SMARTMARKETDATA

Providing Unique, Relevant, Credible, and Accessible Market Data and Analytics to Financial Services

LinkUp Jobs Data

Presented On:

Attendees:

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SmartMarketData, LLC

- SmartMarketData (SMD) finds unique and relevant alternative data sets, and helps productize them for consumption by Wall Street. Key services include:
  - Product Development
  - Operations
  - Identifier/Reference Data Mapping
  - Business Development
  - Client Admin
  - Data Science and Research
  - Custom Data Science and Research for customers

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LinkUp Jobs Data

The LinkUp Raw Jobs data is a database of company level job posts, gathered directly from company career portals like “ibm.com/careers”. We do not capture jobs from “aggregators” like Indeed. This makes our raw data clean, with no duplicates and no stale data – among other things.

- The data consists of raw data files, as well as analytics. The RAW data consists of job level meta data, and descriptions.
- The engine behind LinkUp’s Job Search platform is driven by a very sophisticated and complex technology infrastructure that systematically “spiders” corporate web sites to gather information about open job postings.
- While scraping an individual website once is not a technological feat today, doing it daily for greater than 55,000 companies is. LinkUp has spent years developing technology to deliver the most reliable, accurate and timely jobs data in the industry.
- The jobs data history extends back to 2007-08-03, and covers some 55,000+ companies. The data is captured, analytics processed, and delivered daily. We started capturing the descriptions data in 2014.

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Why is this jobs data important?

- Jobs are the basis of the economy. Jobs growth is highly correlated to economic growth.
- Companies hire when they are growing, they stop hiring & layoff when they are declining. LinkUp gives a picture of what company managements' growth expectations are for their future.
- Current employment data is monthly, delayed, and survey based.(BLS NFP,ADP). It is fraught with error and room for bias, and revised over and over again.
- Public companies only report number of employees quarterly at best, and these numbers are point in time, rounded, and subject to bias. They are not 'audited'
- LinkUp RAW jobs data is near real-time, objective and unbiased, and gives a picture of Company, Sector, Industry, Region, and Job Category's (SOC Code) expectations for future job growth.
- Using LinkUp RAW, we can create analytics which give a near real-time look at the expected jobs/employment outlook for companies, tickers, or virtually any aggregate
- Having near real-time insight into objective data portraying management expectations for growth in the future is new, relevant, and virtually unprecedented. We see few if any other data sources that are so directly predictive of the future.
  - POS data is at best "What happened today?"
  - Geo-Location data is at best "What happened today"
  - LinkUp Job posts are "What IS going to happen tomorrow!"

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Use Case Themes 1:

- Long/Short companies with growing/declining job posts
  - Relative to self, y/y, m/m etc.
  - Relative to peers/industry % chg
- Look for companies with large and quick drops
  - Could be layoffs approaching
  - Could be M&A approaching
- Look for companies entering new geographic markets
- Look for companies entering new product markets

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Use Case Themes 2:

- Look for growth in jobs in regions – predicts increase in Real Estate prices.
- Look for forensic evidence of demand, for instance Requirements for specific software expertise.
- Look for mix shifts in job types:
  - Part-time/full-time
  - Work from home/remote
  - Salaried vs hourly
  - White collar vs. blue collar

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Use Case Themes Macro:

- Predict the monthly NFP employment number
- Predict growth, decline in industries, regions
- Predict JOLTS – our USMacro and USMacro 10000 are directly correlated to the Bureau of Labor Statistics Job Openings.

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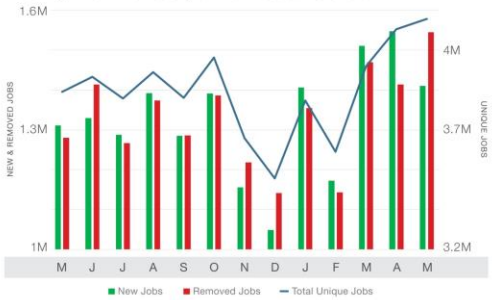
Macro Use Cases

New, Removed, and Total Jobs



The LinkUp 10,000

U.S. Hiring Velocity (Days to fill)

SOC Occupations

Top & Bottom Occupations

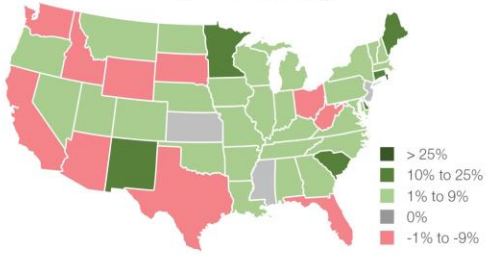
May 2019 Top & Bottom Occupations by SOC	MoM	YTD
↑ Healthcare Occupations	6%	25%
↑ Business and Financial Operations Occupations	3%	36%
↑ Management Occupations	2%	29%
↑ Computer and Mathematical Occupations	1%	29%
↓ Food Preparation and Serving Related Occupations	-3%	-5%
↓ Transportation and Material Moving Occupations	-5%	10%

NAICS Sectors

Top & Bottom Occupations

May 2019 Top & Bottom Occupations by NAICS 2-digit	MoM	YTD
↑ Educational Services	6%	13%
↑ Health Care and Social Assistance	4%	12%
↓ Retail Trade	-3%	-3%
↓ Accommodation and Food Services	-3%	-11%
↓ Manufacturing	-5%	-3%

New Job Listings



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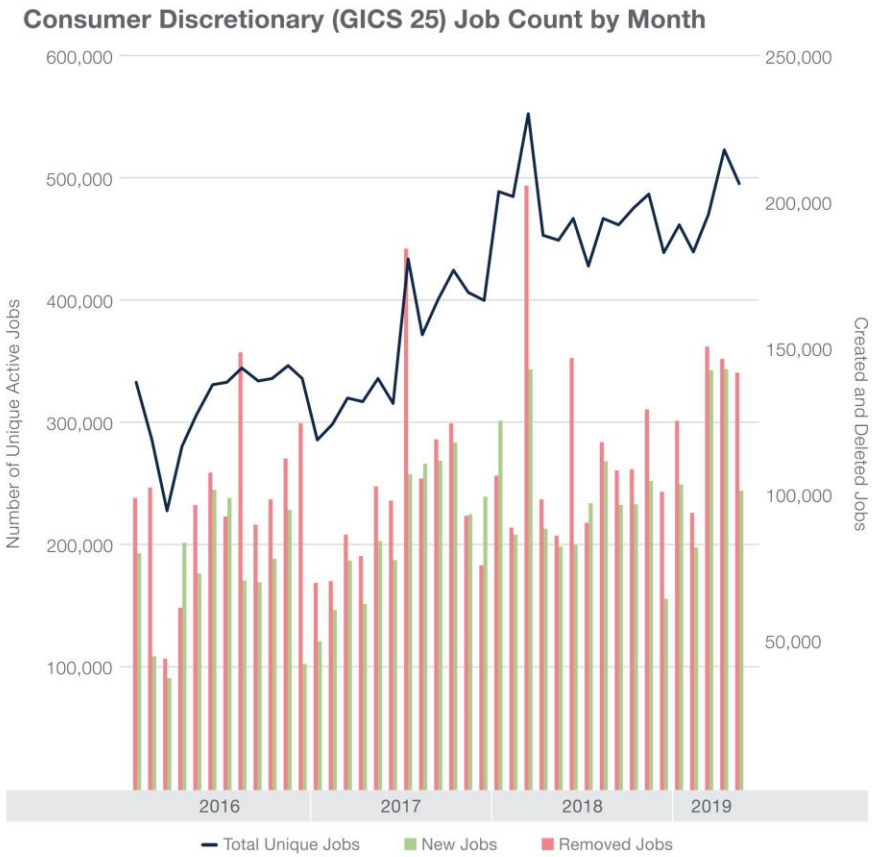
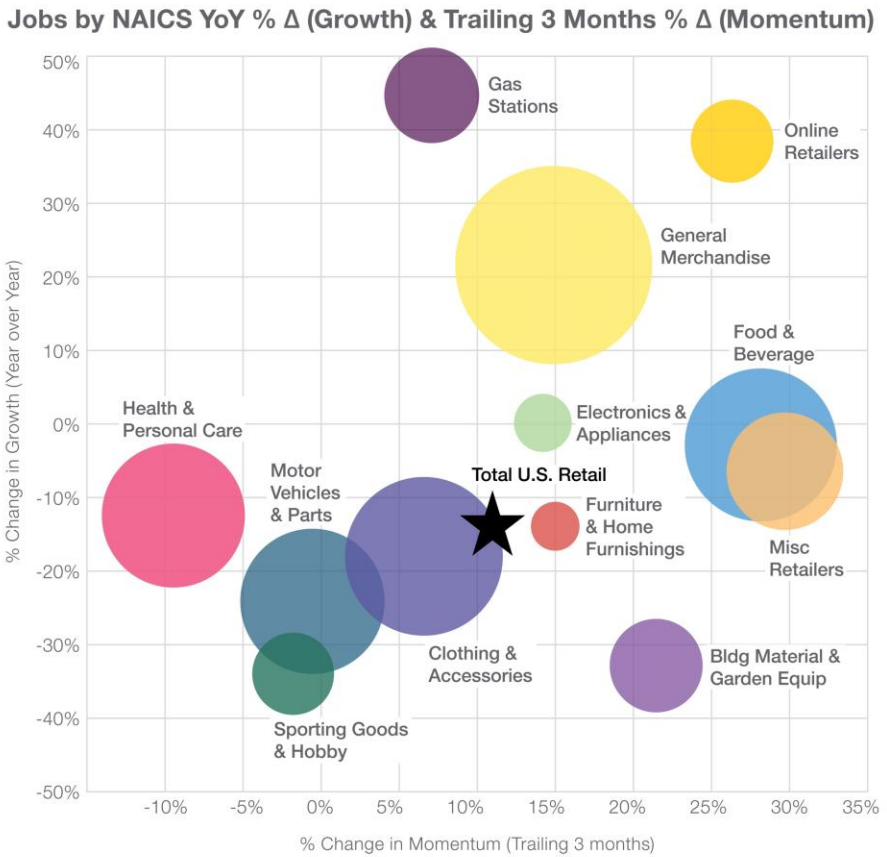
Use Case: Retail Industry Labor Trends





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Data Stats

The possibilities are almost endless. This data broadly covers all worldwide markets, and can be applicable to many different quantitative and discretionary investment strategies.

- 200M jobs
- 240 of countries
- 49,000 companies
- 3,500+ Active Tickers
- 41M international jobs (21%)
- 160M US jobs

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The RAW Data

- jobs_base - **7.22GB, adding <~10MB per day**
  - This is an enhanced "jobs" table, which is just the immutable data for a given hash, with some important modifications to the LU standard data.
- jobs_log - **14.1GB, adding <~10MB per day.**
  - With the and scrapelog as a foundation, we have created a true hash level point in time log for the entire history of the data. You can now look at 2007-08-03, and see the "daily" view on that date. The result though is a perfect PIT dataset, at the atomic "hash" level. This dataset is 5 BILLION records! BUT, because of how we have constructed it, it requires only ~14GB of storage space, and is flexibly and quickly consumable. No archives, dailies, pit, or deltas needed. Pull the whole file up to date, or just select the scrape_date (s) you want.
- descriptions - **92GB, growing ~80MB per day**
  - These are the job descriptions from each job post. They are unstructured text. LU started to capture these in 2014

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Reference Data Files

- scrapelog - **121MB, adding <~50KB per day**
  - We have created an enhanced “scrapelog”, which eliminates ALL of the gaps in the previous log and provides a complete historical base of company level scrapes. The scrapelog adjusts the deleted dates to point in time, so they reflect reality as you would have known it on any given day. We have also incorporated the dates that company level scrapes were decommissioned.
- reference - **~12MB**
  - This is the consolidated reference data file. It contains LinkUp reference data, like the “company_name” associated with the “company_id”. It also contains the market data reference items like tickers, sedols, etc., as well as broader identifiers like LEI.
- auxiliary - ~**6MB – grows slightly periodically**
  - This directory contains auxiliary tables, typically from external sources as “helper” tables. For instance, the ‘/smd-lu/auxiliary/soccode/soc_2010’ directory parquet contains all of the 2010 soc code descriptions.

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Current Analytics

- analyticsCore/analytics_core - **each Aggregate can be from 20-1GB depending on the aggregate**
  - The analytics_core is our "core" analytics, created for any "aggregate". An aggregate is a subset of jobs. For instance "Macro" is all jobs. "USMacro" is just jobs with country='USA'. An infinite number of aggregates can exist.
  - Just grab a code and go! Adding new aggregates all the time. https://github.com/SmartMarketData/LinkUp_Enhanced_Documentation/blob/master/LU_Enhanced_Aggregate_Analytics_Codes.xlsx
  - Core analytics are:
    - jobsactive - # of job posts active on a given day
    - jobscreated - # of jobs created on a given day
    - jobsremoved - # of jobs removed/deleted on a given day
    - Duration_active – the length of time the current jobs on average have been posted in days
    - Duration_closed – the length of time the removed/deleted jobs on average have been posted in days
  - Current codes:

BaseCode	BaseName	SubCode	SubAggregate	Code	Description
0001	Macro	00	None	00011000000001	macro level data, includes ALL jobs aggregated, daily
0001	Macro	01	company_id	00011010000001	macro level data, includes ALL jobs aggregated by company_id
0001	Macro	02	ticker	00011020000001	macro level data, includes ALL jobs aggregated by Refinitiv's RIC
0001	Macro	03	ticker_fs	00011030000001	macro level data, includes ALL jobs aggregated by Factset's primary ticker
0001	Macro	10	country	00011100000001	macro level data, includes ALL jobs aggregated by country
0001	Macro	11	state	00011110000001	macro level data, includes ALL jobs aggregated by state
0001	Macro	70	SOC Major	00011700000001	macro level data, includes ALL jobs aggregated by the highest level SOC Major code
0001	Macro	71	SOC Minor	00011710000001	macro level data, includes ALL jobs aggregated by the 2nd highest level SOC Minor code
0001	Macro	72	SOC Broad	00011720000001	macro level data, includes ALL jobs aggregated by the 3rd highest level SOC Broad code
0001	Macro	73	SOC Detailed	00011730000001	macro level data, includes ALL jobs aggregated by the 4th highest level SOC Detailed code

- analyticsEnhancedJob-
  - This parquet holds "analytics" that are specific to a "job". For instance the "socCode2010", the job "url", as well as "badhash" which flags jobs that were in the data set point-in-time, but later removed as "bad". This file is partitioned by "analyticType", so you can extract all or just the information you need.

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Analytics Pipeline

- Part-time job aggregates
- Remote Work/Work from home job aggregates
- Sector, Industry, Sub-Industry aggregates
- SOC Code Major, Minor, Detail aggregates
- BLS Salary data by Job Classification and Regional Job Classification
- We also provide custom aggregates (i.e. portfolios, universes, watch lists, specific tickers, you name it), via daily parquet feeds and/or detailed Excel sheets with data and charts - delivered via email or on the web.

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The Files & File Delivery

- Glossary https://github.com/SmartMarketData/LinkUp_Enhanced_Documentation/blob/master/LU_Enhanced_Glossary.xlsx
- All files are in parquet format. Most are elegantly partitioned for selective access to slices of each file.
- AWS S3 – with sync and Glue capability
- Timing
  - scrapelog ~9:30PM EDT(1:30AM UTC)
  - jobs_base ~10:30PM EDT(2:30AM UTC)
  - jobs_log ~10:30PM EDT(2:30AM UTC)
  - analyticsEnhancedJob ~10:30PM EDT(2:30AM UTC)
  - descriptions ~11:00PM EDT(3:00AM UTC)
  - reference ~11:00PM EDT(3:00AM UTC)
  - analyticsCore ~12:30AM EDT(4:30AM UTC)

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Resources

- Resources can be found at https://github.com/SmartMarketData/LinkUp_Enhanced_Documentation

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Additional Information Follows

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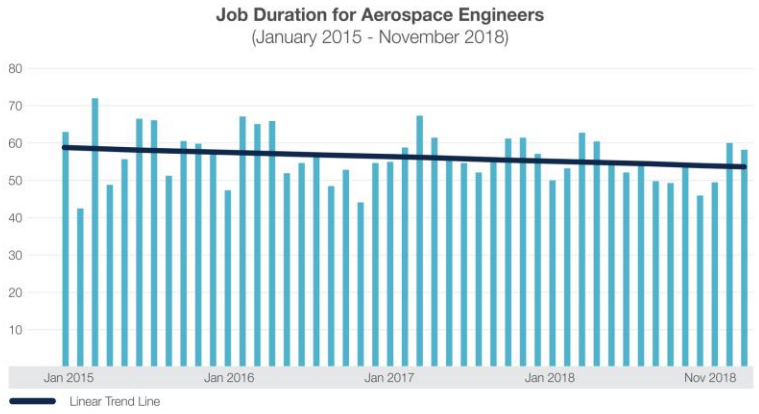
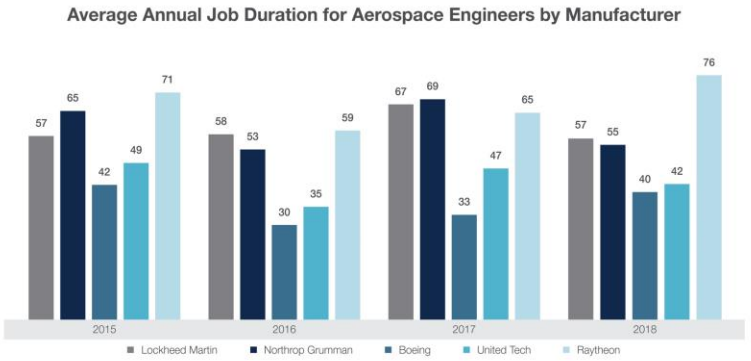
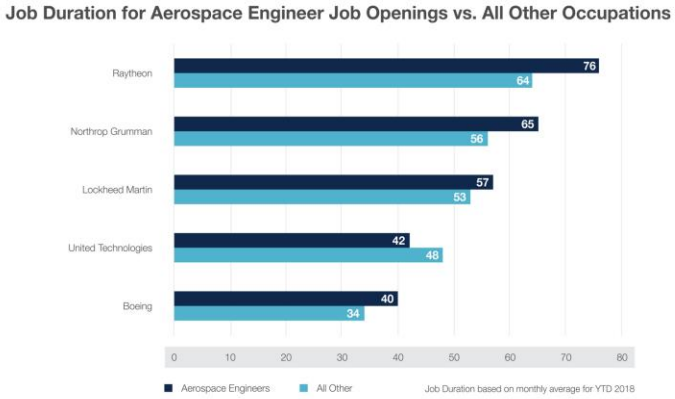
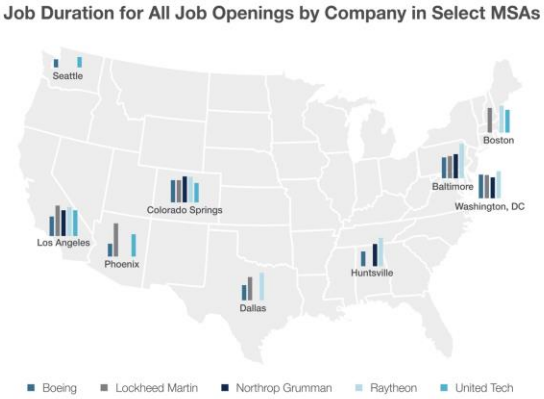
Use Case: Aerospace Engineers









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Use Case: Company Signals

amazon

GM

charming charlie

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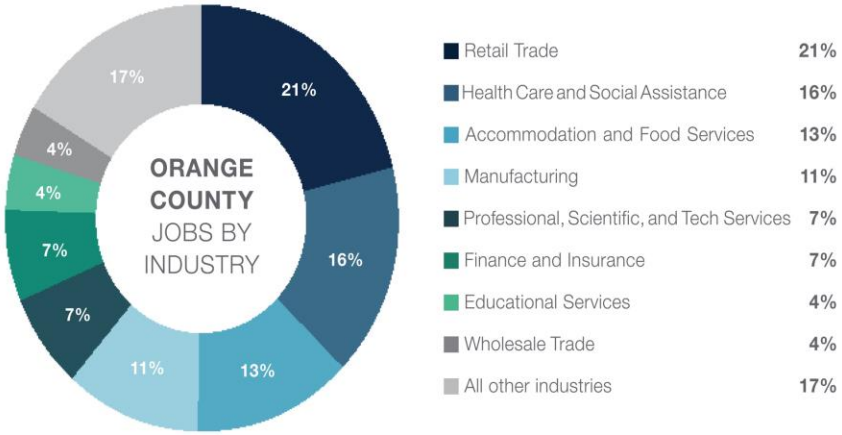
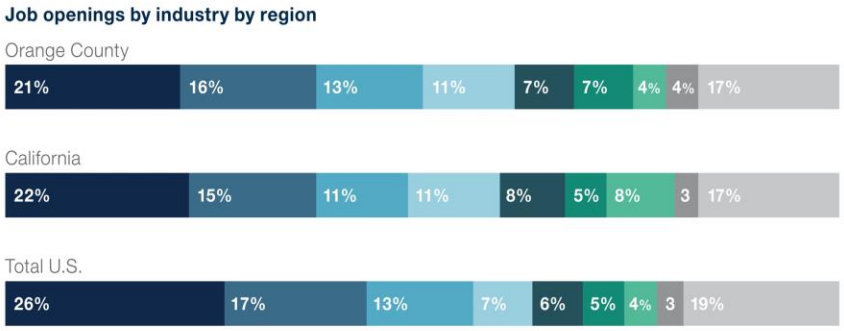
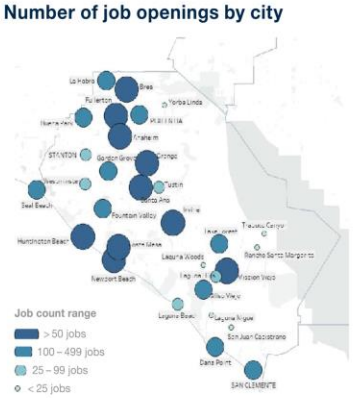
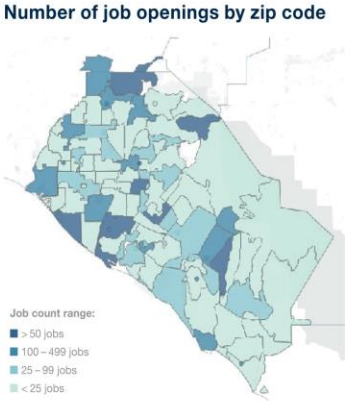
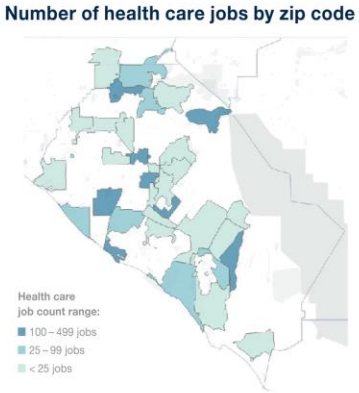
Use Case: Orange County

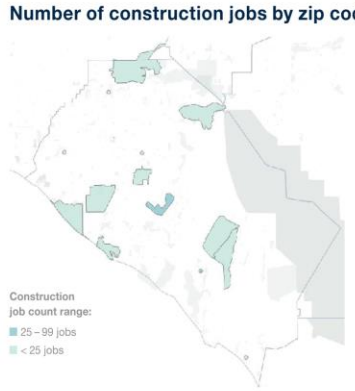












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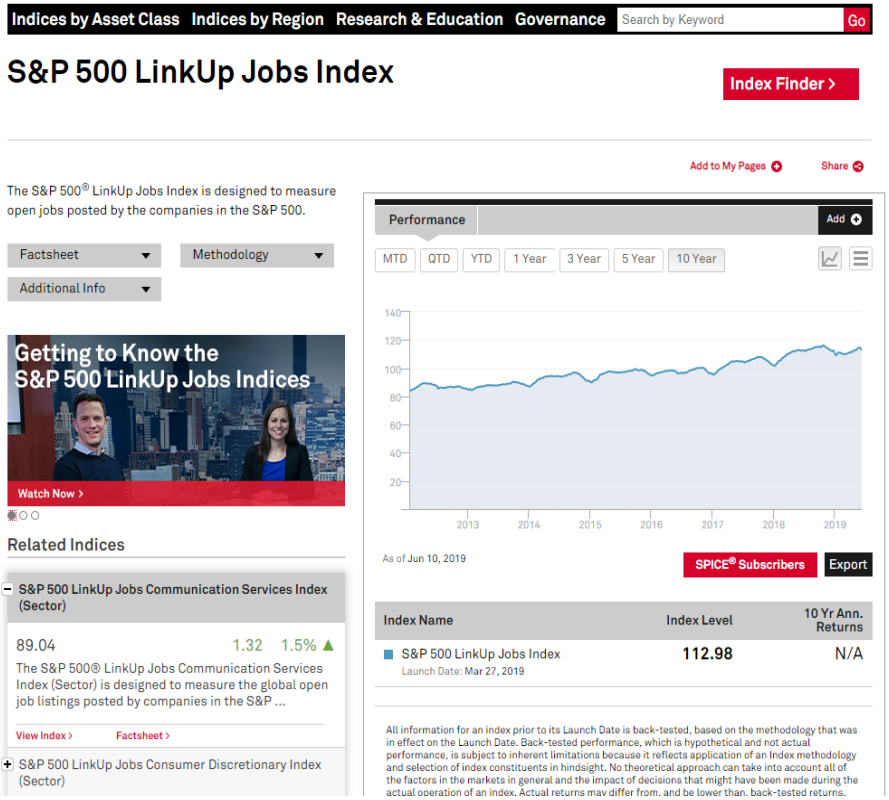
The S&P 500 LinkUp Jobs Index

LinkUp has partnered with S&P Dow Jones Indices, the world's leading index provider, to create the S&P 500 LinkUp Jobs Index, the first index of its kind

- Launched in May 2019, the S&P 500 LinkUp Jobs Index measures labor demand for companies within the S&P 500 at an aggregate and sector level and is delivered on a weekly basis
- The index provides a forward-looking indicator of employment and job growth across the entire U.S. economy
  - Job openings data is highly correlated to, and predictive of, non-farm payrolls, unemployment and economic health
- LinkUp has also developed a series of related data packages associated specifically with the S&P 500 that deliver a range of analytics and detailed job openings data for systematic and fundamental applications

"Current labor market data do a decent job telling the story of recent job growth but where the job market is heading is just as important to investors as where it has already been. With the S&P 500 LinkUp Jobs Indices, we're giving market participants forward-looking metrics supported by quality-checked data to help forecast future U.S. job growth and better understand macroeconomic and sector trends impacting the U.S. market."

– Reid Steadman, Managing Director at S&P Dow Jones Indices



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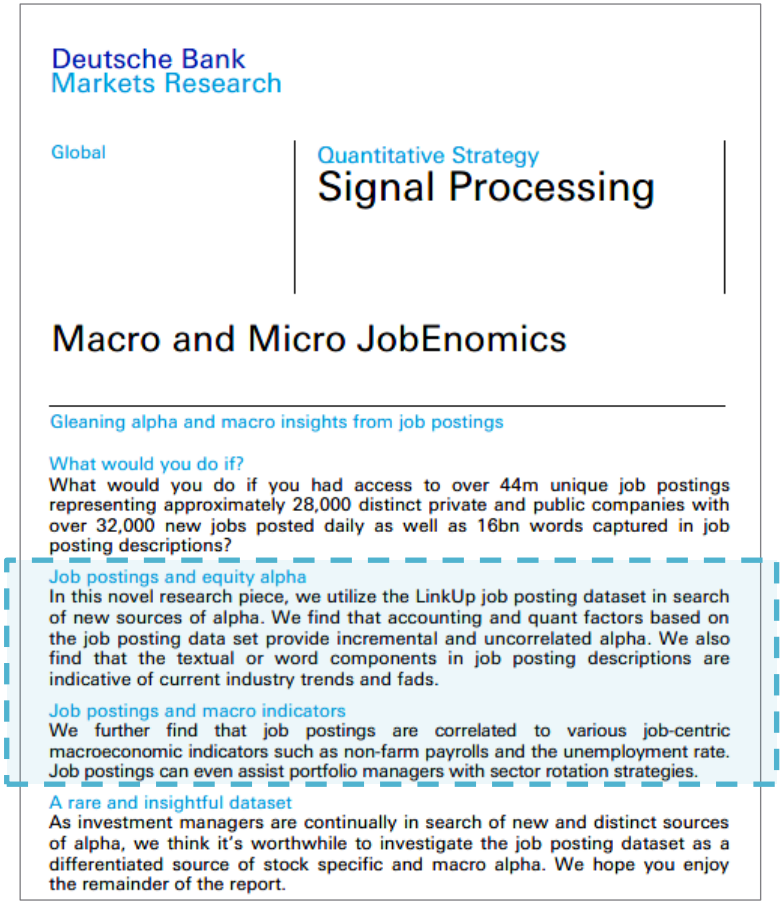
Deutsche Bank Quant Research

Report produced by Deutsche Bank's quant team
highlights the value of LinkUp's data to produce trading signals

- The Fed is closely monitoring employment-related data for its management of the Federal Funds target rate; accordingly investors are keenly interested in changes in employment-related numbers and forecasts and closely watching any employment-related indicators
- Traditional macroeconomic employment indicators tend to be backward looking (i.e., measuring whether individuals are currently employed)
- Systematically gauging future job prospects requires gathering new datasets that are predictive of future job growth
- In a study of LinkUp's job posting dataset, Deutsche Bank determined:
  - Accounting and quant factors based on this dataset provide incremental and uncorrelated alpha
  - Textual components in job posting descriptions are indicative of current industry trends
  - Job listings data is correlated to job-centric macroeconomic indicators
- An internal correlation analysis conducted by LinkUp resulted in findings in-line with Deutsche Bank's conclusion
  - Since 2014, LinkUp's monthly job count data has a R^2 of 0.95 vs. Bureau of Labor Statistics ("BLS") non-farm payroll counts



Deutsche Bank
Markets Research

Global

Quantitative Strategy
Signal Processing

Macro and Micro JobEnomics

Gleaning alpha and macro insights from job postings

What would you do if?
What would you do if you had access to over 44m unique job postings representing approximately 28,000 distinct private and public companies with over 32,000 new jobs posted daily as well as 16bn words captured in job posting descriptions?

Job postings and equity alpha
In this novel research piece, we utilize the LinkUp job posting dataset in search of new sources of alpha. We find that accounting and quant factors based on the job posting data set provide incremental and uncorrelated alpha. We also find that the textual or word components in job posting descriptions are indicative of current industry trends and fads.

Job postings and macro indicators
We further find that job postings are correlated to various job-centric macroeconomic indicators such as non-farm payrolls and the unemployment rate. Job postings can even assist portfolio managers with sector rotation strategies.

A rare and insightful dataset
As investment managers are continually in search of new and distinct sources of alpha, we think it's worthwhile to investigate the job posting dataset as a differentiated source of stock specific and macro alpha. We hope you enjoy the remainder of the report.

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Competitive Positioning

Standing apart from competition in terms of both data quality and company maturity

Data Providers	LinkUp	Thinknum	burningglass	U.S. Bureau of Labor Statistics	Gartner	LinkedIn
Business model	Strong	Medium	Medium	Weak	Medium	Medium
History of data	Strong	Weak	Medium	Strong	Medium	Strong
Quality of data	Strong	Strong	Weak	Medium	Weak	Strong
Coverage of data	Strong	Medium	Strong	Medium	Weak	Medium
Versatility of data	Strong	Strong	Weak	Medium	Weak	Medium
Timeliness of data	Strong	Strong	Weak	Weak	Weak	Medium

While there are a variety of labor data providers in the market, most have material flaws that significantly limit the value and utility of the job market data provided

Strong
Medium
Weak

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Larry Green, CFA – President of SMD

- *Larry is the Founder and President of SmartMarketData, LLC, SmartMarketData was founded in 2014 and provides services to Alternative Data providers and consumers which include Data Productization, Operations/Delivery, Business Development, Data Science/Analytics, Entity Mapping, and Bespoke research and analytics.*
- Prior to starting SmartMarketData.com, Larry was Global Head of Market Data Solutions at Wipro Technologies, a $25 billion IT Consulting Firm. At Wipro, Larry's team provided advisory and solution services around Reference and Market Data to both consumers, and providers of Market Data.
- Prior to Wipro, Larry served as Global Head of Portfolio Management Products at Refinitiv. In this position, he was responsible for roughly $100 million dollars of business represented by industry leading products Thomson One Investment Management, Baseline, and Starmine Professional.
- Prior to this role, Larry was Director, Institutional Sales for Refinitiv where he was responsible for sales to some of the largest investment firms in the world, including Fidelity, State Street, Wellington and Putnam, among many others. In this role, Larry was considered an SME on the very broad Refinitiv desktop product and content portfolio.
- Before Refinitiv, Larry spent 5 years as an Analyst for hedge fund Maple Row Management. Larry contributed to Maple Row's growth from less than $50 million AUM to >$400 million AUM, as well as performance which ranked Maple Row in the top 10 of all US Long/Short Equity hedge funds during his tenure.
- Prior to Maple Row, Larry was Senior Institutional Sales Executive for Bridge Information Systems, later purchased by Refinitiv. In this role Larry was responsible for managing and selling to large accounts in New York and Connecticut, and he was instrumental in the development and roadmap of advanced features for new equity products. Before Bridge, Larry was an Analyst for the Aetna Investment Group where he was responsible for fixed income portfolio performance, attribution and risk analysis.

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