Predictive Analytics

Alternative Data Primer and 10 Thematic Case Studies for Investors

Primer

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Predictive Analytics
Global

BofA Data Analytics

Thomas (T.J.) Thornton
Head of Rsch Mktg & Analytics
BofAS
+1 646 855-2449
thomas.thornton2@bofa.com

Toby Wade
Head of Predictive Analytics
BofAS
+1 646 855 1444
toby.wade@bofa.com

Kenneth Tsu
Data Analytics Rsch Analyst
BofAS
+1 646 855 3574
kenneth.tsu@bofa.com

Haim Israel >>
Equity Strategist
Merrill Lynch (Israel)
+972 3 607 2007
haim.israel@bofa.com

Mark Troman >>
Research Analyst
MLI (UK)
+44 20 7996 4194
mark.troman@bofa.com

Eli Kobzev >>
Data Analytics Rsch Analyst
MLI (UK)
+44 20 7996 4363
eli.kobzev@bofa.com

Kate Pavlovich >>
Data Analytics Rsch Analyst
MLI (UK)
+44 20 7996 7726
kate.pavlovich@bofa.com

Alternative: Time to cash-in all this (big) data

Alternative data is an asset class of information that has come into being off the back of the broader data explosion. Traditional financial data relies on information from company filings, investor presentations, media coverage, historical market prices, etc, which are now commoditized and easily accessible on financial databases. Alternative data can come from a plethora of sources, including satellite imagery, GPS tracking, transactional data, sentiment analysis of social media and news feed, etc. They are often less structured and less readily accessible[1]. Many tech companies are generating "data exhaust" or orthogonal data that is a by-product of their core activity. They are now monetizing this with the financial services community, which can combine it with other data sources to generate investment ideas. BofA Global Research has made extensive use of this data and in this primer we illustrate how investors can utilize this data through ten thematic use cases.

55% of investor AUM not (yet) using Alt Data

Despite the significant hype, according to our Fund Management Survey (FMS), 55% ($234bn out of $434bn) of assets under management (AUM) are not using alt data. And of the investors that have been using alt data, 59% ($77bn out of $189bn) of AUM have only been using it for less than two years, with 71% of the investor AUM considered fundamental/discretionary. The FMS data highlights the big opportunity that investors have by incorporating alt data into their investment process. Getting access to alt data is important, as its advantages over traditional fundamental data can be thought of in two ways: 1) it is typically higher frequency than traditional fundamental data 2) data can be an independently additive.

10 Thematic Use Cases

We present ten thematic alt data use cases that allow us to bring examples to life with data and how it relates back to the financial markets. The themes include: Remote Working, Solitary Leisure, Shifting Housing Preferences, Distress Companies, FinTech, Cutting the Cord, ESG, Economy Rebounding and Big Data Consumer. Each use case leverages various combinations of either our own BofA proprietary data, our existing alt data vendor relationships or Eagle Alpha (data broker with access to thousands of datasets). The BofA proprietary data we use includes our BofA ESGMeter™, aggregated BAC U.S. credit and debit card data, surveys, high yield bonds predicted defaults and the BofA Brand Momentum Indicator. The types of alt data that we utilize range from web traffic, app downloads & usage, social media, news sentiment, geolocation, telecom number portability, web scraping, flight traffic and job postings. We bring this mosaic of BofA proprietary data and other alt data together to identify thematic trends impacting the markets.

[1] Source: Opimas 2017, Integrity Research, FirstMark

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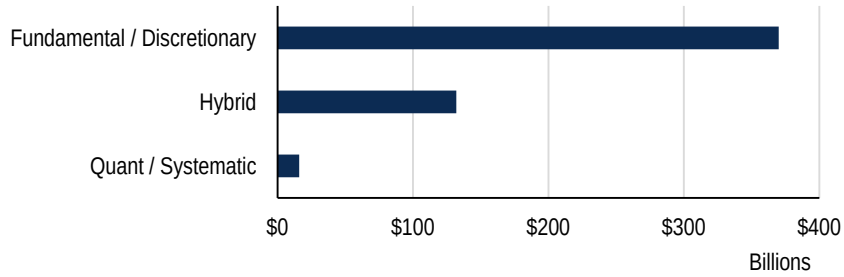
55% of AUM not (yet) using Alt Data

According to our August 2020 Fund Management Survey (FMS), 55% ($234bn out of $434bn) assets under management (AUM) are not using alt data. And of the investors that have been using alt data, 59% ($77bn out of $189bn) of AUM have only been using it for less than two years, with 71% of the investor AUM considered fundamental/ discretionary. The FMS data highlights the big opportunity that investors have by incorporating alt data into their investment process. See Appendix for questions split by frequency count.

Chart 1: How would you describe your investment style?

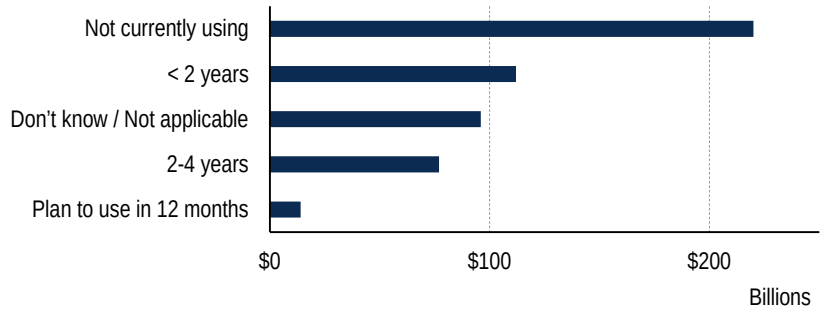
Measured in total Assets Under Management from Fund Management Survey



Source: BofA Global Fund Manager Survey

Chart 2: For how long have you been using alternative data in your investment process?

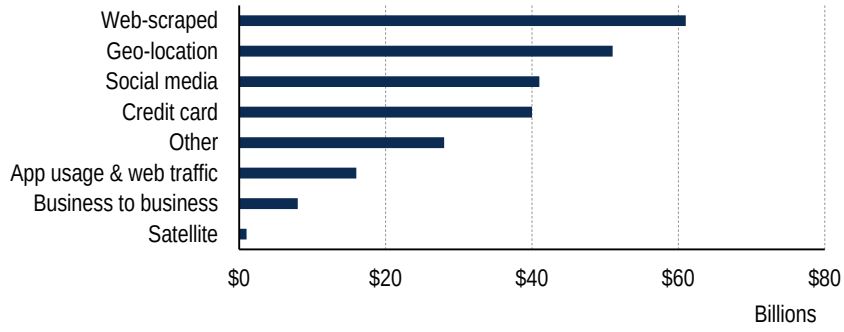
Measured in total Assets Under Management from Fund Management Survey



Source: BofA Global Fund Manager Survey

Chart 3: What types of alternative data sources are you using?

Measured in total Assets Under Management from Fund Management Survey



Source: BofA Global Fund Manager Survey

Big data is...BIG!

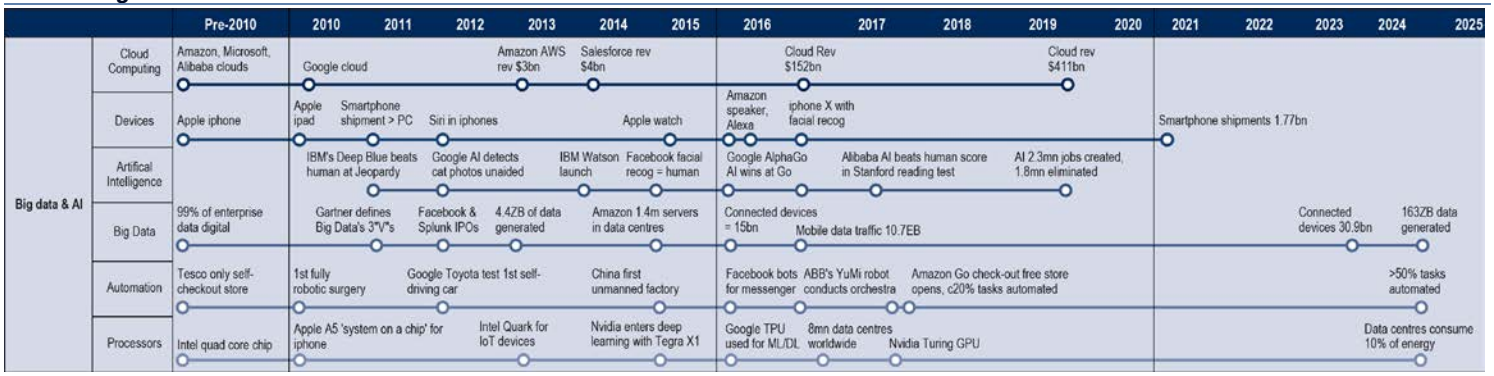
"If data is the new oil, then China is the new Saudi Arabia" (Kaifu Lee, ex-President of Google China)

- We will create as much data in the next 2 days than we have done since the dawn of civilization through to 2000....[1.]
- ...But only 0.5-1.0% of all data is ever analyzed and used. [2.]
- ...If we to use 24% of data global GDP would have doubled today! [3.]
- There has been a 1-trillion fold increase in computing performance over the past 60 years [4.]
- The computing power of 1 exaflop is equivalent to every human on Earth doing a calculation per second for 4 years [5.]
- By 2025, 200bn connectable devices, 28x more than the entire human race, will collect every piece of data on you [6.]
- Every day 1 out of 8 searches on Google are completely new and have never been done before, creating a completely new database [7.]
- Just one Google search uses around the same amount of computing power it took to send the Apollo 11 astronauts to the Moon [8.]
- There are 40x more bytes of data than there are stars in the observable universe [9.]
- Computing power to train the largest AI datasets had increased 300,000x in the last decade roughly doubling every 3 months [10]

Sources: [1.] Eric Smit, former CEO of Google; [2.] IDC; [3.] IDC; [4] Visual Capitalist; [5.] BBC; [6.] IoT Analytics; [7.] Google; [8.] Visual Capitalist; [9.] TechCrunch ; [10] TechCrunch

Data, or the application of advanced analytics to vast data sets, already drives major business across many industries. However, this theme evolves at breakneck speed and we identify multiple drivers in the next five years such as the Internet of Things (IoT), data creation, stronger computing power and 5G among others. We see traditional industries in general, and the capital market in particular, jumping on the Big Data bandwagon and creating value by analysing vast amounts of their data. Artificial Intelligence is set to come on by leaps and bounds in the next 5 years, fuelled by Big Data and helped by other major developments (in machine learning software and processors). Big Data and AI go hand-in-hand – together, they are set to enable many future technologies such as autonomous cars and mass customisation of products. Factory automation via robots and workplace automation via software (chatbots, voice services, self-service checkouts, natural language translation) are poised to transform employment trends across the world, with mixed outcomes and a likely increase in inequality. Sectors involved include technology, semiconductor and software companies, while sharing platforms will also be key. Traditional bricks and mortar retail and old media are most at risk of disruption.

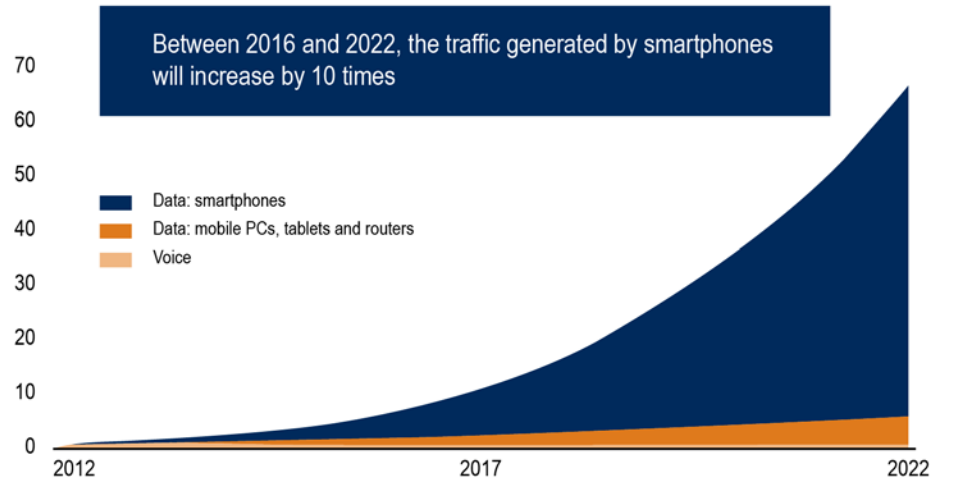
Exhibit 1: Big Data & AI innovation timeline



Source: BofA Global Research, company data

Global data is doubling every 2-3 years. Currently, we are storing and transmitting only 1% of global data (IDC). Therefore, if we take into consideration 1) the exponential growth of data creation, 2) that the amount of global data stored and analysed could swell given that 37% of data could be useful if analysed (vs 1% actually analysed today), and 3) that more people will go online globally. The digital universe has reached the level of the Yottabyte, with 90% of the world's data having been created in the past two years (source: IBM). As of 2019, there are c.5.5bn mobile phone users worldwide, of which about half use smartphones. There are >4bn internet users, >3bn social network users and there could be 30-50bn connected devices by 2025E and 1tn by 2035E. As a result, the amount of data created is projected to double every 2-3 years, reaching 175ZB by 2025E vs 12ZB in 2015 (Source: IDC). The untapped Big Data potential is huge, given that only c.0.5-1% of data generated has ever been analysed.

Exhibit 2: Explosion of mobile data (Exabyte/ month)

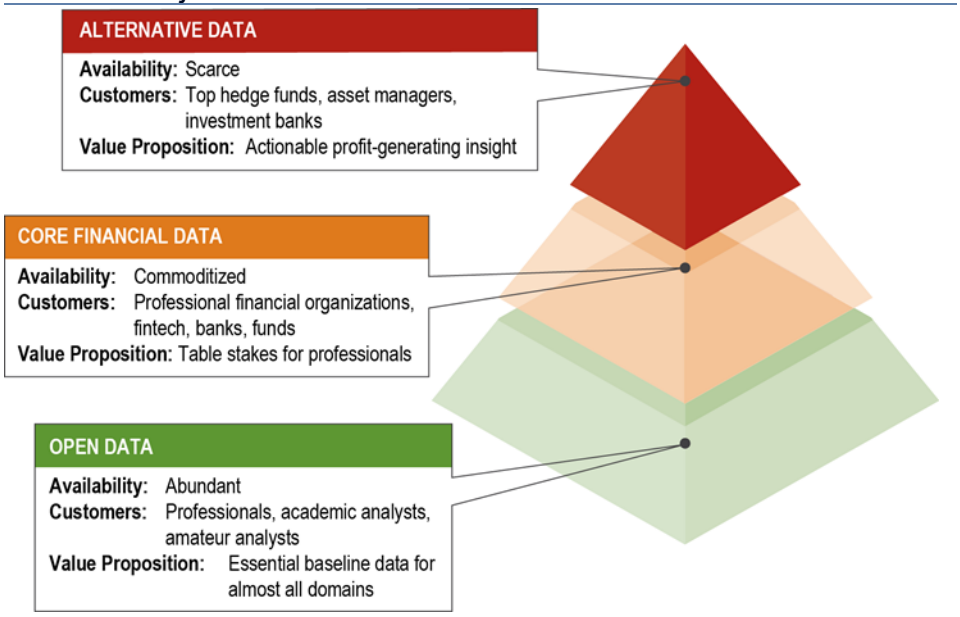


Source: Ericson Mobility

Alternative: Time to cash-in all this data

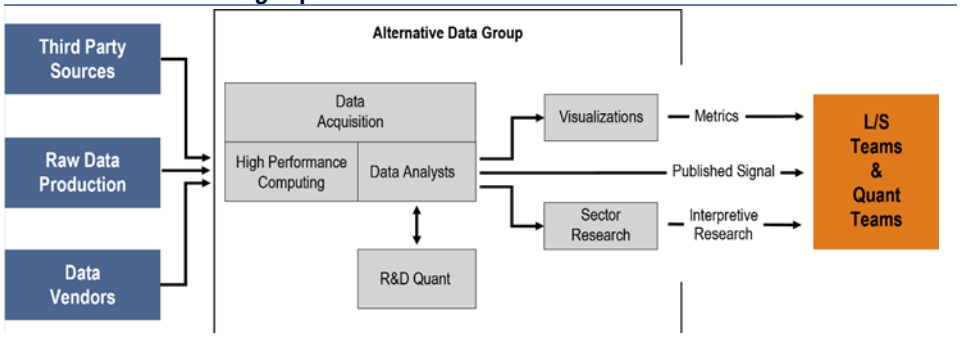
Alternative data is an asset class of information that has come into being off the back of the broader data explosion. Traditional financial data relies on information from company filings, investor presentations, media coverage, historical market prices, etc, which are now commoditized and easily accessible on financial databases. Alternative data can come from a plethora of sources including satellite imagery, GPS tracking, transactional data, sentiment analysis of social media and news feed, etc. They are often less structured and less readily accessible (source: Opimas 2017, Integrity Research, FirstMark). Many tech companies are generating "data exhaust" or orthogonal data that is a by-product of their core activity. They are now monetizing this with the financial services community, which can combine it with other data sources to generate investment ideas.

Exhibit 3: Hierarchy of financial data



Source: Quandl

Exhibit 4: Alternative data group



Source: Integrity Research

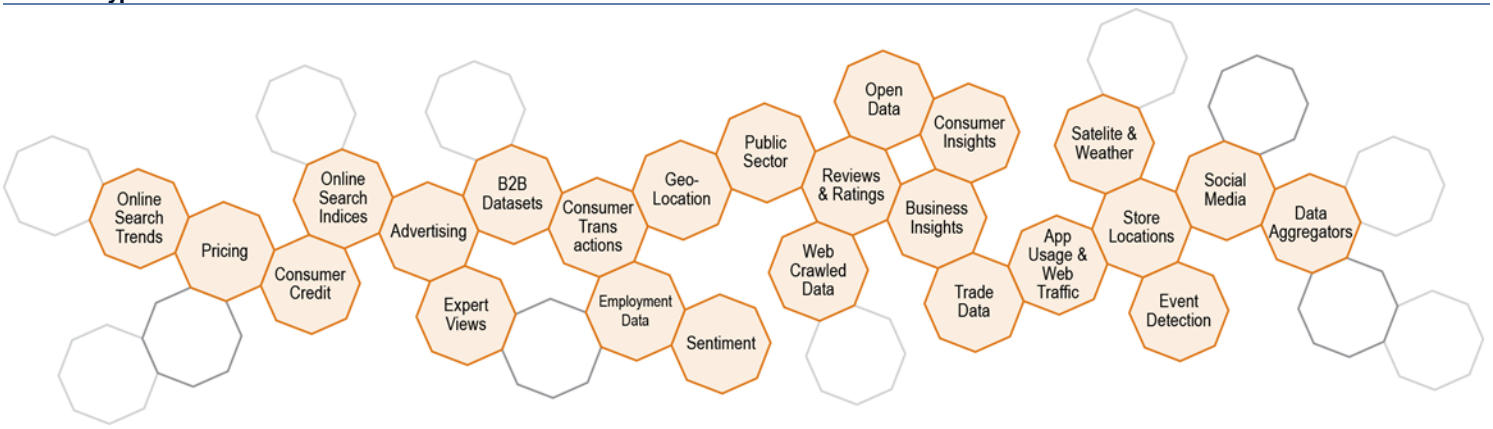
For example, the app Foursquare was able to predict Chipotle's sales by capturing geo-location data from check-ins and visits through its apps. This data was then extrapolated to accurately predict the financial performance of the restaurant chain (source: FirstMark).

Table 1: Each sector potentially has unique alternative / types of datasets

Individuals	Businesses	Sensors		
Social media	Transaction data	Satellites	Transport	GPS and telematics data from vehicles
Reviews and ratings	Employment data	Geo-location	Agriculture	Sensor data from agricultural crops, fields, equipment
Online searches	B2B transactions	Weather	Telecoms	App downloads and usage
Personal data	Public sector data	IoT sensor data	Logistics	Cargo transport data from fleet
Consumer credit		Footfall	Retail	Consumer footfall and transaction data
Email receipts			Other	Business health metrics from credit platforms

Source: BofA Global Research

Exhibit 5: Types of alternative data



Source: Eagle Alpha

Value of data for markets

The ability of alternative data to generate value for the investment community will vary according to the data's level of detail, history, breadth and rarity. Similar to other types of data used by the buy-side and sell-side, the value of data will often decay over time. The more investors who have access to it, the more it will become commoditized and fail to generate excess returns. Hence even in alternative data, innovation and fresh data sources are key to maintaining competitiveness.

Exhibit 6: Spectrum of alternative data diffusion

FULLY DIFFUSED

These are some of the table stakes for anyone undertaking market analysis.

LOOKING FOR THIS?	TRY HERE:
Stock Prices (US)	End-of-Day Stock Prces quandl.com/data/EOD *(from Quote Media)*
Stock History (Europe)	London Stock Exchange Prices quandl.com/data/XLON *(from Exchange Data International)*
Fundamentals (US)	Core US Fundamentals quandl.com/data/SF1 *(from Sharadar)*
Fundamentals (Europe)	Global Fundamentals quandl.com/data/RB1 *(from Robur)*
Futures (US)	Continuous Futures quandl.com/data/SCF *(from Steven Analytics)*
Futures (Europe)	Eurex Futures quandl.com/data/BCEUX *(from Barchart)*

DIFFUSING NOW

Not yet looking at these types of dat? Time to start.

LOOKING FOR THIS?	TRY HERE:
Sentiment Data	AlphaOne Sentiment quandl.com/data/AOS *(from Accern)*
Advertiser Spending	Total US Ad Spend quandl.com/data/BL1 *(from Borell)*
Satellite Imagery Analysis	Ursa Space www.ursapace.com
Economic Data	CLS quandl.com/data/CLSH
Transportation	North American Commodoties Transport quandl.com/data/RR1 *(from Transmatch)*

NASCENT

Get a jump on the competition by seeking out sources in these industries.

LOOKING FOR THIS?	TRY HERE:
Nanosatellite (weather, maritime)	Windward *www.windward.eu*
Drone Imagery	3D Robotics *www.3dr.com*
Internet of Things	Samsara *www.samsara.com*
Wearable Tech	Sensoria *www.sensoriafitness.com*
Food Prices in Developing Countries	Premise *www.premise.com*
Ag Tech	Tellus Labs *www.telluslabs.com*

FULLY COMMODITIZED

MODERATELY COMMODITIZED

UNTAPPED

Eventually, all untapped data becomes fully commoditized and a necessity.

Source: Quandl

Sector Alt Data Landscape

- **Consumer / TMT** – very mature space, data coverage is comprehensive, especially as so much credit card spend and mobile/desktop activity relates to these sectors but there's been some alpha decay as credit card data proliferates. *Social* media, search and web traffic data can be helpful in tracking brands in staples where there are fewer direct transactions with consumers. App traffic, web traffic and social media commentary can be useful in tracking streaming services. Michelle Meyer's weekly BofA on USA note provides useful data on many consumer categories and there are a multitude of other even more specific notes published by BofA Global Research analysts.

- **Healthcare** – Data offerings not as robust as for tech and healthcare but BofA research has found value in regular surveys which have spanned from home health provider volume growth to hospital capex plans. Health Care Facilities: Home Health Survey, Health Care Facilities: Cost/capital survey. Hospital Survey: Inpatient and outpatient vol growth turn positive in Sept. The Biopharma team has analyzed HR data to understand how companies are growing and investing Biopharma data employment trends. The BofA healthcare team has also deployed surveys during COVID to understand the appetite for testing as corporates ask employees to return to the office. COVID-19 Investment Implications Series: Corporate 'Back to Work' & Testing survey. Patent data and social media posts about drug side effects and efficacy are other areas that some firms have explored.

- **Industrials, Materials** – Geolocation data has been used to assess the inventories of commodities stored outside. BofA Research recently launched the Commercial Aerospace Tracker which offers insights into the types of planes that are flying, changes in airline schedules and freight vs. passenger. BofA also conducts surveys of industrial companies, including Andrew Obin's fluid power survey and Ken Hoexter's bi-weekly Truck Shipper Survey.

- **Financials** – App data can be helpful in understanding growth in payment apps or the use of online banking apps. Card data spend trends and even Internet searches can be an indicator of consumer health. HR data can be helpful as an indicator of which companies are investing in the technologies that are rapidly changing the industry.

- **Real Estate** – Residential real estate data is available through vendors as transactions are posted online, and real estate searches can even be sliced by the city or state in which they originate. BofA research has done numerous consumer surveys on housing such as this one on housing views post COVID, and Liz Suzuki's Home Work series which recently looked again at the desire to move. As for REITs, BofA card data provides insight into some of the asset types, including hotels and gaming REITs.

Pricing Trends in Alt Data

As per a recent Eagle Alpha paper, *Data on Data*, the cost of alt data varies depending on the type of dataset, with credit, credit card, geo-location, app usage, web scrapes and employment data tends to be the most expensive.

- The average contract price that Eagle Alpha has observed in their dataset sales business in 2020 is $56K but there are outliers with some datasets costing well into the six figures. Consumer transaction data is typically priced above that $56k average.

- Deflation:

    - The consumer transaction space has seen a number of new entrants in the last several years and this has put pressure on prices in some cases. Examples of consumer transaction data are credit and debit card data, email receipt data and data from financial apps.

- Stability/Inflation:
    - Eagle Alpha has observed price increases by the leading providers of financial flow data.
    - COVID-19 has been a catalyst for interest in geo-location data. While there has been a significant increase in demand, Eagle Alpha has seen that much of what fundamental managers have looked for with this data are bespoke one-offs.

How to think about alpha in alt data sets

- Most alt data sets are not "the answer" – they are part of an overall mosaic
    - Many large firms are complex to model – data may only cover 1-2 areas of a large company
    - Using multiple data sets can help strengthen signal – but drives cost
    - Value in indicators that blend large/public/raw data sets together
- Large, raw data sets often have the most to offer in un-tapped signals.
    - Text data (Earnings, news, filings). Allows for custom sentiment models to be run in order to have differentiated signals independent of traditional vendors

Common methods of accessing alt data

- **Curating raw data:** Web scraping SEC filings or pricing data from company websites. Typical disadvantage of this approach is the lack of historical data if starting from scratch.
- **Partnering with alt data vendors directly:** Attending various conferences establishing bi-lateral agreements with vendors that add value to the investment process.
- **Alt data brokers:** Since there are 1000s of alt data vendors, it can feel overwhelming to process. One option is to considering data brokers such as Eagle Alpha or Battle Fin who have access to underlying alt data vendor relationships.
- **Alt data research:** Research departments or firms who create their own data driven research and predictions primarily focus on this business model.

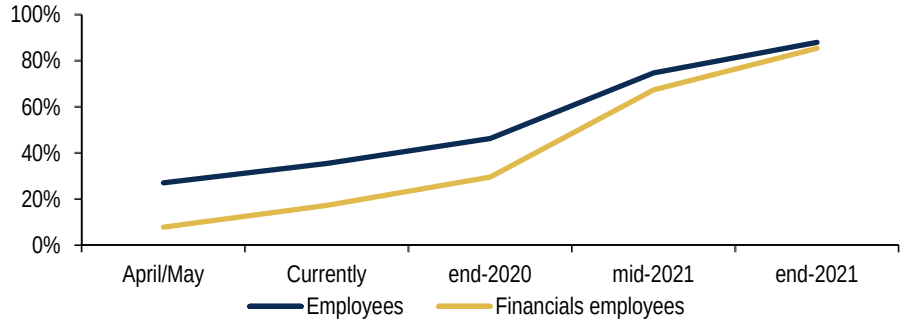
10 thematic use cases

Our intention here is to teach with alt data examples. We present 10 tangible use cases to bring to life how alt data can be used to shed insight on how these thematic trends are impacting the markets. These trends can have direct consequences on investment portfolios. The thematic use cases include: Remote Working, Solitary Leisure, Shifting Housing Preferences, Distress Companies, FinTech, Cutting the Cord, ESG, Economy Rebounding and Big Data Consumer. Each use case leverages various combinations of either our own BofA proprietary data, our existing alt data vendor relationships or Eagle Alpha (data broker with access to thousands of datasets).

1 – Remote working: Survey, Geolocation, Web Traffic

The COVID-19 outbreak has had a far-reaching impact on the US workforce, with most corporations enacting some level of work-from-home protocols. According to our BofA Proprietary Back to Work Survey of over 200 corporates under BofA equity research coverage, the financial sector is one of the most patient in returning to office given their ability to carry out business as usual from work-from-home. Only 17% of their employees are currently 'back-to normal', with 29% and 67% expecting back to office by the end of 2020 and mid-2021 respectively.

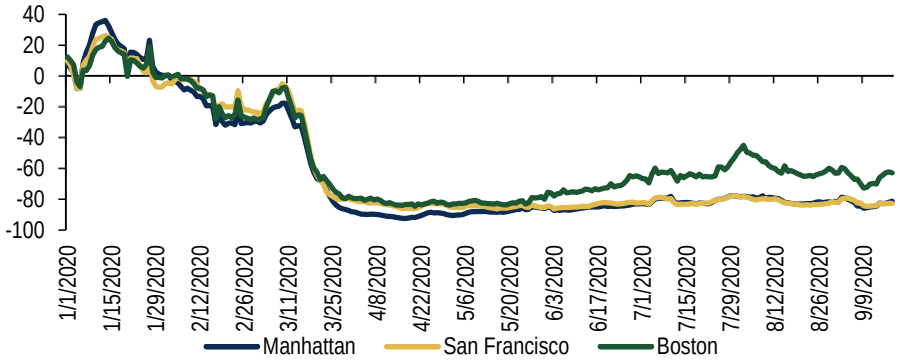
Chart 4: Average number of employees in-office (or 'normal' work setting): all sectors vs. Financials



Source: BofA Global Research

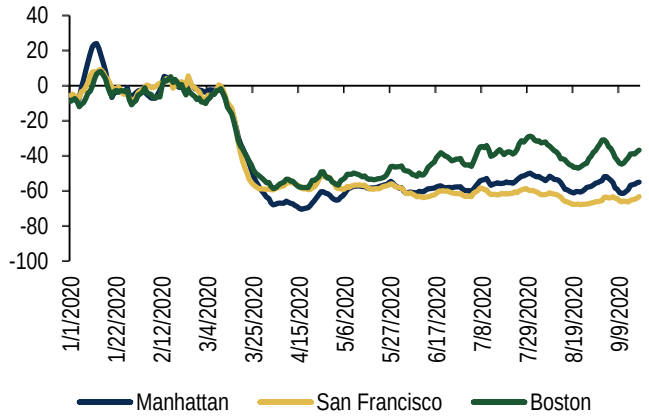
Utilizing geolocation data from Eagle Alpha, we compare foot traffic by visitor type for central business district in New York City, San Francisco and Boston to gauge the trends on people returning to office. See Exhibit 7-9 for Census Block Groups (CBGs) selected in each city. Foot traffic for workers slumped 80-90% yoy in April following the COVID-19 outbreak. Traffic has not come back in Manhattan and San Francisco as it was both down -83% in September. Boston slightly improved to -65%, suggesting that more workers have returned to office relative to Manhattan and San Francisco. Chart 6 and 7 show foot traffic for residents/locals and non-locals respectively. Notably, foot traffic for non-locals is recovering in Boston rapidly since August, outpacing Manhattan and San Francisco by ~40%.

Chart 5: YoY changes on foot traffic for workers



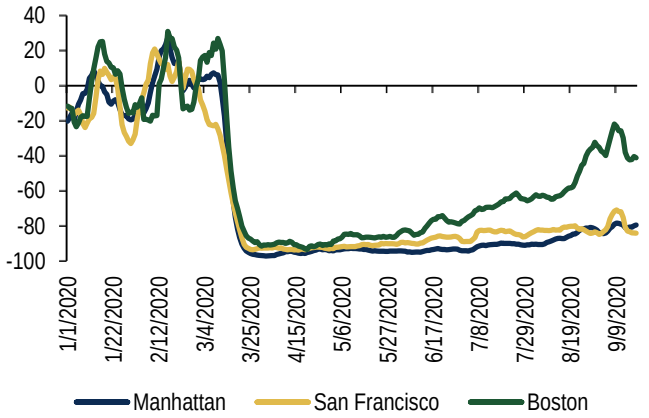
Footnote: Workers are defined as distinct identifiers who work in the CBG
Source: Eagle Alpha

Chart 6: YoY changes on foot traffic for residents and locals



Footnote: Residents are defined as distinct identifiers who live in the CBG. Locals are defined as distinct identifiers who live in another CBG within the MSA
Source: Eagle Alpha

Chart 7: YoY changes on foot traffic for non-locals



Footnote: Non-locals are defined as distinct identifiers who live in another CBG outside the MSA
Source: Eagle Alpha

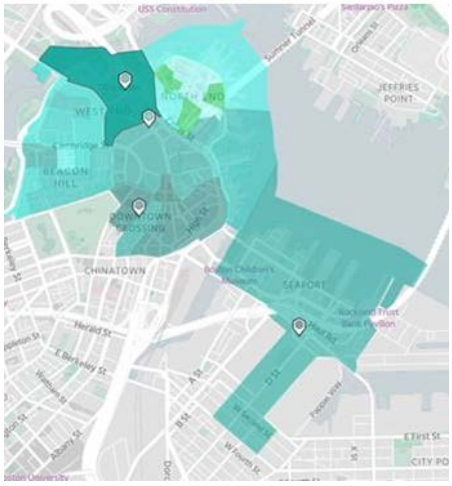
Exhibit 7: CBGs selected in Manhattan

Source: Eagle Alpha

Exhibit 8: CBGs selected in San Francisco

Source: Eagle Alpha

Exhibit 9: CBGs selected in Boston



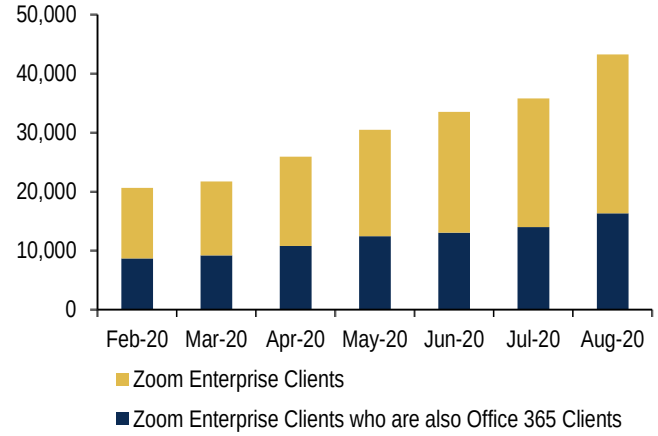
Source: Eagle Alpha

Growth in enterprise IT spending on cloud-based offerings

COVID-19 has accelerated the shift of enterprise IT spending from on-premises to cloud-based environment given the need for remote working, and some degree of 'work from home' will be here to stay based on our Back to Work Survey even after the

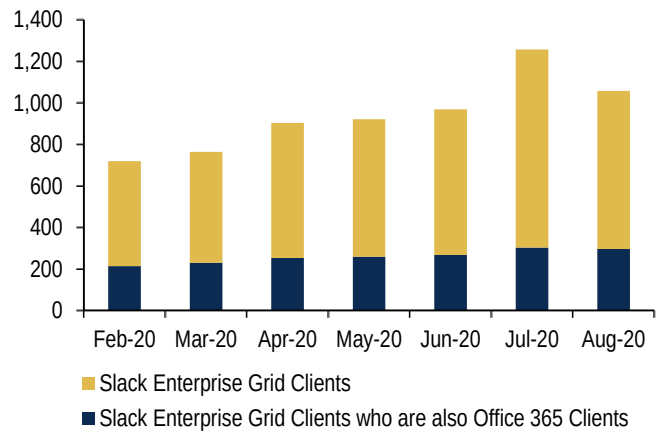
pandemic has passed. There is an increasing demand for enterprise messaging and collaboration services such as Slack, Zoom and Microsoft Office365/Teams. Slack and Zoom have gained attention as cost effective and easy-to-use collaboration platforms, while Microsoft with their Teams product in Office365 bundle has rapidly improved their offerings since the beginning of 2020. A data vendor partnering with Eagle Alpha has been monitoring enterprise adoption on Slack, Zoom and Teams. Chart 8-Chart 9 shows that the number of Zoom Enterprise clients has doubled to ~43,000 from February to August, while Slack Enterprise Grid clients grew +50%.

Chart 8: Total Zoom Enterprise Clients



Source: Eagle Alpha

Chart 9: Total Slack Enterprise Grid Clients



Source: Eagle Alpha

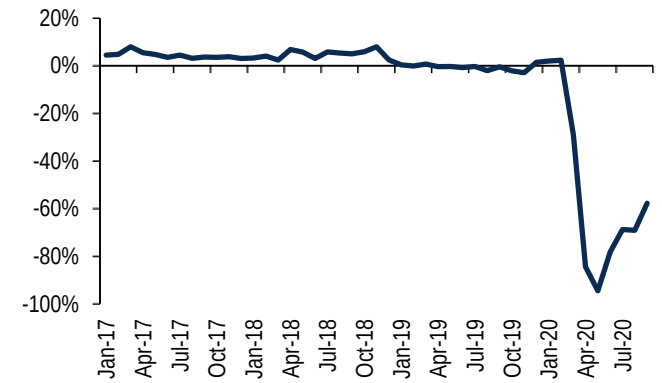
2--Solitary Leisure: Card, Social Media, Apps, Web Traffic

Tracking In-Home and Outdoor Leisure Pursuits

We believe there is a long-term demand to move away from gyms to in-home fitness, with COVID-19 accelerating the shift. While gyms are now reopening, they are operating at limited capacity and under tight requirements. BAC aggregated U.S. credit and debit card data for gym spending was soft, down -58% yoy in September. For in-home fitness, we track social media activities with Social Standards, an analytics company that analyze Instagram and Twitter posts. The number of "home workouts" posts on Instagram has increased significantly since the COVID-19 outbreak, due to gym closures and stay-at-home orders across the US. While the number of posts peaked in April, latest trends remain strong with posts up +230% yoy in September (Chart 11).

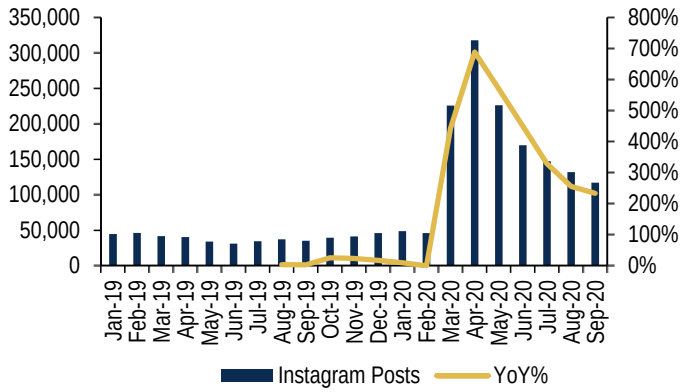
See BofA on USA for methodology, limitations, and disclaimers for BAC card data and commentary on broader retail trends from the Economics team.

Chart 10: YoY% changes on gym spending based on BAC aggregated card data



Source: BAC internal data

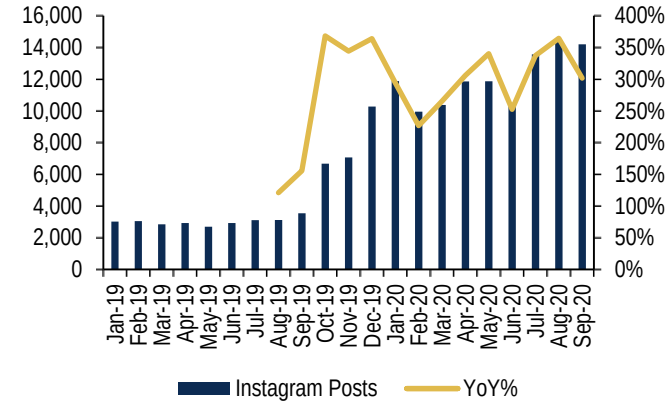
Chart 11: "home workouts" posts on Instagram



Source: BofA Global Research, Social Standards

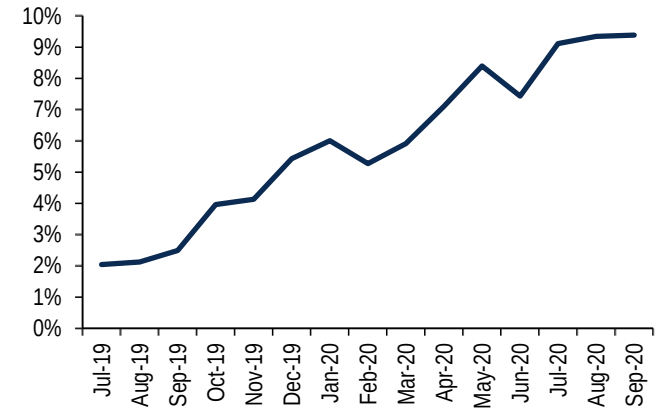
BofA Internet analyst Justin Post has highlighted the impact of the in-home fitness trend on Peloton. The number of Instagram posts mentioning Peloton increased to 14K in September from 10K in March. Peloton conversations also continue to accelerate in "Fitness Equipment" posts, suggesting Peloton gained share in the sector. According to a data vendor with Eagle Alpha which tracks credit card data and bank information of millions of US users, spending on Peloton have been accelerating since March, with the company and NordicTrack being the market share gainers (Chart 14-15).

Chart 12: Peloton posts on Instagram



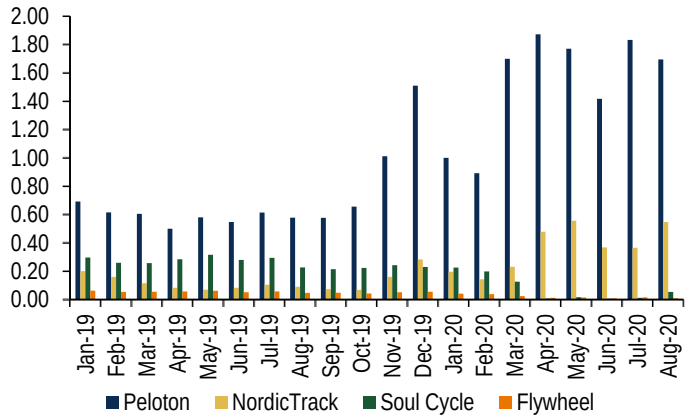
Source: BofA Global Research, Social Standards

Chart 13: Peloton conversations as % of Fitness Equipment posts



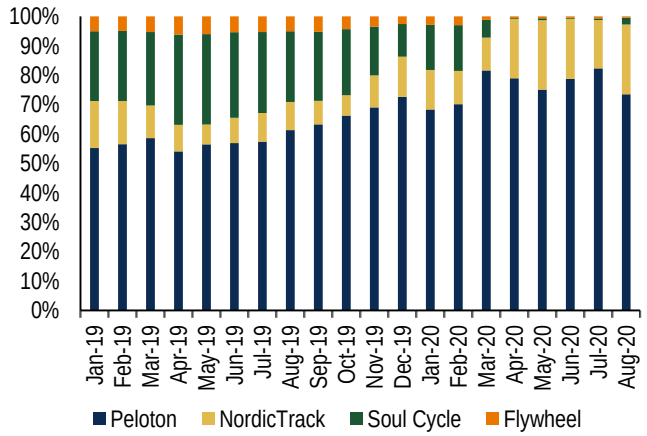
Source: Social Standards

Chart 14: Spending trends on Peloton and its competitors (indexed to spending level for Peloton on Jan 2020)



Footnote: Spending dollar amount is indexed so that the level of spending on Jan 2020 for Peloton is equal to 1. For example, the indexed level for March 2020 spending for NordicTrack will be equal to its actual spending level on March 2020 divided by the actual spending level for Peloton on Jan 2020
Source: Eagle Alpha

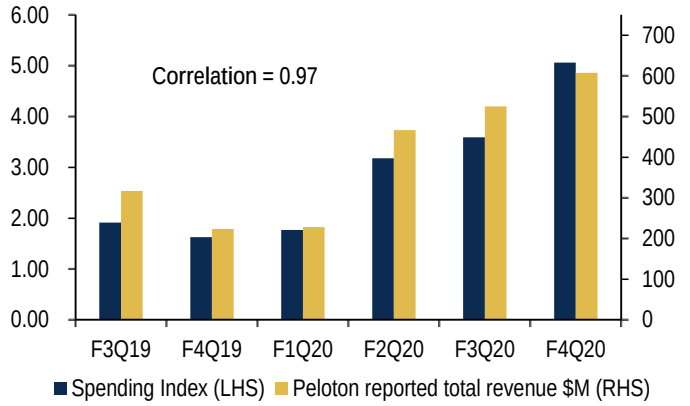
Chart 15: Market share of Peloton and its competitors



Source: Eagle Alpha

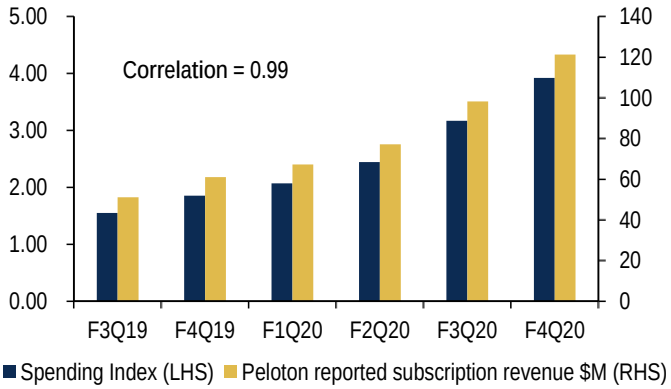
We compare the spending data with 1) Peloton reported total revenue and 2) subscription revenue (excluding connected fitness product). Results show that it correlates well with company reported numbers in the last 6 fiscal quarters with correlation of 0.97 and 0.99 respectively. We also track app downloads from Sensor Tower and Web traffic from SimilarWeb as an indicator of new subscription growth.

Chart 16: Peloton reported total revenue vs. Spending index on Peloton from Eagle Alpha



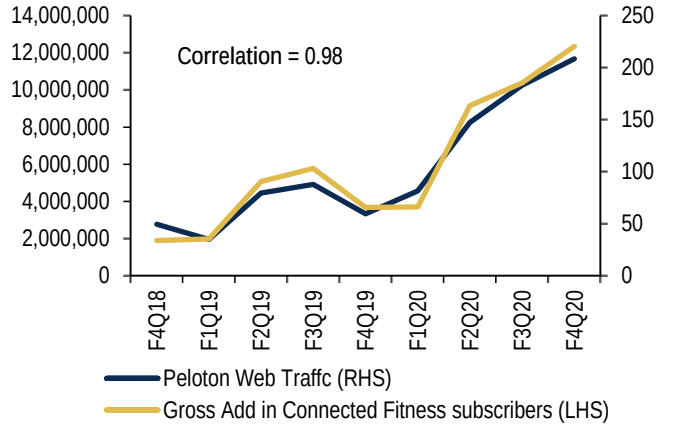
Footnote: Spending dollar amount is indexed so that the level of spending on Jan 2020 for Peloton is equal to 1. For example, the indexed level for March 2020 spending will be equal to the actual spending level on March 2020 divided by the actual spending level for Peloton on Jan 2020
Source: Eagle Alpha, company reports

Chart 17: Peloton reported subscription revenue vs. Spending index on Peloton subscription from Eagle Alpha



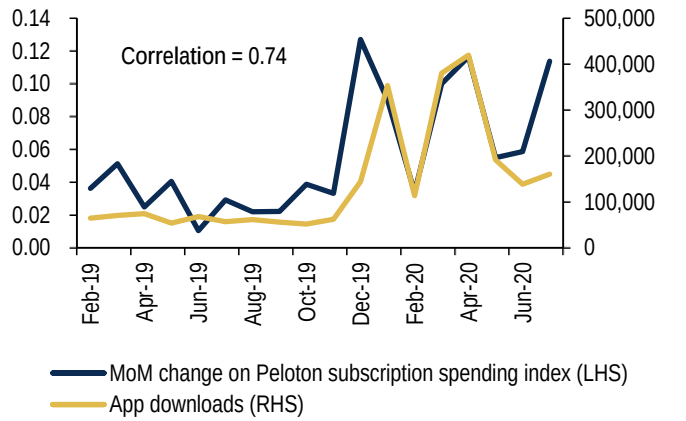
Footnote: Spending dollar amount is indexed so that the level of spending on Jan 2020 for Peloton is equal to 1. For example, the indexed level for March 2020 spending will be equal to the actual spending level on March 2020 divided by the actual spending level for Peloton on Jan 2020
Source: Eagle Alpha, company reports

Chart 18: Web visits vs. Peloton reported gross adds Connected Fitness subscribers (in thousands)



Source: SimilarWeb, www.similarweb.com, company reports

Chart 19: App Downloads vs. monthly change on Peloton subscription spending index from Eagle Alpha

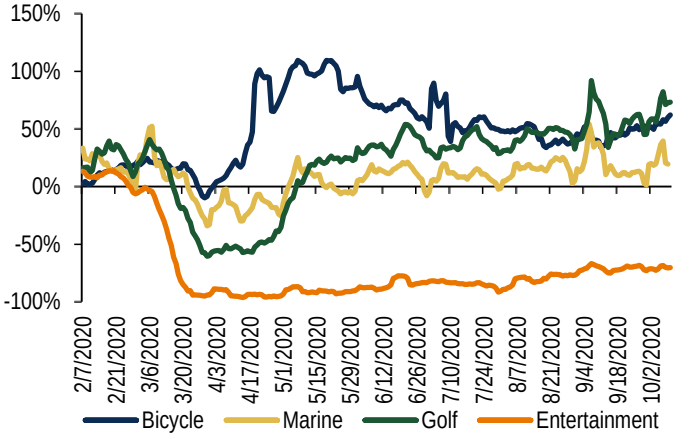


Footnote: Spending dollar amount is indexed so that the level of spending on Jan 2020 for Peloton is equal to 1. For example, the indexed level for March 2020 spending will be equal to the actual spending level on March 2020 divided by the actual spending level for Peloton on Jan 2020
Source: Eagle Alpha, Sensor Tower

Outdoor Solitary Leisure

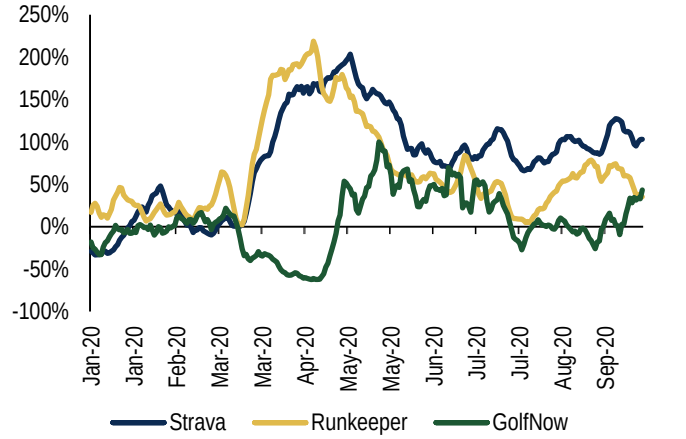
COVID-19 is shifting the consumer spending away from traditional entertainment to solitary leisure activities due to demand and practice of social distancing. According to aggregated BAC U.S. credit and debit card data through Oct-10th, spending on entertainment (movie theatres, tourist attractions and amusement parks) is down -70% yoy (7 day moving avg.). Bicycles are a significant beneficiary of solitary leisure activities with spending accelerating materially since late-March, while recent trends remain strong. Golf and marine categories are also solid as spending has recovered in May with latest aggregated card data showing +73% and +19% yoy respectively. App downloads for running, cycling and golf are showing similar story, with Strava, Runkeeper and Golf now tracking up +103%, +35% and +43% yoy respectively (7 day moving avg.).

Chart 20: Daily spending for Bicycle, Marine, Golf and Entertainment services, based on BAC aggregated card data (yoy%, 7 day moving avg.)



Source: BAC internal data. Marine includes marinas & marine services/supplies and boat leases/rentals. Golf includes golf courses. Entertainment includes amusement parks, movie theaters and other tourist attractions.

Chart 21: App downloads for Strava, Runkeeper and Golfnow (yoy%, 7 day moving avg.)



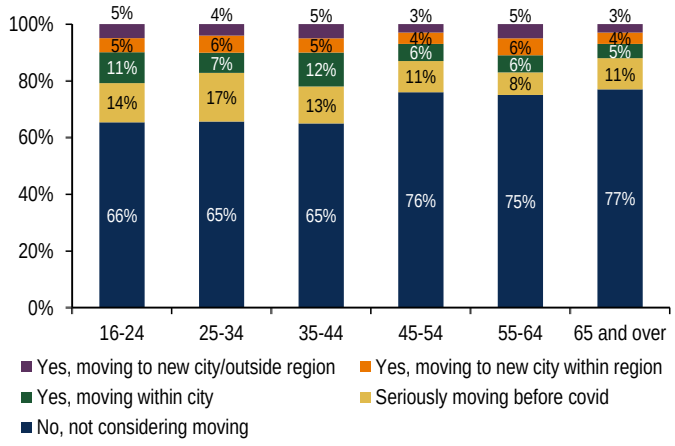
Source: BofA Global Research, Sensor Tower

3 – Shifting Housing Preferences: Survey, Web Scraping

The impact of COVID-19 on moving decisions may be less pronounced than headlines suggest according to our August housing survey. 18% of overall respondents cited COVID-19 as a potential catalyst for moving, while 13% had already seriously considered moving before the pandemic. In addition, of those who contemplated moving post COVID, the biggest percentage are looking to remain in the same city/town with little

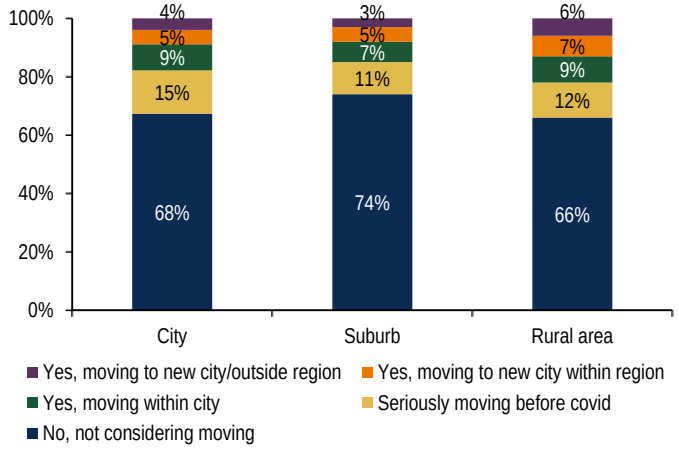
difference whether respondents were living in cities, suburbs and rural areas (Chart 22-23). To gauge the latest trends on housing demand and preferences, we utilized web scraping data on Zillow provided by a data vendor from Eagle Alpha. We analyzed Zillow data (home value, transactions etc.) by zip code in dense cities including New York City, San Francisco and Chicago, and also the neighborhoods of these three cities.

Chart 22: Has the COVID-19 outbreak led you to seriously consider moving to a different house or apartment? (Filtered by age group)



Source: BofA Global Research survey

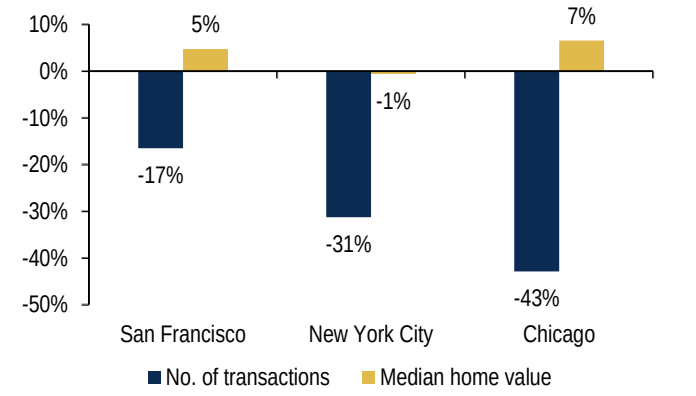
Chart 23: Has the COVID-19 outbreak led you to seriously consider moving to a different house or apartment? (Filtered by living area)



Source: BofA Global Research survey

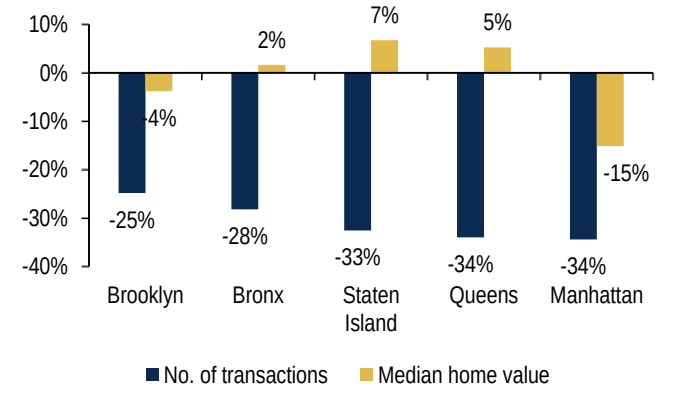
In June 2020, despite a significant decline in sales volume for all three cities as impacted by COVID-19, median home value remained resilient with NYC slightly down yoy and SF/Chicago up +5%/+7%. City numbers, however, mask many underlying stories as neighborhoods saw highly varied performance. For the boroughs in NYC, Manhattan (-15%) and Brooklyn (-4%) posted decline while State Island, Queens and Bronx outperformed. Upper East Side was the weakest neighborhood with median home value down -46% while Northeast Queens was the strongest (See Table 2 for the top/bottom 10 NYC neighborhoods). For SF and Chicago, see Exhibit 11-12 which shows yoy% on median home value by zip code within the cities. Desire to move within cities, something suggested by the BofA survey, has likely increased the desirability of certain neighborhoods and diminished the desirability of others and some of this seems to be evident in the data.

Chart 24: YoY% changes on transactions and median home value in NYC, SF and Chicago (June 2020 vs. June 2019)



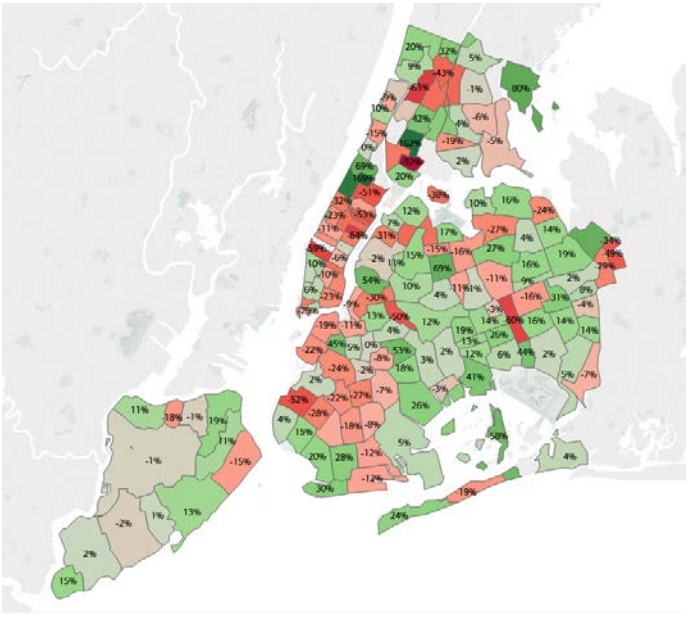
Source: Eagle Alpha

Chart 25: YoY% changes on transactions and median home value in the boroughs of NYC (June 2020 vs. June 2019)



Source: Eagle Alpha

Exhibit 10: YoY% changes on median home value by zip code in NYC (June 2020 vs. June 2019)



Source: Eagle Alpha, Tableau, BofA Global Research

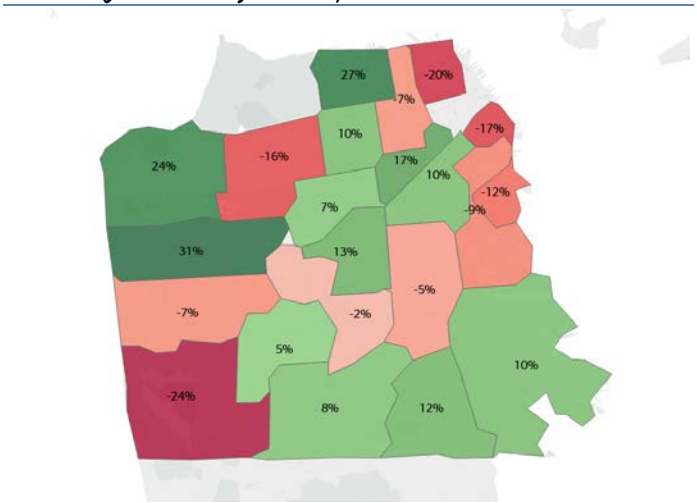
Table 2: Top 10 and bottom 10 NYC neighborhoods based on median home value YoY% (June 2020 vs. June 2019)

		Transactions		Median Home Value	
Neighborhood	Borough	Total	YoY	Median by Zip	YoY
Top 10					
Northeast Queens	Queens	53	-47%	$600,000	72%
Central Brooklyn	Brooklyn	89	-18%	$1,125,000	21%
North Queens	Queens	143	-27%	$819,500	20%
Southwest Brooklyn	Brooklyn	71	-30%	$731,388	20%
Southwest Queens	Queens	130	-40%	$641,250	16%
Central Queens	Queens	48	-16%	$890,000	16%
Kingsbridge and Riverdale	Bronx	39	-33%	$347,500	14%
Jamaica	Queens	146	-46%	$600,000	14%
Stapleton and St. George	Staten Island	60	-56%	$605,000	13%
West Central Queens	Queens	158	-9%	$592,250	6%
Bottom 10					
Flatbush	Brooklyn	66	-29%	$595,000	-16%
Port Richmond	Staten Island	39	-49%	$420,000	-18%
Chelsea and Clinton	Manhattan	77	-39%	$718,750	-18%
Northwest Brooklyn	Brooklyn	143	4%	$1,107,500	-19%
Northwest Queens	Queens	53	-22%	$688,933	-19%
Borough Park	Brooklyn	84	-33%	$848,250	-20%
Gramercy Park and Murray Hill	Manhattan	109	-39%	$838,750	-24%
Sunset Park	Brooklyn	33	6%	$739,750	-25%
Bronx Park and Fordham	Bronx	44	5%	$229,000	-43%
Upper East Side	Manhattan	160	-31%	$848,000	-46%

Footnote: Only include neighborhoods with more than 30 transactions; Neighborhood stats are aggregated up from the zip codes

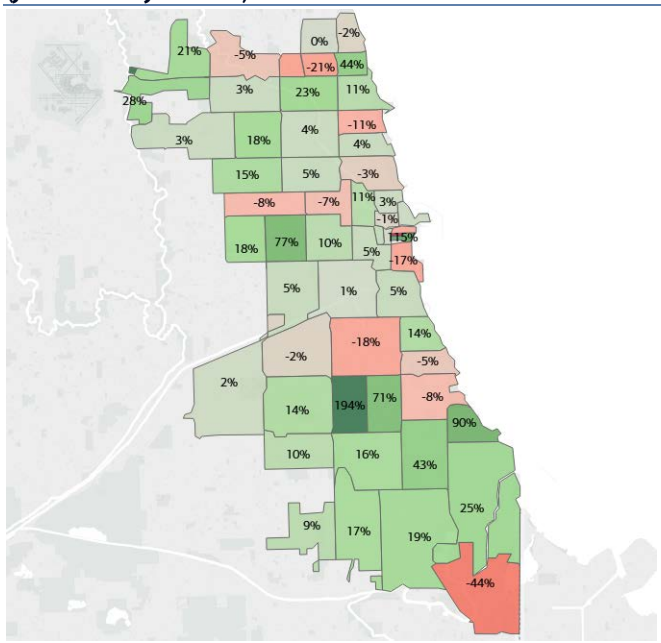
Source: Eagle Alpha

Exhibit 11: YoY% changes on median home value by zip code in San Francisco (June 2020 vs. June 2019)



Source: Eagle Alpha, Tableau, BofA Global Research

Exhibit 12: YoY% changes on median home value by zip code in Chicago (June 2020 vs. June 2019)



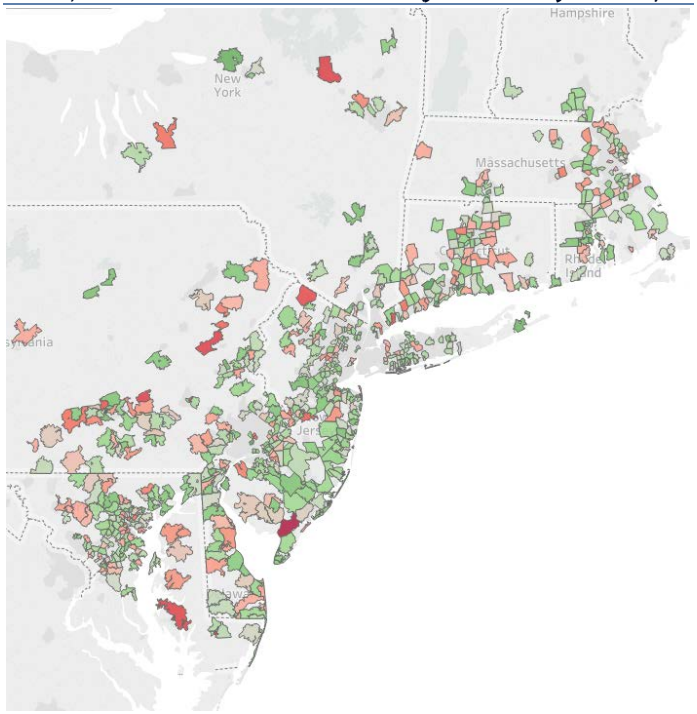
Source: Eagle Alpha, Tableau, BofA Global Research

Measuring Urban Flight – Best and Worst Zips within 200 Miles of NYC

Zip details enable us to track the housing demand of the suburbs and other towns away from NYC by analyzing the zips within 200 miles of the city. This can give us an indication on where people tended to move under the pandemic. Results suggest coastal areas were favorite spots as median home value posted yoy increases for the majority of the coastal zips (see Exhibit 13). Notably, Long Branch NJ and East Hampton NY were in the Top 10 zips along with Stratford and Clinton in CT. Closer to NYC, Bronxville in Westchester NY posted significant growth with median home value up +43%. In

addition, New Jersey seems to have benefited from urban exodus as median home value rose for most of the zips in June.

Exhibit 13: Outperforming and underperforming zips within 200 Miles of NYC, based on median home value YoY% (June 2020 vs. June 2019)



Footnote: Only include zip codes with more than 30 transactions
Source: Eagle Alpha, Tableau, BofA Global Research

Table 3: Top 10 and bottom 10 zips within 200 Miles of NYC, based on median home value YoY% (June 2020 vs. June 2019)

			Transactions		Median Home Value	
Zip	City	State	Total	YoY	Median	YoY
Top 10						
17104	Harrisburg	PA	44	16%	$66,500	103%
646)8	Monroe	CT	30	-27%	$475,000	58%
19131	Philadelphia	PA	35	-39%	$170,000	55%
6615	Stratford	CT	31	-33%	$309,900	49%
6413	Clinton	CT	36	-8%	$300,000	48%
13440	Rome	NY	59	64%	$124,000	45%
10708	Bronxville	NY	43	23%	$865,000	43%
7740	Long Branch	NJ	53	-12%	$465,000	42%
11937	East Hampton	NY	37	19%	$1,189,000	42%
21128	Perry Hall	MD	40	-11%	$424,118	41%
Bottom 10						
17110	Harrisburg	PA	36	-32%	$85,000	-32%
21223	Baltimore	MD	46	28%	$33,500	-32%
6830	Greenwich	CT	56	44%	$1,257,500	-36%
7461	Sussex	NJ	39	-25%	$170,000	-36%
21613	Cambridge	MD	43	-19%	$102,500	-38%
12078	Gloversville	NY	32	220%	$46,500	-38%
18235	Lehighton	PA	30	-14%	$95,000	-39%
17046	Lebanon	PA	32	-48%	$76,200	-39%
21826	Fruitland	MD	36	-28%	$94,500	-45%
8270	Woodbine	NJ	34	113%	$87,650	-55%

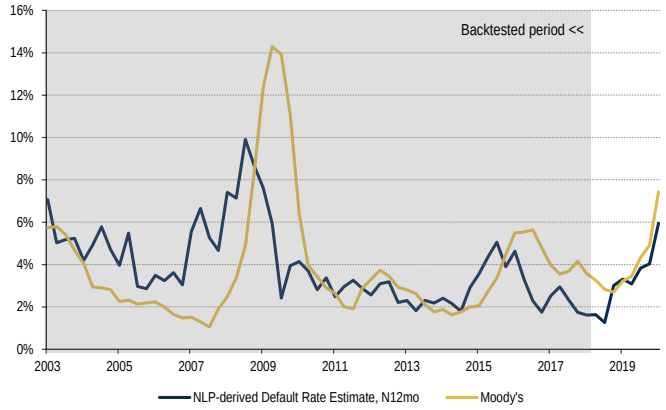
Footnote: Only include zip codes with more than 30 transactions
Source: Eagle Alpha

4 – Distressed Companies: Transcripts, HR data, Credit

BofA – AI meets High Yield Credit

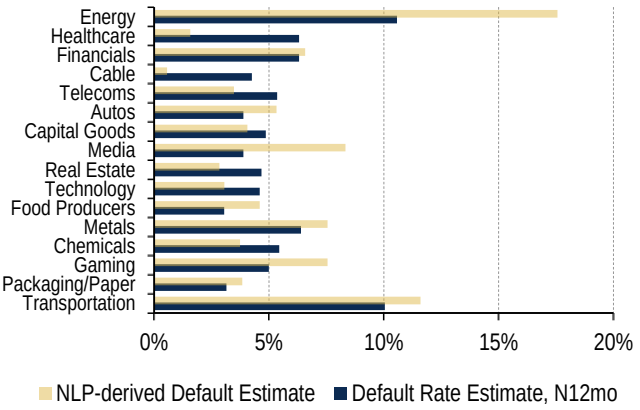
As the High Yield market tends to lead other markets, the Predictive Analytics team partnered up with the High Yield Credit Strategy team to apply the latest machine learning tools to analyzing the credit risk. In a nutshell, the technique described here is based on a Natural Language Processing (NLP) model to process earnings calls transcripts in order to predict the probability default rate over the next 12 months. We used a Machine Learning model called Support Vector Machine (SVM) in order to detect key language, if mentioned on the earnings call, leads a higher likelihood of debt default over the next 12 months. The NLP engine parses over thousands of key phrases such as 'cost cutting', 'asset sales' and 'cash burn' to establish the linkages for defaults occurring.

Exhibit 14: Regression estimate based on the BofA NLP-driven US HY Default Rate Indicator[2]



Source: BofA Global Research
Backtested period: from Jan 2003 to Dec 2017.
This performance is back-tested and does not represent the actual performance of any account or fund. Back-tested performance depicts the theoretical (not actual) performance of a particular strategy over the time period indicated. No representation is being made that any actual portfolio is likely to have achieved returns similar to those shown herein.

Exhibit 15: Sector-level estimate based on the BofA NLP-driven US HY Default Rate Indicator



Source: BofA Global Research

Default Reveal

We leverage Default Reveal, a screening tool that is built by Eagle Alpha to identify potentially distressed companies. The framework incorporates unstructured and structured data from five data vendors, such as commercial trades, payable balances, line of credit balances, utilization rate, payroll, job postings/deletions and voice stress from earning calls (See Table 4 for detailed descriptions). In this section, we present two use cases on AMC Theaters and Kroger.

Table 4: Data Overview on Default Reveal

Data Description	Granularity	Company Coverage	History	Frequency
Lines of Credit as reported by Lenders and Utilization Data, Days Paid Late	Company level	5 million + public and private	7 years	Monthly
B2B Commercial Trades, Vendor Type, Payable Days Beyond Terms. UCC Filings Collections, Scores, Derogatory Statements	Company level	5 million + , public and private	7 years	Monthly
Payment to employee	26 Industry Sub Sector & Zip Code (6 Digit NAIC Code)	100,000 + , public and private	5 years	Monthly
Voice Stress on Earnings Call	Company Level	Public Company only (Russell 1000)	7 years	Quarterly
Job Postings and Deletions from corporate websites	Company Level	50,000 +, public and private	5 years	Daily
Fundamental / cash burn, security, loan and credit prices	Company Level	100,000+ public and private	7 years	Daily

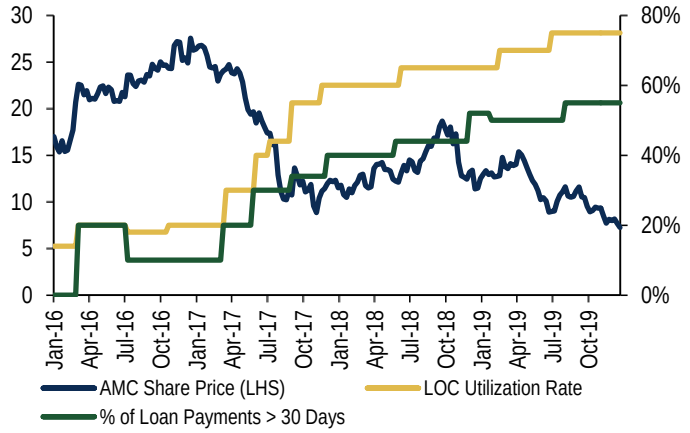
Footnote: The framework incorporates unstructured and structured data from five data vendors. The unstructured data is processed using NLP techniques to extract relevant data fields such as number of loans outstanding and days beyond terms on payables
Source: Eagle Alpha

In recent years, AMC Theaters faced severe challenges from online streaming services such as Netflix and movie studios' premium video-on-demand (PVOD). The stock had been under pressure and the company also experienced financial difficulties. Default

[2] The analysis of the BofA NLP-driven US HY Default Rate Indicator in this report is back-tested and does not represent the actual performance of any account or fund. Back-tested performance depicts the hypothetical back-tested performance of a particular strategy over the time period indicated. In future periods, market and economic conditions will differ and the same strategy will not necessarily produce the same results. No representation is being made that any actual portfolio is likely to have achieved returns similar to those shown herein. In fact, there are frequently sharp differences between back-tested returns and the actual results realized in the actual management of a portfolio. Back-tested performance results are created by applying an investment strategy or methodology to historical data and attempts to give an indication as to how a strategy might have performed during a certain period in the past if the product had been in existence during such time. Back-tested results have inherent limitations including the fact that they are calculated with the full benefit of hindsight, which allows the security selection methodology to be adjusted to maximize the returns. Further, the results shown do not reflect actual trading or the impact that material economic and market factors might have had on a portfolio manager's decision-making under actual circumstances. Back-tested returns do not reflect advisory fees, trading costs, or other fees or expenses.

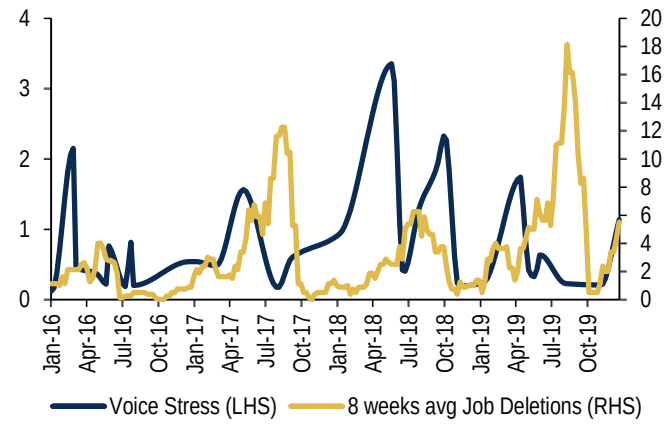
Reveal data shows that LOC utilization rate began to accelerate in March 2017 from 20% to 60% in six month. It continued to climb in recent years and reached 75% in mid-2019. Late payments on loans also jumped in the same time period as payments beyond 30 days increased materially from 10% to 40% in 2017. Using voice stress analysis of earnings calls, there was significant stress in May 2017 and May 2018. For job postings in AMC's corporate website, a significant number of job postings were removed in 3Q17 and 4Q19.

Chart 26: AMC share price vs. LOC utilization rate and % of loan payments beyond 30 days



Source: Eagle Alpha

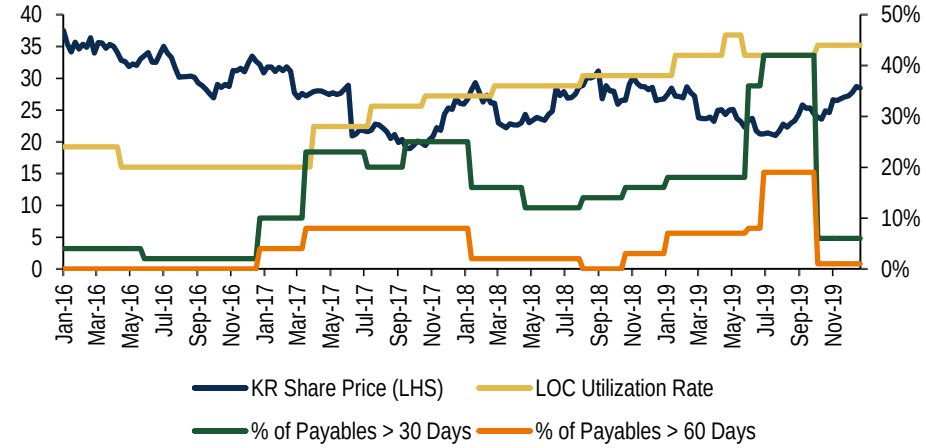
Chart 27: Voice stress on earnings call and Job deletions in corporate website



Source: Eagle Alpha

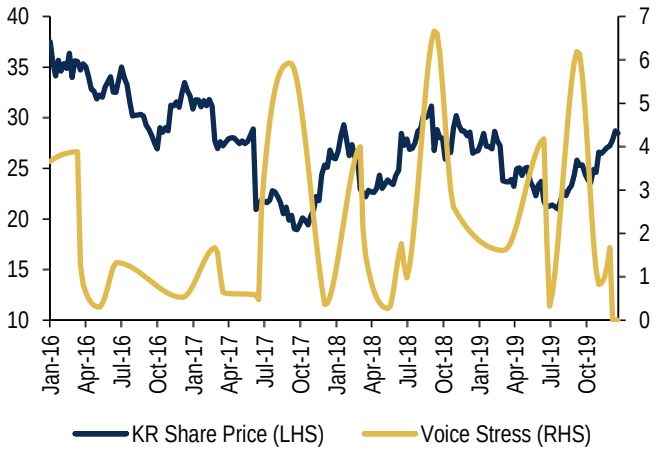
Kroger, the second largest U.S. food supermarket retailer, began to experience credit deterioration in early 2017 as the grocery wars, precipitated by Whole Foods, led to pricing pressure across major grocery chains. LOC utilization rate and B2B trade payables past 30 and 60 days accelerated in 2017. Trade payables improved in 2018 before a significant increase in mid-2019, while LOC utilization rate remained high. Similar trends can also been seen in voice stress and job posting deletions in 2017 and 2019.

Chart 28: Kroger share price vs. LOC utilization rate and % of payables beyond 30/60 days



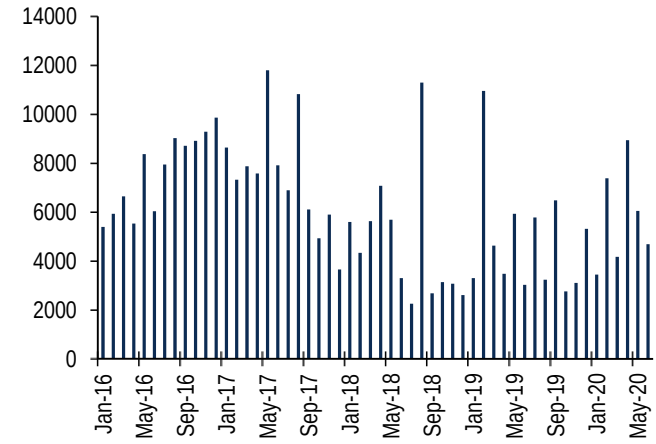
Source: Eagle Alpha

Chart 29: Kroger share price vs. voice stress on earnings call



Source: Eagle Alpha

Chart 30: Job posting deletions in Kroger corporate website



Source: Eagle Alpha

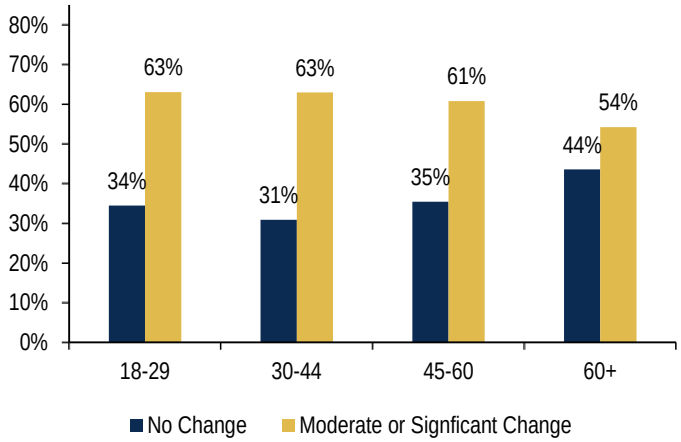
5 – Fintech and m-commerce: Survey, BAC Card, Apps

The COVID-19 pandemic has accelerated the penetration of e-commerce spending. Aggregated BAC U.S. debit and credit card data shows that e-commerce penetration increased from 19% in January to 32% in April 2020. BofA Internet analyst Justin Post remains constructive on the sector as 60% of respondents expect to spend more online post COVID-19 according to his e-commerce survey.

Chart 31: How will the COVID-19 pandemic impact your future online spending habits?

Source: BofA Global Research

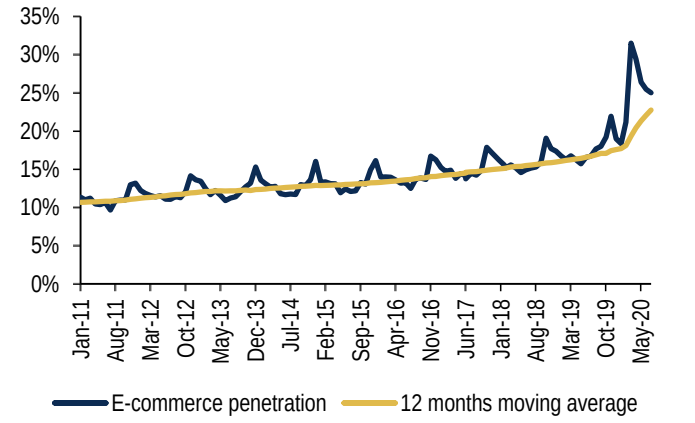
Chart 32: Expected shopping habit change by age



Source: BofA Global Research

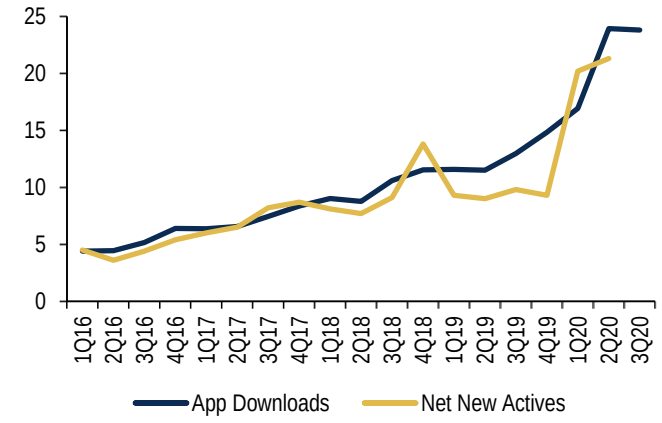
Fintech and m-commerce companies are well positioned to be one of the main beneficiaries in this trend. Paypal has seen a significant increase in net new actives (NNAs) in recent months. To better gauge potential growth in NNAs, BofA Payments, Processors & IT Services analyst Jason Kupferberg has begun tracking PayPal mobile app downloads (Chart 34).

Chart 33: COVID-19 has accelerated e-commerce penetration



Source: BAC internal data

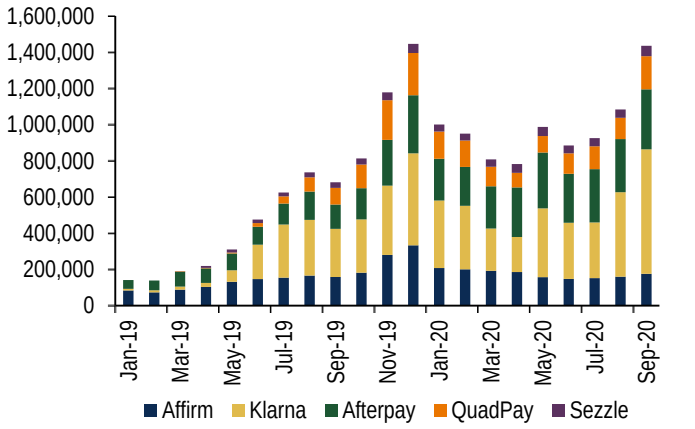
Chart 34: PayPal Quarterly App Downloads vs. Net New Actives (NNA)



Source: Sensor Tower, company documents

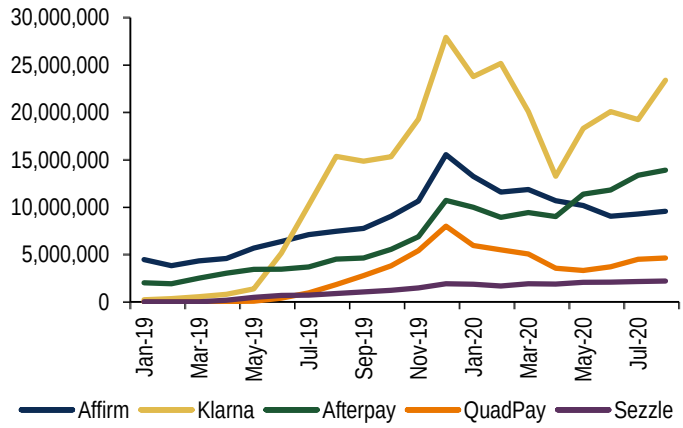
Buy-now-pay-later (BNPL) companies have gained prominence in recent months due to a shift to online spending and consumers looking for more flexible ways to pay. They offer customers the ability to pay for purchases over time in equal instalments. Chart 35 shows that app downloads for BNPL providers have accelerated strongly since April, mainly driven by Klarna and Afterpay. In addition, Paypal recently launched a new BNPL product, 'Pay in 4' which is expected to go live in the US in 4Q20.

Chart 35: No. of downloads for buy-now-pay-later apps in the US



Source: Sensor Tower

Chart 36: No of app sessions opened for buy-now-pay-later apps in the US



Source: Eagle Alpha

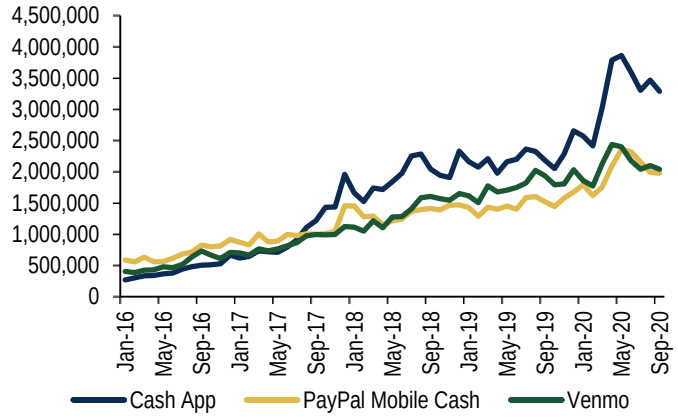
The pandemic has accelerated the presence of m-commerce in the in-store market, as contactless payments are encouraged to reduce the transmission of coronavirus. Afterpay announced its partnership with Google Pay and Apple Pay in the US so that customers can tap their smartphones at point-of-sale terminals to make in-store BNPL payments. Paypal also announced its QR code functionality in its mobile wallets and expects to go live at all CVS locations by year end.

P2P payment

The popularity of peer-to-peer (P2P) payment apps have been growing rapidly in recent years, with Cash App, Venmo and Paypal being the leading players. Activity levels on all three apps continue to climb after the COVID-19 outbreak despite the lockdowns forced businesses to close and consumers to stay home. App downloads increased significantly as Cash App recorded 3.8M downloads in April while Venmo and PayPal posted more than 2M. For number of sessions opened, Cash App and PayPal accelerated meaningfully while Venmo grew steadily. The surge of usage could be driven by 1) inflows from

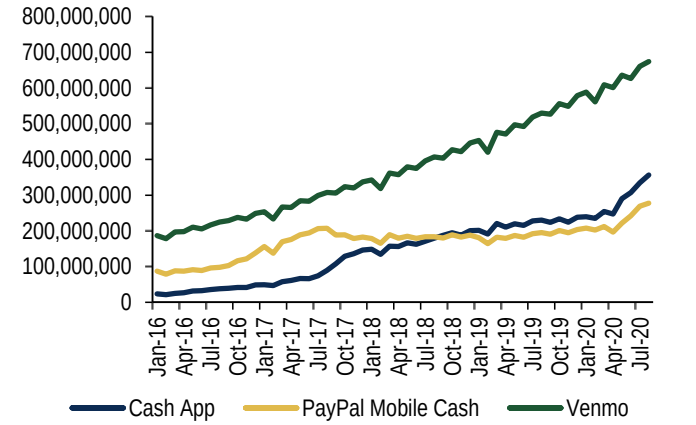
government stimulus that drives further engagement and network effects, 2) people sending money to family and friends impacted by the economic fallout, and 3) consumers preference to avoid in-person banking under the pandemic.

Chart 37: No. of downloads for P2P payment apps in the US



Source: Sensor Tower

Chart 38: No of sessions opened for P2P payment apps in the US

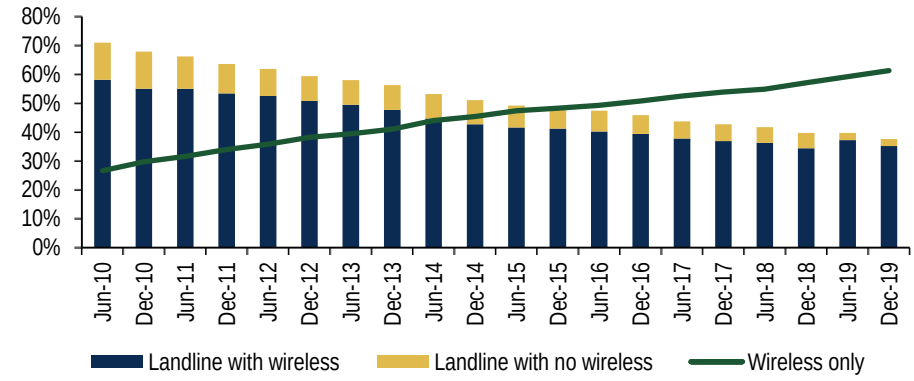


Source: Eagle Alpha

6--Cutting the Cord: Telecom number portability

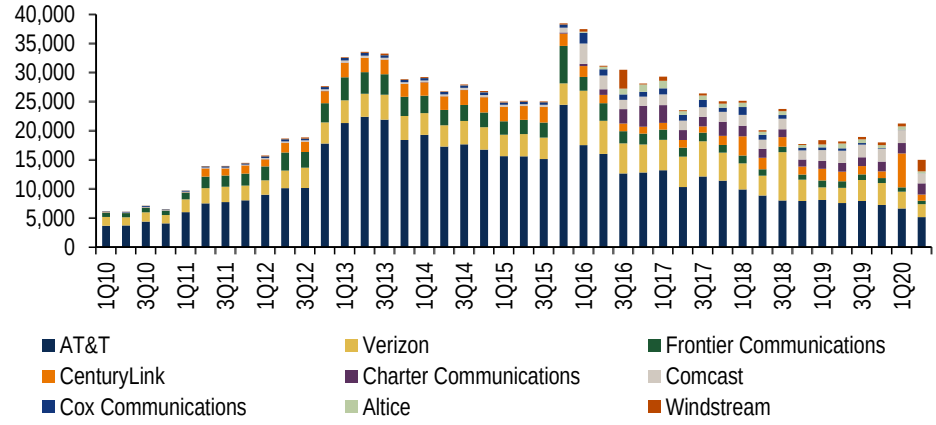
Consumers have been cutting the cord on landlines over the last decade, due to the rapid growth in the usage of mobile phones. According to the semi-annual surveys performed by the Centers for Disease Control and Prevention (CDC), the number of households with wireless only has surpassed households with a landline telephone since 2016 (Chart 39). We worked with a data vendor partnering with Eagle Alpha to analyze porting data, which tracks telephone numbers/customers switching between service providers. It allows us to monitor the latest trends on landline and wireless, and identify winners/losers among the providers. Chart 40 shows that porting activities from landline to wireless were strong in 2013 and late 2015/early 2016, while the trend moderated in recent years. Among the telcos, AT&T had the most landlines porting to wireless followed by Verizon, Frontier and CenturyLink in the past decade.

Chart 39: % of household with landline and wireless telephones



Source: CDC

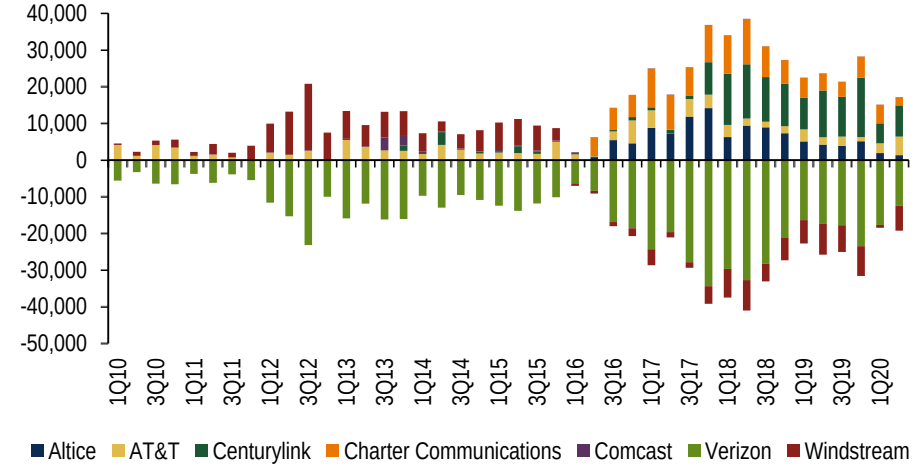
Chart 40: Total number of ports from landline to wireless in major cities



Footnote: major cities include Chicago, Houston, Los Angeles, New York City, Philadelphia, Phoenix and San Francisco
Source: Eagle Alpha

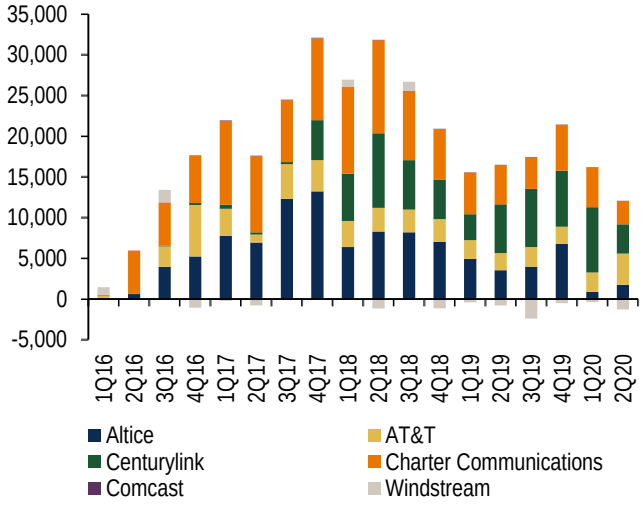
We take a closer look at New York City, where competition has intensified as more players have entered the landline market in recent years. Verizon lost customers to its competitors for every quarter in the past 10 years and the decline has widened since 2017, while AT&T was able to maintain stable gains over the years (see Chart 42 for the companies to which Verizon lost its share). According to the porting data (Chart 43) Altice grew mainly at the expense of Verizon, while Altice lost customers to CenturyLink.

Chart 41: Net landline porting adds by service provider in New York City



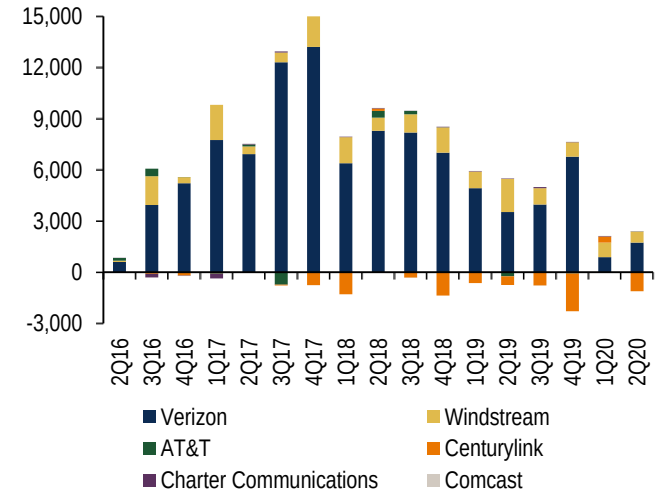
Footnote: Porting data does not include new telephone number activations and terminations of telephone numbers
Source: Eagle Alpha

Chart 42: Where did Verizon's landline customers switch to in NYC?



Source: Eagle Alpha

Chart 43: Where did Altice's landline customers switch from in NYC?



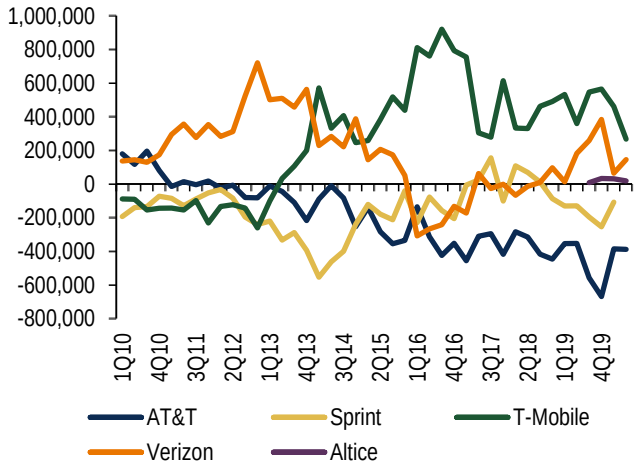
Source Eagle Alpha

Wireless

The wireless industry has benefited from the rapid growth of smartphones, with the carriers offering different packages to increase customer sign-ups. According to the porting data, T-Mobile had been increasing market share while AT&T underperformed (Chart 44). Verizon posted declines in 2016-2018 driven by Los Angeles, New York City and Phoenix (Chart 45). In September 2019, Altice launched an aggressively priced, unlimited mobile offering to compete with the big four wireless carriers. The launch had a decent start in NYC with 4Q19 and 1Q20 each posting ~16K net new ports, but the pace moderated to ~10K in 2Q20. Chart 47 shows Altice's wireless customers were mainly gained from AT&T, T-Mobile and Verizon, with each contributing 24-30% of total Altice's net adds prior to the T-Mobile/Sprint merger.

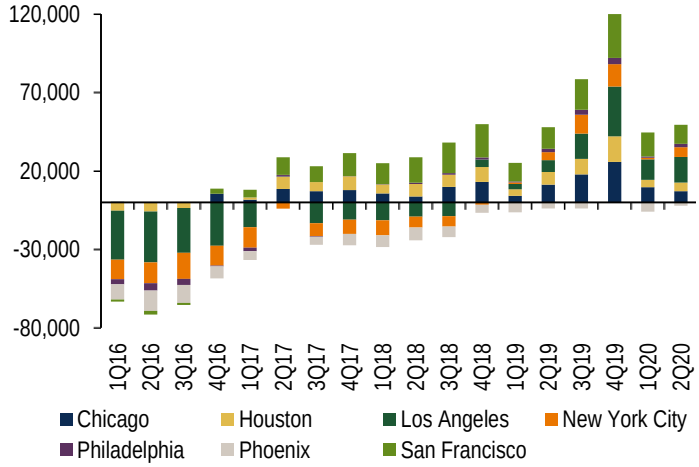
Note that the porting net adds is not a direct comparison to company reported numbers as 1) it only tracks telephone numbers switching between telcos 2) it does not include new telephone number activations and terminations of telephone numbers 3) it includes ports of both postpaid and prepaid customers, 4) porting activities of Mobile Virtual Network Operators (MVNOs) are shown in the data as ports of their host network operators. That said, we think trends are helpful in a relative basis to track the share gainers/losers.

Chart 44: Net wireless porting adds by service provider in the US



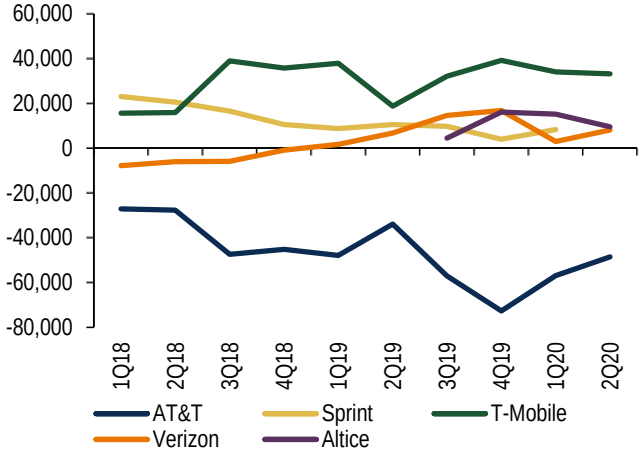
Footnote: Porting data does not include new telephone number activations and terminations of telephone numbers; Porting activities of MVNOs are observed in the data as ports of their host network operator; Post T-Mobile/Sprint merger in April 2020, porting activities of Sprint are shown under T-Mobile
Source: Eagle Alpha

Chart 45: Verizon's net wireless porting adds by city



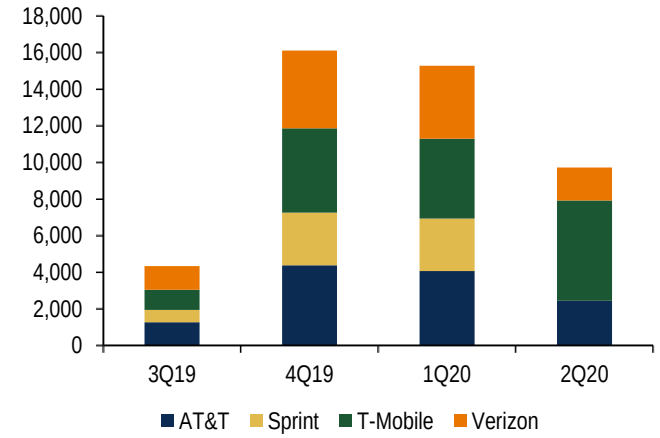
Footnote: Porting data does not include new telephone number activations and terminations of telephone numbers; Porting activities of MVNOs are observed in the data as ports of their host network operator
Source: Eagle Alpha

Chart 46: Net wireless porting adds by service provider in New York City



Footnote: Porting data does not include new telephone number activations and terminations of telephone numbers; Porting activities of MVNOs are observed in the data as ports of their host network operator; Post T-Mobile/Sprint merger in April 2020, porting activities of Sprint are shown under T-Mobile
Source: Eagle Alpha

Chart 47: Where did Altice's wireless customers switch from in NYC?

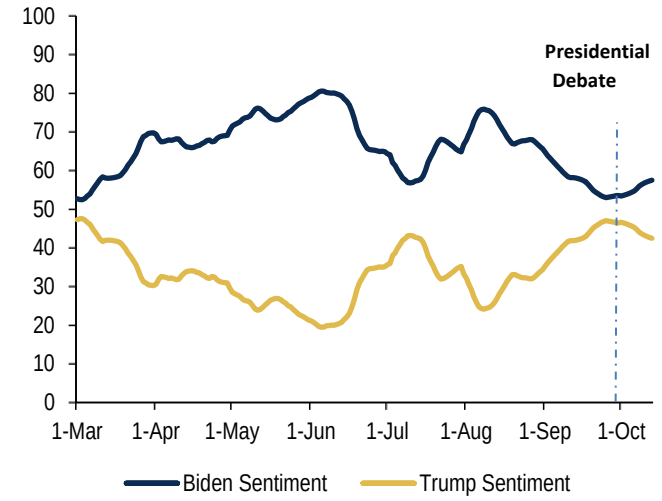


Source: Eagle Alpha

7 – Elections: News Sentiment

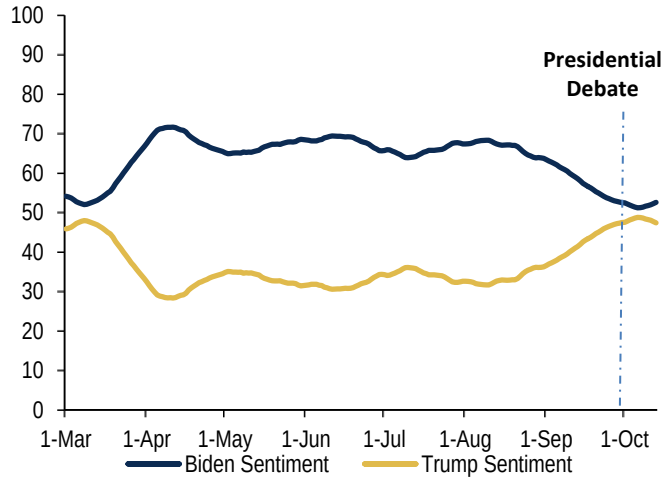
We looked at news sentiment[3] data that reflects the latest trends for the US Presidential campaign. Since Super Tuesday[4], news sentiment for Biden relative to Trump has consistently been higher, although much of the gap closed in June/July, and then again in Aug/Sep, before widening a bit after the September debate. We also believe it is important to track sentiment in the competitive swing states[5] from the 2016 election where the percentage margin between candidates was less than 5%. According to the news sentiment provided by Eagle Alpha, the sentiment scores across competitive states are about as narrow as they have ever been. Interestingly, after first presidential debate on Sept 29 2020, the gap in sentiment has slightly started to widen in favour of Biden as measured across the US as a whole as well as the competitive states.

Chart 48: Trump vs. Biden News Sentiment for US



Source: Eagle Alpha

Chart 49: Trump vs. Biden for competitive swing states



Source: Eagle Alpha

Trending Topics

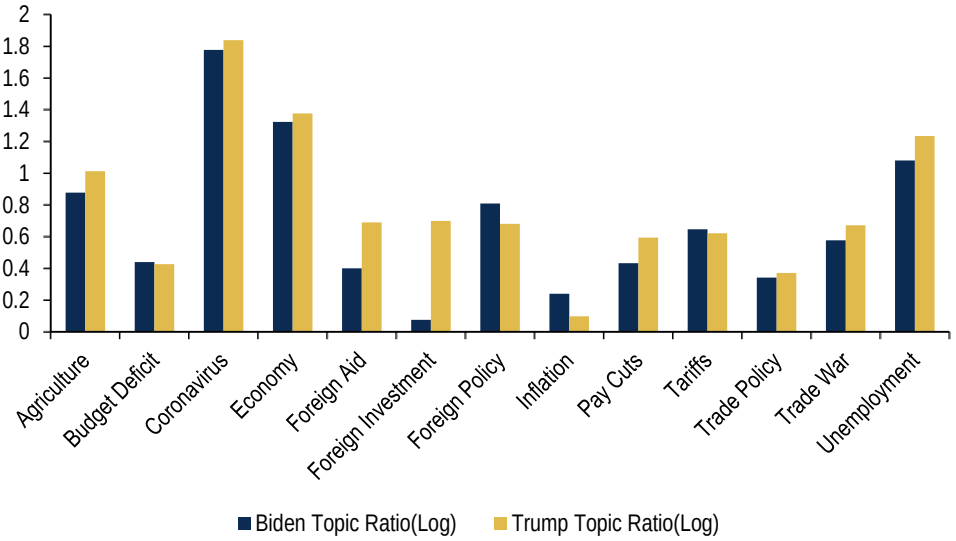
Next, we looked at the trending topics ratio that provides an insight on the number of times a candidate is associated with a particular topic in the news. We focus on economic related topics since there seems to be a more obvious link back to the financial markets. The topic ratio is the percentage of news stories mention each topic together with the presidential candidate, expressed as a ratio in comparison to all news stories mentioning the presidential candidate. We take the last 6 months average of the topic ratio and then the log in order to standardize across all topics (as otherwise news stories containing Coronavirus and Unemployment tend to make order to view data on the same scale). In the last 6 months, Trump's name has appeared more in the news about Agriculture, Foreign Aid and investment, Trade War, Pay Cuts and Unemployment while Biden's name appeared more often for Inflation, Tariffs and Foreign Policy.

[3] News sentiment estimates for each news article is associated with a positive or negative tone. News sources include Dow Jones, Wall Street Journal, Barrons, MT Newswires, Benzinga, among others. Web content captures local, regional, and national newspapers and reputable blogs and content aggregator sites.

[4] Super Tuesday one of the most consequential days in the Democratic primary: the single day when the most states held primaries or caucuses, the most voters went to the polls, and the most delegates were allotted to candidates.

[5] Michigan, New Hampshire, Pennsylvania, Wisconsin, Florida, Minnesota, Nevada, Maine, Arizona, North Carolina, Colorado

Chart 50: In the last 6 months, Trump's name has appeared more in the news about Agriculture, Foreign Aid and investment, Trade War, Pay Cuts and Unemployment while Biden's name appeared more often for Inflation, Tariffs and Foreign Policy. Topic Ratio last 6 month average*



Source: Eagle Alpha

*The topic ratio is the percentage of news stories mention each topic together with the presidential candidate, expressed as a ratio in comparison to all news stories mentioning the presidential candidate. We take the last 6 months average of the topic ratio and then the log in order to standardize across all topics (as otherwise news stories containing Coronavirus and Unemployment tend to make order to view data on the same scale).

8 – ESG: News, Reviews, SEC filings, BofA ESGMeter™

BofA ESGMeter

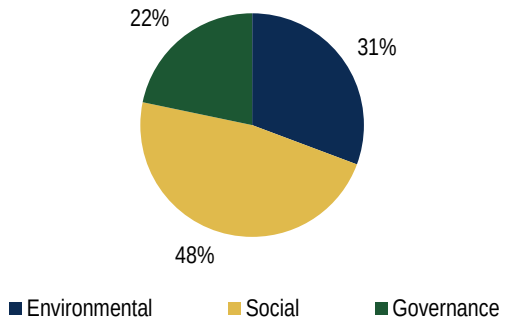
BofA ESGMeter is a proprietary metric based on quantitative and fundamental inputs that reflects BofA Global Research's assessment of a company's ESG-related attributes. ESGMeter is intended to indicate a company's likelihood of experiencing stronger Financial Stability (which we define as higher return on equity and lower earnings and price volatility) over the next three years relative to its "Peer Group", which is comprised of stocks in the BofA Global Research coverage universe as well as additional stocks in the Russell 1000 not under coverage but assigned a sector classification by BofA Global Research. There are three ESGMeter levels – Low, Medium, and High – with High indicating that a company has attributes we expect to be most likely to translate into superior financial stability. This framework is based on two elements: (1) a quantitative analysis incorporating a wide array of ESG attributes to determine which have been effective signals of financial stability historically within each industry group, and (2) a fundamental overlay, where our analysts provide qualitative industry-group level input on the importance of particular ESG attributes. Currently, the ESGMeter framework has been launched for Staples, Communication Services, Financials and Consumer Discretionary with the other sectors coming soon.

BofA ESGMeter Communications Services Example

For BofA ESGMeter communication services sector, the level assigned to a company reflects the application of our ESG team's quantitative analytical framework applied to over 140 ESG attributes included in the Intercontinental Exchange (ICE) ESG data set (see underlying report for details) and reflects a proprietary weighting methodology for those attributes that has been developed with input from BofA fundamental equity analysts. ESGMeter weights by industry group are included in the charts below.

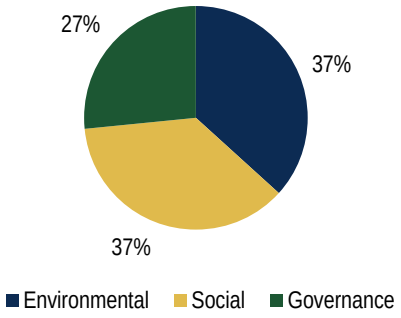
ESGMeter is not intended to be indicative of a company's future stock price performance and is independent of the BofA Global Research fundamental equity analyst's investment rating, volatility risk rating, income rating or price objective for that company.

Chart 51: Social factors are most important for Media & Entertainment
ESGMeter weightings for Media & Entertainment Industry Group



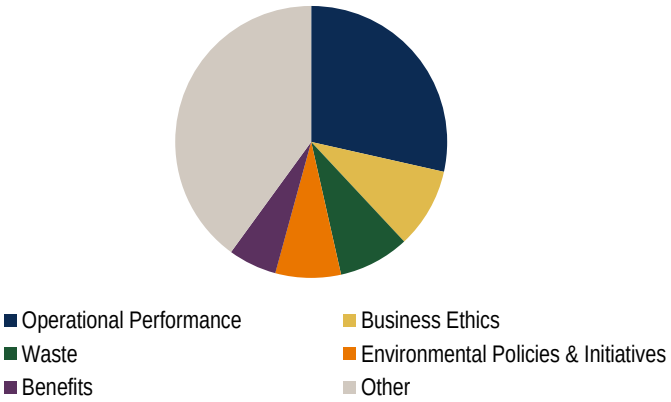
Source: BofA Global Research
Note: Weightings reflect quantitative results and fundamental analyst inputs. See original BofA ESGMeter report for detailed methodology.

Chart 52: Environmental factors are most important for Telecom Services
ESGMeter weightings for Telecom Services Industry Group



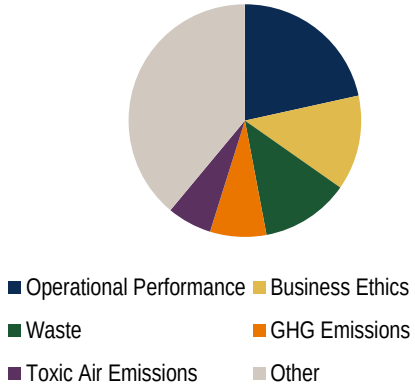
Source: BofA Global Research
Note: Weightings reflect quantitative results and fundamental analyst inputs. See original BofA ESGMeter report for detailed methodology.

Chart 53: ESGMeter subcategory weightings for Media & Entertainment



Source: BofA Global Research, ICE Data Services
Note: Weightings reflect quantitative results and fundamental analyst inputs. See original BofA ESGMeter report for detailed methodology.

Chart 54: ESGMeter subcategory weightings for Telecom Services



Source: BofA Global Research, ICE Data Services
Note: Weightings reflect quantitative results and fundamental analyst inputs. See original BofA ESGMeter report for detailed methodology.

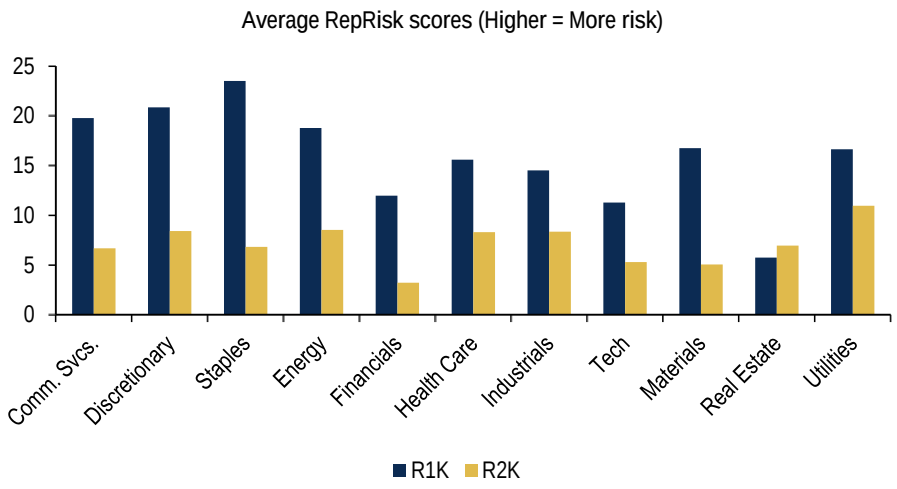
Assessing ESG risk through RepRisk data

Many traditional ESG ratings providers use company reports and other self-disclosed sources and therefore often do not incorporate information on emerging controversies in real time. RepRisk is a provider that leverages natural language processing capabilities to screen hundreds of thousands of documents daily from third party data sources around the globe. Pleases see our ESG teams' research (When bad news hits good companies) that takes a deep dive on testing the efficacy of this dataset.

RepRisk assesses the ESG risks companies are exposed to, which can have reputational, compliance and financial impact on a company. RepRisk scores are based on news flow research that is both human and machine-based. Additionally to the risk exposure scores, RepRisk also provides information on the violation of the UN Global Compact Principles (including the severity of the violation).

The RepRisk data can be used to measure ESG controversy risk in order to assess the effect on investment performance. The data can be aggregated across the overall US market, defined as the Russell 3000, or on a sector basis. Large caps have experienced higher controversy scores than small caps across all the sectors. This is common bias in ESG data as large cap names typically have more news articles written about them suggesting a steady information flow to the markets.

Chart 55: Large caps have generally experienced higher controversy risk vs. small caps across sectors
Average RepRisk scores for Russell 1000 (R1K) and 2000 (R2K) by sector (as of 4/2020)



Source: BofA Global Research, RepRisk

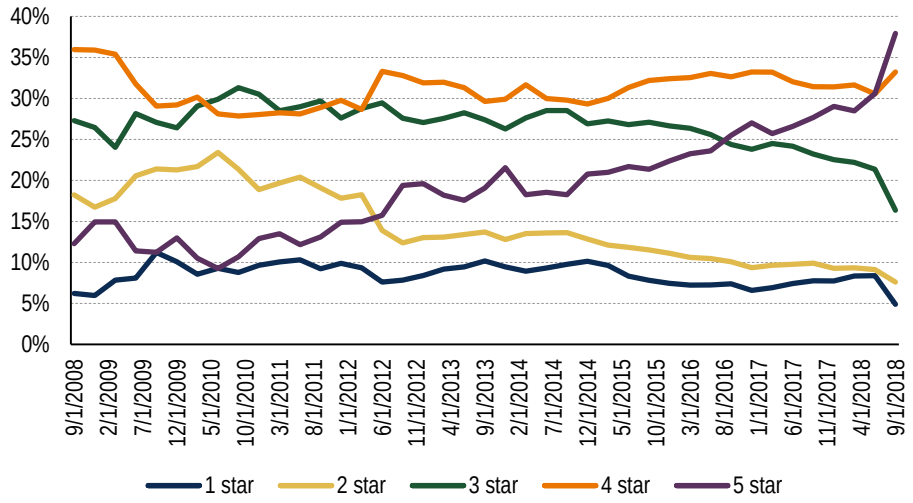
Glassdoor

In previous work, our US Equity Quant team found that Glassdoor ratings can be used as a systematic trading strategy (Extracting alpha from Glassdoor ratings). In their analysis, they found that stocks with high ratings would have outperformed those with low ratings by almost 5ppt per year from 2013 to 2018 by creating quintile strategies. Glassdoor is the largest global website repository for employee reviews and ratings, and is intended to provide insights into a firm's culture and working environment for prospective employees. The ratings can range from 1 (least attractive) to 5 (most attractive), and cover overall ratings, CEO reviews, compensation, career satisfaction, work-life balance, senior management, company outlook and if employees recommend the company. Employees can also enter written responses in the pros and cons sections.

There has been some criticism that ratings have increased over time due to employers encouraging employees to rate them. Today, the percentage of 5-star ratings is at an all-time high (Exhibit 16), largely driven by a small group of companies. Despite this, the BofA US Equity Quant team found no degradation in their back-tested results over time. In addition, they found that natural language processing techniques applied to written reviews can help shield against gaming as text offers extra information.

Exhibit 16: Signs of potential gaming on Glassdoor

Distribution of ratings from current employees, 2008-2018



Source: BofA Global Research, Thinknum

Former employees are more jaded

The US Equity Quant team's analysis found that former employees are harsher than current employees in terms of the overall rating (Table 5) in both the average and median. There is some risk associated with former employees as their reviews might be outdated and clear bias in the data.

Table 5: Former employees are more jaded

Descriptive statistics on Glassdoor review overall ratings between current versus former employees from Sep 2008 to Dec 2018

	Current	Former
Number of Reviews	1245946	970050
Average	3.50	3.09
Median	4.00	3.00
Standard Deviation	1.20	1.26

Source: BofA Global Research, Thinknum

Longer reviews tend to matter more than shorter ones

Longer reviews as defined as greater than 30 words matter more than shorter ones as we think this is an indication that more thought and effort has been put into the review. To test this, we take the median value of 30 words per review (Table 6) and repeat the quintile strategy on reviews longer than 30 words. In addition, folks that are negative tend to write reviews that are longer versus positive as indicated in total count in cons versus pros section.

Table 6: Employees write longer reviews when they are negative

Data represents current employees from 2008 to 2018

	# of words	# of words in pro section	# of words in con section
Count	1246014	1246014	1246014
Mean	48	20	29
Standard Deviation	61	25	47
Min	0	0	0
0.25	16	7	8
0.5	30	12	15
0.75	56	23	30
Max	2696	1366	2608

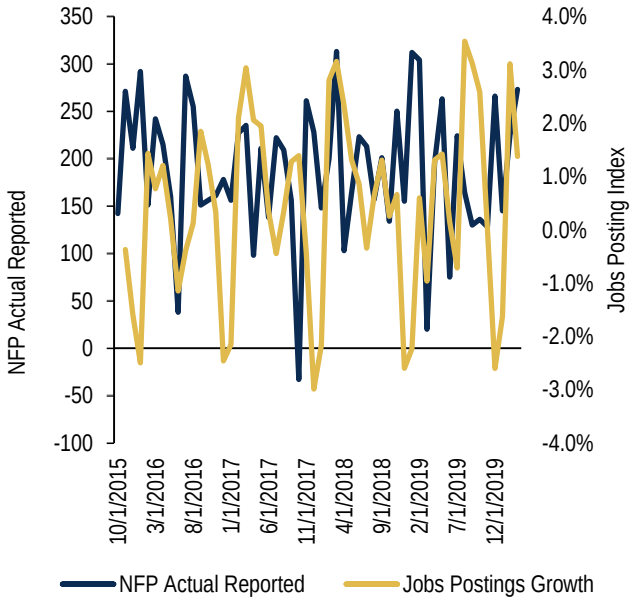
Source: BofA Global Research, Thinknum

9 – Economy rebounding: Job Postings, Flight Traffic

Jobs returning

Since the COVID-19 crisis has started, the focus on jobs returning has been paramount (see our recent report from our Econ team). Outside of traditional datasets, Job Postings can be an effective tool for predicting the change in Non-Farm Payrolls (NFP) during this recent COVID-19 period (Chart 57). Note that the Job Postings dataset is received on the Monday before the Friday NFP, which provides an early read on the most watched payroll number. Job Postings below are aggregated from all of the S&P 500 stocks websites in order measure economic activity originated from individual companies. The Job Postings Index methodology is defined by the underlying alt data vendor that Eagle Alpha provided.

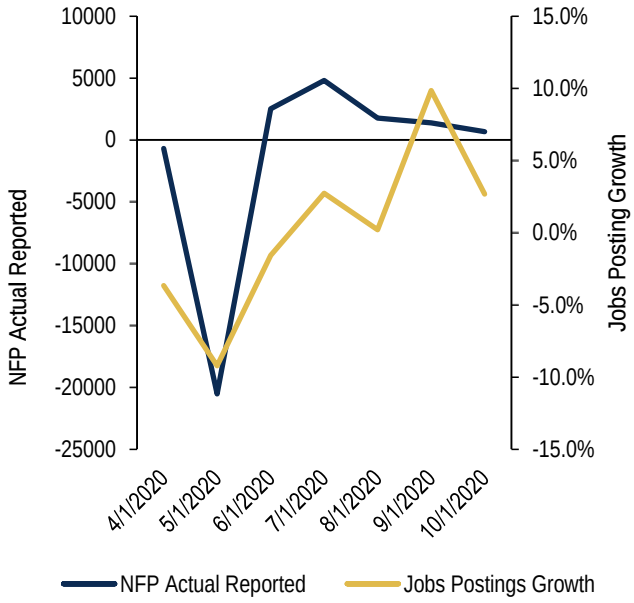
Chart 56: Job Postings MoM not as helpful for Non-Farm Payrolls during normal times pre COVID-19



Source: BofA Global Research, Eagle Alpha

Chart 57: Job Postings MoM led the COVID-19 drop in Non-Farm Payrolls

Note that the Job Postings dataset is received on the Monday before the Friday NFP, which provides an early read on the most watched payroll number

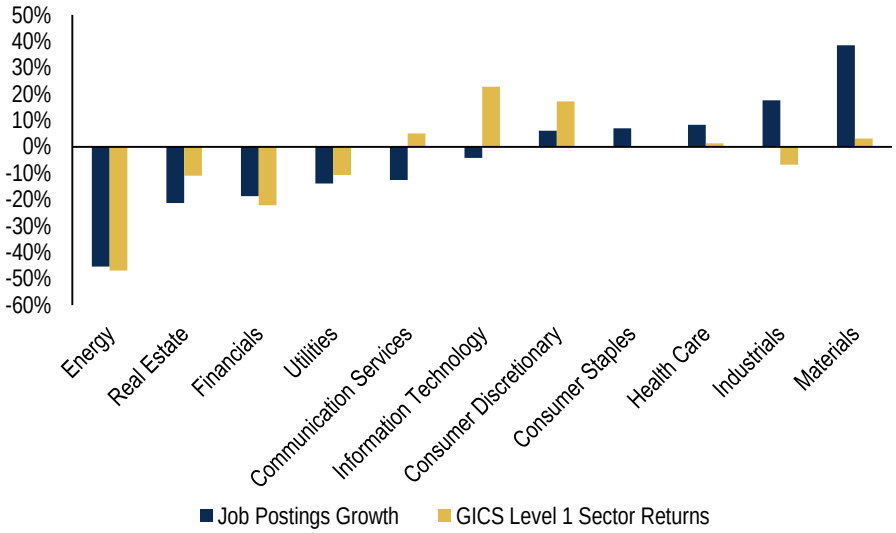


Source: BofA Global Research, Eagle Alpha

We shed further light by analyzing Job Postings by the S&P 500 GICS Level 1 Sector relative the excess returns. Chart 58 shows that for most sector returns that are down YTD (Jan-Sep 2020), they broadly match the Job Postings decline. While Materials seems to be underpriced relative to its Job Postings growth. Note that this is a sector aggregated view of how Job Postings could be utilized. However, one can drill down to individual stocks dynamics and analyze the types of positions that they are hiring for.

Chart 58: 2020 YTD Job Postings growth in line for YTD GICS Sector return for the S&P 500

Opportunity that Materials might be underpriced



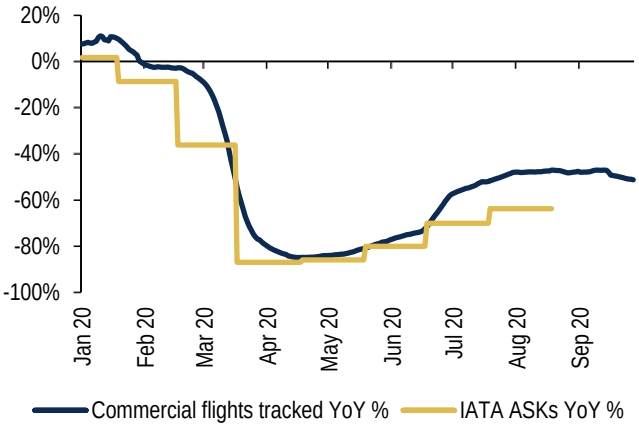
Source: BofA Global Research, Eagle Alpha

Flight Tracker

Global air traffic provides an insight into multiple sectors like Aerospace, Tourism, Lodging, which can be helpful in understanding how the economy is recovering. We analyzed Flightradar24 data to track the global air traffic both in commercial and freight business. The dataset provides a real-time insight into daily activity by engine type, airframe, narrowbody vs widebody, commercial vs. freight, region, airline and airport, providing a frame of reference for the COVID-19 recovery (see latest from our Aerospace team).

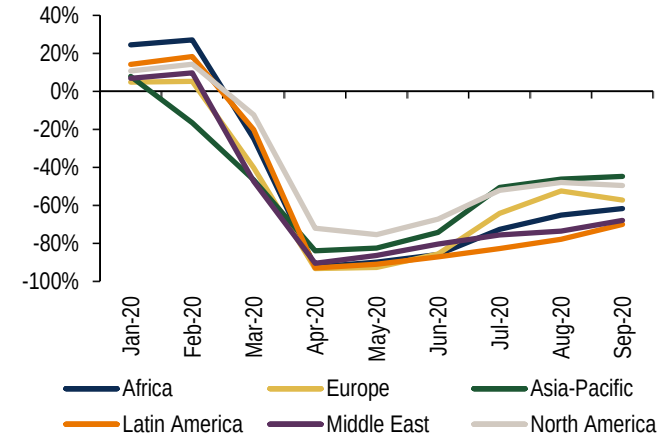
Daily commercial flight cycles fell to a monthly avg. trough of -82%/-83% in April/May, comparing to IATA ASKs of -87% and -86% in April/May respectively. Commercial cycles staged a partial recovery in July/August and were -47% in mid-September. However, the recovery has stalled and cycles have started to edge down as quarantines are reintroduced and airlines cut their planned schedules for Autumn/Winter.

Chart 59: Global commercial flight - 14 days moving average YoY%



Source: BofA Global Research, Flightradar24

Chart 60: Total number of take-off from regions YoY%

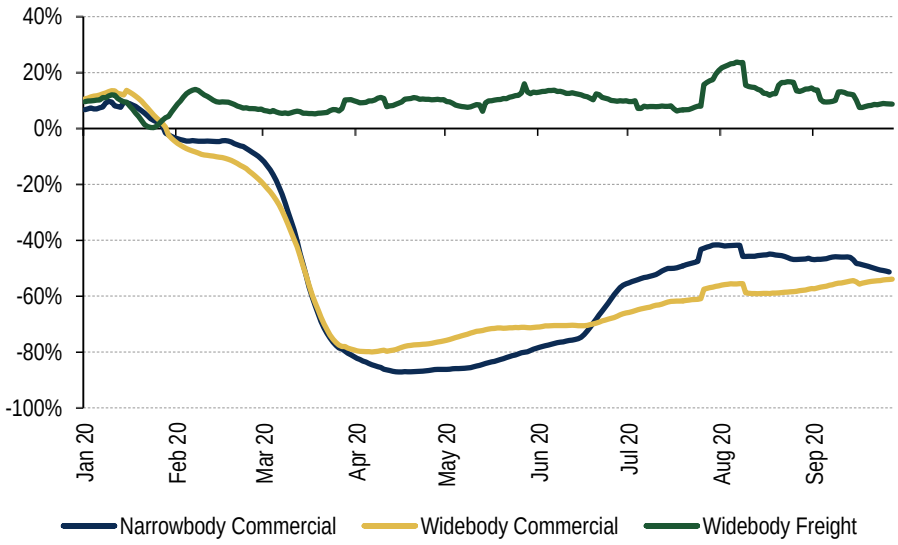


Source: BofA Global Research, Flightradar24

Dedicated widebody freighter flights have significantly outperformed commercial widebody and narrowbody, reflecting a higher number of freight flights to offset lost passenger belly capacity (usually 50% of global freight capacity). It shows that freighter platforms and engines with heavy freight exposure could outperform. Further,

narrowbody commercial outperformed widebody over the summer months, reflecting opening of short-haul passenger routes across the summer season, showing short-haul could lead the recovery.

Chart 61: Narrowbody commercial vs. Widebody commercial/freight -14 day avg. daily flight YoY%



Source: BofA Global Research, Flightradar24

10 – Big Data consumer: Social Media, Searches, Web Traffic

Every 60 seconds an estimated $996,656 was spent online in 2019 (BofA Transforming World Atlas). As consumers spend increasing time and money online it is becoming vital to track this activity for both investors and corporates alike. We can track online and macro consumer metrics on a monthly basis. This allows us to monitor individual brand momentum and overall sector demand on a QTD basis. Sources such as regional sales data, our proprietary BAC card data, Baidu search trends, Google trends, social media followers, tax refund and many others all give us insight into the consumer space.

BofA Brand Momentum

We can monitor digital presence and performance of consumer brands and rank them against each other. Brands that remain in top ranking quarter over quarter can harness the power of the virtuous cycle, generating a stronger online presence which in turn can materialize into higher revenue growths. We also created an indicator from the blend of alt data metrics to use as both a directional tracker of sector and individual brand growth (Chart 62-63).

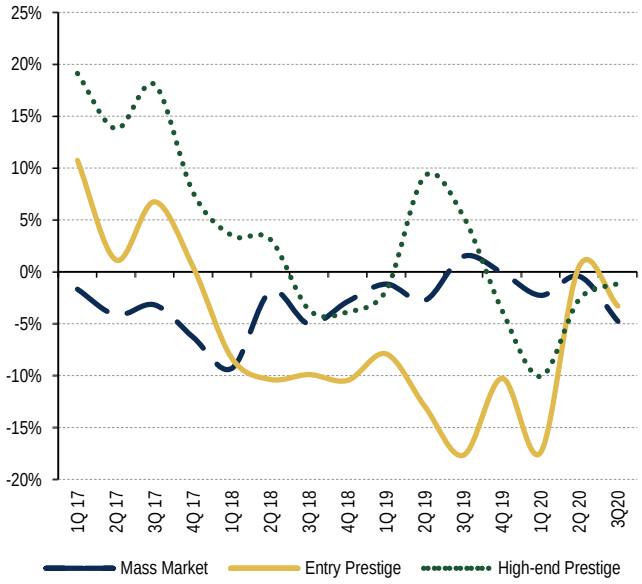
In brand momentum products we aggregate:

- Social media follower growth (Instagram, Facebook, Twitter, Weibo, Youtube, Pinterest)
- Google trends
- Baidu search trends
- Webtraffic (SimilarWeb)

This approach works well across multiple global sectors including Global Luxury, Global HPC/Cosmetics, Sportswear and South Africa Non-food retail.

Chart 62: Beauty Brand momentum allows us to monitor brand heat by market segment

Weighted-average quarterly Beauty Brand momentum by price tier (3Q20 includes July and August)

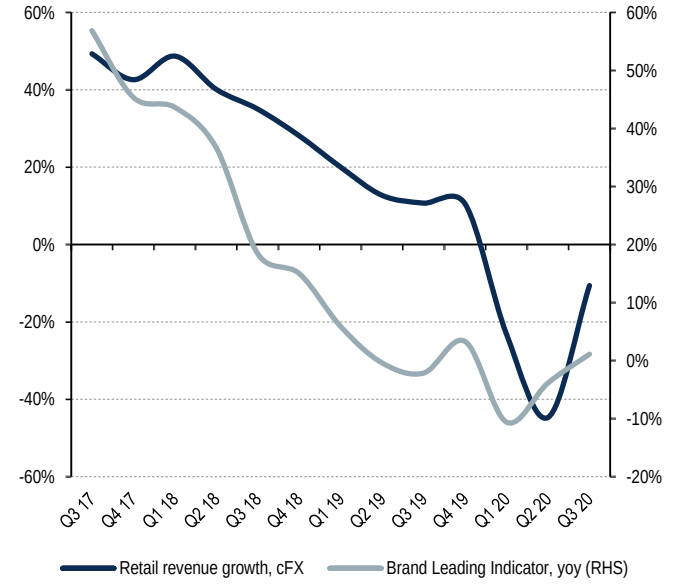


Source: BofA Global Research, Social media websites (Facebook, Instagram, Twitter, Weibo, YouTube), Google trends, Baidu trends, SimilarWeb (similarweb.com). Note: SimilarWeb data included since 3Q19; Social media websites data included since 1Q20

Disclaimer: The indicator identified as the BofA Beauty Brand Barometer above is intended to be an indicative metric only and may not be used for reference purposes or as a measure of performance for any financial instrument or contract, or otherwise relied upon by third parties for any other purpose, without the prior written consent of BofA Global Research. This indicator was not created to act as a benchmark

Chart 63: BofA Luxury brand momentum indicator highly correlates to Gucci revenue growth on a directional basis (0.82 correl. Since Dec-16)

Gucci retail revenue growth (at constant FX) compared to BofA Brand Leading Indicator



BofA Global Research, Social media websites (Facebook, Instagram, Twitter, Weibo, YouTube), Google trends, Baidu trends, SimilarWeb (similarweb.com)

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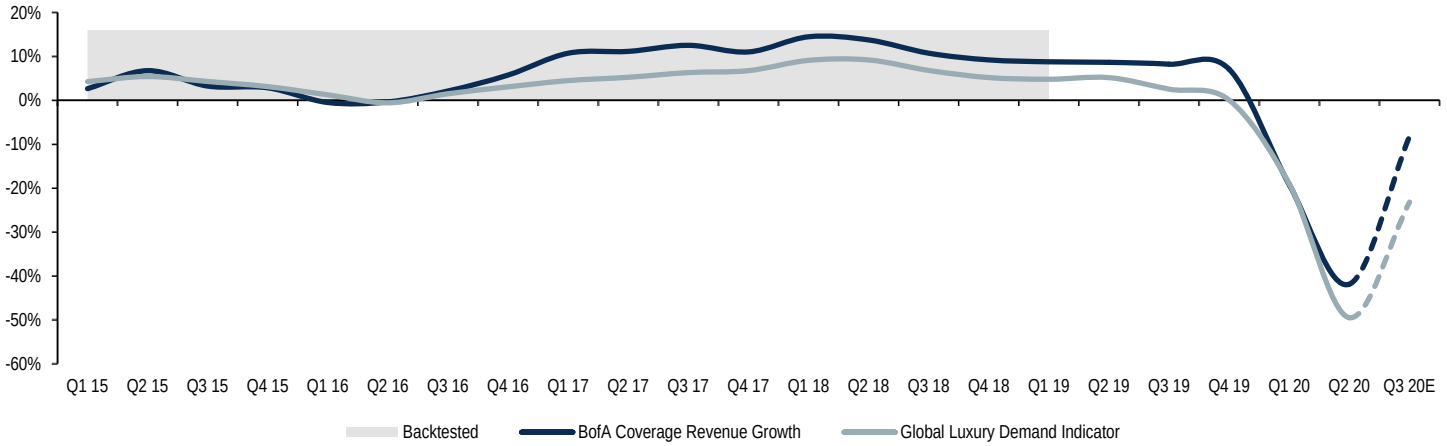
Consumer Demand

To track sector revenue growth directionally, we combine over 50 monthly data points on the luxury sector. We look at BAC aggregated card (luxury), sales, tourism, Swiss watch export, tax refunds data and many more globally from four key regions: Asia (ex. Japan), Europe, US and Japan.

- The first aim of the indicator is look a large amount of consumer-relevant data in aggregate. There are over 50 data points that are released each month which can be indicative of sector demand
- The second aim of the indicator is to provide a highly correlated indicator of revenue growth on QTD basis. We assess the correlation between each component data source and sector revenues and combine the data in a weighted average to create the indicator
- Indicator has 0.93 correlation since Q1 2015 for Global Luxury Demand

Chart 64: BofA Global Luxury Demand Indicator is highly correlated to sector revenue growth directionally (0.93 Correlation since 1Q15)

BofA Global Luxury Demand Indicator vs. BofA European coverage luxury sector revenue growth (revenue weighted average of covered companies)



Source: BofA Global Research estimates, company reports. Q3 QTD 2019 BofA coverage is based on BofA Global Research estimates.

The shaded area represents back-tested results from Q1 15 to Q1 19. The unshaded area represents actual performance since Q2 19. This performance is back-tested and does not represent the actual performance of any account or fund. Back-tested performance depicts the theoretical (not actual) performance of a particular strategy over the time period indicated. No representation is being made that any actual portfolio is likely to have achieved returns similar to those shown herein.

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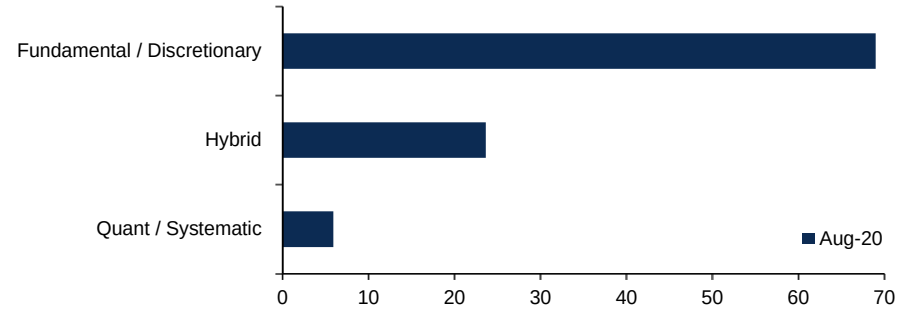
Appendix

Fund Management Survey Questions by Frequency

According to our Fund Management Survey (FMS) representing Assets Under Management of $593bn, 61% of investors are not using alt data. And of the investors that have been using alt data, 56% of them have only been using it for fewer than two years, with 69% of these investors considered fundamental/discretionary. The FMS data highlights the big opportunity that investors have by incorporating alt data into their investment process.

Chart 65: How would you describe your investment style?



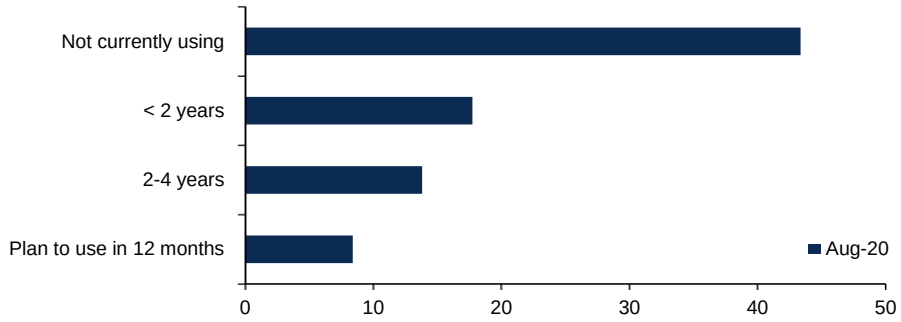
Source: BofA Global Fund Manager Survey

Table 7: How would you describe your investment style?

% saying	Aug-20
Fundamental / Discretionary	69
Hybrid	24
Quant / Systematic	6
Don't know / Not applicable	1

Source: BofA Global Fund Manager Survey

Chart 66: For how long have you been using alternative data in your investment process?



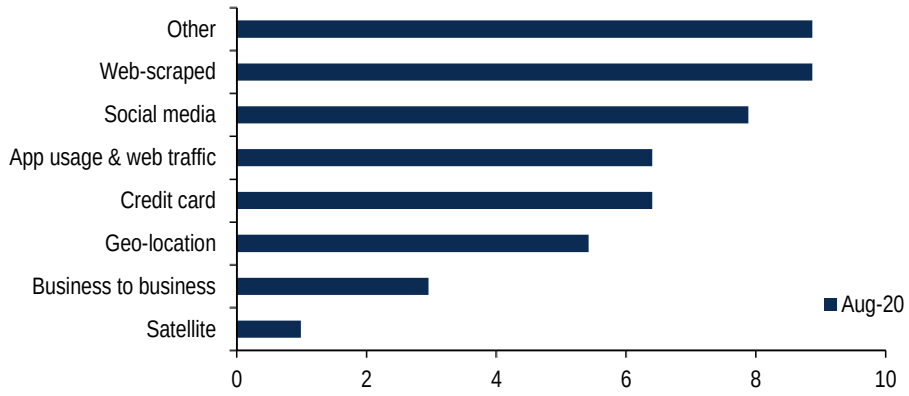
Source: BofA Global Fund Manager Survey

Table 8: For how long have you been using alternative data in your investment process?

% saying	Aug-20
Not currently using	43
< 2 years	18
Don't know / Not applicable	17
2-4 years	14
Plan to use in 12 months	8

Source: BofA Global Fund Manager Survey

Chart 67: What types of alternative data sources are you using?



Source: BofA Global Fund Manager Survey

Table 9: What types of alternative data sources are you using?

% saying	Aug-20
Don't know / Not applicable	52
Web-scraped	9
Other	9
Social media	8
Credit card	6
App usage & web traffic	6
Geo-location	5
Business to business	3
Satellite	1

Source: BofA Global Fund Manager Survey

Overview of Types of Alt Data

Exhibit 17: Typical types of data

Type of Data	Description	Maturity	Typical Issues	Typical Uses
Satellite	Use orbit images to identify trends in consumer traffic, travel / leisure, industrial utilization, energy inventory, etc…	Low	Satellite Coverage, Resolution	• Historically Retail • Emerging Energy and Industrial
Credit Card	One of the oldest forms of alternative data. Historically most users have subscribed to "processed" data due to size/complexity of raw data sets	High	Small # of Raw Data sets, Commoditization of processed data	• Retail / Consumer
Email Data	Email receipt data from consumer transaction from Consumers who provide email access to data firms	Low	Small panel sizes, Immature vendors	• Retail / Consumer
Mobile Location Data	Location data from cell phones **applications** that triangulate location via wifi and cell towers	Medium	Quality of location data, some vendors have small panels	• Retail / Consumer • Industrial • Energy
Mobile Location Via Cell Towers	Data from cell phone users captured via actual data transmitted via cell tower	Low	"Resolution" of location, aggregation of end user data	• Industrial • Energy • Mobile App Usage

Source: BofA Global Research

Exhibit 18: Typical types of data

Type of Data	Description	Maturity	Typical Issues	Typical Uses
Web scraping Data	The web provides a broad set of data, from web site usage, to actual web content from company web sites that can be scrapped and analyzed.	Medium	Movement to Mobile Apps, Restrictions to use of scraped data	• Retail / Consumer • Search Trends
Browser Clickstream Data	Clickstream data is the actual data links that people click when using a browser. Since users must give access, sometimes panels can be small/skewed	Medium	Panel size, large amounts of data	• Retail / Consumer • Search Trends
Corporate Databases	Some firms (typically private) are monetizing data like T&E expense. Or POS data at auto dealers.	Low	Small panel size, difficult to source, cost vs. panel size	Business spend trends
Social Media /Sentiment	Use Twitter, Facebook and other social media sources to identify trends (aka "social listening")	Medium	True sentiment difficult to identify, skew of data, validity of data	Retail / Consumer
Government Databases	US Government databases have a wide array of "free" information including shipping data, SEC data, oil drilling permits, etc…	Medium	Varies by database, but typically raw data only	• Multiple

Source: BofA Global Research

Exhibit 19: Typical types of data

Type of Data	Description	Maturity	Typical Issues	Typical Uses
Shipping Data	Since 2010, global shipping traffic has use a satellite transponder system which allows for ship location tracking. Another source of shipping information is Customs databases.	Medium	Understanding ship cargo status, limited # of providers	• Global supply chain • Commodities
Sector-based "Data Aggregators"	Multiple sectors have long existing "data aggregators" that collect data from each contributor and report out to contributors	High	Detailed data usually only for contributors, data aggregation to high level	• Multiple Sectors

Source: BofA Global Research

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