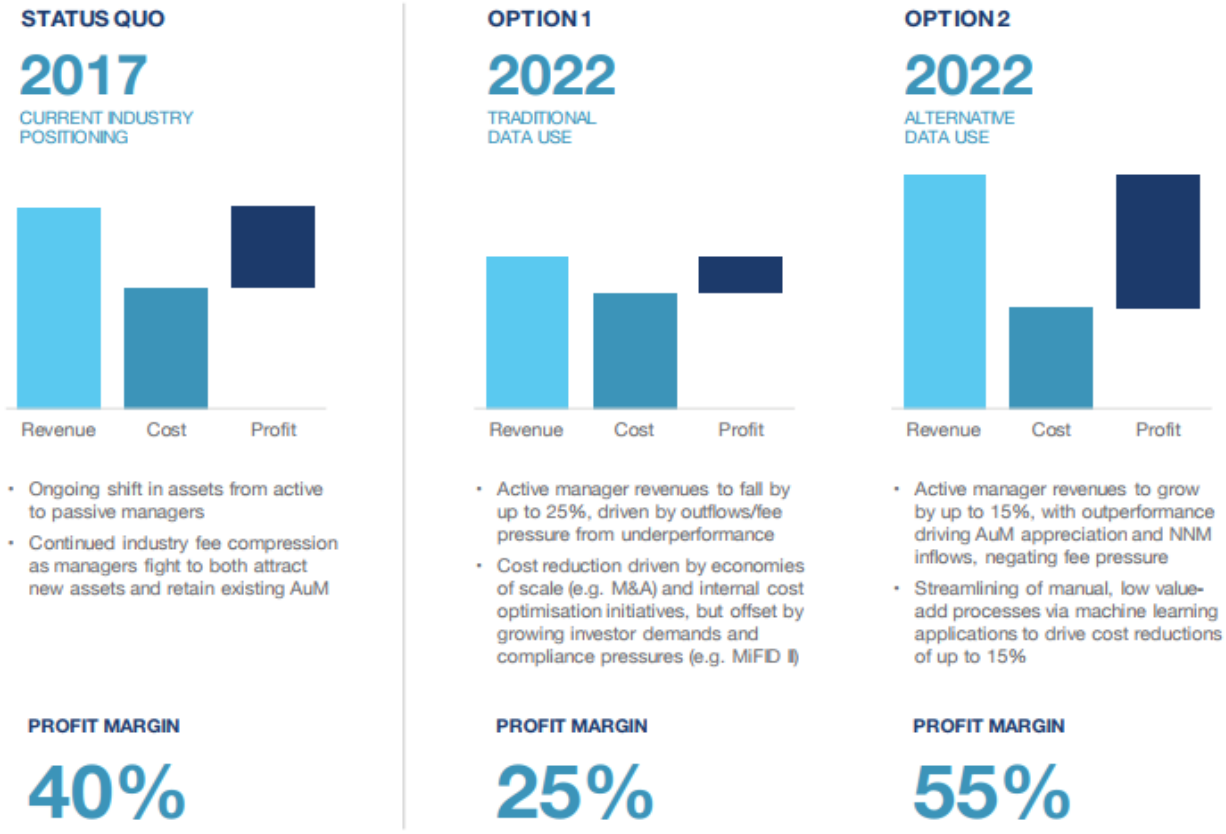


Source: Geoffrey Moore 'Crossing the Chasm', Eagle Alpha

enquiries@eaglealpha.com

A reason for the increased adoption is that active managers are realising that they have to innovate in order to protect (or increase) their profit margin. As Quinlan & Associates[1] stated "given ongoing revenue and cost headwinds, we see active managers who continue to operate under traditional business models stand to see their profit margins compressed from an industry average of 40% at present to 25% by 2022". See Figure 2.

Figure 2: Alternative Data to Drive Active Manager Profits



Source: Quinlan & Associates

Firms that are still not on the adoption curve ("on the fence") constantly ask Eagle Alpha how alternative data can be applied to their investment process. The goal of this report is to answer that question based on our five years of experience in the alternative data space and by aggregating insightful content from third parties e.g. investment banks and data vendors. This report is the second of a series of reports published by Eagle Alpha which outline alternative data applications and case studies. We welcome all comments, suggestions and ideas to improve the next version of these reports.

[1] Source: 'Alternative Alpha: Unlocking Hidden Value in the Everyday', September 2017

In Section 2 we address a question which we are commonly asked: is there any alpha in alternative datasets?

In Section 3 we outline applications for:

- Each of the 24 categories of alternative data.
- Equity, macro and credit asset classes.
- Quantitative funds, discretionary hedge funds and traditional mutual funds.

In Section 4 we provide 20 case studies. Each case study is classified by asset class, alternative data category and type of asset manager.

In Section 5 we provide a brief overview of Eagle Alpha.

In Section 6 we discuss how asset managers source datasets and outline how Eagle Alpha can help.

In Section 7 we detail our upcoming event that will showcase 50 of the highest quality datasets that we are aware of today.

Section 2: Is There Alpha In Alternative Data?

Despite alternative data being in its infancy, we find clients already asking us about the erosion of alpha in these datasets and we wish to address this briefly.

One example of alpha erosion that is often cited is the use of credit card data to predict quarterly revenues. However, analysis of quarterly results for S&P 500 retailers doesn't support this assertion. The average error for consensus estimates on these retail stocks, although still low at 1.5% over the four quarters to Q2 2017, has actually increased slightly in recent times and was above the five-year average of 1.4% in Q2 2017. Likewise, the average one day stock move on the day of earnings results has been increasing. The average earning-announcements-day move was 6.9% in the four quarters to Q2 2017 compared to an average of 5.7% in the preceding five years. We see no evidence that the increased use of credit card data to predict retail revenues in the US is eroding the alpha opportunity around quarterly revenues.

The assertion that the alpha in alternative data is being eroded also fails to recognize the fact that everyone has a different definition of alpha, depending on their investment horizon and investment style. Quantitative funds might use consumer transaction data to build a trading strategy across over 100 stocks, a discretionary hedge fund could use the same data to make calls on a small number of stocks around earnings. A mutual fund could use the same consumer transaction to better understand the fundamentals and competitive dynamics in a sub-sector, analyzing factors such as average basket size, frequency of shopping and customer switching.

There are a number of reasons why we believe the alpha opportunities in alternative data are at the very early stage of being realized:

<u>Current adoption lags traditional datasets</u>

- Alpha is still being found in traditional datasets, such as price data, despite being much more widely available and used than non-traditional datasets!
- Today only a small number (150) of asset management firms worldwide are working with alternative data. It will be a few years before thousands of asset management firms are working with alternative data and usage becomes widespread.
- Of these 150 firms, only a small percentage have licensed more than 30 datasets. Today there are 515 datasets in Eagle Alpha's database.

Alternative datasets are richer than traditional datasets

- Some datasets are very deep, involving hundreds of variables and dimensions. Because of this depth, advanced data science knowledge can provide an informational edge.
- The amount of new alternative data is increasing. In the future, there will be thousands of alternative datasets spread across categories, asset classes and geographies. Existing datasets are constantly adding enhancements and coverage. More data results in more opportunities for information extraction.
- Increasing complexity of algorithms allows for better extraction of patterns from previously unusable, unstructured data, such as text and imagery.

Barriers to entry are higher for alternative datasets

- Alternative datasets have a higher technological and statistical requirements for extracting alpha. Differences in the ability to extract and interpret information from alternative data sources will result in inefficient discounting of new information. Asset managers staffed with individuals well versed in statistical concepts will have a better prospect of identifying alpha in the data. Differentiation in data providers' capabilities will result in alpha generating opportunities as some sources will provide signals that are more accurate than others.
- Many firms work with raw data as opposed to partially pre-processed data data so that proprietary data processing practices and algorithms can be applied to alternative datasets.
- Multiple datasets may be required to answer a single question, giving an advantage to companies that hold multiple datasets and have an efficient way to manage and merge the datasets.
- Alternative datasets can be more expensive than traditional datasets, presenting another entry barrier to smaller investment firms.

Finally, for discretionary investors, data is only as valuable as the questions asked of it. Investors who have unique angles in their fundamental analysis will seek answers to questions that other investors have not thought of asking. For example, web crawled data may be aggregated and analyzed with the intention of understanding barriers to entry for certain services and products.

Section 3: Applications

Section 3.1: Introduction

In this section we outline the benefits of using alternative data, applications relevant to different categories of alternative data, asset classes (equity, macro and credit) and types of asset managers (quantitative funds, discretionary hedge funds and traditional mutual funds).

Quinlan & Associates[2] published a good summary of the benefits of integrating alternative data into an investment process. They identify five benefits: 1) greater volume of data and information; 2) unforseen insight; 3) competitive edge; 4) fiduciary duty; and 5) efficiency. See Figure 3 below.

Figure 3: Benefits of Integrating Alternative Data into An Investment Process

	Alternative Data	Traditional Data	Description
Greater Volume of Data and Information	• Frequently updated • Shorter history • Wide breadth	• Sparsely updated • Longer history • Narrow breadth	• Large amounts of data are being generated constantly, leading to more available information for better analysis • Frequent updates mean asset managers can carry out analysis sooner, enhancing portfolio construction
Unforeseen Insight	• Wide breadth • Profound implications to multiple assets, or even industries	• Narrow breadth • Only provides particular information, normally only directly relevant to few assets	• New data provides information on more than just financial performance, leading to better trend and performance predictions • Discovery of hidden relationships can help devise investment strategies
Competitive Edge	• Requires investments and capabilities	• Available to all • Analysis can be conducted relatively easily	• Talent and technologies are needed to gain value from alternative data, giving asset managers with the right resources higher alpha-generation
Fiduciary Duty	• Make use of available information and data	• Make use of financial data and few conversations only	• Asset managers are in charge of making optimal decisions for clients, and hence should incorporate as much data and analysis as possible into the investment process
Efficiency	• Rapid and efficient research and analysis • Wide coverage	• Highly manual research and analysis • Narrow coverage	• Alternative data provides insight to multiple assets, and can replace certain aspects of the current research process • Research analysts can spend longer time on better modelling or investment strategies

Enhance alpha-generation

Source: Quinlan & Associates

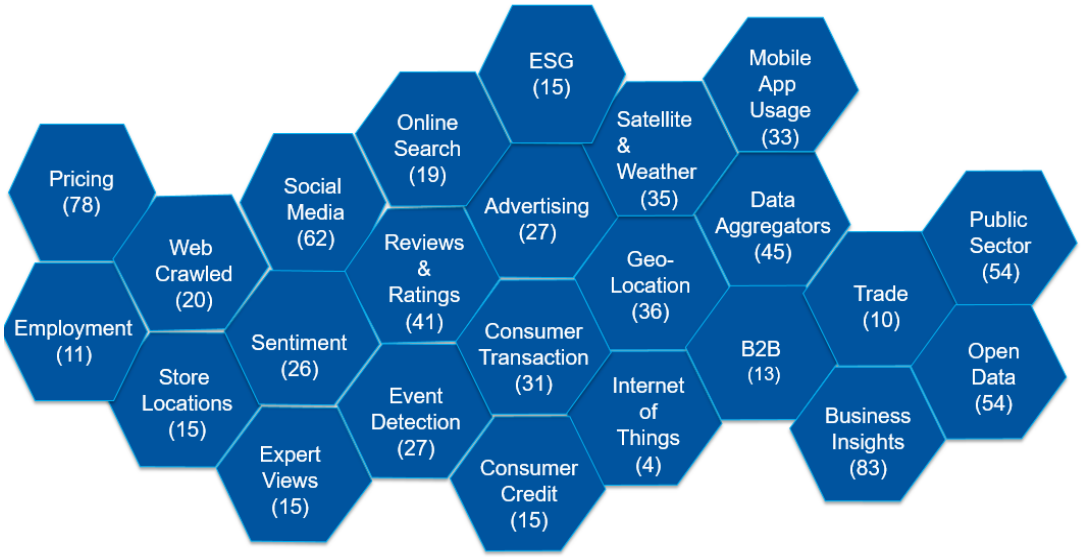
[2] Source: '[Alternative Alpha: Unlocking Hidden Value in the Everyday]', September 2017

Section 3.2: Applications by Category of Alternative Data

Eagle Alpha created the first taxonomy for alternative data. This taxonomy has 24 categories – see Figure 4. The most common categories, based on our dialogue and analytics, include consumer transaction, geo-location, satellite and sentiment. Today there are 515 datasets in our database.

Access to detailed profiles on these datasets and insights into the most (and least) common datasets, based on our dialogue and analytics, are available to clients of Eagle Alpha's Data Sourcing solution (see Section 6).

Figure 4: Eagle Alpha's 24 Categories of Alternative Data



Source: Eagle Alpha

Below we highlight a number of examples of applications for each of the 24 categories of alternative data. These examples are based on our discussion with asset managers since 2012.

1. Advertising: advertising data can be used to track category popularity e.g. luxury products and financial products such as mortgages, automobiles, cybersecurity etc. Advertising data exchanges have data on consumer interests over time based on their internet browsing habits. Very few investors have worked with this data and its predictive potential is largely unexplored. Data aggregators track corporate advertising spending on various platforms and by campaign.

2. App Usage & Web Traffic: mobile app usage can indicate the level of product adoption. Mobile banking, smart home devices, and restaurant apps are just a few of the potential use cases. Trends in mobile app reviews can help investors evaluate product success.

Country specific data can provide insights into product adoption internationally. Investors can also track services embedded in apps such as payment providers and advertising services. Web browsing traffic, both online and mobile, can be used to estimate company revenues, particularly if the web pages providing purchase confirmations are tracked.

Please refer to the case study #14 on page 59.

3. B2B: a variety of data aggregators offer datasets about enterprise products and B2B commerce. Some of these datasets are relevant for a range of industries, such as ones that monitor enterprise level internet browsing activity, Alibaba's B2B trade index and enterprise survey providers. Other datasets provide niche information, such as databases of industrial materials and databases of oil contracts and drilling concessions.

4. Business Insights: certain datasets can provide unique insights into corporate activity. For example, by monitoring changes on corporate websites, new or discontinued services and mid-level management changes can be tracked. Other datasets provide insights into corporate credit quality. Datasets that detail acquisitions and startups at the industry and sub-industry level can yield insights into industry dynamics.

5. Consumer Credit: marketplace lending data is frequently updated daily, showing amount of loan issuance, loan pricing, borrower credit quality and defaults levels. Other data providers track consumer credit quality overall in specific countries. This data, which is typically more timely than other sources, can be used for determining momentum and inflection points in the consumer credit cycle.

6. Consumer Transactions: this data can come from a variety of sources and can provide merchant level transaction data (e.g. retailer, airline, service provider), product level purchase data (e.g. beverages and automobiles) and macro level data. Some data sources, such as credit card transaction data, represent a large user base. Other data sources involve smaller panels, such as 2% of consumers, yet still provide reliable signals.

Consumer transaction data is frequently used to indicate quarterly revenue growth as the data is available before quarterly corporate earnings are released. However, as noted in Section 2, consumer transaction data can also be used by long-term investors e.g. to evaluate online/offline shopping habits, product success, brand stability, stage of product adoption, demographics of customer base, and the temporal impacts of promotional campaigns. In addition, payment processing data, such as usage of PayPal and Square, is frequently identifiable in consumer transaction data.

In October 2017 Eagle Alpha will release its first (quasi) proprietary consumer transaction dataset. It is based on credit card data of a data partner.

Please refer to case studies #2 (page 29), #3 (page 31), #4 (page 33), #5 (page 35) and #11 (page 49).

7. Data Aggregators: technological innovation has allowed aggregators to collect data from disparate sources, and aggregate that data in a format that is helpful for asset managers. Aggregators may mine the deep web or carry out timely analysis of government filings and releases. Other aggregators operate exchanges, or platforms, where datasets may be purchased.

8. Employment: listings of job postings can be used to evaluate corporate strategy and direction, industry growth rates, and demand for specific skills. For example, is the demand for candidates with experience in Tableau, or Google AdWords, growing or plateauing? Another example of an application would involve examining which countries enterprise software companies are hiring business development personnel for.

Please refer to case study #1 (page 27).

9. ESG: alternative data sources can provide insights into the environmental, social and governance (ESG) standards at a company. ESG criteria may be monitored via a variety of data categories, including social media, satellite, open and public data. Additionally, sources which monitor business complaints, business reputation, employee compensation and hiring trends can also be useful resources.

10. Event Detection: alerts to breaking news from major news wires or social media sources allow traders to react before news is fully discounted in asset prices. Other events monitored include government filings, weather and changes in residence.

11. Expert Views: topic and sentiment trends among experts in any industry, or field of expertise, can differ substantially from the trends observed in the general population and in news feeds. Eagle Alpha's proprietary algorithm can identify experts on Twitter, which enable asset managers to collect and analyze their commentary. Groups of experts may be large and cover common topics, such as international trade policy. Or, groups may be niche in nature, such as experts whose focus is hearing aids or drone technology.

12. Geo-location: location data derived from mobile devices can yield timely information on visitation trends. Common industry applications include retailers, restaurants, hotels, travel, transportation and REITs. In addition to observing the level of growth in foot traffic, this data can be used to identify the impact of promotions and weather events. Cross brand loyalty and regional idiosyncrasies may be identifiable. Geo-location data providers receive location data from mobile app owners, bluetooth beacons and sensors.

13. Internet of Things (IoT): while connected devices will eventually be able to provide data that allows asset managers to better understand consumer and business activity, the near-term opportunities lie in understanding which companies will benefit from IoT. Suppliers to the IoT industry and companies leveraging IoT in the course of their business both stand to gain economic benefits. Data which tracks the digital footprint of IoT activity can provide indications of specific product adoption and overall market growth. As a

nascent category, there are relatively few data providers, but IoT market development is likely to result in increased data availability.

14. Online Search: numerous academic studies have been published establishing that data regarding the volume of online searches can be used as an indicator of economic activity, as well as an indicator of consumer interest in a product or topic. Furthermore, these studies show that the best indicators are generally built with data from a basket of terms as opposed to a single term or a small number of terms. Complex data science techniques are used to determine the most indicative search terms and the most effective model for combining those terms into an indicator. Online search data has several years of history, is available in a timely fashion and is notably broad in its topic coverage.

Please refer to case studies #5 (page 35), #7 (page 40), #12 (page 52), #13 (page 55), #16 (page 63) and #17 (page 66).

15. Open Data: Open Charge Map API allows users to access data on specific topics such as locations of electric vehicle charging stations globally. The Wayback Machine provides a historical archive of internet pages which may be useful when backfilling data for a web crawling program. The GDELT Project provides a platform that monitors the world's news media from nearly every corner of every country in print, broadcast, and web formats, in over 100 languages, every moment of every day and provides a historical archive of news media content.

16. Pricing: aggregated pricing data of goods and services for both businesses and consumers is now more readily available than it has been in the past. This data can provide insights into corporate revenues and industry dynamics. Alternative measures of inflation have been developed using web crawled pricing data. This category also includes real estate sales, leases and rentals.

17. Public Sector: government agencies publish large datasets that can be used gauge both social and economic activity as well as the impact of regulation on the market. For example, the Consumer Finance Protection Bureau (CFPB) provides access to its database of customer complaints relating to financial services companies. TED (Tenders Electronic Daily), a supplement to the Official Journal of the EU, publishes 460,000 calls for tenders per year, for about 420 billion euro of value.

18. Reviews & Ratings: product and service reviews posted online can be harvested and analyzed for ratings trends and frequently mentioned topics. Numerous academic studies have shown that consumers place credence in online reviews and that favorable reviews generally lead to increased sales. At the same time, excessive reviews and complaints can be signs of poor management. App reviews can provide insights into consumer satisfaction with app services such as mobile banking. Other data providers track brand reputations by incorporating a variety of sources that gauge consumer and B2B opinions.

19. Satellite: the interpretation of satellite images into data or intelligence is useful to asset managers on many fronts e.g. general economic activity, agriculture, mining, construction and real estate, shipping, oil & gas, project monitoring and retail.

Please refer to case study #8 (page 42).

20. Sentiment: scoring of news feeds and social media posts by sentiment and novelty is a popular data source, especially for quantitative funds. Sentiment scoring may be applied to investor commentary, consumer attitudes toward products and brands, or mainstream news feeds. Sentiment data providers, in addition to mapping articles to entities such as government agencies and publicly traded companies, may provide a number of additional scores. Examples include novelty, relevance, price impact estimate, and momentum. Data can be applied to factor models or used ad hoc in momentum and contrarian trading strategies.

21. Social Media: clients of Eagle Alpha typically leverage social media data for analyzing consumer trends, reception of product launches, brand popularity, customer satisfaction, corporate/customer engagement, and technology usage (social media platforms owned by publicly traded companies).

Please refer to case studies #15 (page 61) and #16 (page 63).

22. Store Locations: tracking store locations can yield insights into corporate growth and strategy, particularly when store hours and promotions are also tracked.

23. Trade: macro firms leverage new alternative trade datasets for balance of payment estimates, insights into major commodity markets, indications of national competitive advantages and indications of consumer strength. Stock focused strategies use trade data to gauge sales of companies whose products can be linked to imports/exports of specific goods, fundamental analysis of transportation stocks and to analyze supply chains.

Please refer to case study #18 (page 68).

24. Web Crawled: crawling projects are frequently used to track website changes, e-commerce activity (prices, product listings, promotions, reviews), public commentary and government filings.

Please refer to case studies #6 (page 37), #9 (page 43), #10 (page 47), #16 (page 63), #19 (page 70).

Section 3.3: Applications by Asset Class

In this section we outline examples of applications for the equity, macro and credit asset classes.

Equity

Equity investors are the biggest users of alterative data. Whilst the consumer and technology sectors are the most common there are alternative datasets available for every sector. Below we highlight examples of applications across 11 sectors and also disclose the number of datasets within each sector based on our current database.

1. Consumer Discretionary (147 datasets): consumer transaction data can provide near real-time insight, and longer-term trends, into spending at retailers and on specific products. Online search data has proven valuable at identifying inflection points in consumer interest in a product or service. In October 2017 Eagle Alpha will release our first (quasi) proprietary consumer transaction dataset. It is based on credit card data of a data partner.

2. Consumer Staples (87 datasets): sentiment data can provide a perspective on brand performance.

3. Energy (35 datasets): satellite imagery and export data can provide insight into both demand and supply over both the short and long-term.

4. Financials (61 datasets): growth in peer-to-peer lenders and other non-traditional lending channels has created a wealth of data to better understand the health of consumer credit and take the temperature of the lending market.

5. Health Care (50 datasets): employment data can provide an insight into company strategy or success of trials through hiring trends.

6. Industrials (66 datasets): trade data enables analysts to track industrial company shipments thus providing an insight into growth dynamics for the business.

7. Information Technology (60 datasets): analysts can track the supply chain of major technology companies as well as the shipment of finished products.

8. Materials (37 datasets): vehicle tracking can provide real-time information on commodity flows and supply and demand imbalances.

9. Real Estate (31 datasets): using geo-location data it is possible to track footfall to major shopping malls.

10. Telecommunciation Services (20 datasets): app data providers can provide important insight into phone activations and consumer behavior.

11. Utilities (26 datasets): Some data vendors deliver real-time statistics on supply and demand of electricity.

For detailed equity case studies please refer to Section 4 (case studies #1-16 on pages 27-63).

Macro

Wells Fargo[3], in a paper in April 2017, gave a good high level summary of applications related to macro: "Big data could help analysts solve many modern-day puzzles, such as productivity growth and its living standard relationship, micro-foundations of macroeconomic models, consumer/firm/investor behaviour and many more. In addition, big data would help include what is often the missing link of demographics in many economic/financial theories such as the consumption function. For instance, the current consumption function employed to analyze consumers' behavior estimates an average behavior that does not distinguish consumers' behavior by demographic or geographic region. Another potential utilization of big data would be to improve current methods to estimate the state of the overall economy as well as different sectors' / regions' performances. For the financial world, big data would increase opportunities for profits and help manage risk more efficiently by incorporating broader information in risk modeling".

Below we highlight examples of more specific applications across 8 types of macro data and also disclose the number of datasets within each macro category (based on our current database).

1. Commodities (46 datasets): in 2016 Cargometrics (a shipping data vendor) was so successful that it turned itself into a hedge fund. In August 2017 Maersk invested in Cargometrics. There are several similar datasets that can be used by commodity investors e.g. a dataset to analyze the activity of Chinese ports.

2. Current Account (47 datasets): one of Eagle Alpha's data partners provides a Trade Nowcasting dataset that gives estimates of imports and exports for over 10 countries including China and Brazil.

3. Financial Instruments (45 datasets): trade nowcasting datasets can be used by investors for a variety of purposes e.g. foreign exchange.

4. Housing & Real Estate (66 datasets): the Bank of England uses an online listing dataset that analyzes 80% UK housing sales. This dataset is more timely than publicly available sources. Use cases include: analyze property deal flow and volume, track the

[3] Source: 'Big Data Applications in the Economics/Financial World Part I: Opportunities and Challenges', April 2017

liquidity of the property market, track the liquidity and availability of secure consumer credit.

5. Inflation (49 datasets): MIT's Billion Prices Project ("BPP") collects prices from hundreds of retailers to construct an inflation index. BPP suggests that its index is a good measure for predicting the overall U.S. inflation rate.

6. Labor Market (40 datasets): one of our most popular datasets provides timely and granular data regarding the labor market, particularly the U.S. labor market. The dataset has 8 years of history, is mapped to thousands of tickers, is updated daily and can by analyzed at various levels e.g. state or sector.

7. Personal/Household Sector (53 datasets): consumer transaction data is used to forecast private consumption. For example, there are credit and debit card datasets available at an aggregated region/sector level for the US or China.

8. Surveys/Cyclical Indicators (58 datasets): several asset managers have leveraged online search data to build indicators for topics such as housing and employment. For example, the Scientific Activity Equity team at Blackrock[4] published a paper that gave an overview regarding how it uses internet search data to predict U.S. retail sales. Eagle Alpha has built 8 similar indicators that are inputs into our clients models.

For detailed macro case studies please refer to case studies #17 (page 66), #18 (page 68) and #19 (page 70).

Credit

We have seen credit investors use consumer defaults data to gauge consumer credit, geo-location data to track distressed situations of retailers and analysis regarding muni-bonds (e.g. correlation with mentions online of drought in California with the states muni-bonds). Below we detail specific examples regarding muni-bonds and commercial mortgage backed securities.

1. Muni-Bonds: in August 2017, IHS Market published a note[5] regarding how alternative data can be used for muni-bonds. Below are the selected highlights:

- "Municipal bond investors are beginning to examine more "non-traditional" datasets for making investment decisions and surveillance given the potential wide gaps between reporting periods".

[4] Source: 'The Evolution of Active Investing. Finding Big Alpha in Big Data', July 2015

[5] Source: 'Boats, Quotes, and Automobiles: Alternative Data for Municipal Bond Investors', August 2017

- "We believe that the inevitable rising rate environment will take away some of the cushion that has recently allowed municipalities to refinance into lower debt payments, which will increase the demand for new sources of data to more effectively price and tier municipal bond risk".

- "Using Puerto Rico's ports to gauge government income...the correlation is 54% and the R-squared is 0.2908 between the four-month lagged ship count and actual monthly tax collections from January 2014 to June 2017".

- "Using auto registration data to determine demographic shifts. A proxy for population migration is the changes in the U.S. auto vehicle registrations…the migration of new luxury vehicles between states is one potential gauge for the movements of higher income and net worth individuals among states".

2. Commercial Mortgage Backed Securities (CMBS): The Scientific Active Equity team at Blackrock outlined[6] how alternative data can be used for CMBS:

- "On the surface, the universe of CMBS appears to be a rather unruly dataset – but beneath the surface are rich veins of data at the individual loan or pool level. By combining machine-learning techniques and portfolio manager expertise a deeper understanding of the underlying data can be gained".

- "In order to extract value from data on tens of thousands of CMBS loans, it is necessary to write programmes that can read important information that is generally contained in an annex to the prospectus supplement for each security. This is a complicated process with a high potential for error that requires strict quality control standards. In addition to the top line data that a well-designed algorithm can extract, CMBS can also contain subordinate financial details that are buried within sub paragraphs or footnotes of loan documentation. These can significantly alter the top line data".

- "The details of this kind of subordinate financial need to be assessed manually by experts with product specific knowledge in order to gain a more complete understanding of the risk profile of individual loans. If managers are able to combine the necessary human market expertise with a powerful computing platform, it is possible to build a model that can help to better predict loan default".

For a detailed case study regarding credit please refer to case study #20 (page 73).

[6] Source: 'The Evolution of Active Investing. Finding Big Alpha in Big Data', July 2015

Section 3.4: Applications by Type of Asset Management Firm

In this section we outline examples of applications for quantitative funds, discretionary hedge funds and traditional mutual funds.

Quantitative Funds

Many of the early adopters of alternative data were the larger quantitative funds. The use cases are varied - at JPMorgan's 2017 quantitative conference 237 investors were asked "How do you plan to use Big Data and Machine Learning in investing?"

- 30% said to enhance existing risk premia / quant strategies.
- 20% said to build new risk premia / quant strategies.
- 25% said to enhance portfolio construction / risk management.
- 17% said to make discretionary calls / trades.
- 8% said do not plan to use.

In a July 2017 paper entitled "Discover the Hidden World of Alternative Data" WorldQuant stated: "for investors, especially those who play in the world of quantitative finance, increasing access to alternative data from emerging sources like IoT could give rise to a variety of new investment ideas and trading strategies". Below we outline specific applications, based on public information, of WorldQuant, Blackrock SAE and Acadian.

WorldQuant[7]:

- Satellites "can keep track of the number of factories under construction in rural China, a possible indicator of the strength of that country's industrial production".
- "Social media has been a particularly rich source for analysis by investors who are trying to understand market sentiment and predict business performance".
- Sentiment "analysis is useful in determining new-product perception and brand reputation, assisting investors in forming predictions about the growth of a company or industry".
- "Real-time access to data on ship movements can prove useful in building a comprehensive picture of global shipping and an accurate understanding of competitor and market trends".

[7] Source: 'Discovering the Hidden World of Alternative Data', July 2017

- "Acquiring diverse shipping data can be used to better understand the costs and health of companies' supply chains".

Blackrock SAE[8]:

- "One area of research that has proved rewarding is measuring the impact of employee sentiment on company profitability…Today by using big data analysis and crowdsourcing research, we can not only measure employee sentiment on a much wide scale, but also in a more timely and accurate way. To do this we automated 'web-scraping' capabilities to look into job sites where employees provide feedback on thousands of employers around the world, as well as other sources of employee sentiment including social media, blogs and chat rooms. When all of the relevant data from these sources has been collected an overall sentiment score for a company is calculated and this score can be regularly updated and changes monitored".

- "Rather than focusing on a 70-year-old monthly survey of 500 consumers (Michigan Consumer Sentiment Index), we think it is possible to achieve more accurate results with a more modern toolkit and a much larger sample size…Most consumers now precede big purchases with some research on the internet. By tracking search activity, around the world, or big-ticket items, we can gain a more complete picture of consumers' purchasing intentions, which also includes granular data on the types of items that are likely to be purchased in different geographic regions. The results of this type of analysis appear promising".

Acadian[9]:

- In March 2017 Acadian announced that it was the first investment firm to use Bing Predicts, a machine-learning project that mines internet search and social-media data, for factors to try to forecast events like a corporation's quarterly results.

- "With Bing search history, we know what consumers are searching for, and how that will relate to the future earnings of companies," Ryan Stever, director of quantitative global macro research. "Anything that can speak to the future earnings growth of a company is going to be valuable to us".

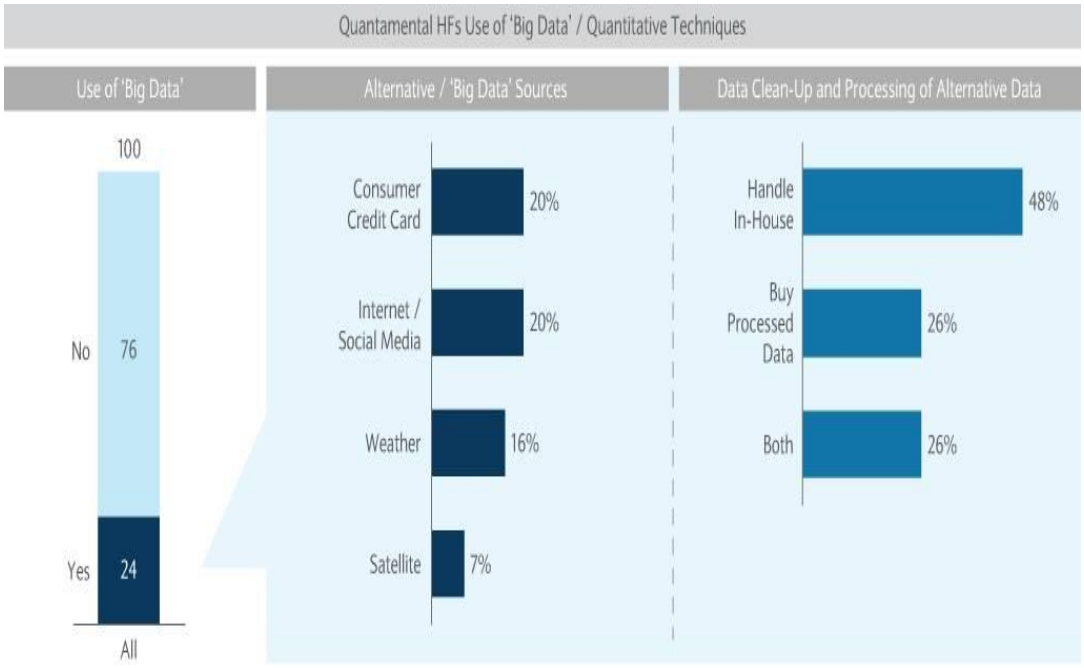
[8] Source: 'The Evolution of Active Investing. Finding Big Alpha in Big Data', July 2015

[9] Source: 'Acadian to use Microsoft's big data technology to help make bets', March 2017

Discretionary Hedge Funds

According to the Barclays[10] survey regarding alternative data, 24% of discretionary hedge funds use alternative data with the most popular categories being: 1) consumer credit card; 2) internet / social media; 3) weather; and 4) satellite. See Figure 5. Applications for these categories are discussed on pages 10-14.

Figure 5: Results of the Barclays Survey Regarding Alternative Data



Source: Barclays

Below we give three examples of hedge funds that have publicly disclosed that they use alternative data:

- **Third Point**[11]: in its 2016 year-end investor letter stated: "we have added data science to our toolkit for identifying interesting, uncorrelated opportunities".
- **Point 72**[12]: at a CB Insights conference in June 2016 the Chief Market Intelligence officer of Point72, Matthew Granade, stated that alternative data is useful for generating alpha. He said: "it is a real change from how investing used to work…if you want to understand what is going on with McDonald's, you are going to have to look at credit card transactions data, you are going to look at geo-location data, at app downloads and a

[10] Source: 'Rise of the machines', June 2017

[11] Source: 'Daniel Loeb's Third Point Hedge Fund 4th Quarter Commentary', February 2017

[12] Source: 'The New Alpha: How Alternative Data is Going to Change Institutional Investing', June 2016

handful of other things. And suddenly you are going to have a very robust picture of how McDonald's is doing and you are not going to have to talk to McDonald's about that".

- **Citadel**[13]: the firm is building a large centralised data organisation. Ken Griffin, founder and CEO of Citadel, stated "our ability to leverage big data effectively in our investment process is critical to our success as a firm". In July 2017 it announced that Laszlo Korsos, who most recently served as a lead data scientist at Uber Technologies, was joining the firm as Chief Data Officer.

Traditional Mutual Funds

A Greenwich Associates[14] survey regarding alternative data included responses from 46 traditional mutual funds. When asked what were the benefit metrics of alternative data sources?

- 57% said changes to business risk predicted in the coming months.
- 46% said predictive indicators of future viability of a business based on its payment experience.
- 41% said risk of disruption of a business's supply chain.
- 41% said benchmark or index measuring the health of the small business economy at the national/regional/industry level.

Based on Eagle Alpha's dialogue with traditional mutual funds the five most common applications of alternative data are (in no particular order):

1. Identification of consumer trends and preferences: new products (Samsung S8) and geographic expansion (e.g. Monster Beverages).
2. Assess corporate quality from employee and customer reviews, social media commentary and government complaints.
3. Evaluate corporate execution via website changes, store growth, employment data, export and import data.
4. Monitor industry competition: pricing, promotions.
5. Gauge pace of secular industry trends e.g. the electronification of automobiles.

[13] Source: 'Uber's Laszlo Korsos Joins Citadel as Chief Data Officer', July 2017

[14] Source: 'Alternative Data for Alpha', January 2017

Below we give three examples of traditional mutual funds that have publicly disclosed that they use alternative data:

- **Schroders**[15]: in its 2015 annual report, Schroders stated that "analysis of 'big data' could become a key differentiator…this year we set up a Data Insights team, representing a significant new initiative for the Group. The team is focused on developments in data analytics for investment and research, to enhance and complement the existing skills of our fund managers and analysts". The report went on to say "the quantity of information available for investment research purposes is increasing at such a rate that traditional industry practices and skillsets are unable to absorb and process it. Global trends in digitalisation, social media, open data and technology are all creating vast streams of alternative data that are often highly unstructured and extremely obscure. However, they contain valuable and often unique insights".

- **State Street**: in an August 2016 Institutional Investor article[16] entitled "Unexpected risk meets unexpected data," State Street's Chairman and CEO highlighted a few ways investors can use surprising sources of information to enhance portfolio transparency and identify risk exposure ahead of potential black swan events e.g. "Online retail. When consumers order products, they may be helping investors better track inflation trends to help recalibrate investment strategies before, and after, an event. PriceStats, an inflation series built by State Street Global Markets on online data, uses technology to monitor price fluctuations on roughly 5 million items and tends to identify price shocks faster than similar measures of offline prices, helping investors quickly understand potential shifts in inflation in more than 70 countries".

- **NN Investment Partners**[17]: In an interview in May 2017 a senior portfolio manager (Mark Robertson) told Fund Selector Asia that "opinions and emotions expressed in online content, from news articles, through blogs, forum posts, social media such as Facebook or LinkedIn, to tweets, can provide a sense of market sentiment that can reinforce or even anticipate fundamental indicators, thereby helping make investment decisions". Mark went on to say that "the big data we've incorporated is very good at picking out turning points and extremes". The article included a case study:

    - In early 2017, the team's scorecards were generally positive on commodity markets, despite some signals of credit tightening in China.

[15] Source: '2015 Markets in Review', March 2016

[16] Source: 'Unexpected Risk Meets Unexpected Data', August 2016

[17] Source: 'NN IP Gains From Sentiment Analysis', May 2017

- As part of its sentiment analysis, the team monitored political risk and emotional sentiment indices around commodities.
- “Around mid-April we saw a really sharp deterioration in both of these signals in our scorecards, at the same time the overall scorecard was still giving us a positive view”.
    - The sentiment shift reinforced the misgivings the team already had, based on their fundamental analysis, and a decision was made to reduce commodity exposure.
    - The Bloomberg Commodity Index subsequently fell from 86.3 on 13 April to 82.0 on 9 May 2017.

Section 4: 20 Case Studies

In this Section we present 20 case studies that are based on Eagle Alpha proprietary datasets and tools as well as third party datasets. Our goal is to show case studies relevant to a variety of asset classes and investment approaches and which use a variety of alternative data types.

Four of the 20 case studies involve using consumer transaction data for predicting quarterly revenues of publicly traded companies. Five case studies involve using online search data as an indicator for corporate revenues and the U.S. unemployment rate. Three case studies apply web crawled product price data to predict quarterly revenues. The other case studies draw upon employment, mobile app, social media, credit, trade and real estate data.

The case studies are in the following order: equity, macro and credit. Within each asset class the case studies are in the following order: quantitative use cases, short-term discretionary use cases and long-term discretionary use cases.

#	Asset Class	Manager Type	Data Category	Key Takeaway	Page #
1	Equity	Quantitative Fund	Employment	Testing shows that there is alpha in the data, with the "Jobs Active" variable producing the highest and most consistent returns (6-8% yearly).	27
2	Equity	Quantitative Fund	Consumer Transaction	Cross-sectional analysis of the data (an Eagle Alpha data partner) vs stock prices performed by J.P. Morgan, generated annualised returns of 16.2% and a Sharpe ratio of 1.13.	29
3	Equity (JE)	Discretionary (short-term)	Consumer Transaction	Using consumer transaction data, Eagle Alpha's predictive model for Just Eat correctly pointed to stronger than expected revenues in H2 2015 and H1 2016.	31
4	Equity (PYPL)	Discretionary (short-term)	Consumer Transaction	Eagle Alpha's predictive model for PayPal using email receipt data accurately predicted a revenue beat in Q2 2017.	33
5	Equity (SBUX)	Discretionary (short-term)	Consumer Transaction, Online Search	Eagle Alpha's predictive model for Starbucks using email receipt data accurately predicted a revenue beat in Q2 2017.	35
6	Equity (601633 CH)	Discretionary (short-term)	Pricing	In Q4 2014, The CAI (China Auto Insight) data was more accurate than consensus estimates at predicting an important inflection in revenue growth.	37
7	Equity (FINL)	Discretionary (short-term)	Online Search	The search indicator correctly predicted weakness in Finish Line sales ahead of earnings in December 2016.	40
8	Equity (DKS)	Discretionary (short-term)	Satellite Imagery	Satellite data analysis showed falling traffic at Dick's Sporting Goods since the start of 2017. On August 15th 2017, Dick's Sporting Goods reported worse-than-expected results.	42

9	Equity (GPRO)	Discretionary (shorter-term)	Pricing	Online pricing data pointed to negative fundamentals for GoPro, which were reflected in subsequent results and stock price.	43
10	Equity (FIT)	Discretionary (longer-term)	Pricing	Online retail data showed improving sell-through trends for Fitbit in the first half of 2017. On August 2nd 2017, Fitbit reported better than expected results with adjusted revenue of $353.3m vs consensus estimate of $339.2m.	47
11	Equity (SQ)	Discretionary (long-term)	Consumer Transaction	Analysis of the email receipt data for Square indicated that the growth in number of sellers has been in decline since the first quarter of 2010.	49
12	Equity (BRBY)	Discretionary (long-term)	Online Search	Citi concluded that the short-term 1-month YoY observation crossing over the 3-month moving average YoY indicates major inflection points of same store sales growth for Burberry.	52
13	Equity	Discretionary (long-term)	Online Search	Online search data provided early indicator of weakness in sportswear sector. The industry analysis supported our case for fundamental weakness for FINL and FL and pointed to longer term fundamental issues for both companies.	55
14	Equity (TWX)	Discretionary (long-term)	Mobile App	App data showed an early indicator of a positive inflection in revenue growth for HBO, one of Time Warner's largest divisions.	59
15	Equity (ATVI)	Discretionary (long-term)	Social Media	Using social media data, we correctly highlighted that the Overwatch game was well positioned to set a new sales record for Activision Blizzard.	61
16	Equity (LULU)	Discretionary (long-term)	Online Search, Social Media, Pricing	Eagle Alpha's analysis proved correct i.e. Lululemon reported sales growth of 13% YoY in Q3 2016 which was in line with our expectations.	63
17	Macro	Discretionary (long-term)	Online Search	EA's US Unemployment index has a 5-year correlation of 0.9 with the US Unemployment Rate, with an out-of-sample prediction improvement of 14% compared with a baseline ARIMA model.	66
18	Macro	Discretionary (long-term)	Trade Nowcasting	Statistical backtesting has proven the indicators are frequently a better predictor than street-mean estimates, while also having the advantage of a substantial lead time.	68
19	Macro	Discretionary (long-term)	Pricing	Online property listings data was used to research buy-to-rent investors which led to the subsequent clamp down on mortgage lending.	70
20	Credit	Discretionary (long-term)	Credit Risk	Testing showed that the probability of bankruptcy within 12 months ranges from 10% to 50% when a company gets a stress score of "1".	73

1. Equity > Quantitative Fund > Employment Data

Key Takeaway

Testing shows that there is alpha in the data, with the “Jobs Active” variable producing the highest and most consistent returns (6-8% yearly).

Dataset

Our data partner collects listings of jobs from corporate websites. It is updated daily and has 3+ million job listings and descriptions. The company also produces one of the most accurate estimates for US Non-Farm Payroll figures and provides other macro employment data. The data covers approximately 15,000 companies in the 2007-2016 period, of which around 3,500 companies are publicly traded in the US.

Backtesting/Significance

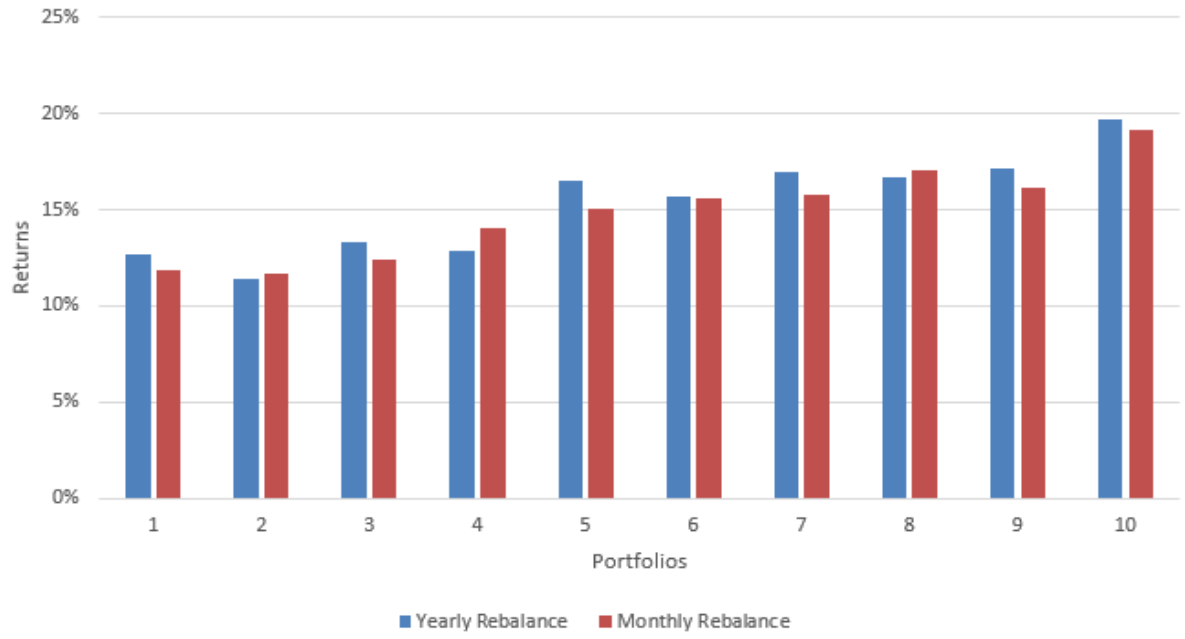
We used two variables: “Jobs Created” (number of job posting created by companies) and “Jobs Active” (number of job postings that are currently active and open). We also normalized these variables and transformed them using different change specifications. Then we deflated all variables by the firm market value of equity at the end of the year. In total, we had 10 variables.

We formed monthly and annual portfolios by dividing the sample of firms based on the 10 variables into both deciles and quintiles. The top portfolio (for deciles - portfolio 10) is the portfolio of 10% of the firms where the variable examined was the highest for a given month/year, and the bottom portfolio (portfolio 1) is the 10% of the firms where the variable is the lowest.

We then calculated each portfolio future returns after the formation period using both monthly and yearly return horizons. Finally, we calculated the hedge returns, i.e. the top portfolio average return minus the bottom portfolio average return (portfolio 10 minus portfolio 1 in the case of deciles).

The results suggest that there is alpha in the variables, with “Jobs Active” producing the highest and most consistent returns (Figure 6). Yearly hedge returns were between 6-8%. In the case of “Jobs Created”, yearly hedge returns were between 2-4%.

Figure 6: Jobs Active Portfolio Returns



Source: Employment Data, Eagle Alpha

2. Equity > Quantitative Fund > Consumer Transaction Data

Key Takeaway

Cross-sectional analysis of our partner dataset, performed by J.P. Morgan, generated annualised returns of 16.2% and a Sharpe ratio of 1.13.

Dataset

The dataset is delivered through a partnership with a provider that collects anonymized purchase data from around 2 million active shoppers, scanned from email purchase receipts. It covers over 600 merchants from more than 25 industries.

The provider transforms multiform unstructured email receipt data into a normalized digestible consumer transaction dataset. The dataset is also granular as it includes item and SKU-level transaction data, which is filtered into 53 product categories.

Geography	Coverage	Mapped to Tickers	History	Collection Frequency	Delivery Frequency	Lag Time	Delivery Method
USA	600 merchants	No	Since 2013	Real-Time	Weekly	7 days	Excel, TSV

Below we include an extract from J.P. Morgan's report "Big Data and AI Strategies. Machine Learning and Alternative Data Approach to Investing." J.P. Morgan analyzed a dataset of email receipts for 97 companies. 36 of these were private companies, and 61 public, 31 of which were S&P 500 constituents.

Taking liquidity into consideration, J.P. Morgan decided to test trading signals for the S&P 500 companies only.

Backtesting/Significance

We analyzed three time series: the dollar spend, number of orders and number of buyers. While number of orders and number of buyers are highly correlated (~99%), dollar spend is not highly correlated with number of buyers/orders (~25%).

We aggregated the daily spend/order/buyer data into a weekly score and calculated week-over-week percentage change for each. After winsorizing to 5th-95th percentile, we tested both the level and z-score as signals. Based on a cross-sectional comparison, we went long the top 5 stocks and short the bottom 5 stocks. The portfolio was rebalanced weekly.

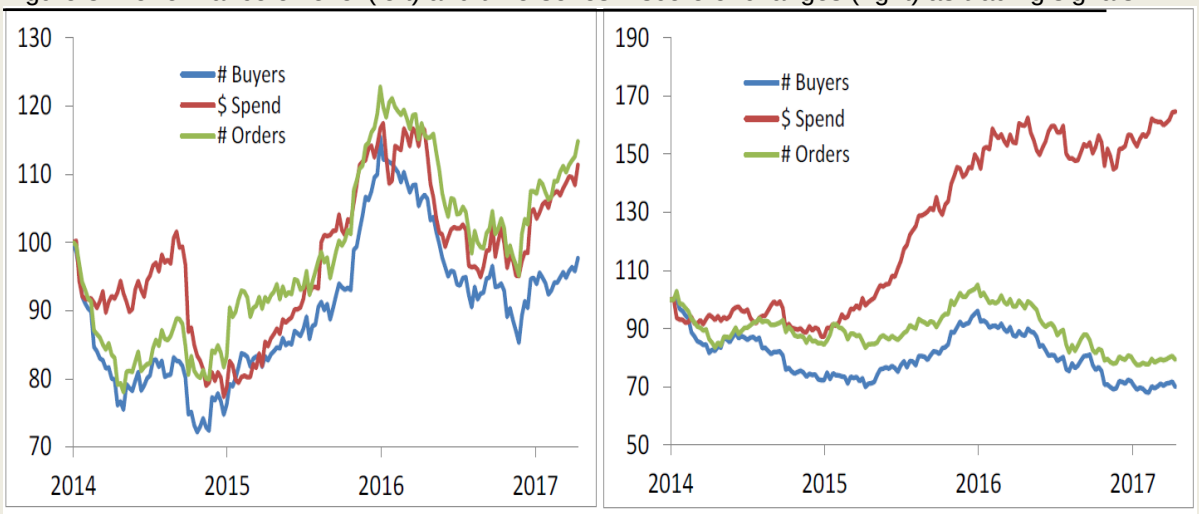
Figure 7: Sharpe ratios of various strategies using Dollar Spend, Buyer Count and Order Count

Dollar Spend Data	Top 6/ Bottom 6	Buyer Count Data	Top 6/ Bottom 6	Order Count Data	Top 6/ Bottom 6
Level	0.29	Level	0.02	Level	0.36
Z-score 4 week	1.13	Z-score 4 week	-0.71	Z-score 4 week	-0.49
Z-score 5 week	0.72	Z-score 5 week	-0.49	Z-score 5 week	-0.14
Z-score 6 week	0.67	Z-score 6 week	0.04	Z-score 6 week	0.11

Source: J.P. Morgan Macro QDS, Eagle Alpha

We also plot cumulative returns using the level (i.e. percentage of aggregated figure) and the 4-week z-score for all 3 datasets.

Figure 8: Performance of level (left) and time-series z-score of changes (right) as trading signals



Source: J.P. Morgan Macro QDS, Eagle Alpha

The 4-week z-score on the Dollar Spend metric displayed an impressive sharpe ratio of 1.13 (Figure 7). Annualised returns for this same portfolio also impressed at 16.2%. This can be seen in the right-hand chart in Figure 8 above.

3. Equity (Just Eat JE) > Discretionary (Short-Term) > Consumer Transaction Data

Key Takeaway

Using consumer transaction data, Eagle Alpha's predictive model for Just Eat correctly pointed to stronger than expected revenues in H2 2015 and H1 2016.

Dataset

Consumer transaction data is provided by Eagle Alpha's partner and consists of anonymized panel data drawn from users of the UK's largest personal financial assistant, an app/web platform. Data is collected in near real-time, directly from bank and credit card records.

The panel consists of 230 million transactions across over 500,000 accounts and grows by an average of 5 million transactions per month. With each panel member holding an average of 4 financial accounts, across multiple providers, this consumer transaction dataset represents the UK's largest complete collection of consumer financial activity.

Geography	Coverage	Mapped to Tickers	History	Collection Frequency	Delivery Frequency	Lag Time	Delivery Method
UK	U.K. National, with regional breakdowns	Yes	Since 2012	Daily	Daily, Weekly, Fortnightly & Monthly	3 days	AWS S3, FTP

Backtesting/Significance

Eagle Alpha's Just Eat model based on U.K. consumer transaction data has shown a MAPE of 1.8% in backtesting, a large improvement on consensus which has an MAPE of 3.7%.

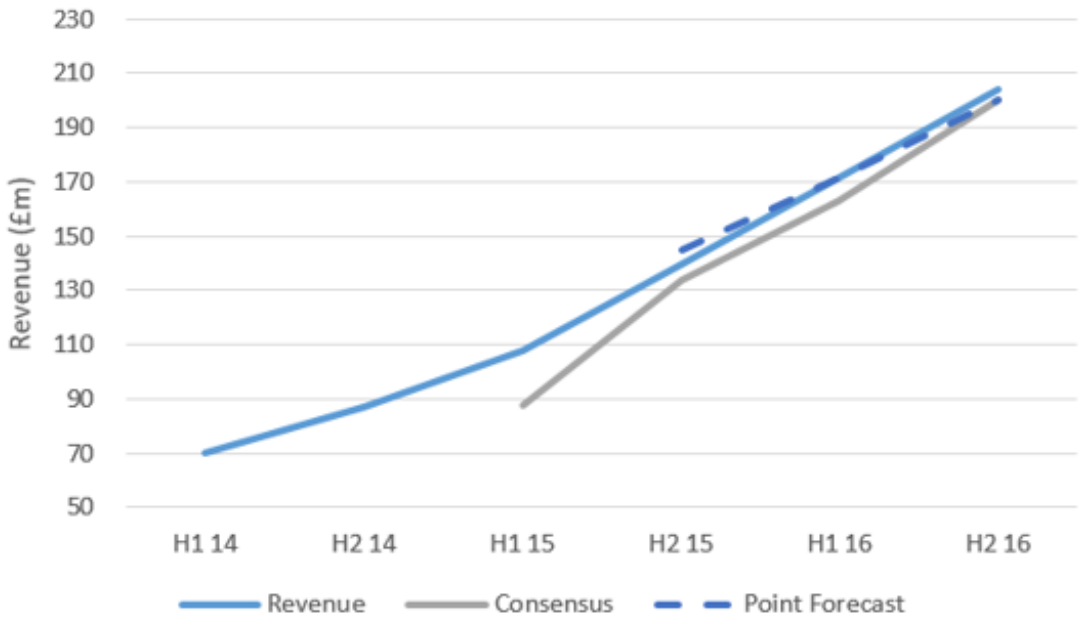
Note: testing of this dataset across 41 UK retailers found that it improved the predictive power of a baseline ARIMA model in 88% of cases.

Case Study

Using consumer transaction data, Eagle Alpha's predictive model for Just Eat correctly pointed to stronger than expected revenues in H2 2015 and H1 2016.

Our ARIMAX model forecasted H1 2016 revenues at 171.6m compared to a consensus estimate of 163m. In H2 2015 our model predicted revenues of 144.8m compared to a consensus estimate of 134m.

Figure 9: Eagle Alpha's Model Predicted Stronger Than Expected Results



Source: Eagle Alpha Analysis, Consumer Transaction Data, Bloomberg

Actual revenues for the second half of 2015 came in at 140m beating consensus, in line with our prediction. Following the H1 2016 beat the Just Eat share price rose by 4.3% on the day and 17.6% on the month. Similarly, the stock rose by 3% after the H2 2015 beat.

4. Equity (PayPal PYPL) > Discretionary (Short-Term) > Consumer Transaction

Key Takeaway

Eagle Alpha's predictive model for PayPal using email receipt data accurately predicted a revenue beat in Q2 2017.

Dataset

The dataset is delivered through a partnership with a provider that collects anonymized purchase data from around 2 million active shoppers, scanned from email purchase receipts. It covers over 600 merchants from more than 25 industries.

The provider transforms multi-form unstructured email receipt data into a normalized and digestible consumer transaction dataset. The dataset is also granular as it includes item and SKU-level transaction data, which is filtered into 53 product categories.

Geography	Coverage	Mapped to Tickers	History	Collection Frequency	Delivery Frequency	Lag Time	Delivery Method
USA	600 merchants	No	Since 2013	Real-Time	Weekly	7 days	Excel, TSV

Backtesting/Significance

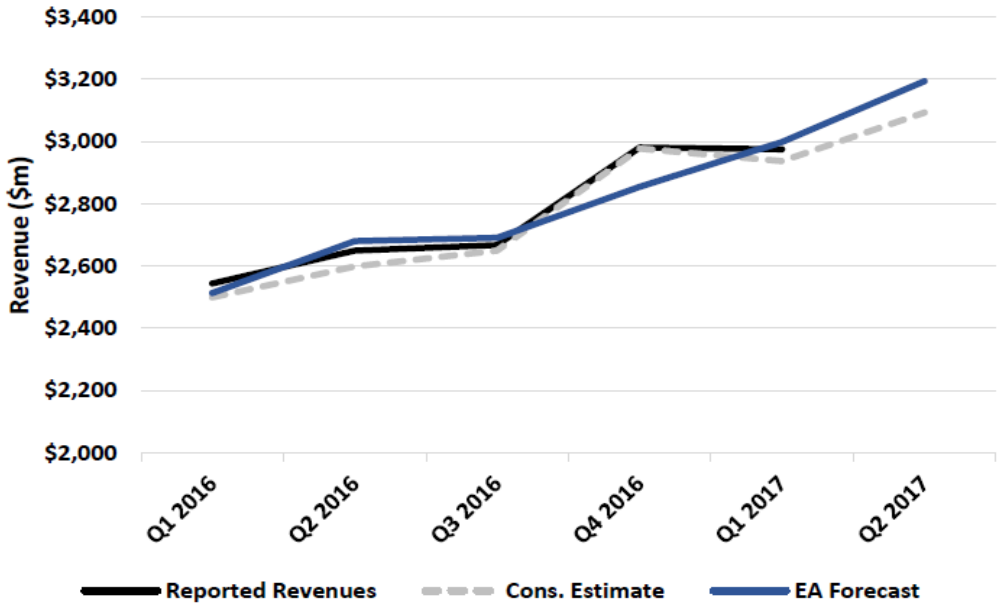
Eagle Alpha's PayPal model has a MAPE of 1.6% and the standard deviation of our error is 2.0%. With a low historical mean error, we had confidence in our PayPal predictive estimate for Q2 2017.

Note: broader testing of this dataset across 66 US retailers found that it improved the predictive power of a baseline ARIMA model in 60% of cases. In additon, Eagle Alpha's Data Insights team has published 5 quarterly reports incorporating predictive indicators using this dataset. Three of these indictors proved accurate equating to a hit rate of 60%.

Case Study

On July 13th 2017, Eagle Alpha published a research note analyzing PayPal's Q2 using email receipt data. Eagle Alpha's PayPal predictive model suggested better Q2 revenue than consensus estimates.

Figure 10: Eagle Alpha Model Predicted June Quarter Upside for PayPal



Source: Eagle Alpha Analysis, Email Receipt Data, Bloomberg

In the note, we concluded: “Using email receipt data, Eagle Alpha’s predictive model for PayPal is pointing to a stronger than consensus quarter for revenue in the June quarter. The current Bloomberg estimates for PayPal is $3,093m.”

On July 26th 2017, PayPal reported better-than-expected results and raised revenue estimates for the full fiscal year. The company reported revenue of $3.14B.

5. Equity (Starbucks SBUX) > Discretionary (Short-Term) > Consumer Transaction

Key Takeaway

Eagle Alpha's predictive model for Starbucks using email receipt data accurately predicted a revenue beat in Q2 2017.

Datasets

The dataset is delivered through a partnership with a provider that collects anonymized purchase data from around 2 million active shoppers, scanned from email purchase receipts. It covers over 600 merchants from more than 25 industries.

The provider transforms multi-form unstructured email receipt data into a normalized and digestible consumer transaction dataset. The dataset is also granular as it includes item and SKU-level transaction data, which is filtered into 53 product categories.

Geography	Coverage	Mapped to Tickers	History	Collection Frequency	Delivery Frequency	Lag Time	Delivery Method
USA	600 merchants	No	Since 2013	Real-Time	Weekly	7 days	Excel, TSV

Google Trends is a public web facility based on Google Search that shows how often a particular search term is entered relative to the total search-volume over time across various regions of the world. Using Google Trends, Eagle Alpha has built company specific indices based on search terms that are related to a given retailer's product offering. This involves an exhaustive process for identifying search terms related to a company's revenues using both internal and third party tools.

Backtesting/Significance

Our Starbucks model, based on email receipt data, has a MAPE of 5.8% and the standard deviation of our error is 6.9%. Note: broader testing of the email receipt dataset across 66 US retailers found that it improved the predictive power of a baseline ARIMA model in 60% of cases.

Over the last 19 quarters our Starbucks search index based on Google search volumes has demonstrated a two-quarter hit rate of 68% in in-sample testing, and a three quarter hit rate of 53%. This means that 68% of the time the three-month moving average has moved in the same direction as same store sales over a two-quarter period.

Eagle Alpha's Data Insights team has published 21 quarterly reports for consumer companies incorporating Google search data. 15 of these indicators proved accurate equating to a hit rate of 71%.

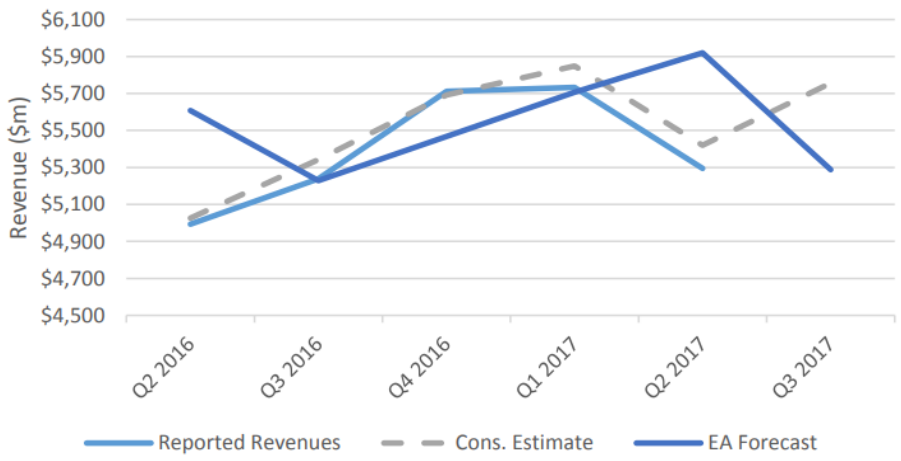
Case Study

Using email receipt and Google search data, Eagle Alpha published a research report on July 14th 2017 predicting a weaker June quarter for Starbucks versus consensus.

Figure 11 below shows that according to Eagle Alpha's predictive model Bloomberg estimates for Starbucks FYQ3 were too high. Consensus revenue estimates were at $5.75bn as analysts were predicting a YoY revenue growth of 9.9%.

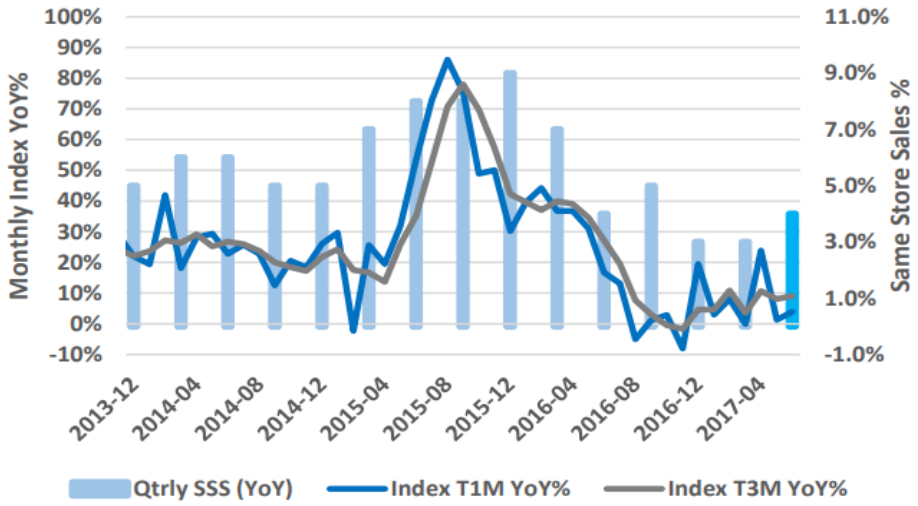
Our Starbucks search index (Figure 12) was in line with the previous two quarters, calling into question consensus expectations for SSS to accelerate later in 2017.

Figure 11: Eagle Alpha Model Predicted June Quarter Downside for Starbucks



Source: Eagle Alpha Analysis, Email Receipt Data, Bloomberg

Figure 12: Search Data Suggested Stagnant Quarterly Growth



Source: Eagle Alpha Analysis, Email Receipt Data, Bloomberg

6. Equity (Great Wall Motors 601633 CH) > Discretionary (Short-Term) > Pricing Data

Key Takeaway

In Q4 2014, The CAI (China Auto Insight) data was more accurate than consensus estimates at predicting an important inflection in revenue growth.

Dataset

Eagle Alpha's CAI dataset is provided through a partnership agreement with a leading Chinese financial automotive consultant. The dataset is collected using a large panel of dealerships throughout China, combining other data sources such as web data and more traditional data sets to create a large and well-structured database.

Geography	Coverage	Mapped to Tickers	History	Collection Frequency	Delivery Frequency	Lag Time	Delivery Method
China	National, with regional breakdowns	No	Since 2012	Mixed – Month/ Bi-Monthly	Mixed – Month/ Bi-Monthly	Between 5 & 20 days	API, CSV

Backtesting/Significance

The CAI data shows a 99% correlation with revenues for domestic Chinese auto manufacturer Great Wall Motors (601633 CH) over a 5-year period, and a 95% correlation with YoY revenue growth. The calculated dealership revenue also correctly projected the directional movement of reported revenues for Great Wall in fourteen of the fifteen quarters between Q1 2013 and Q3 2016.

An ARIMAX[18] model for predicting Great Wall Motors (601633 CH) revenue demonstrated an out-of-sample MAPE of 4.9%. This compares to a MAPE of 10.3% on a baseline ARIMA model using just historic revenues. The error rate for market consensus estimates was 8.1% over the same period. Directional accuracy is also markedly improved over the baseline model, increasing from 57% to 86%.

Note: Eagle Alpha has published 31 quarterly reports incorporating scraped data. 20 of these indicators proved accurate equating to a hit rate of 65%.

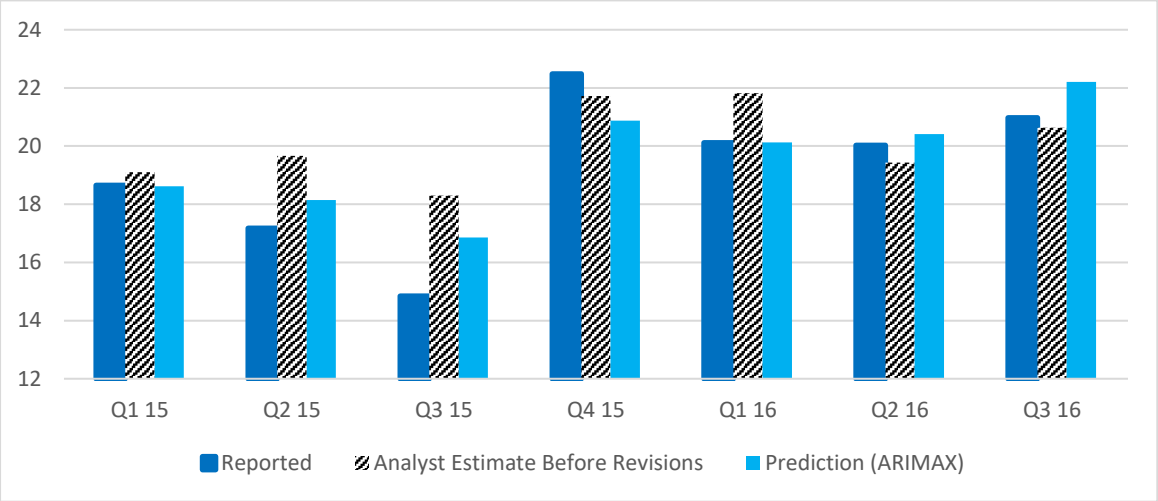
Case Study

The 4.9% error rate discussed above is better than the error rate for market consensus estimates of 8.1% over the same period. This is shown in Figure 13 below. The analyst estimates in this calculation were taken one month after the end of the quarter, as the CAI data is published between 5 and 20 days after month-end. It's clear that the predictive

[18] Autoregressive integrated moving average with exogenous variables

model using CAI data provides investors with a more accurate revenue estimate for Great Wall Motors.

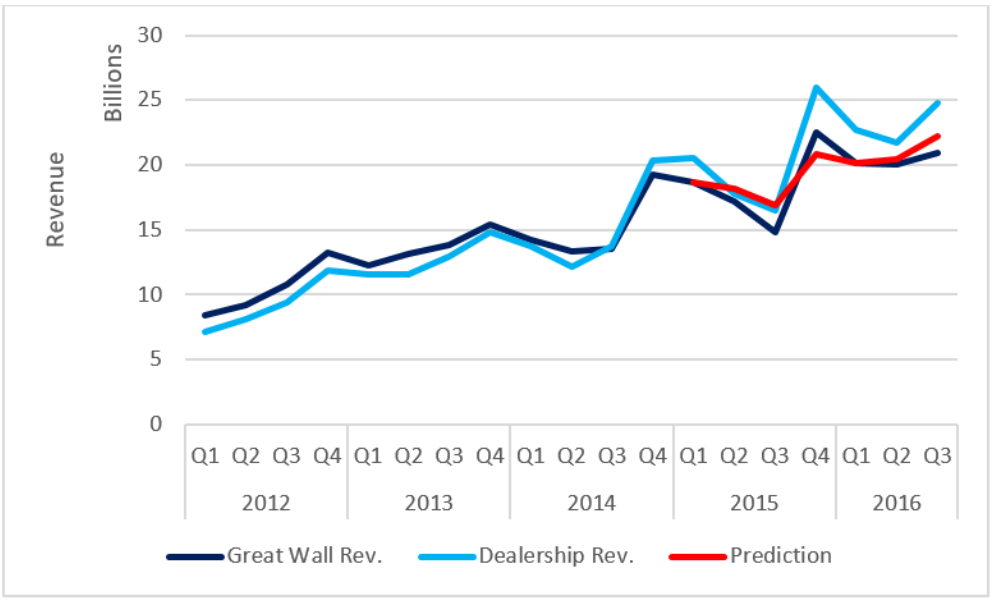
Figure 13: Reported Numbers V Estimates V EA Prediction



Source: Eagle Alpha Analysis, Bloomberg, CAI Data

In Q4 2014, the CAI data was more accurate than consensus estimates at predicting an important inflection in revenue growth. Analyst estimates were for QoQ revenue growth of 17% for Great Wall Motors, compared to reported QoQ growth of 42%. Estimated QoQ growth based on the CAI raw data was much closer at 48%.

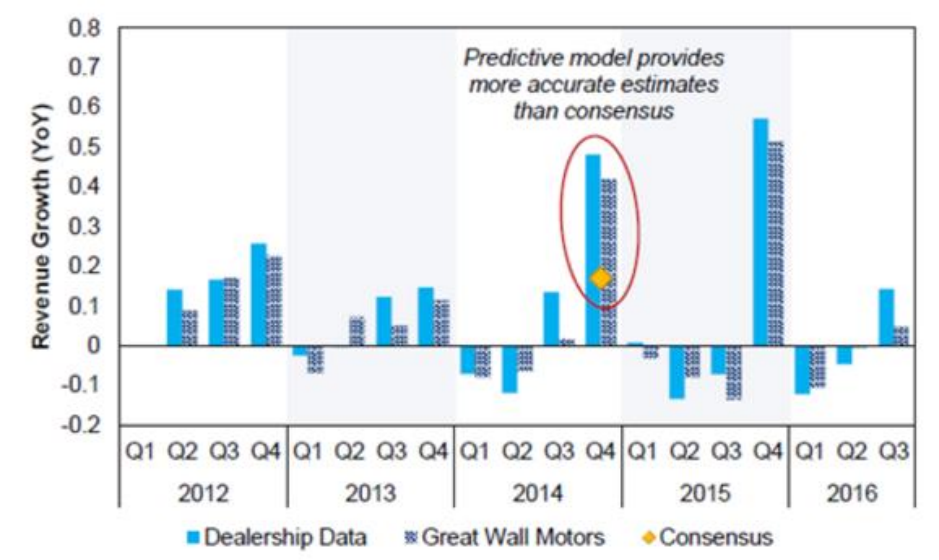
Figure 14: Great Wall Revenue Prediction



Source: Eagle Alpha Analysis, Bloomberg, CAI Data

This case study was validated by Citi and included in their report titled ‘Searching for Alpha: Big Data. Navigating New Alternative Datasets’ (Figure 15).

Figure 15: Great Wall Motors Revenue Growth vs CAI Dealership Data



Source: Eagle Alpha, Bloomberg, CAI Data, Citi Research

7. Equity (Finish Line FINL) > Discretionary (Short-Term) > Online Search Data

Key Takeaway

The search indicator correctly predicted weakness in SSS ahead of earnings in December 2016. The company's stock reacted to the change in fundamentals and is down significantly since then.

Dataset

Google Trends is a public web tool based on Google Search that shows how often a particular search term is entered relative to the total search-volume over time across various regions of the world. Using Google Trends, Eagle Alpha has built company specific indices based on search terms that are related to a given retailer's product offering. This involves an exhaustive process for identifying search terms related to a company's revenues using both internal and third party tools.

Geography	Coverage	Mapped to Tickers	History	Collection Frequency	Delivery Frequency	Lag Time	Delivery Method
Global	B2B, Retail, Luxury, Restaurants	Yes	Since 2006	Daily, Weekly and Monthly	Monthly	1-3 days	JPG, PNG, SVG, PDF, CSV

Significance

Observing crossing points of three-month and one-month moving averages of one of these search indices has proved predictive of inflection points in revenue growth for companies across a broad range of sectors including retail, luxury goods and restaurants.

Over the last 18 quarters the Finish Line indicator demonstrated a three-quarter hit rate of 78% in in-sample testing. This means that 78% of the time the three-month moving average has moved in the same direction as same store sales over a three-quarter period.

Note: Eagle Alpha has published 21 quarterly reports for consumer companies incorporating Google search data. 15 of these indicators proved accurate equating to a hit rate of 71%.

Case Study

On December 5th 2016, Eagle Alpha published a report on US sports retailer Finish Line using Google Trends data. The Figure 16 below shows the signal pointing to a strong uptrend prior to the August 2016 quarter when the company reported better than expected results.

However, the directional change of the index in the November 2016 quarter indicated that Finish Line's SSS (same-store sales) growth was at risk and Eagle Alpha data insight analysts anticipated that management outlook for the following quarter could disappoint.

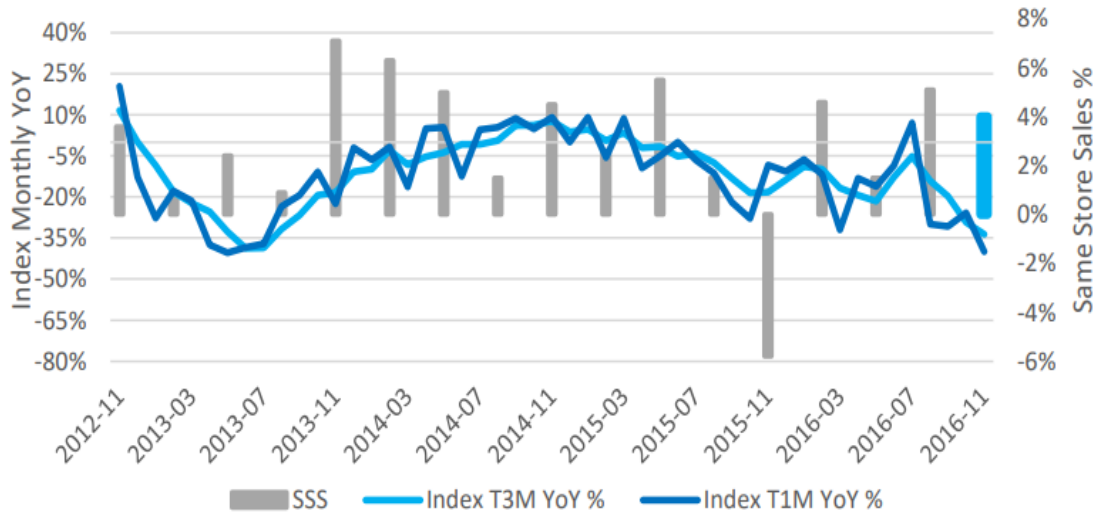
On December 21st 2016, Finish Line reported a weak quarter and gave poor guidance for the following quarter. “We are disappointed that our third quarter sales and earnings fell short of our expectations,” said Sam Sato, Chief Executive Officer of Finish Line.

Eagle Alpha’s Data Insights report on December 5th 2016, indicated that the search index, an indicator of consumer demand based on online search data, was pointing to weakness in SSS for Finish Line. The report stated: “the sharp downtrend observed in the index in recent months (Figure 16) indicates that expectations for SSS growth at FINL are at risk, or that management outlook for the February quarter may disappoint”.

Finish line reported SSS of 0.7% for the November 2016 quarter compared to expectations for growth in excess of 4%. The company also reported a significant drop in SSS in the February quarter of -4.5%.

The search indicator correctly predicted weakness in SSS ahead of earnings. The company’s stock reacted to the change in fundamentals and is down significantly since then.

Figure 16: Search Signal Index for FINL



Source: Eagle Alpha Analysis

8. Equity (Dick's Sporting Goods DKS) > Discretionary (Short-Term) > Satellite

Key Takeaway

Satellite data analysis showed falling traffic at Dick's Sporting Goods since the start of 2017. On August 15th 2017, Dick's Sporting Goods reported worse-than-expected results.

Dataset

The case study presented below was prepared by a satellite imagery data analytics company that catalogued and backtested more than one million parking lot images that accounted for 1.5 billion cars over seven years. The traffic data obtained from satellite images can then be used to analyze cumulative YoY car count growth rates and compare it to revenue growth and share price dynamics.

Case Study

Car counts at Dick's Sporting Goods have been falling since the start of 2017. There was a 7.2% YoY drop in Q1 2017 and then a further 8.4% YoY drop in Q2 2017 (Figure 17). The downward trend continued in July and August 2017 proving to be an early indicator of Q2 2017 results.

On August 15th 2017, Dick's Sporting Goods reported worse-than-expected results with same store sales rising by 0.1% which was much lower than the company's forecast of 2-3% and the consensus estimate of 1.7%.

Figure 17: DKS Cumulative YoY% Change in Car Counts

Source: Satellite Data Analytics Provider

Disclaimer

This case study is directly from the vendor and Eagle Alpha has not backtested the data.

9. Equity (GoPro GPRO) > Discretionary (Shorter-Term) > Pricing Data

Key Takeaway

Online pricing data pointed to negative GoPro (GPRO) fundamentals, which were reflected in GoPro's subsequent results and, ultimately, GoPro's stock price.

Dataset

Pricing data is crawled from the websites of large retailers. This can provide an insight into long term trends, as well as the most recent trading performance, and is based on metrics such as average selling price and share of bestselling products in a category. Eagle Alpha owns this dataset.

The dataset currently supports over 100 brands/companies from categories including Tech Hardware (e.g. Apple, Cisco, Canon), Consumer Electronics (e.g. Sony, LG Electronics, Harman), Household Appliances (e.g. Whirlpool, Electrolux) and Leisure Products (e.g. Mattel, Hasbro) and the list is growing all the time.

Geography	Coverage	Mapped to Tickers	History	Collection Frequency	Delivery Frequency	Lag Time	Delivery Method
U.S	U.S Consumer Products Market	Yes	Since 2013	Daily, Weekly and Monthly	Daily, Weekly and Monthly	1 day	Excel/CSV

Significance

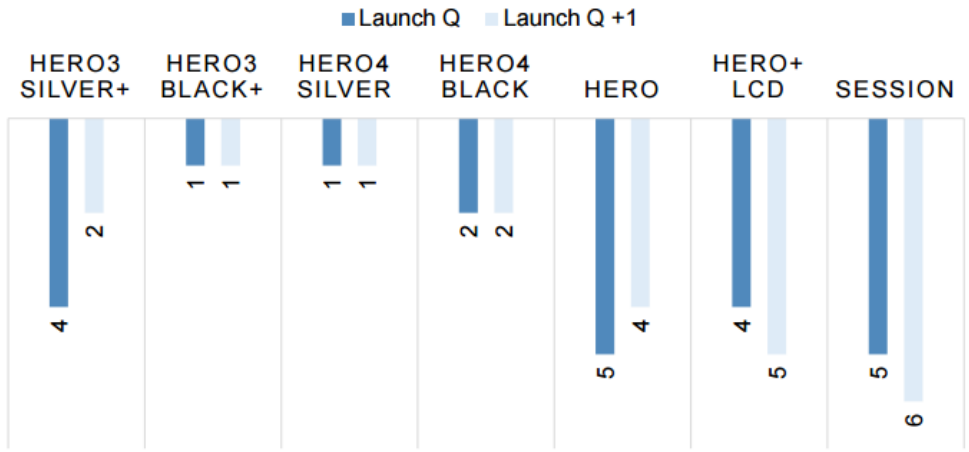
Pricing data has proved valuable at providing a directional indicator for the sales of consumer products, particularly around major product launches.

Note: Eagle Alpha has published 31 quarterly reports incorporating scraped data. 20 of these indicators proved accurate equating to a hit rate of 65%.

Case Study

Eagle Alpha first published a Data Insights report on action camera manufacturer GoPro (GPRO US) on October 21st 2015. The data from US electronics websites pointed to potential weakness in GoPro revenue for the third quarter of that year. The crawled data was showing weak demand for GoPro's products, and a negative mix shift to lower end products that was likely to impact average selling prices (ASP). The report also highlighted weakness in the ranking of bestselling cameras, including the Session product which had recently been released (Figure 18).

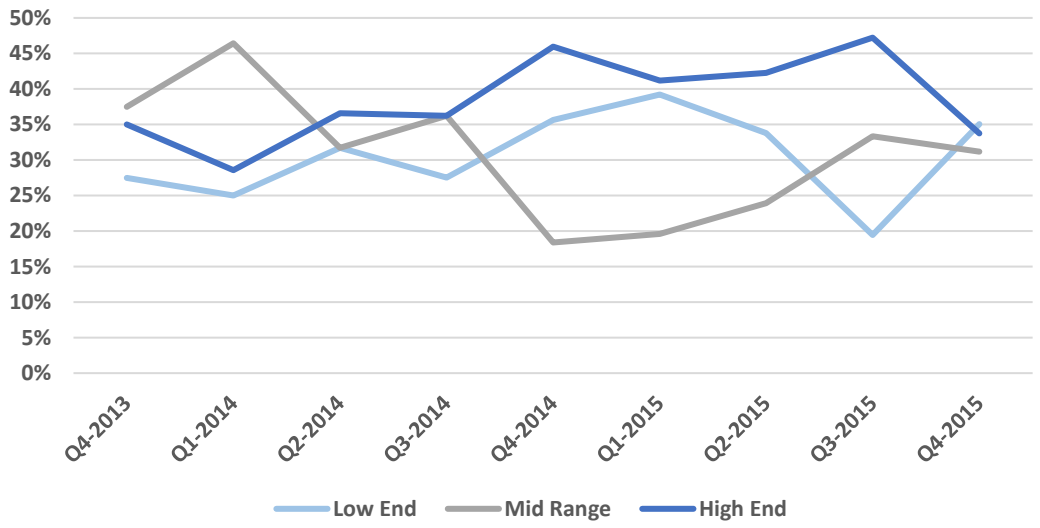
Figure 18: Weakness in the Ranking of Bestselling Cameras



Source: Eagle Alpha Analysis, E-Commerce Data

Subsequent Eagle Alpha reports in 2016 continued to point out that demand for GoPro was diminishing and that ASP trends continued to remain under pressure. A report on February 9th 2016 titled “Focus on Entry Level Products Ignores Issues Elsewhere” showed that GoPro was seeing price pressure across all price points and that growth in lower end cameras was unlikely to compensate for price and share compression of mid-range and higher end products (Figure 19).

Figure 19: Split of Bestsellers by Price Segment

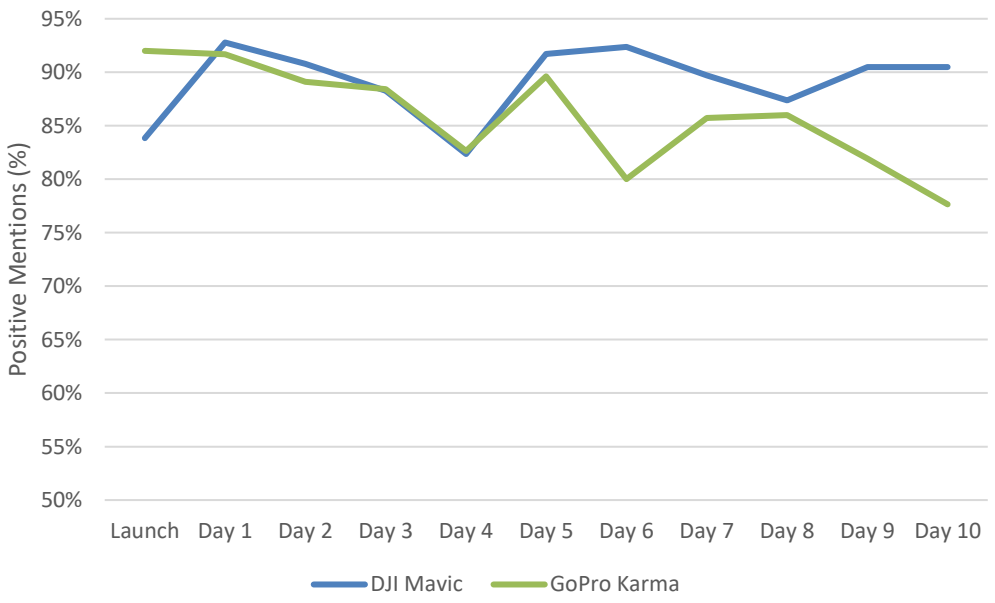


Source: Eagle Alpha Analysis, E-Commerce Data

By the September quarter of 2016 Eagle Alpha analysis was showing that “key elements are stabilizing for the action camera brand … but YoY pressure persists”. This quarterly update also highlighted that the introduction of the new Karma drone, which was expected to be received well by consumers and investors, had failed to ignite attention. Using our Web Queries tool, Eagle Alpha discovered evidence that the Karma drone had lost out to rival DJI Mavic shortly after its launch (Figure 20).

Note: our Web Queries tool that enables clients to obtain analytics on over 90 million web sources including: blogs, image and video sites, forums, review sites, social media and news sites.

Figure 20: The Mavic Gained Edge on The Karma

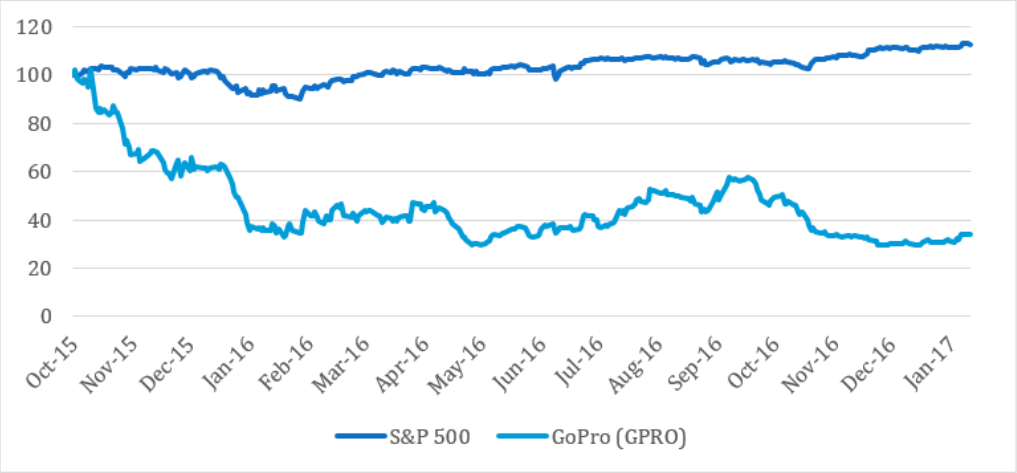


Source: Eagle Alpha’s Web Queries Tool

In addition, the crawled e-commerce data showed that a “month after launch the DJI Mavic was 19th on the list of bestsellers while the GoPro Karma was 54th”. This had implications for the company heading into the important holiday spending period in the US.

These negative fundamentals were reflected in GoPro’s stock price over the period of Eagle Alpha’s coverage. The relative performance of GoPro compared to the S&P 500 over the period can be seen in the following chart (Figure 21).

Figure 21: Indexed Share Price Performance



Source: Eagle Alpha Analysis, Bloomberg

10. Equity (Fitbit FIT) > Discretionary (Longer-Term) > Pricing Data

Key Takeaway

Online retail data showed improving sell-through trends for Fitbit in the first half of 2017. On August 2nd 2017, Fitbit reported better than expected results with adjusted revenue of $353.3m vs consensus estimate of $339.2m.

Dataset

Pricing data is crawled from the websites of large retailers. This can provide an insight into long term trends, as well as the most recent trading performance, and is based on metrics such as average selling price and share of bestselling products in a category. Eagle Alpha owns this dataset.

The dataset currently supports over 100 brands/companies from categories including Tech Hardware (e.g. Apple, Cisco, Canon), Consumer Electronics (e.g. Sony, LG Electronics, Harman), Household Appliances (e.g. Whirlpool, Electrolux) and Leisure Products (e.g. Mattel, Hasbro) and the list is growing all the time.

Geography	Coverage	Mapped to Tickers	History	Collection Frequency	Delivery Frequency	Lag Time	Delivery Method
U.S	U.S Consumer Products Market	Yes	Since 2013	Daily, Weekly and Monthly	Daily, Weekly and Monthly	1 day	Excel/CSV

Backtesting/Significance

Eagle Alpha has published 31 quarterly reports incorporating scraped data. 20 of these indicators proved accurate equating to a hit rate of 65%.

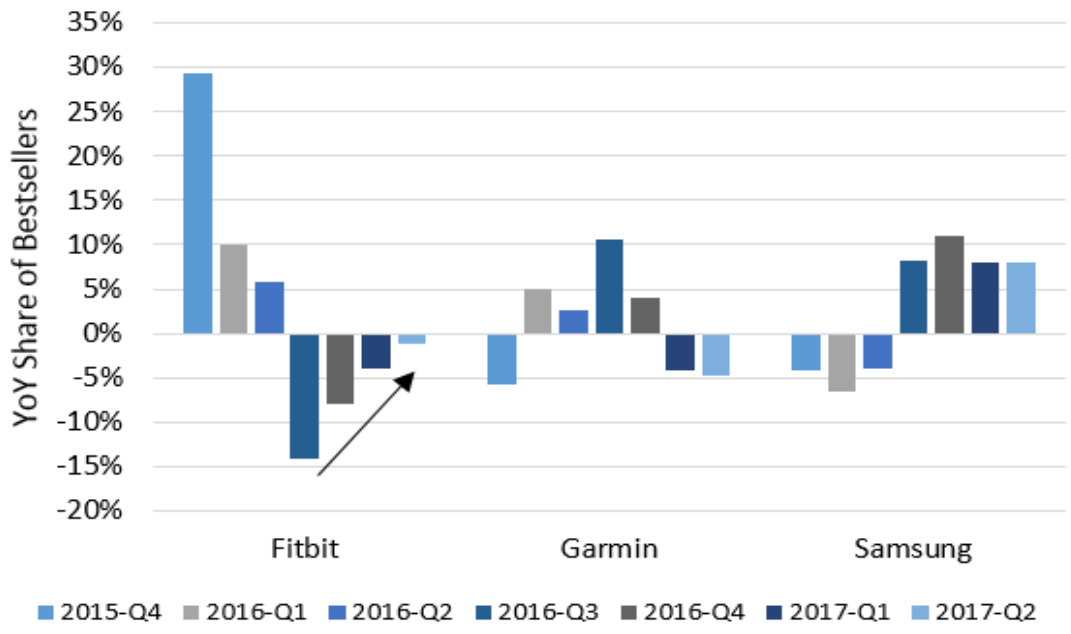
Case Study

On July 4th 2017, Eagle Alpha published a research note analyzing Fitbit's Q2 2017 with the use of online retail pricing data. Our analysis showed improving sell-through trends in the first half of the year. We noted the company's previous comments on improving inventory and concluded that Fitbit would report stronger than expected revenue.

Figure 22 below shows that Fitbit's share of bestsellers stabilized in Q2 as it further consolidated its position as the number one ranked fitness watch (Figure 23).

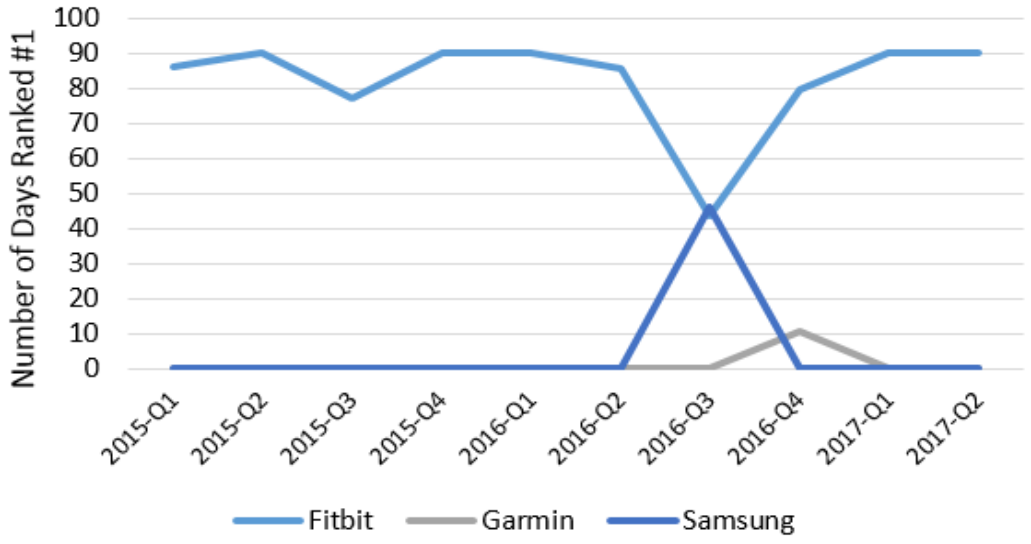
On August 2nd 2017, Fitbit reported better than expected results with adjusted revenue of $353.3m vs consensus estimate of $339.2m. Inventory was again mentioned by CEO James Park following these results. James stated "consumer demand in the second quarter was better than anticipated, enabling Fitbit to reduce channel inventory and generate better sales," which was in line with our analysis.

Figure 22: Online Data Showed Fitbit's Improving Share Trends



Source: Eagle Alpha Analysis, Online Retail Data

Figure 23: Fitbit Consolidated Top Ranking in Fitness Watches in Q2



Source: Eagle Alpha Analysis, Online Retail Data

11. Equity (Square SQ) > Discretionary (Long-Term) > Consumer Transaction Data

Key Takeaway

Analysis of the email receipt data for Square indicated that the growth in number of sellers has been in decline since the first quarter of 2016.

Dataset

The dataset is delivered through a partnership with a provider that collects anonymized purchase data from around 2 million active shoppers, scanned from email purchase receipts. It covers over 600 merchants from more than 25 industries.

The provider transforms multi-form unstructured email receipt data into a normalized and digestible consumer transaction dataset. The dataset is also granular as it includes item and SKU-level transaction data, which is filtered into 53 product categories.

Geography	Coverage	Mapped to Tickers	History	Collection Frequency	Delivery Frequency	Lag Time	Delivery Method
USA	600 merchants	No	Since 2013	Real-Time	Weekly	7 days	Excel, TSV

Backtesting/Significance

Eagle Alpha's predictive model for Square has a mean absolute percentage error (MAPE) of 1.4%, compared to a consensus error of 4.7%. The standard deviation of our error is 1.6%.

Eagle Alpha's Data Insights team has published 5 quarterly reports incorporating predictive indicators using the US Email Receipt Data. Three of these indicators proved accurate equating to a hit rate of 60%.

Case Study

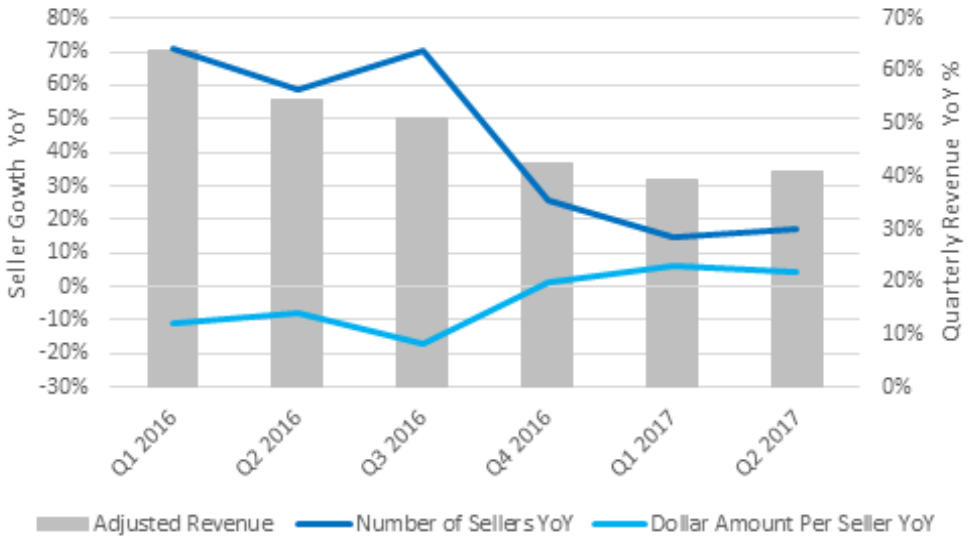
Square held an analyst day in May 2017 where the company gave details on its growth strategies. Two key parts for future growth are to move the company up market to get larger merchants, or sellers, to use Square devices and secondly to grow and retain existing merchants.

Larger sellers are users that have greater than $125k in annualized gross payment volume (GPV). In the June quarter of 2017, Square reported stronger than expected revenue. Adjusted revenue ticked up sequentially to 41% YoY growth, from 39% in the March quarter.

In our data insights report, titled “Email Receipt Data Reveals Improving Seller Fundamentals”, Eagle Alpha examined historical trends for Square sellers and dollar spend at sellers using an email receipt dataset. Square does not disclose seller metrics in annual or quarterly reports.

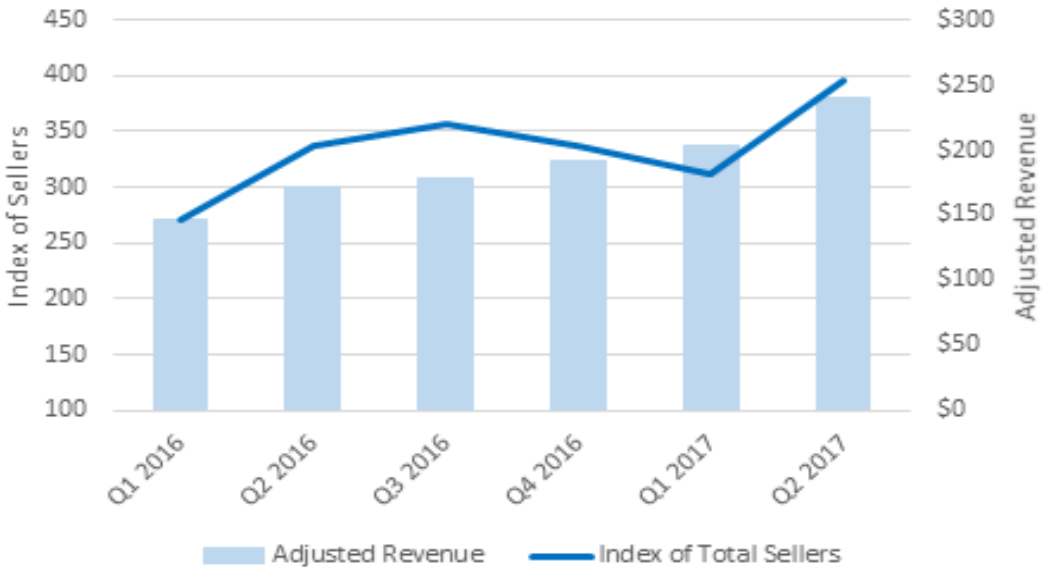
Analysis of the email receipt data indicated that the growth in number of sellers has been in decline since the first quarter of 2016. This has been the primary driver of slowing revenue growth for Square over this period (Figure 24). However, in the June quarter the number of sellers using Square’s platform increased sequentially from 15% in March to 17%. This can also be seen in the unique seller index, where sellers increased to 396 from an average of 325 for all of 2016 (Figure 25).

Figure 24: Metrics for Sellers Improving



Source: Eagle Alpha Analysis

Figure 25: Unique Seller Index



Source: Eagle Alpha Analysis

From the email receipt data, we can also observe that average spend per seller was declining on a YoY basis during 2016. However, growth in spend per seller turned positive in Q4 2016 and this improvement has been helping revenue growth over the first half of 2017.

Data on growth in total sellers, and the amount sold per seller, may be an indication that growth strategies outlined by the company are starting to gain traction and are a positive sign for longer term fundamentals of the company.

12. Equity (Burberry BRBY) > Discretionary (Long-Term) > Online Search Data

Key Takeaway

Citi concluded that the short-term 1-month YoY observation crossing over the 3-month moving average YoY indicates major inflection points of same store sales growth for Burberry.

Dataset

Google Trends is a public web tool based on Google Search that shows how often a particular search term is entered relative to the total search-volume over time across various regions of the world. Using Google Trends, Eagle Alpha has built company specific indices based on search terms that are related to a given retailer's product offering. This involves an exhaustive process for identifying search terms related to a company's revenues using both internal and third party tools.

Geography	Coverage	Mapped to Tickers	History	Collection Frequency	Delivery Frequency	Lag Time	Delivery Method
Global	B2B, Retail, Luxury, Restaurants	Yes	Since 2006	Daily, Weekly and Monthly	Monthly	1-3 days	JPG, PNG, SVG, PDF, CSV

Significance

Observing crossing points of three-month and one-month moving averages of one of these search indices has proved predictive of inflection points in revenue growth for companies across a broad range of sectors including retail, luxury goods, restaurants and 2B software.

Over the last 19 quarters the Burberry indicator demonstrated a two-quarter hit rate of 58% in in-sample testing, and three-quarter hit rate of 68%. This means that 58% of the time the three-month moving average has moved in the same direction as same store sales over a two-quarter period.

We prefer to measure the accuracy of our search signals indicators by reference to the hit rate, as we believe it better captures the goal of the tool to identify inflection points in growth for a company. However, below we present analysis from Citi's March 2017 report "Searching for Alpha: Big Data" which focuses on correlations.

Figure 26 appears to support our prior that short-term 1-month YoY observation crossing over the 3-month moving average YoY indicates major inflection points of same store sales growth as depicted by the green circles on the chart. Another interesting finding is that consensus[19] is pretty bad at predicting same store sales growth. In fact, it only achieves close to 20% of correlation with actual reported figures. With either the 1-month YoY or 3-month moving average YoY measures based on EA equity index for Burberry, the correlation jumps to over 70% which is a significant improvement. The additional advantage of this search data is its timeliness – the data at the end of the quarter is available immediately, whilst official figures typically are announced at least 3 weeks after quarter-ends. The timeliness and much improved correlation of the new dataset with actual reported figures make such an offering appealing.

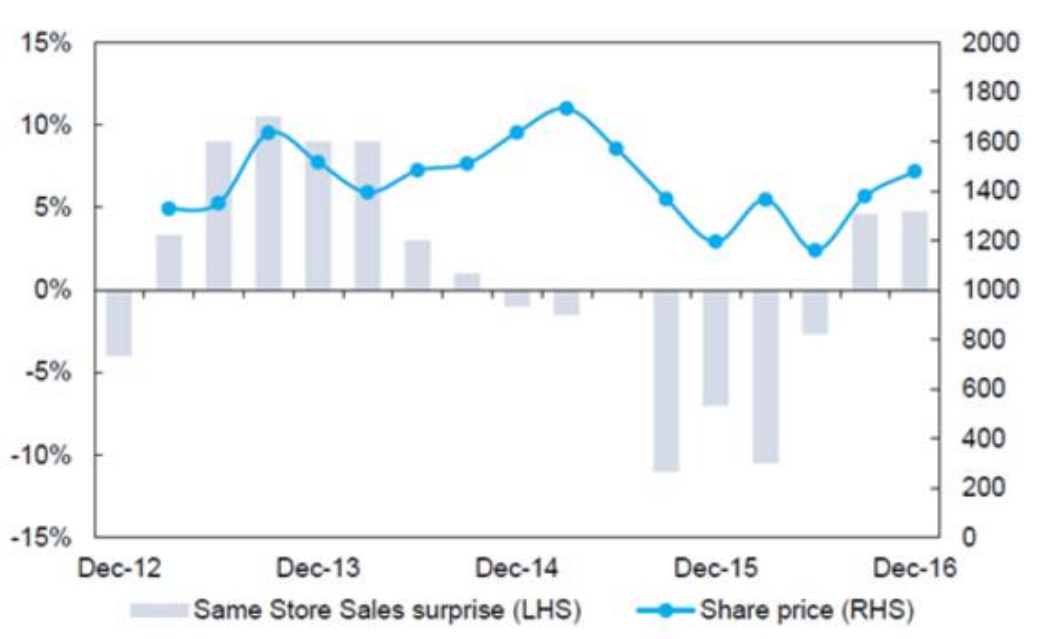
In Figure 27 we highlight that same store sales does have pricing impact especially the surprise element of it. That is, markets react to the positive/negative sales surprise. This suggests that, if we are able to predict the inflection points better with Google Trends data, there could be pricing implications from being able to act sooner and more accurately than the bulk of investors.

Figure 26: Burberry Same Store Sales vs Eagle Alpha Stock Index

Source: Eagle Alpha, Citi Research

[19] *The consensus data is sourced from Bloomberg but it has low analyst coverage issues as not all analysts publish their estimates for same store sales.*

Figure 27: Burberry's Same Store Sales Surprise vs Share Price



Source: Bloomberg, Citi Research

13. Equity (Sportswear Industry) > Discretionary (Long-Term) > Online Search Data

Key Takeaway

Online search data provided early indicator of weakness in sportswear sector. The industry analysis supported our case for fundamental weakness for FINL and FL and points to longer term fundamental issues for the sportswear space.

Dataset

Google Trends is a public web tool based on Google Search that shows how often a particular search term is entered relative to the total search-volume over time across various regions of the world. Using Google Trends, Eagle Alpha has built company specific indices based on search terms that are related to a given retailer's product offering. This involves an exhaustive process for identifying search terms related to a company's revenues using both internal and third party tools.

Geography	Coverage	Mapped to Tickers	History	Collection Frequency	Delivery Frequency	Lag Time	Delivery Method
Global	B2B, Retail, Luxury, Restaurants	Yes	Since 2006	Daily, Weekly and Monthly	Monthly	1-3 days	JPG, PNG, SVG, PDF, CSV

Significance

Observing crossing points of three-month and one-month moving averages of one of these search indices has proved predictive of inflection points in revenue growth metrics for companies across a broad range of sectors including retail, luxury goods and restaurants. Over a nineteen quarter period a Search Signal for Finish Line (FINL) and Foot Locker (FL) has demonstrated a three-quarter hit rate of 74% in in-sample testing. This means that 74% of the time the three-month moving average has moved in the same direction as same store sales (SSS) over a three-quarter period. Over a twelve quarter period the indicator for Under Armour (UAA) has demonstrated a three-quarter hit rate of 67% in in-sample testing.

Note: we have published 21 quarterly reports for consumer companies incorporating Google search data. 15 of these indicators proved accurate (71% hit rate).

Case Study

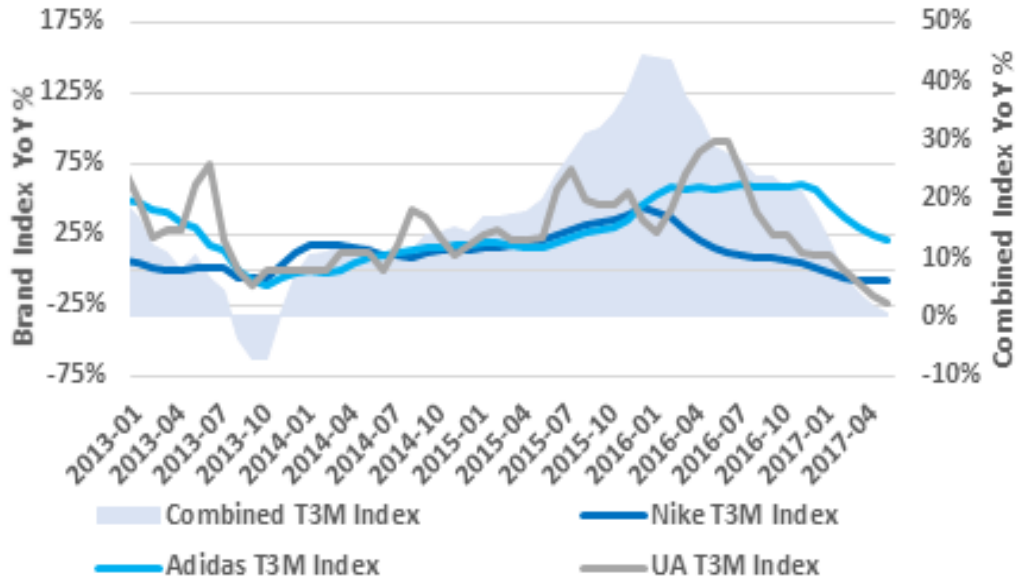
In December 2016, Eagle Alpha published a report on US sports retailer FINL and FL using Google Trends data. The Search Signal for Finish Line was indicating that SSS growth was at risk and could disappoint management expectations. Subsequently Finish Line reported a poor quarter and offered weak guidance for the March quarter. In February of 2017 Eagle Alpha published a follow up report on the sports retailers where we highlighted that the Search Signal for FL had deteriorated and pointed to a risk of the company missing expectations. The company reported strong SSS and offered positive

guidance for the April quarter. However, in April the company preannounced negatively for the quarter, reducing SSS guidance from 5% to 2%. When the company reported the quarter SSS was just 0.5%. Search Signals proved to be an early indicator of fundamental weakness for both FL and FINL.

The negative trends seen at FL and FINL triggered Eagle Alpha to take a deeper dive into the industry to see what could be catching company management off guard. Analysis of industry trends led to the conclusion that the problems for FINL and FL were more rooted in industry dynamics than company specific issues. This can be seen in Figure 28. Using Google Trends, we created indices of sports apparel and sports footwear for the big three global sports brands of Adidas, Nike and Under Armour.

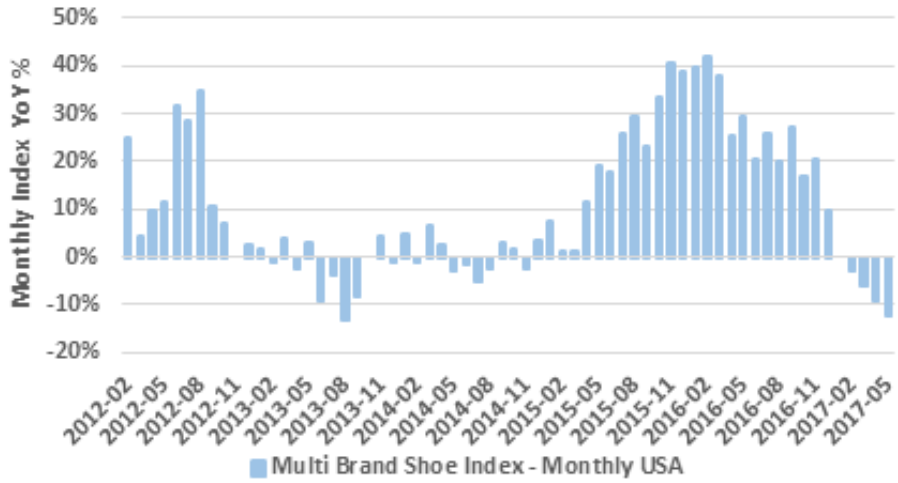
We also created a combined index of all three brands. As can be seen in Figure 28, a three-month moving average of our index began to roll over in early 2016, stabilized somewhat in mid-2016 and then accelerated to the downside in late 2016. The decline in the combined index happened in waves. This can be observed by looking at the individual brands. Nike rolled over in early 2016, followed by Under Armour in mid-2016 and finally by Adidas in late 2016. Looking at consumer interest in sports footwear alone, we created an index of sports shoes for the top 3 global brands plus Asics, Puma, Vans and New Balance. This index declined through 2016 and accelerated to the downside, into negative growth, in late 2016 and early 2017 (Figure 29). The sharp drop in both the sports index and shoe index in late 2016 coincided with the negative report from FINL and the delayed reaction from FL in the spring of 2017.

Figure 28: Big 3 Global Brands in Decline Through 2016



Source: Eagle Alpha Analysis

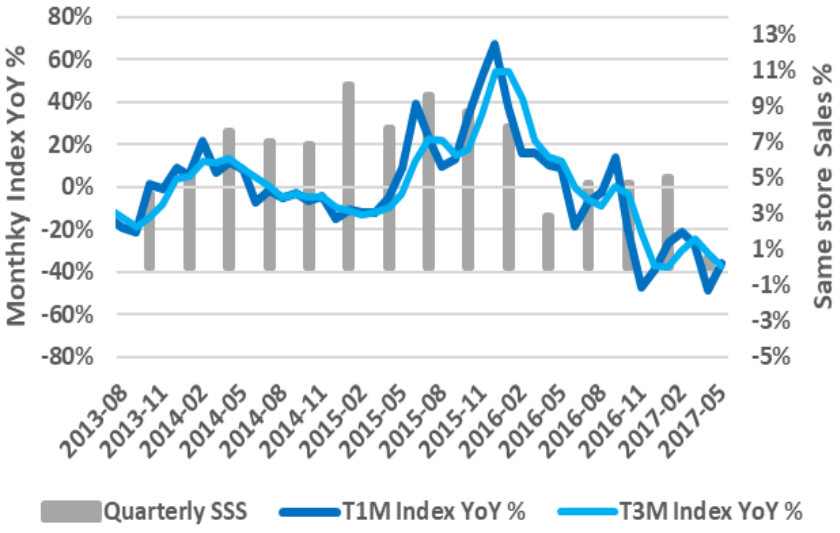
Figure 29: Shoe Index Turns Negative in Early 2017



Source: Eagle Alpha Analysis

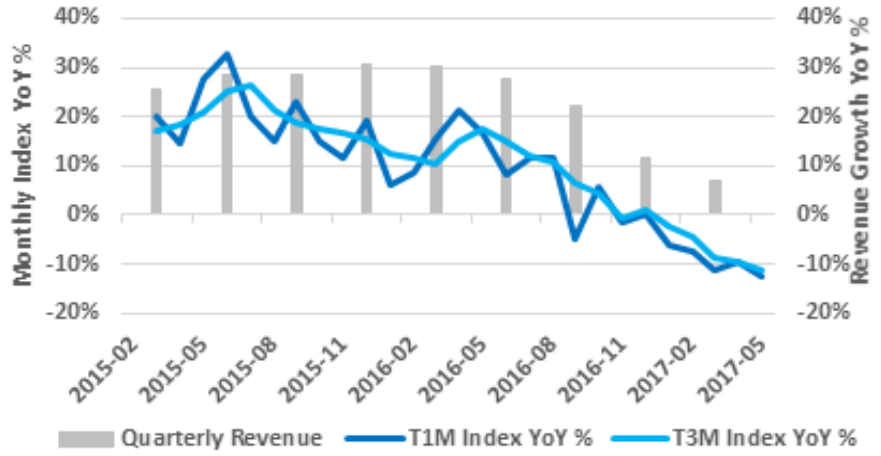
This industry analysis supported our case for fundamental weakness for FINL and FL and pointed to longer term fundamental issues for both companies. The Search Signal indicators for both companies remained weak in June, indicating further potential weakness in SSS. The June 2017 report included Figure 30, below, of Foot Locker. Subsequently both FL and FINL reported very weak quarters and the stocks traded off significantly. From the time of Eagle Alpha's first Search Signal report on FINL and FL in December of 2016 to September of 2017 the stocks declined 65% and 55% respectively.

Figure 30: Foot Locker Trends Leading SSS Decline



Source: Eagle Alpha Analysis

Figure 31: Under Armour Trends in Steep Decline



Source: Eagle Alpha Analysis

Eagle Alpha's industry report in June 2017 included a Search Signal for Under Armour that also showed very negative search trends (Fig 31). When UAA reported, management lowered guidance for the full year. The stock declined approximately 30% in the two months after our report.

Investors have only recently started to consider the implications for Adidas and Nike of the negative results at the retailers and Under Armour. These stocks have been weak in recent months and have seen broker downgrades. However, headwinds for the sector were apparent in search data over 12 months before.

14. Equity (Time Warner TWX) > Discretionary (Long-Term) > Mobile App Data

Key Takeaway

App data showed an early indicator of a positive inflection in revenue growth for HBO, one of Time Warner's largest divisions.

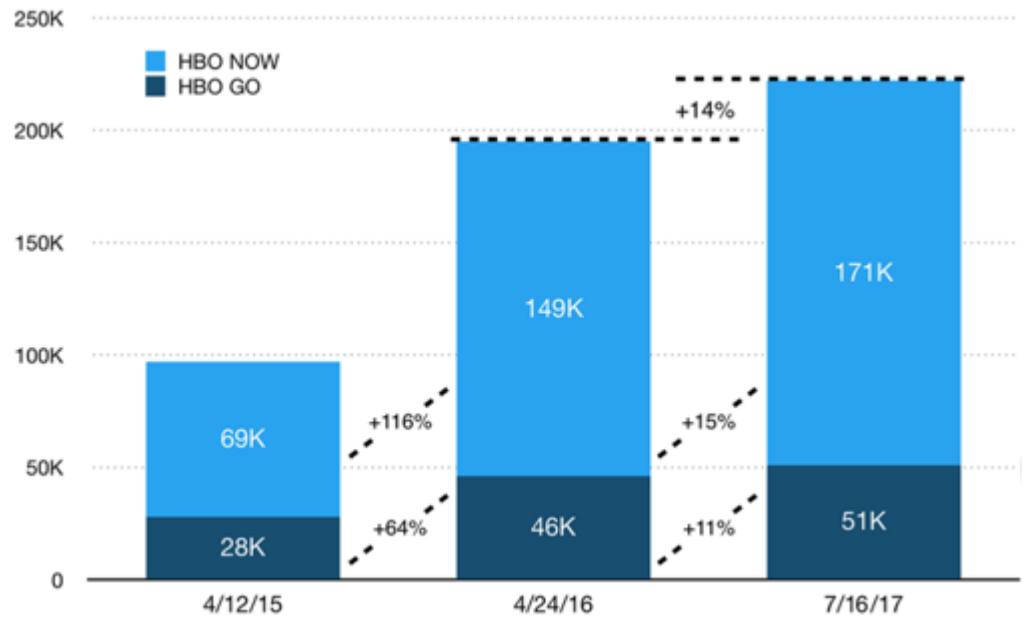
Dataset

App download and usage data is an example of an alternative data source that can be used to analyze product adoption and brand satisfaction. This type of data enables investors to track activity in a wide range of sectors from banking to food delivery to online entertainment.

Case Study

On July 19th 2017, an app data provider published a report highlighting record number of new installations of both HBO NOW and HBO GO. The network's streaming services reached the peak of approximately 222,000 installs due to the premiere of season seven of Game of Thrones (Figure 32).

Figure 32: HBO Mobile App Peak New Installs (United States)



Source: App Data Provider

The subsequent report publish on August 18th stated: “The sizable influx of new subscribers reflected in our download estimates at the time drove record single-day revenue one month later as their 30-day free trials converted to paid subscriptions.”

HBO NOW rose to the top of the App Store revenue charts and grossed around $2.6 million across both the App Store and Google Play on August 16th 2017. This represents a 41% increase over the previous record of $1.3 million recorded on June 24th 2016.

HBO is one of Time Warner’s largest divisions but growth for the division has been slowing in recent quarters, therefore this analysis could be an early indicator of a positive inflection in revenue growth for HBO.

Disclaimer

This case study is directly from the vendor and Eagle Alpha has not backtested the data.

15. Equity (Activision Blizzard) > Discretionary (Long-Term) > Social Media Data

Key Takeaway

Using social media data, we correctly highlighted that the Overwatch game was well positioned to set a new sales record for Activision Blizzard (ATVI).

Backtesting/Significance

Eagle Alpha's Data Insights team has published 12 quarterly reports incorporating social data. 10 of these indicators proved accurate equating to a hit rate of 77%.

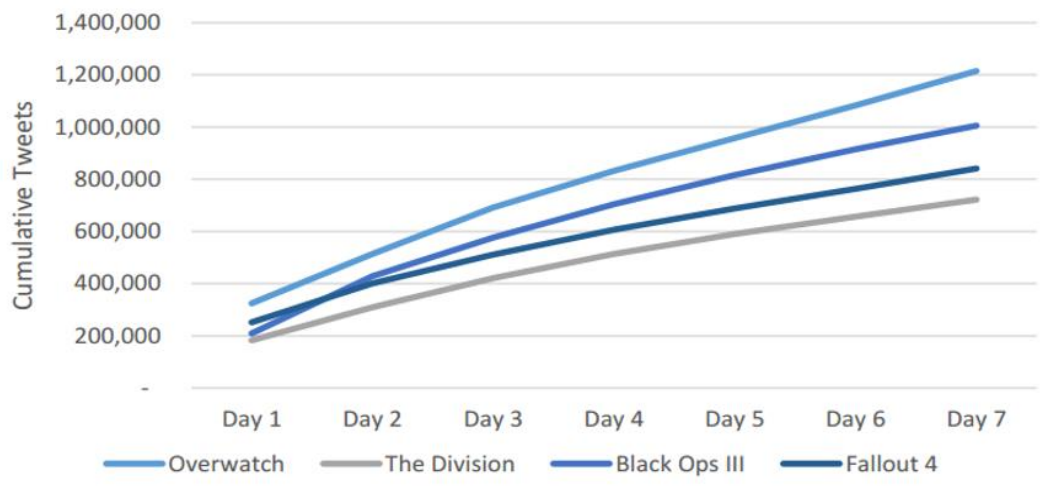
Dataset

Social media data is created through the public's interaction with social media platforms such as Twitter, Facebook, YouTube and Twitch. Access to this data can be obtained directly from the provider themselves or often through third party platforms. This case study also incorporated Eagle Alpha's Web Queries tool. Web Queries is a query based tool that enables clients to obtain analytics on over 90 million web sources including: blogs, image and video sites, forums, review sites, social media and news sites.

Case Study

On June 3rd 2016, Eagle Alpha published a Data Insights report on video games publisher Activision Blizzard (ATVI US) titled "Activision Blizzard: Overwatch Positioned to Set New Sales Record." The report highlighted the potential success of the company's latest game, Overwatch. Overwatch enjoyed stronger Twitter visibility when compared to the competition and the strong positive sentiment towards the title pointed to positive consumer reaction to the title.

Figure 33: Overwatch Twitter Visibility Much Stronger than Comp Titles

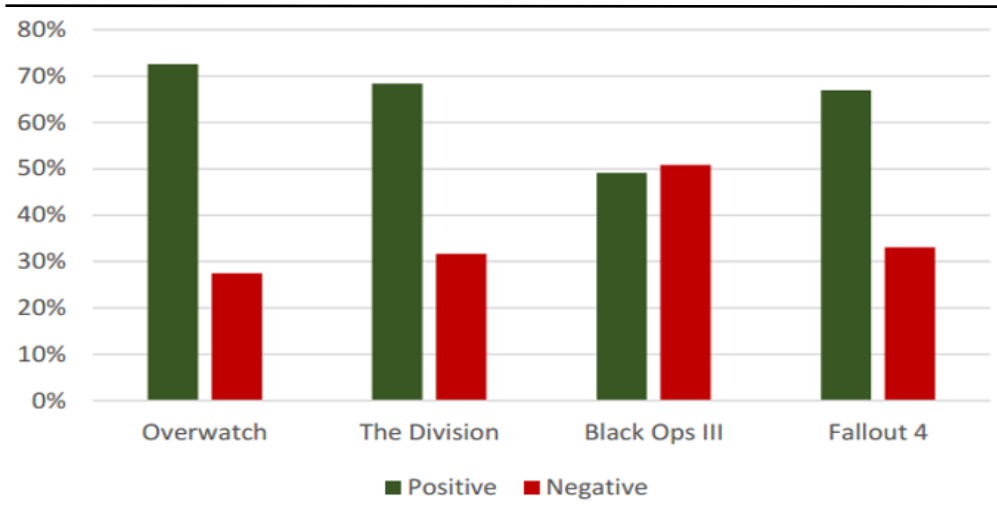


Source: Eagle Alpha Web Queries

Over 1.2m tweets mentioned Overwatch in the first week post the game's launch, while the competition gathered much lower number of mentions: Black Ops III (1m), Fallout (840k) and the Division (720k).

The Eagle Alpha Web Queries tool was also used to analyse consumer comments and sentiment around Overwatch. The first week comparative statistics are presented below, and clearly show a stronger performance for Overwatch compared to rival titles.

Figure 34: Overwatch Leads on Twitter Sentiment for First Week



Source: Eagle Alpha Web Queries, Twitter

On June 14th 2016, Activision reported that Overwatch had over 10 million players after only three weeks of the launch. The Division, on the other hand, was launched in the beginning of March 2016 and had 9.5 million players more than two months after the launch.

In August 2016, Overwatch hit the 15 million user mark, reaching the milestone faster than any other game in Blizzard's history. More recently, January 27th 2017, Activision announced that Overwatch reached another milestone by amassing more than 25 million players.

16. Equity (Lululemon LULU) > Discretionary (Long-Term) > Online Search, Social Media, Pricing Data

Key Takeaway

Eagle Alpha's analysis proved correct, i.e. Lululemon (LULU) reported sales growth of 13% YoY in Q3 2016 which was in line with our expectations.

Datasets

Google Trends is a public web tool based on Google Search that shows how often a particular search-term is entered relative to the total search-volume over time across various regions of the world.

Social media data is created through the public's interaction with social media platforms such as Twitter, Facebook and YouTube. Access to this data can be obtained directly from the provider themselves or often through third party platforms.

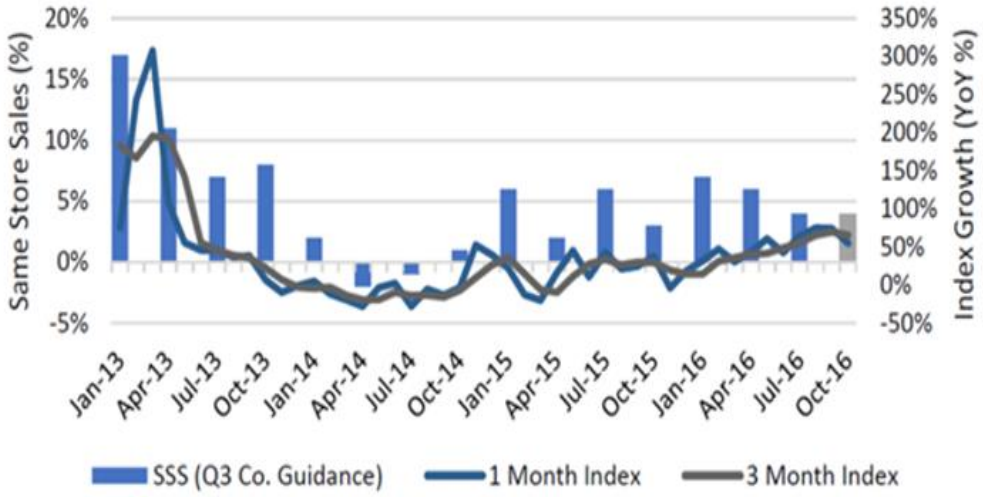
Pricing data is crawled from the websites of large retailers. This can provide an insight into long term trends, as well as the most recent trading performance, and is based on metrics such as average selling price and share of bestselling products in a category. Eagle Alpha owns this dataset.

This case study also incorporated Eagle Alpha's Web Queries tool. Web Queries is a query based tool that enables clients to search over 90 million web sources including: blogs, image and video sites, forums, review sites, social media and news sites.

Case Study

Lululemon's (LULU) same-store sales (SSS) have been decelerating since the beginning of 2016 with Q2 numbers particularly disappointing. On November 22nd 2016, Eagle Alpha published a note on Lululemon highlighting stabilized momentum in Q3. Figure 35 below shows that search data suggested stable to improving SSS in Q3 2016.

Figure 35: Search Signal Index for LULU

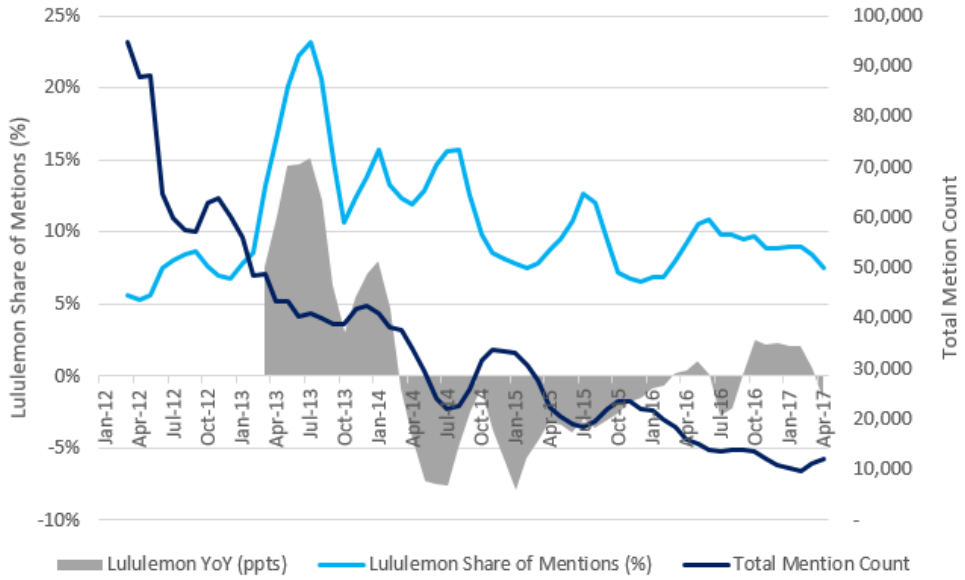


Source: Eagle Alpha Analysis

According to social media data, the athleisure trend was experiencing continued pressure. However, Lululemon improved its competitive position as the company received a meaningful share of mentions across blogs and forums for the first time since 2014 (Figure 36).

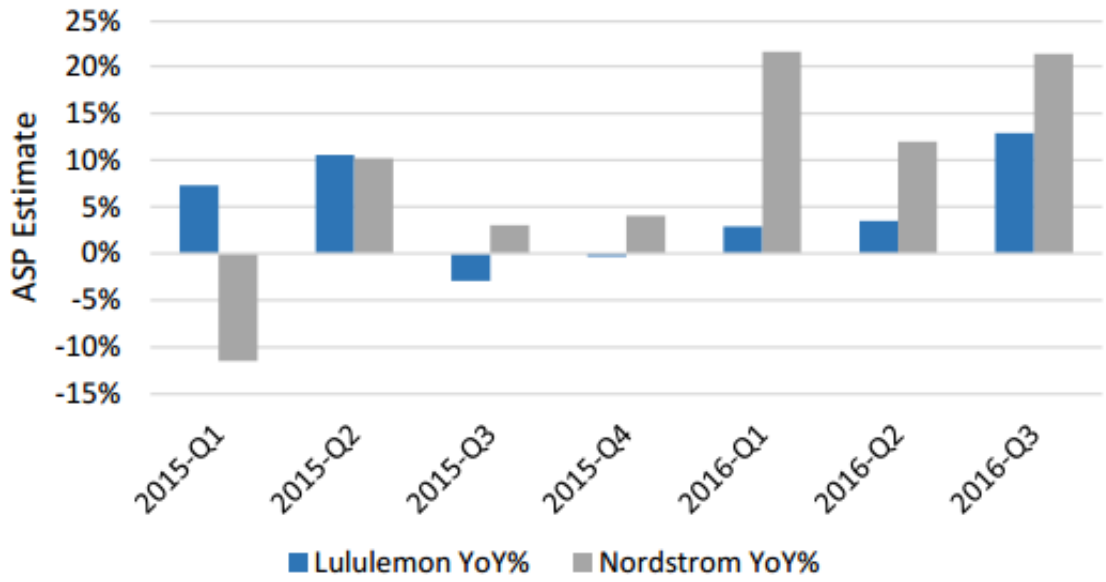
Eagle Alpha's YoY average selling price (ASP) estimate for Lululemon grew by 13% in Q3 2016, representing the fastest change since Q1 2015 (Figure 37).

Figure 36: Lululemon Share of Mentions Across Blogs and Forums



Source: Eagle Alpha Web Queries

Figure 37: Lululemon Price Growth Accelerated



Source: Eagle Alpha Analysis, Online Pricing Data

In our November 2016 report, we concluded: “consensus estimates are for Q3 2016 revenues growth of 13% YoY, slightly behind the 14% number reported in Q2. This revenue growth looks achievable.” On December 7th 2016, Lululemon reported sales growth of 13% YoY – in line with our expectations.

17. Macro > Discretionary (Long-Term) > Online Search Data

Key Takeaway

Eagle Alpha's US Unemployment index has a 5-year correlation of 0.9 with the US Unemployment Rate, with an out-of-sample prediction improvement of 14% compared with a baseline ARIMA model.

Dataset

Google Trends is a public web tool based on Google Search that shows how often a particular search-term is entered relative to the total search-volume over time across various regions of the world. There are several advantages to using search data as a determinant of economic activity. The data is very timely, it has over 10 years of history, it is unique and offers unparalleled flexibility in terms of the variety of issues that can be analysed. The data is also generated as a by-product of people's normal day-to-day activity, as opposed to traditional survey methods which rely on individuals or firms responding to survey questions after the event. This can avoid problems associated with non-response or inaccurate responses.

Geography	Coverage	Mapped to Index	History	Collection Frequency	Delivery Frequency	Lag Time	Delivery Method
U.S	US Labor Market	Yes	Since 2006	Monthly	Monthly	1 to 14 days	CSV

Backtesting/Significance

Eagle Alpha data scientists and data insight analysts have invested three years into finding the best way to use online search data to predict economic indicators. We have devised our own proprietary methodology that leverages all relevant academic research, as well as accepted best practices in the field.

Each index is built using a rigorous process: 1) generate relevant search terms; 2) source the search volume for each term dating back to 2004; 3) clean the data and adjust for outliers and seasonality; 4) search terms are ranked by their predictive scores; and 5) final index includes a selected basket of terms, and measures co-movement of search activity with a particular economic indicator. To obtain a detailed overview of our methodology please contact us.

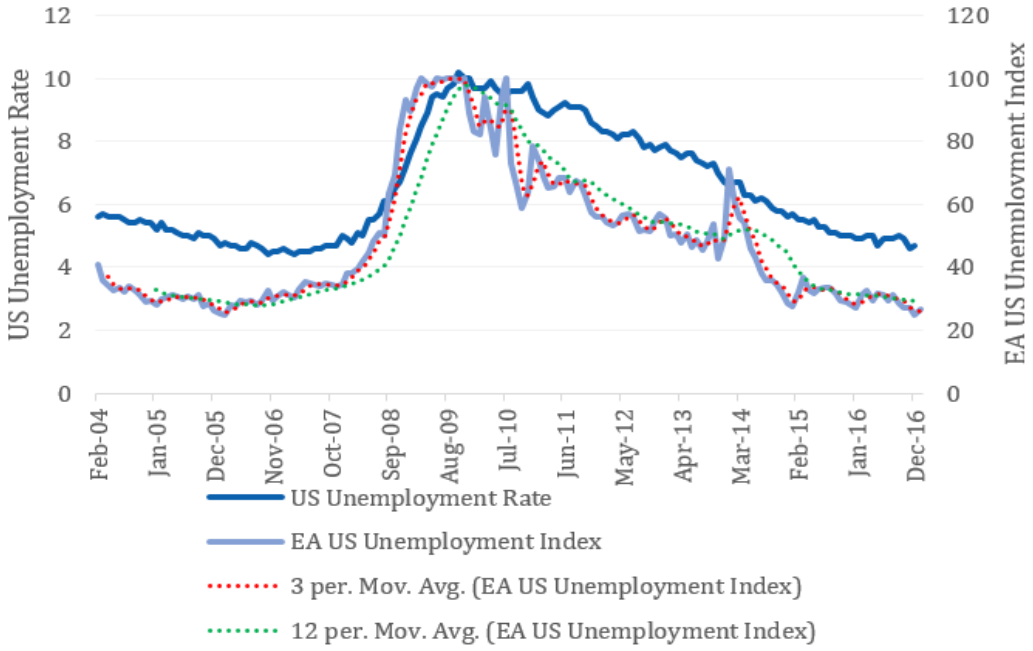
These indices are not designed to provide point estimates for macro investors, but instead add value by improving the predictive power of clients' estimation models.

Case Study

Eagle Alpha's US Unemployment Index (Figure 38) is a measure of online search activity relating to the claiming of unemployment benefits. The index has a 5-year correlation of 0.9 with the US Unemployment Rate and testing shows an out-of-sample prediction improvement of 14% over a baseline ARIMA model of unemployment over the same period.

In January 2017, the index increased by 1.8 points. This is the largest MoM change since August 2016. The 3 and 12-month moving averages mirror each other closely, which is consistent with the US economy operating close to full employment.

Figure 38: EA US Unemployment Index vs. Unemployment Rate (US)



Sources: Eagle Alpha, Google, BLS, Bloomberg

18. Macro > Discretionary (Long-Term) > Trade Nowcasting Data

Key Takeaway

Statistical backtesting has proven the indicators are frequently a better predictor than street-mean estimates, while also having the advantage of substantial lead time.

Dataset

Trade nowcasting indicators provide valuable insights into international trade and industrial production. Our data partner employs big data and predictive analytics techniques, and more than 25,000 times series, to forecast trade balance and industrial production statistics. The data is also available at the level of an individual shipping port, and bespoke feeds can be provided.

Geography	Coverage	Mapped to Tickers	History	Collection Frequency	Delivery Frequency	Lag Time	Delivery Method
Global	12 Countries e.g. USA, CAN, JPA, GB, GER, TAI	No	Since 2010	Daily	Daily	1 day	API, CSV

Backtesting/Significance

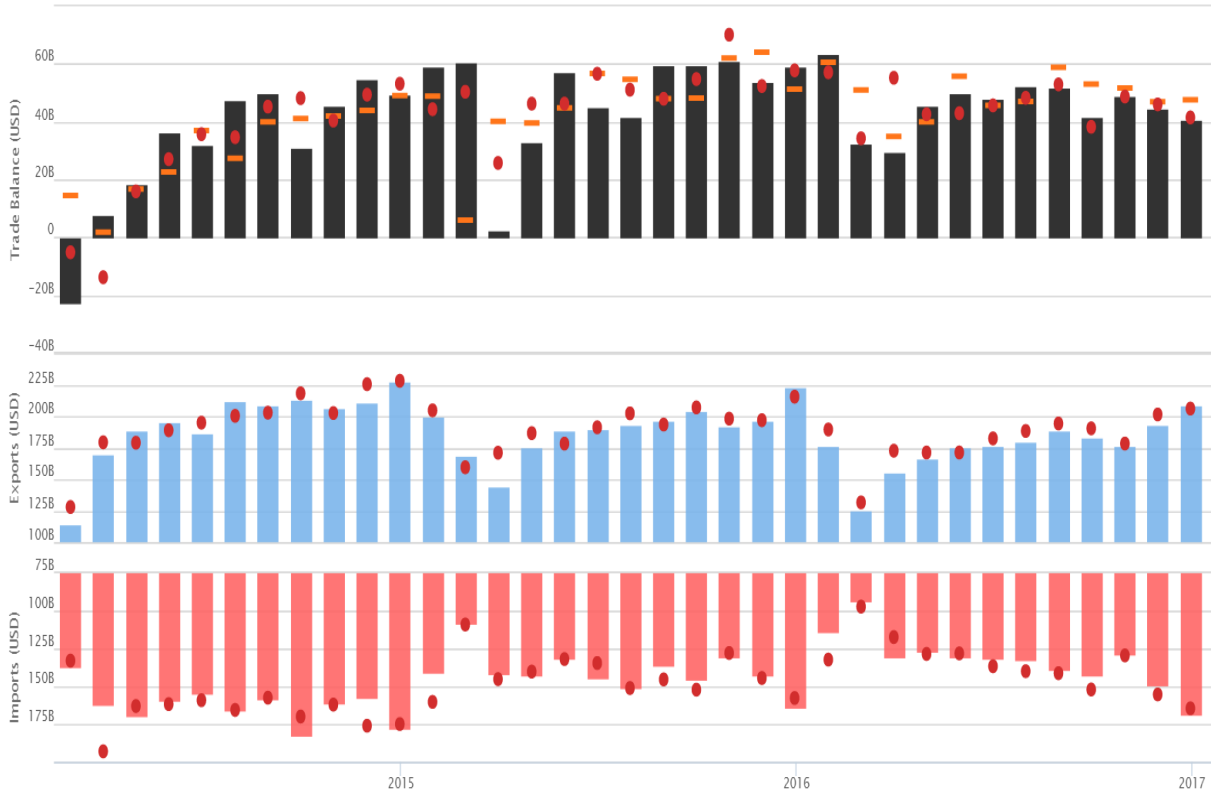
Statistical backtesting has proven the indicators are frequently a better predictor than street-mean estimates, while also having the advantage of substantial lead time. Over the last 3 years, the indicators were better than street estimates in 67% of the time.

Case Study

Considering China's trade balance, Figure 39 below shows monthly values from February 2014 onwards. Red dots show the trade nowcasting forecasts, while orange dashes indicate street estimates.

In January 2017, it was reported that China's trade remained sluggish in December 2016 with exports decreasing 6.1% YoY. Imports, on the other hand, increased by 3.1% YoY vs. 6.7% YoY in November 2016.

Figure 39: China's Trade Balance



Source: Trade Nowcasting Indicators

19. Macro > Discretionary (Long-Term) > Pricing Data

Key Takeaway

Online property listings data was used to research buy-to-rent investors which led to the subsequent clamp down on mortgage lending.

Dataset

The case study below is based on an online property listings dataset that covers 80% of UK sales. This dataset is more timely than any publicly available dataset. Our partner's data can be actionable in various ways, such as analysing property deal flow and volume, tracking liquidity of the property market, tracking the liquidity and availability of secure consumer credit, analyzing consumer confidence around envisaged indebtedness, and advanced indicator of strength or weakness in housing related consumer discretionary stocks as well as telecom and utilities.

Geography	Coverage	Mapped to Tickers	History	Collection Frequency	Delivery Frequency	Lag Time	Delivery Method
U.K.	80% of U.K home sales	No	Since 2005	Daily	Daily	1 Day	FTTP, CSV

Case Study

Bank of England analysts demonstrated their research in several papers: 'How much do investors pay for houses?' (September 2015)[20], 'Five facts about buy-to-let' (July 2015)[21], 'Chance favours the prepared mind' (July 2015)[22]. These articles shed a light on the Bank's methodology and how various micro datasets were linked in order to gain valuable insights into UK housing market trends.

Buy-to-rent investors – known as buy-to-let (BTL) in the UK – were becoming large players in the UK housing market. Housing stock held for private renting went from 9% of the total stock in 2000 to 19% in 2013 (Bracke, 2015). The Bank of England decided to investigate whether BTL investors drove the housing prices up and could lead to macro instability.

Product Sales Data (PSD) provided by the Financial Conduct Authority was used to gather details of loans for house purchases. The PSD data was then linked with Land Registry's Price Paid data and the online property listings dataset.

[20] Source: 'How much do investors pay for houses?', September 2015

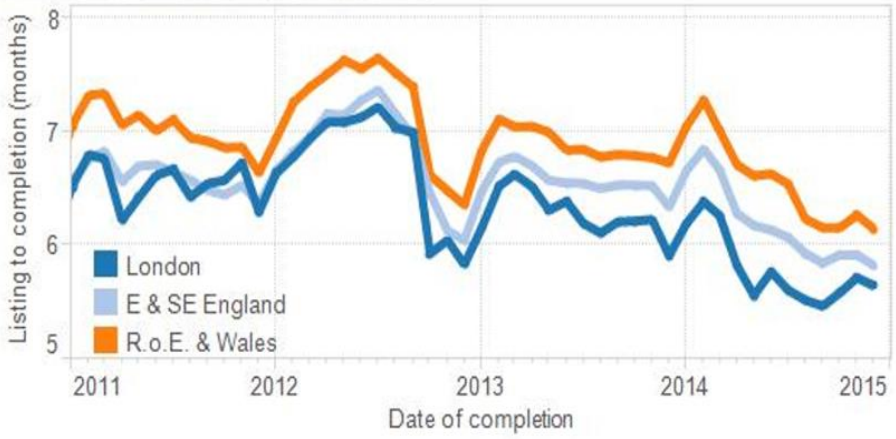
[21] Source: 'Five facts about buy-to-let', July 2015

[22] Source: 'Chance favours the prepared mind: What linked micro data can tell us about the housing market', July 2015

The combination of these datasets allowed the Bank of England to conduct a more precise analysis and get closer to the understanding of the individual agents' decision-making. Some valuable insights are presented below.

A decrease in average time from listing to completion of a sale highlighted increased purchasing activity.

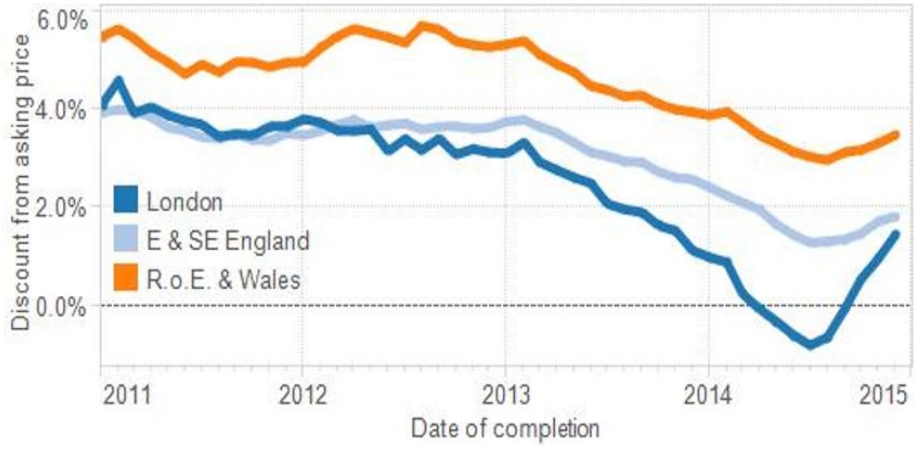
Figure 40:Months from Listing to Completion



Sources: Online Property Listings Dataset, Land Registry Price Paid, ONS Postcode Directory

Buyers were able to negotiate and obtain 4-5% discounts in 2011-2012. However, the analysis showed that buyers lost some of the bargaining power as the speed of transactions increased. In London, the average discount even turned negative at one point.

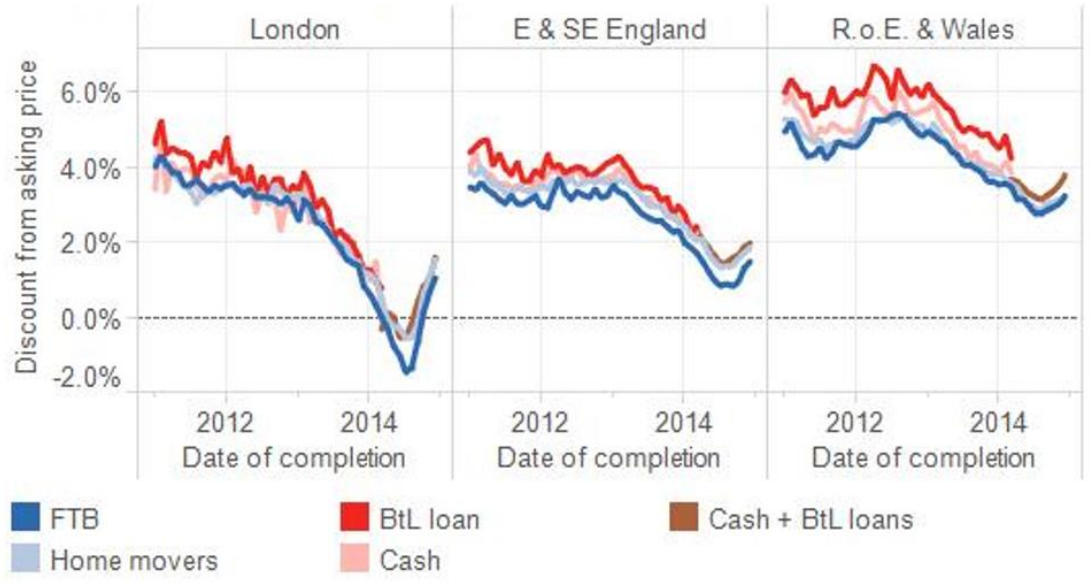
Figure 41: Discount from Last Asking Price



Sources: Online Property Listings Dataset, Land Registry Price Paid, ONS Postcode Directory

The analysis of the micro linked data also revealed that BTL investors were able to secure greater discounts compared to other buyers. They also preferred London properties, and flats in particular.

Figure 42: Discount from Last Asking Price by Buyer Type



Sources: WhenFresh, Land Registry Price Paid, ONS Postcode Directory

Bracke (2015)[23] concluded: "The data show that BTL investors can accelerate the time it takes to sell a property, and BTL discounts are the implicit compensation for this contribution. However, investors' ability to `grease the wheels' of the housing market becomes limited when the market is already performing well. This is precisely when financial stability concerns become most important."

The Bank of England then used the above analysis to further investigate the mortgage-financed part of the housing market as half of all BTL transactions were supported. It then decided to take action and clamp down on BTL lending: "The PRA, the Bank's regulation arm, is concerned that changes to mortgage interest tax relief for landlords will strain buy-to-let borrowers and that only a few lenders include this risk when assessing mortgage applications."

[23] Source: 'How much do investors pay for houses?', September 2015

20. Credit > Discretionary (Long-Term) > Credit Risk Data

Key Takeaway

Testing showed that the probability of bankruptcy within 12 months ranges from 10% to 50% when a company gets a stress score of “1”.

Dataset

Credit score data provider delivers predictive stress scores for credit, supply chain and financial professionals. Credit ratings are prepared for over 57,000 public companies worldwide and can be used to analyze equities with high bankruptcy risks.

Aggregate crowd-sourced usage data from the vendor’s subscribers, credit managers and supply chain professionals from Fortune 1000 companies, is incorporated during the construction of stress scores. The provider found distinct behavioural patterns when its subscribers are concerned with certain companies and investigate them more closely.

Backtesting/Significance

Monthly credit scores have been proven to be highly accurate when predicting corporate failures. Testing showed that the probability of bankruptcy within 12 months ranges from 9.99% to 50% when a company gets a score of “1”.

Case Study

On August 31st 2016, Hanjin Shipping, the world’s seventh-largest container carrier at the time, filed for bankruptcy protection as it could not renegotiate its debts. On September 12th 2016, it was estimated that $14 billion worth of cargo was stuck aboard Hanjin ships and the company lost a third of its market value in two weeks.

On 21st September 2016, the vendor published a case study with the post-filing analysis of Hanjin Shipping’s bankruptcy. Figure 43 below shows that the credit score for Hanjing dropped to “2” in December 2015 and “1” in February 2016 well in advance of the bankruptcy filing.

Figure 43: Monthly Average Credit Scores

Business Name	2015 SEP	2015 OCT	2015 NOV	2015 DEC	2016 JAN	2016 FEB	2016 MAR	2016 APR	2016 MAY	2016 JUN	2016 JUL	2016 AUG	2016 SEP
2GO Group Inc	6	6	7	7	7	6	6	7	7	7	7	7	7
Abetrans Ltd.	3	3	3	3	3	3	3	3	3	3	3	3	3
AP Moeller Maersk A/S	9	9	9	10	9	9	9	9	9	9	9	9	10
Arpeni Pratama Ocean Line Tbk PT	2	2	2	2	2	2	2	2	2	2	2	2	2
Associated British Ports Holdings Plc				9	9	9	9	9	9	9	8	8	8
Atlantska Plovidba dd	4	4	4	4	4	4	4	4	4	4	4	5	5
Avance Gas Holding Ltd	7	8	8	8	8	7	7	7	5	4	3	3	3
Barska plovidba A.D. Bar	4	4	4	4	4	4	4	4	4	4	4	4	4
Bollore SA	6	6	6	6	6	6	5	5	5	5	4	5	5
Buana Listya Tama Tbk PT	6	6	6	6	6	6	4	4			5	5	6
China COSCO Holdings Company Limited	4	4	4	4	4	4	4	3	2	2	2	3	4
China Merchants Energy Shipping Co., Ltd	5	5	6	6	6	6	6	6	6	5	6	6	6
Chu Kong Shipping Enterprises(Grp)Co Ltd	7	7	7	7	7	7	7	7	7	6	7	8	8
Companhia Doca de Imbituba	3	3	3	3	3	3	3	3	3	3	3	3	3
Express Kenya Limited	3	3	3	3	3	3	3	3	3	3	3	3	3
FUSHIKI KAIRIKU UNSO CO., LTD.	5	5	5	5	5	5	5	5	5	5	5	5	5
Hanjin Shipping Co Ltd	3	3	3	2	2	1	2	1	1	2	1	1	1
Kirby Corporation	9	9	9	9	9	9	10	10	10	10	10	9	9
OT Logistics SA	6	6	6	6	6	6	6	6	6	6	6	6	6
South Logistics JSC	7	7	7	7	7	7	7	7	5	5	5	5	5

Source: Credit Risk Data Provider

Disclaimer

This case study is directly from the vendor and Eagle Alpha has not backtested the data.

Section 5: Overview of Eagle Alpha

Eagle Alpha was founded in 2012 with the sole focus of enabling asset managers to obtain alpha from alternative data.

Since 2012 Eagle Alpha has built a product team that is modelled on similar teams of ‘data factories’ at asset management firms. There are four groups that make up our product team: 1) data sourcing professionals whose task is to hunt for and profile datasets; 2) analysts with buyside and sellside experience that understand asset classes and investigate strategies; 3) data scientists that have strong quantitative skills for backtesting and data exploration; and 4) engineers to deliver our solution to clients.

Asset management clients include quantitative funds, discretionary hedge funds and traditional mutual funds. We work with clients that are starting to integrate alternative data into their investment process as well as the most sophisticated users of alternative data. Our solution is focused on education (teach-ins and thought leadership) and alpha (bespoke projects, data insights, analytical tools and data sourcing). Please see Figure 44 for summary information.

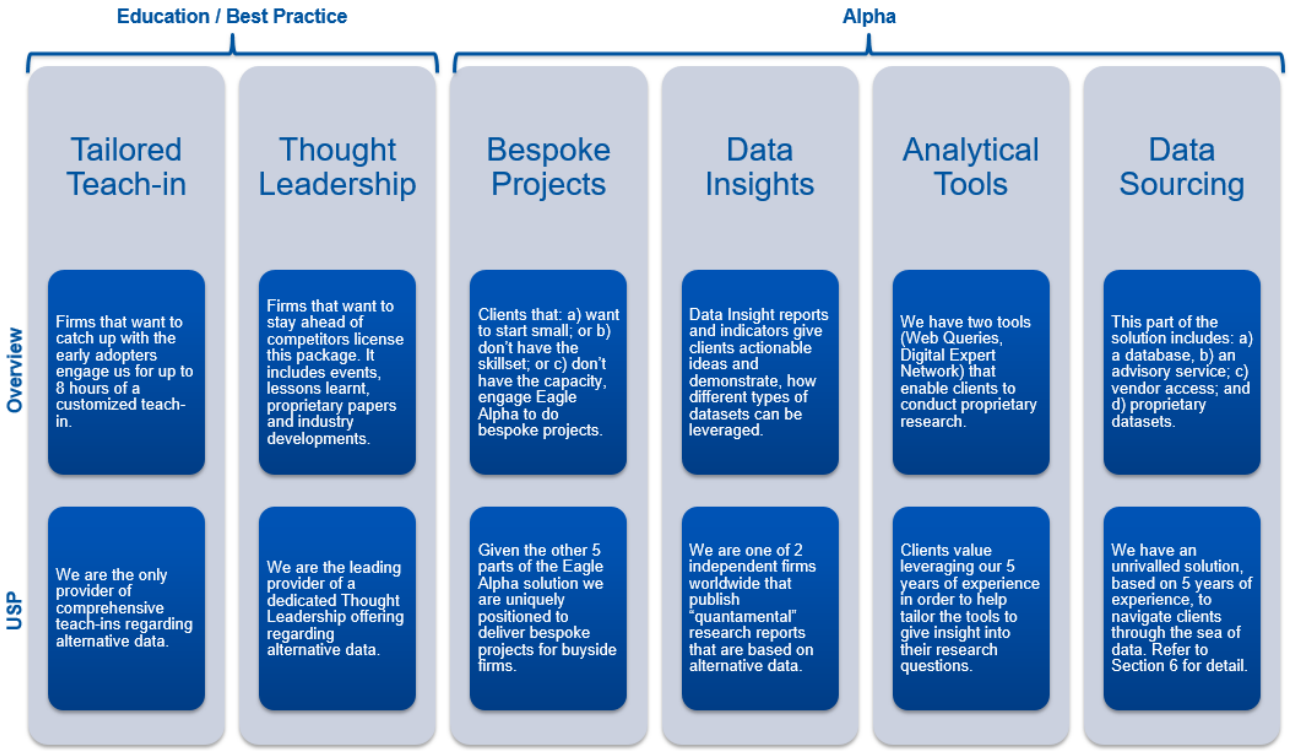
The most popular part of our offering is the Data Sourcing solution. It aggregates the best third-party datasets worldwide (currently 515) and also our (quasi) proprietary and proprietary datasets. See Section 6 (page 76) for more information.

We are a recognized leader in the alternative data space. We regularly host flagship events on alternative data in New York, London and Hong Kong, we author some of the most highly regarded content on the topic, and we have been heavily referenced in alternative data primers by the largest investment banks in the world.

Our vision is to be the 'go-to' firm for the alternative data feeds of asset managers.

Subscribe to our free weekly newsletter for insights on the alternative data space. Learn more at www.eaglealpha.com and follow on Twitter: www.twitter.com/dollareagle.

Figure 44: Summary Information



Section 6: Eagle Alpha's Data Sourcing Solution

Introduction

S&P's "Big data in asset management" paper[24] gave good context to data sourcing. It stated "to generate differentiated insights, asset managers are competing aggressively to secure access to unique big data (alternative data) sources...Given the diverse data sources, asset managers must test and validate the sources. Asset managers should also perform due diligence on data vendors and their sourcing methodologies and ensure that there are no legal or privacy issues...In our survey, identifying the right data sources was ranked as the biggest challenge by more than half of the respondents and among the top two challenges by about three-fourth of the respondents".

Eagle Alpha's Data Sourcing solution is designed to address this challenge. Below we highlight the specific challenges asset managers face regarding alternative data sourcing, outline our solution, state how our solution is differentiated and why our clients license it.

Eagle Alpha's Solution & USPs

Our solution to these challenges has four components:

1. Online database. We have 5 employees dedicated to mapping ALL of the worlds alternative datasets that we believe are of interest to asset managers. Currently there are 515 datasets (as at 8th September 2017). The database is also available via API for clients that have internal catalogues.

   USP: our database has the largest number of alternative datasets and includes the most comprehensive profiles available. Every week we improve the profiles through 100+ hours of phone calls with data vendors.

2. Advisory service. Our best client relationships are those where we have regular with calls to discuss their data needs and provide tailored advice. 3 examples of typical questions clients ask us:

   a. Based on your 5 years of understanding of our investment strategy what datasets must we prioritise for demos/trials?
   b. If we send you a few specific research questions can you email us the most appropriate datasets?
   c. What interesting datasets are coming to market in Q4 2017?

[24] Source: 'Big Data in Asset Management', April 2017

USP: our advisory service leverages our 5 years of experience working in the alternative data space and the wider Eagle Alpha team. We are in a unique position to advise clients given the five other parts of our offering. For example, our data insight analysts publish actionable reports based on alternative datasets and we build indicators based on alternative datasets.

3. Vendor Access. We connect clients with datasets exploring coming to market, datasets doing roadshows through financial centres worldwide and organise events where datasets pitch for your business.

   USP: we host the best data showcase events worldwide. Our next event will have 50 datasets present to 180 asset managers. Please refer to Section 7 (page 79) for our overview of our next event.

4. Proprietary Datasets. We give clients proprietary datasets which are obtained via web crawling and indicators based on online search data.

   USP: In October 2017 we will launch our first (quasi) proprietary dataset that is based on data from a credit card dataset.

Why Clients License Our Data Sourcing Solution

We asked our clients why they purchase a license to our Data Sourcing solution:

- Delivering the database via a feed is a great way for us to complement our internal catalogue.
- You now have 5 people focused on data hunting. We don't have the budget to hire a data procurement team of that size.
- FOMO. You insure we don't miss out on the best datasets.
- As an aggregator you have unique insights into what datasets the market is looking at.
- Monthly advisory calls help us to prioritise which datasets to demo and potentially trial.
- We like to get a 'first look' at new datasets through your pilot fishing roadshows.
- Your data showcase events are the most efficient way for us to meet 50 high quality data vendors in a single day.

- Your knowledge of the latest pricing of hundreds of datasets can help save us time and money.

Next Steps

If your firm is interested in a license of our Data Sourcing solution the next steps are:

1. Contact us to schedule a demo.

2. Email us with a description of your alternative data needs. At the end of the demo we will suggest a solution of how alternative data can address these needs.

3. Following the demo we will send you a deck that outlines our Data Sourcing solution in detail.

4. Decide if your firm wants to take a license. The price is $35,000 per annum for unlimited users per license.

Section 7: The BIG Alternative Data Showcase Event

Following Eagle Alpha's successful data showcase events in New York and London, we are proud to announce the launch of the largest ever alternative data showcase event.

We are handpicking 50 alternative data vendors to pitch to 180 asset managers on Tuesday 5th December 2017 in New York.

Figure 45: The BIG Alternative Data Showcase Event

Why Attend?

Professionals focused on the procurement of alternative datasets are booking tickets because they:

- Don't want to miss out on meeting 50 of the best hand-picked alternative datasets.
- Like to see which other firms are attending.
- Are interested to listen to questions asked by their counterparts at other firms.
- Want to learn insights from a panel of data procurement professionals.
- Can schedule 1-on-1s, attend pre-event drinks and obtain detailed information on each data vendor post event (clients only).

How Does Eagle Alpha Select The 50 Alternative Data Vendors?

Our selection committee hand-picks data vendors based on the following principles:

- Avoid data vendors that are well known to the majority of the buyside.
- Pick data vendors that have recently come to market but are not yet well known.
- Select data vendors that have not yet pitched to any buyside firm.
- Include datasets where Eagle Alpha is the exclusive distributor.
- Pitch three of Eagle Alpha's (quasi) proprietary datasets.
- Present Eagle Alpha's proprietary datasets e.g. a google-based dataset that provides signals for tickers.
- Consider datasets that are about to come to market.
- Ensure representation from several of the 24 categories of alternative data e.g. consumer transactions and geo-location.
- Reserve slots for several data vendors from outside the US.

Please note that the names of the data vendors will not be disclosed prior to the event. This is a similar policy to all our previous data showcase events in New York and London.

Agenda:

Monday, December 4th:

- 1-on-1 meetings with data vendors at mutually agreed locations (exclusively for clients of our Data Sourcing solution).
- Pre-event drinks reception at a venue in midtown with the 20 data vendors that will present on Tuesday (exclusively for clients of our Data Sourcing solution).

Tuesday, December 5th:

- 07.45am: Welcome, breakfast, 50 vendor exhibits.
- 08.30am: Introduction and 5 data vendor pitches (20 minutes each).
- 10.30am: Refreshments, 50 vendor exhibits.
- 11.00am: 6 data vendor pitches (20 minutes each).
- 1.00pm: Lunch, 50 vendor exhibits.
- 2.00pm: Panel of data procurement professionals moderated by Peter Greene, Vice Chair of Lowenstein Sandler's Investment Management Group.
- 2.30pm: 6 data vendor pitches (20 minutes each).
- 4.30pm: Refreshments, 50 vendor exhibits.
- 5.00pm: 3 data vendor pitches (20 minutes each).
- 6.00pm: Cocktail reception with data vendors.

Post Event:

- Obtain, for each of the 50 datasets, an Eagle Alpha tear sheet, a recorded demo/webinar, case studies and testing results. In addition, we will provide audio recordings of the 20 data vendors that presented. The post-event material is only available to clients of our Data Sourcing solution.
- Eagle Alpha will coordinate trials of datasets (clients are prioritised).

Ticket Prices

Attendance is capped at 180 places. In order to secure your place please book early.
Prices:

- Clients of Eagle Alpha's Data Sourcing package receive two complimentary passes.
- Super early bird rate - available until Friday, 15th September 2017: $1,499.
- Early bird rate - available until Friday, 13th October 2017: $1,749.
- Standard rate - available until capacity is reached: $1,999.

This is a must attend event for anyone interested in alternative data. Contact us to learn more. Please note that only asset managers are permitted to attend.

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Data beats opinion

enquiries@eaglealpha.com