The First New York Fed Conference on FinTech

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Big Data and Machine Learning in Finance: A Research Agenda

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Research Topics

1

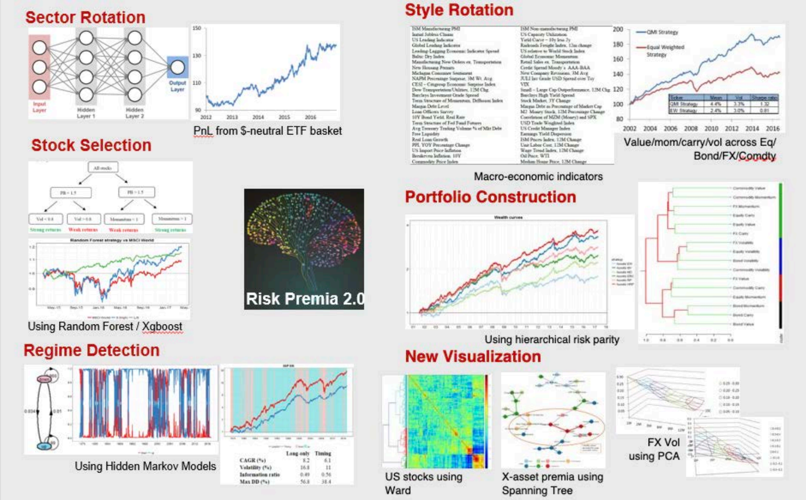
Impact of big/ alternative data on financial markets

2

A grand unified theory of data science for financial time-series

3

New risk premia - Beyond behavioral finance and linear factors



New Data

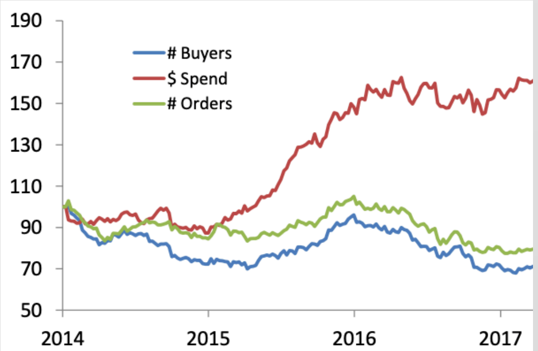
Taxonomy

	Alternative Data	
Individuals	Business Processes	Sensors
Social Media	Transaction Data	Satellites
News & Reviews	Corporate Data	Geolocation
Web Searches & Personal Data	Government Agencies Data	Other Sensors

1. Value in each data-set
2. Change in market structure
3. Limitations of Big Data
4. Other concerns?

Using News Sentiment

Using Email Receipts



Using footfall data

New Tools

What can ML do for a Quant?

1 Clustering / Dimensionality Reduction

2 Feature Selection

3 Interaction Terms

4 Replacement of If-else

Statistics

Combine intuition with data

Signal Processing

Signal from noise

Econometrics

Causation from Correlation

Machine Learning

Patterns in data

Combine, but how?

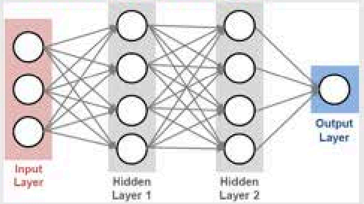
Latest algorithms are in open-source domain. Implications?

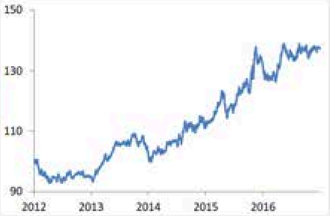
New Risk Premia

Linear zoo → Non-linear ?

Behavioral Finance → Statistical

Sector Rotation

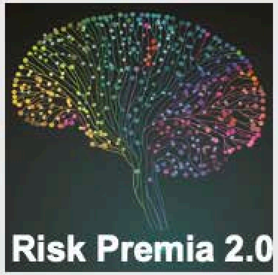




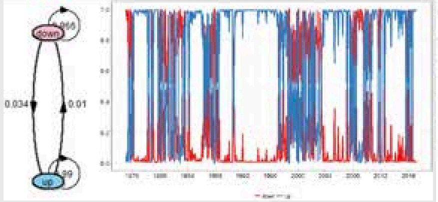
PnL from $-neutral ETF basket

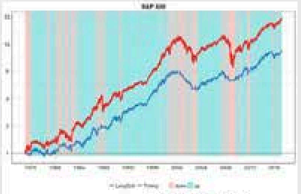
Stock Selection

Using Random Forest / Xgboost



Regime Detection





	Long-only	Timing
CAGR (%)	8.2	6.1
Volatility (%)	16.8	11
Information ratio	0.49	0.56
Max DD (%)	56.8	38.4

Using Hidden Markov Models

Style Rotation

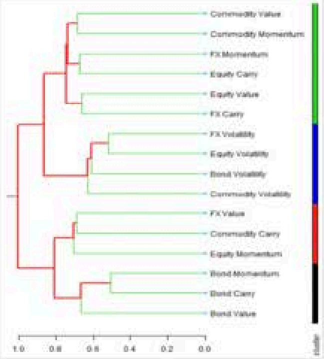
ISM Manufacturing PMI	ISM Non-manufacturing PMI
Initial Jobless Claims	US Capacity Utilization
US Leading Indicator	Yield Curve – 10y less 2y
Global Leading Indicator	Railroads Freight Index, 12m change
Leading-Lagging Economic Indicator Spread	US relative to World Stock Index
Baltic Dry Index	Global Economic Momentum
Manufacturing New Orders ex. Transportation	Retail Sales ex. Transportation
New Housing Permits	Credit Spread Moody's AAA-BAA
Michigan Consumer Sentiment	New Company Revisions, 3M Avg
NAPM Percentage Surprise, 3M Wt. Avg.	JULI Inv Grade USD Spread over Tsy
CESI – Citigroup Economic Surprise Index	VIX
Dow Transportation/Utilities, 12M Chg	Small – Large Cap Outperformance, 12M Chg
Barclays Investment Grade Spread	Barclays High Yield Spread
Term Structure of Momentum, Diffusion Index	Stock Market, 3Y Change
Margin Debt Level	Margin Debt as Percentage of Market Cap
Loan Officers Survey	M2 Money Stock, 12M Percentage Change
10Y Bond Yield, Real Rate	Correlation of MZM (Money) and SPX
Term Structure of Fed Fund Futures	USD Trade Weighted Index
Avg Treasury Trading Volume % of Mkt Debt	US Credit Manager Index
Free Liquidity	Earnings Yield Dispersion
Real Loan Growth	ISM Prices Index, 12M Change
PPI, YOY Percentage Change	Unit Labor Cost, 12M Change
US Import Price Inflation	Wage Trend Index, 12M Change
Breakeven Inflation, 10Y	Oil Price, WTI
Commodity Price Index	Median Home Price, 12M Change

Macro-economic indicators

Ticker	Mean	Vol	Sharpe ratio
QMI Strategy	4.4%	3.3%	1.32
EW Strategy	2.4%	3.0%	0.81

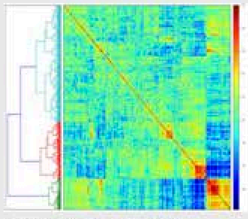
Value/mom/carry/vol across Eq/ Bond/FX/Comdty

Portfolio Construction

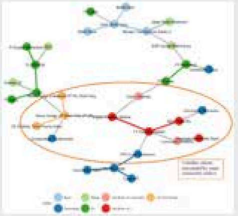


Using hierarchical risk parity

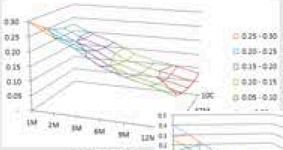
New Visualization

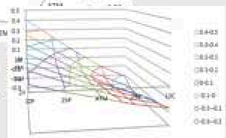


US stocks using Ward



X-asset premia using Spanning Tree





FX Vol using PCA