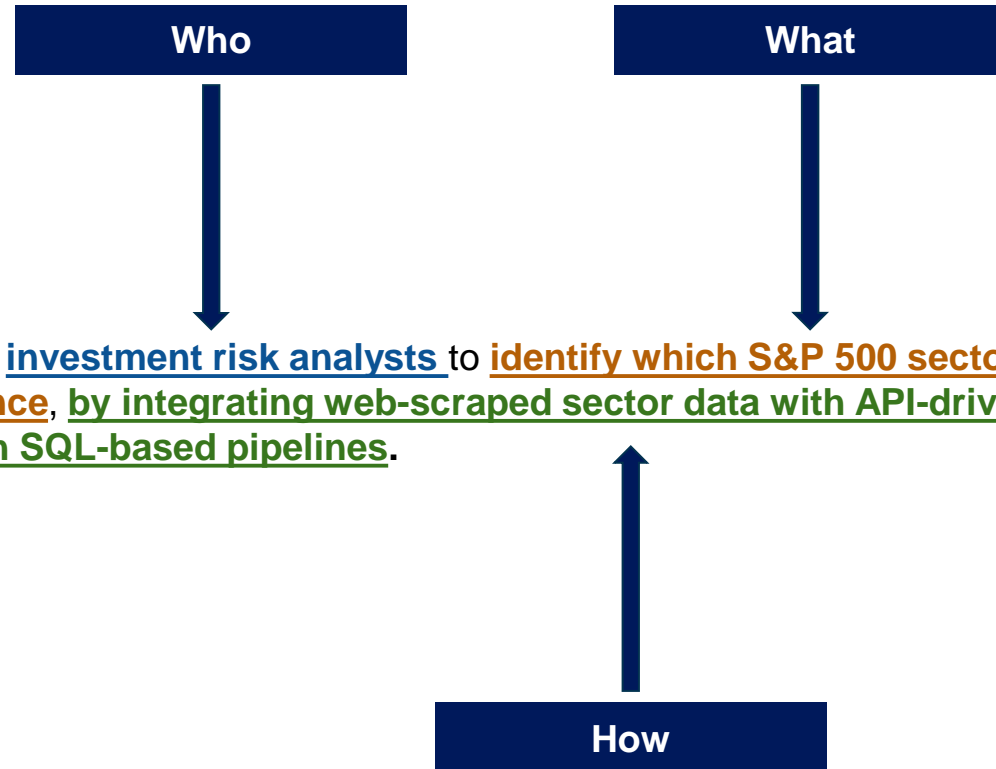


Sector Shockwaves: Analyzing Volatility in the S&P 500

May 2025
Spencer Chavez



A start-to-finish equities analysis framework to draw strong insights and address volatility within the S&P 500



My framework empowers investment risk analysts to identify which S&P 500 sectors offer the best risk-adjusted performance, by integrating web-scraped sector data with API-driven price data and analyzing it through SQL-based pipelines.

Investment Risk and Quantitative Group Analyst Job Description

Key Points

- Demonstrates advanced SQL proficiency
- Mimics real financial workflows
- Handles large-scale market data
- Blends analytics, domain knowledge
- Delivers risk-based performance insights

Job Description Highlights

- Conduct quantitative risk/reward analysis.
- Provide data-driven insights to teams.
- Demonstrate investment management domain expertise.
- Show strong analytical, technical background.
- Proficiency in SQL required.
- Python experience demonstrated (a plus).
- Automate data processes (extraction, transformation).
- Experience with security/market data.
- Analyze equity market investment universe.

The logo for TCW, consisting of the letters 'TCW' in a bold, white, sans-serif font, centered on a dark blue square background.

Job Description Screenshots (1/2)

Essential Duties

- Conduct quantitative and data-driven risk/reward analysis to provide insights to the investment team, client services and marketing teams
- Engage with enterprise teams and external vendors to facilitate the delivery of investment risk projects, including Aladdin implementation
- Provide ongoing support and administration for the derivative risk management program
- Assist with fund and client risk reporting and inquiries
- Stay abreast of industry advancements in areas of market risk, counterparty risk, liquidity risk, and associated technology and data solutions
- Manage and support various ad-hoc projects assigned to the team
- Prepare detailed risk and topical research reports and updates for internal use
- Monitor risk model calibration assumptions and conduct trend analysis

Job Description Screenshots (2/2)

Required Qualifications

- Bachelor's Degree in Economics, Finance, Science and/or Engineering
- A minimum of three years of experience in investment management
- Demonstrated experience in financial analysis and modeling abilities
- Excellent quantitative and analytical skills
- Knowledge with fixed income, equity, and emerging markets investment universe and strategies
- Proficiency in Excel and SQL. Python experience a plus

Leveraging cutting-edge market data using Tiingo API

Why our LLM framework offers a superior value proposition

API Provider



Job Relevance

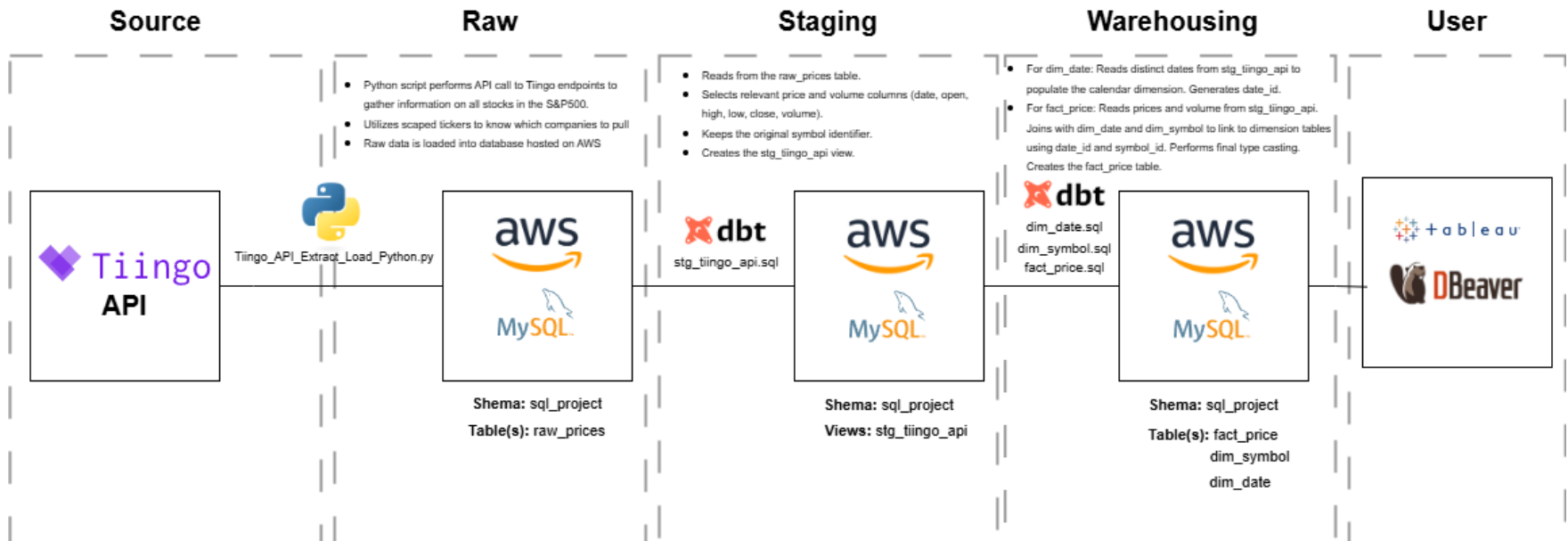
- Provides historical equity pricing necessary for measuring risk-adjusted returns.
- Showcases proficiency in consuming financial APIs for dynamic, up-to-date market data.
- Enables complex performance and volatility calculations aligning with investment risk analysis needs.

Data Collected

- **date**: The date of the trading data.
- **open**: The opening price for the day.
- **high**: The highest price reached during the day.
- **low**: The lowest price reached during the day.
- **close**: The closing price for the day.
- **volume**: The number of shares traded during the day.
- **adj_open**: The adjusted opening price (accounting for dividends and stock splits).
- **adj_high**: The adjusted highest price.
- **adj_low**: The adjusted lowest price.
- **adj_close**: The adjusted closing price.
- **adj_volume**: The adjusted trading volume.
- **div_cash**: The cash amount of dividends paid on that date.
- **split_factor**: The factor by which the stock split on that date (e.g., 2.0 for a 2-for-1 split).
- **symbol**: The stock ticker symbol for which the data was retrieved.

Leveraging cutting-edge market data using Tiingo API

Data Pipeline Diagram



Actions

[dbt_pipeline.yml](#)
[tiingo_api_pipeline.yml](#)
[wikipedia_web_scrape_pipeline.yml](#)

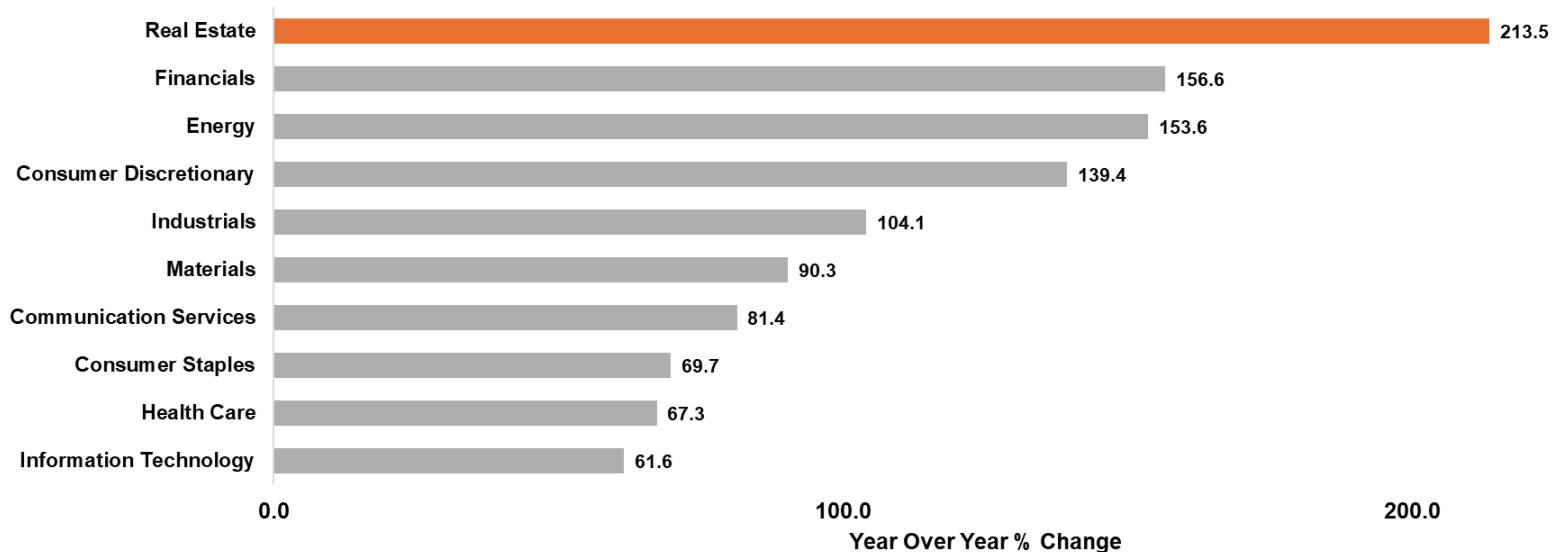
- `tiingo_api_pipeline.yml`:
 - Runs on a schedule (or manually).
 - Executes Python script to fetch latest stock prices from Tiingo API.
 - Loads fetched price data into the `raw_prices` table in MySQL.
- `wikipedia_web_scrape_pipeline.yml`:
 - Runs on a schedule (or manually).
 - Executes Python script to scrape the S&P 500 company list from Wikipedia.
 - Loads scraped company data into the `raw_wikipedia_sp500` table in MySQL.
- `dbt_pipeline.yml`:
 - Runs on a schedule (likely after data ingestion) or manually.
 - Executes dbt run command.
 - Transforms data from raw tables -> staging views -> warehouse tables within MySQL.

2020 proves to be the most volatile year for equities in 10 years, with the Real Estate sector leading the charge

Business Question

Which GICS sector in the S&P 500 has experienced the largest year-over-year increase in daily price volatility since 2015, and when did it occur?

Most Volatile Year-Over-Year Change (2019-2020) by Sector



Insights

- Real Estate volatility surged 213.50%
- All sectors increased over 60%

Recommendation

- Monitor Real Estate exposure closely
- Use defensive sectors as hedges

Prediction

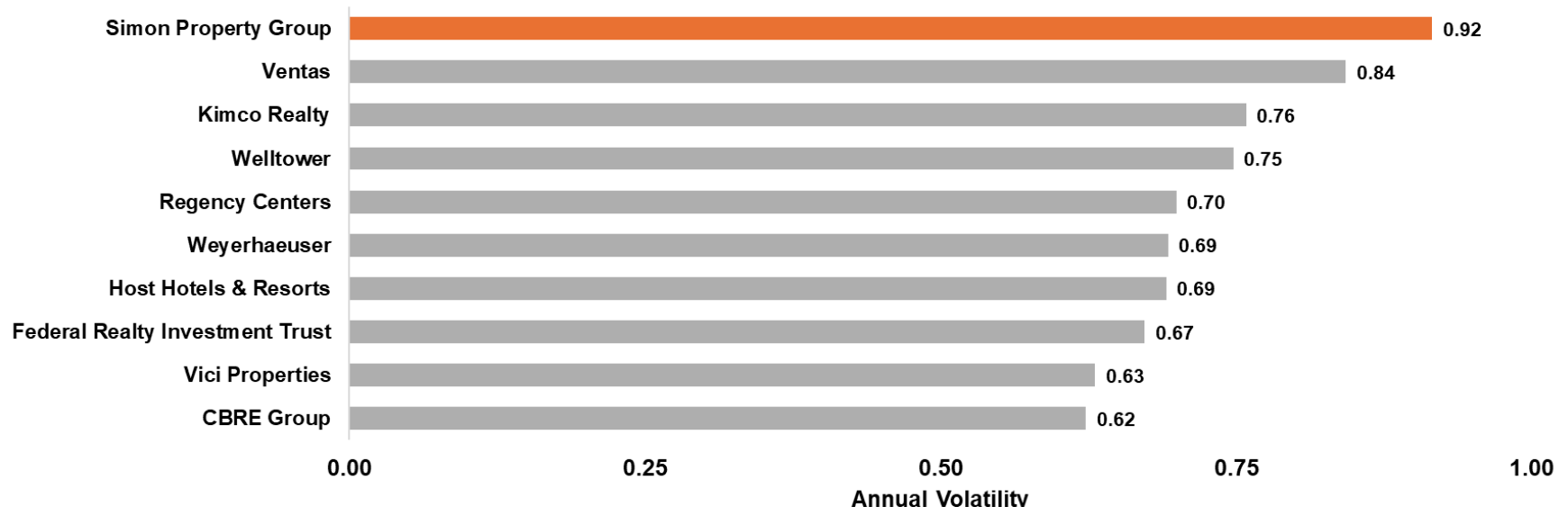
- Real Estate remains crisis-sensitive
- Volatility stays above pre-2020 levels

Physical-Occupancy REITs show highest volatility during the Covid-19 Pandemic

Business Question

Which sub-industries or individual companies within the Real Estate sector drove the large volatility increase observed in 2020?

Top 10 Most Volatile Equities in S&P 500 Real Estate Sector During 2020



Insights

- Retail REITs most volatile (91.59%)
- Digital REITs most stable (40.54%)

Recommendation

- Balance digital and traditional REITs
- Set sub-industry specific risk limits

Prediction

- Digital-physical REIT divide continues growing
- Traditional REITs face ongoing volatility

Utilized Python to extract key S&P 500 metadata from Wikipedia

Scraped Site Host



WIKIPEDIA

Job Relevance

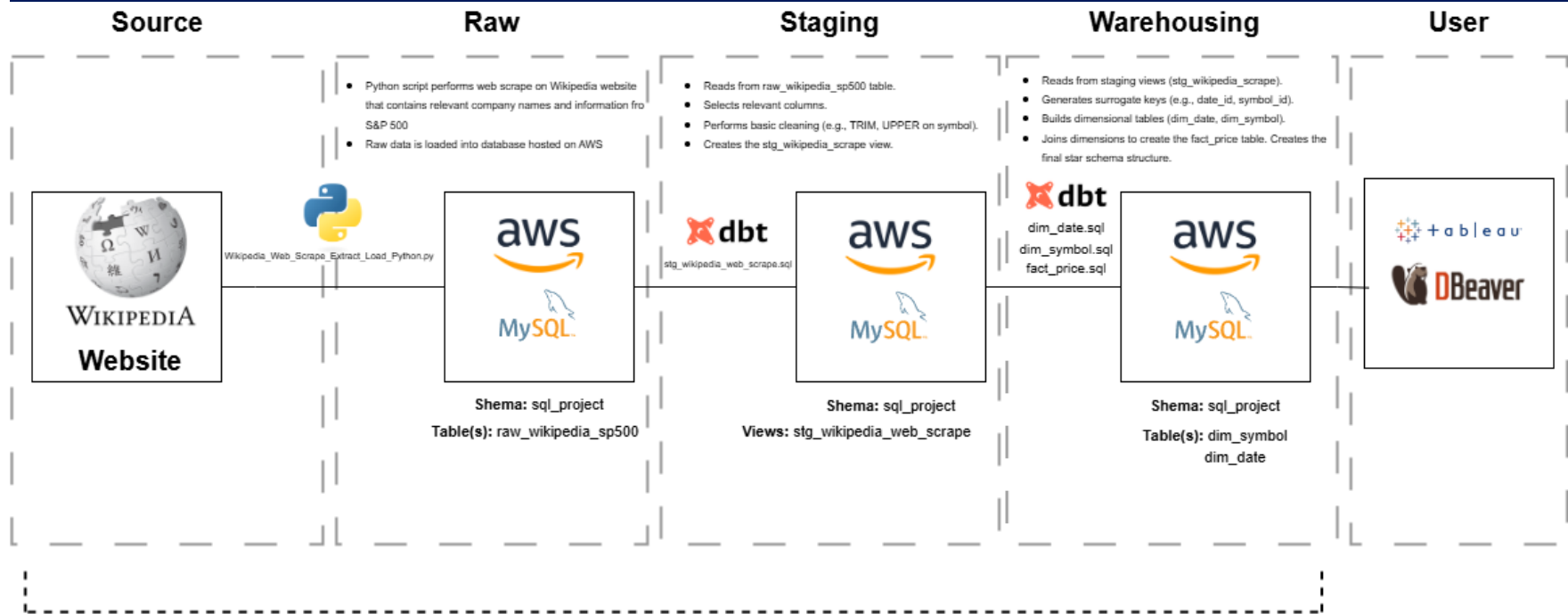
- Demonstrates capability to augment internal datasets with external information (S&P 500 listings, sector tags).
- Confirms a solid grasp of sourcing and cleaning real-world data for analytics.
- Enriches sector-level insights crucial for portfolio or market-wide analysis.

Data Collected

- **Symbol:** The stock ticker symbol.
- **Security:** The name of the company.
- **GICS Sector:** The Global Industry Classification Standard sector.
- **GICS Sub-Industry:** The specific sub-industry classification.
- **Headquarters Location:** The location of the company's headquarters.
- **Date added:** The date the company was added to the S&P 500 index (may vary in format or presence).
- **CIK:** Central Index Key (SEC identifier).
- **Founded:** The year the company was founded.

Utilized existing online databases to extract key S&P 500 metadata from Wikipedia

Data Pipeline Diagram



Actions

dbt_pipeline.yml
tingo_api_pipeline.yml
wikipedia_web_scrape_pipeline.yml

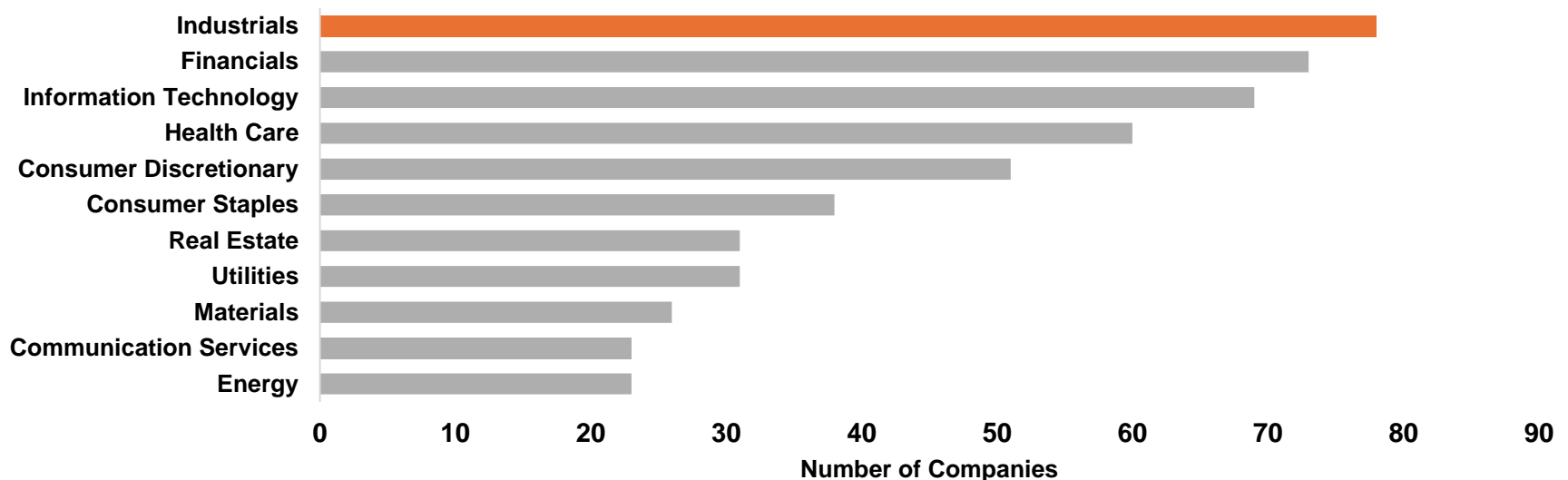
- tingo_api_pipeline.yml:
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Industrials lead with a 15.6% share of S&P 500 sector distribution

Business Question

What is the current sector composition of the S&P 500, and which sectors have the highest concentration of companies?

Company Volume by Sector



Insights

- Growth sectors dominate S&P 500
- Defensive sectors notably underrepresented

Recommendation

- Monitor high cyclical sector exposure
- Balance with non-index defensive stocks

Prediction

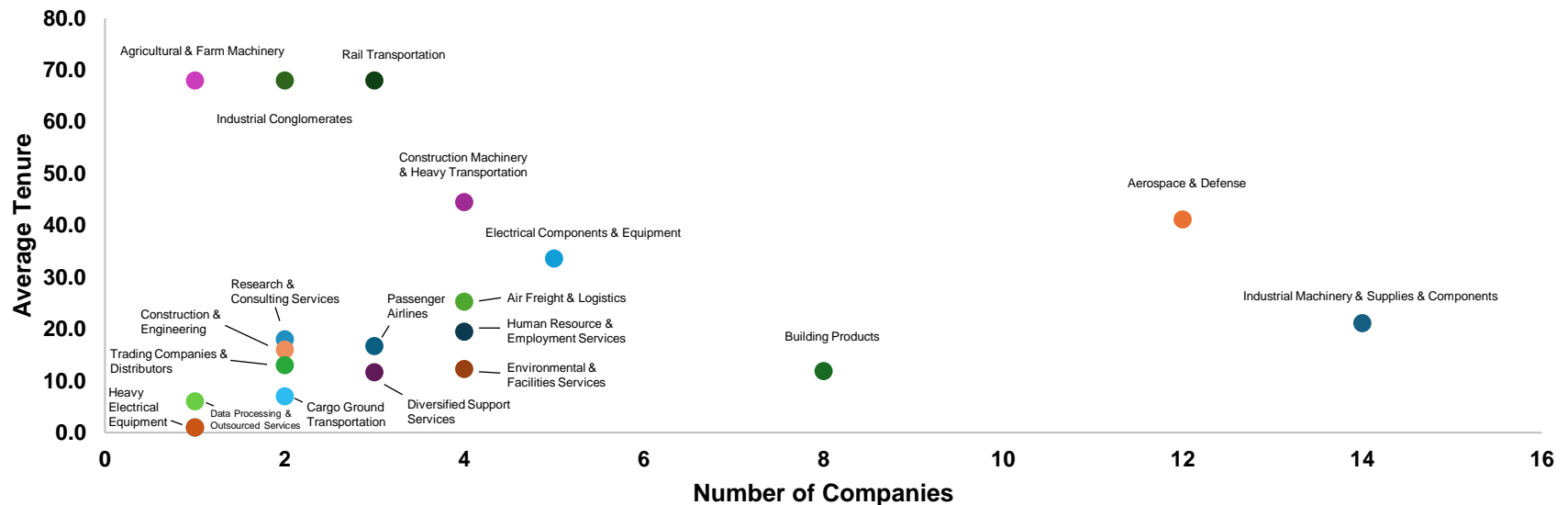
- Growth sectors continue gaining share
- Traditional sectors further consolidate

The industrial sector is comprised of both new leaders and legacy anchors

Business Question

Within the Industrials sector (the largest sector by company count), which sub-industries are most prominent, and what is the average tenure (years since being added to the S&P 500) of companies within those dominant sub-industries?

Largest S&P 500 Sector Composition by Industry



Insights

- Machinery leads in company count
- Legacy transportation shows highest tenure

Recommendation

- Balance old and new industries
- Consider tenure in risk assessment

Prediction

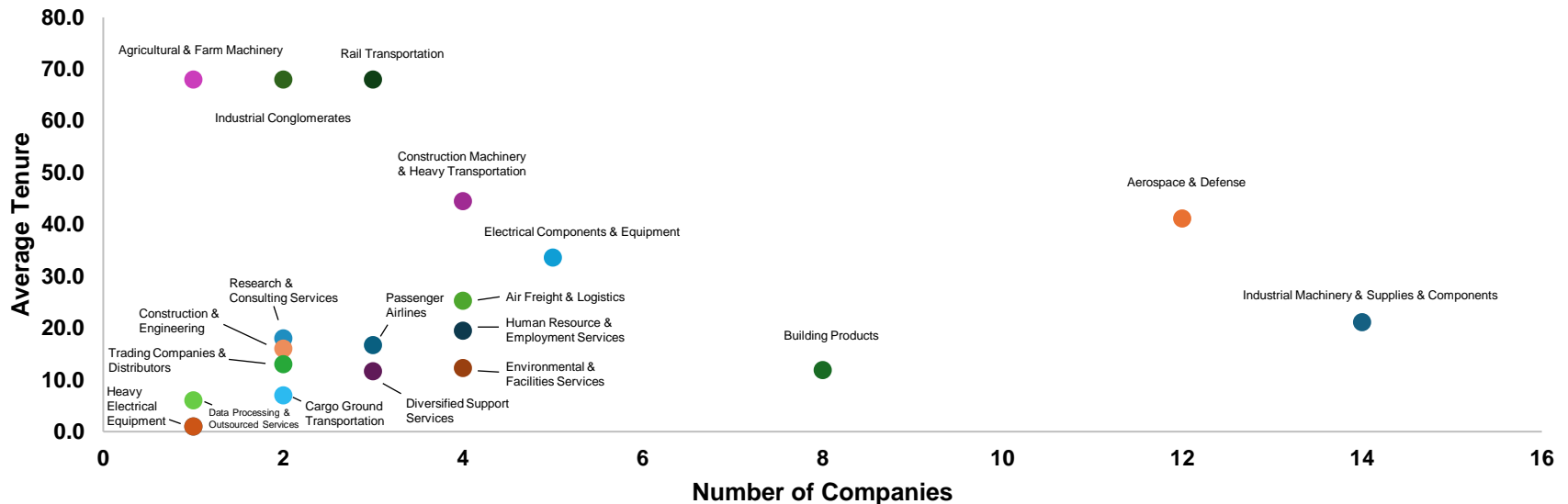
- Tech-driven industrials gain prominence
- Traditional industries maintain core presence

Demonstrated Value for Investment Risk Analytics

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Demonstrated Value for Investment Risk

This project showcases a wide variety of skills and qualifications necessary to excel in an environment like TCW

Project Summary & Job Alignment

- Built S&P 500 risk framework.
- Used Python (scrape, API), SQL.
- Insight: Real Estate volatility surge.
- Insight: Analyzed Industrial sector composition.
- Mirrors TCW Investment Risk Analyst needs.
- Performed quantitative, data-driven risk analysis.

Why I'm a Strong Candidate

- Proven quantitative and analytical skills.
- Technical proficiency: Python, SQL demonstrated.
- Applied investment domain knowledge concepts.
- Generated actionable insights and recommendations.
- Showed initiative and delivered results.
- Strong fit for TCW's requirements.

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