Artificial Intelligence and the Future of Financial Markets

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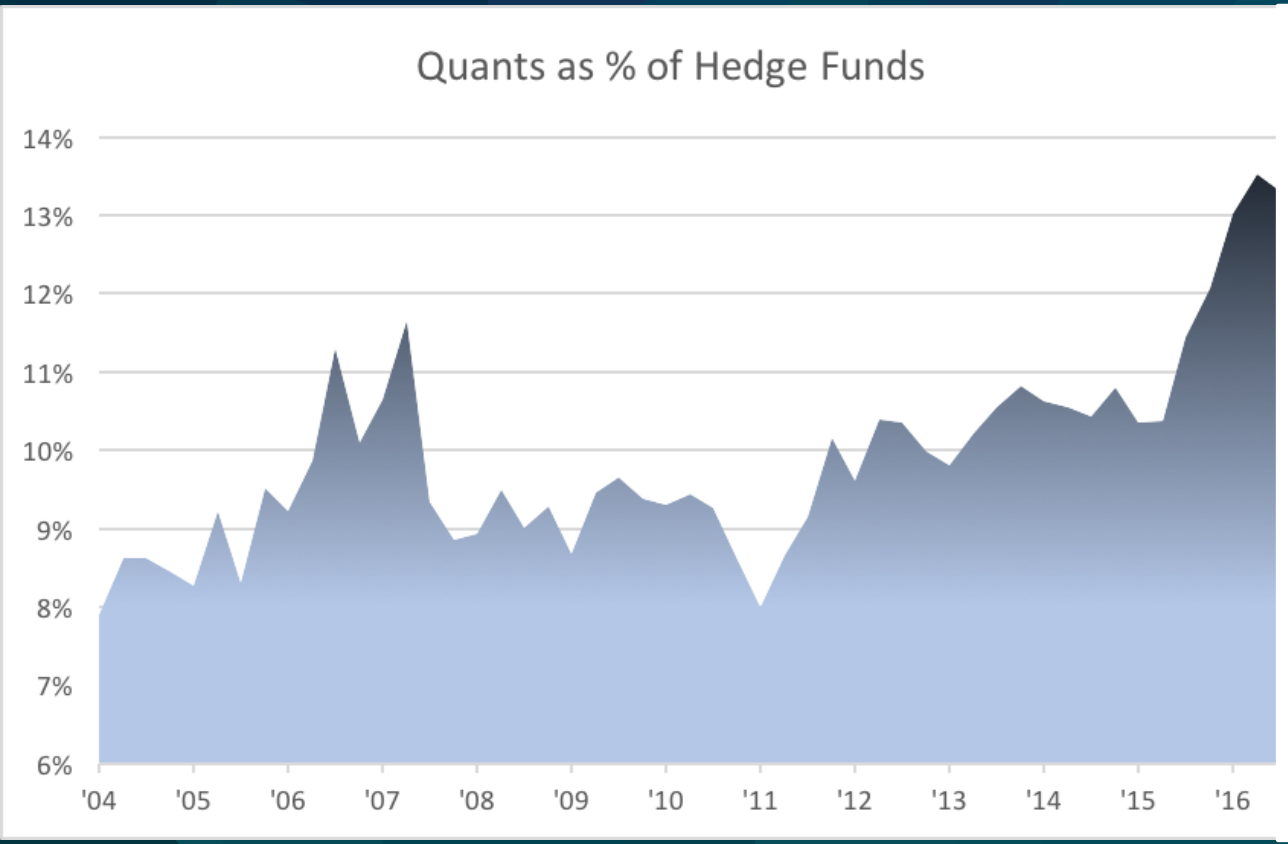
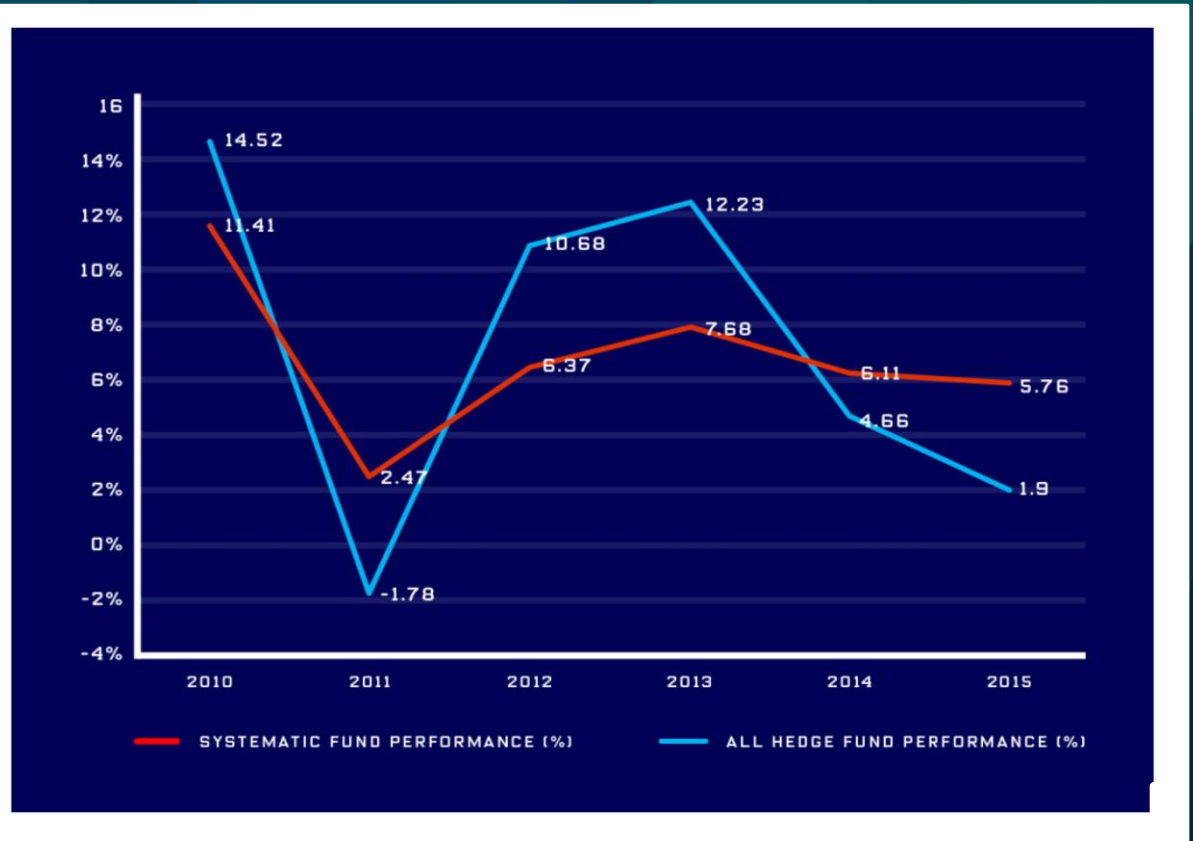
Megatrends in AI & Financial Markets

- The AI 3.0 revolution is transforming finance and asset management, just as in other industries. It only has just begun….
- In the next five years, algo-quant strategies will dominate asset management—the machines are taking over.
- Quant strategies have long out-performed raw discretionary. Discretionary will likely only be a viable strategy in special situations/illiquid distressed opportunities. Even activist funds are going “quantamental.”
- Automated model building/Algorithmic ensembling, Deep NLP, and Deep Neural Network Autoencoding are among the myriad AI technologies set to transform the landscape.
- AI can be put to work in financial markets to predict, simulate, identify, analyze, and automatically trade at massive scale, scope and efficiency.

Quant Funds Represent Nearly 15% of Hedge Funds and over $350 billion AUM – before leverage with low rates…..



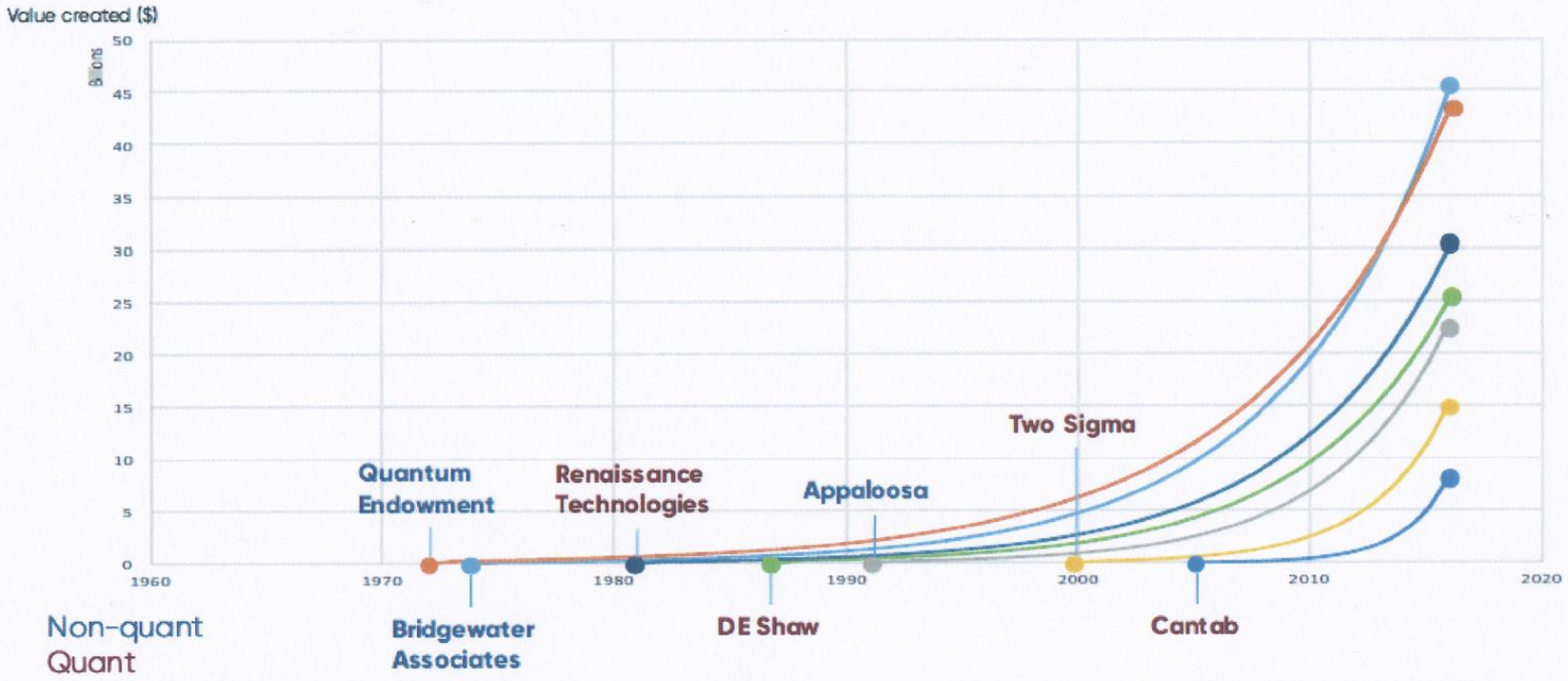
Source: https://www.novus.com/blog/rise-quant-hedge-funds/



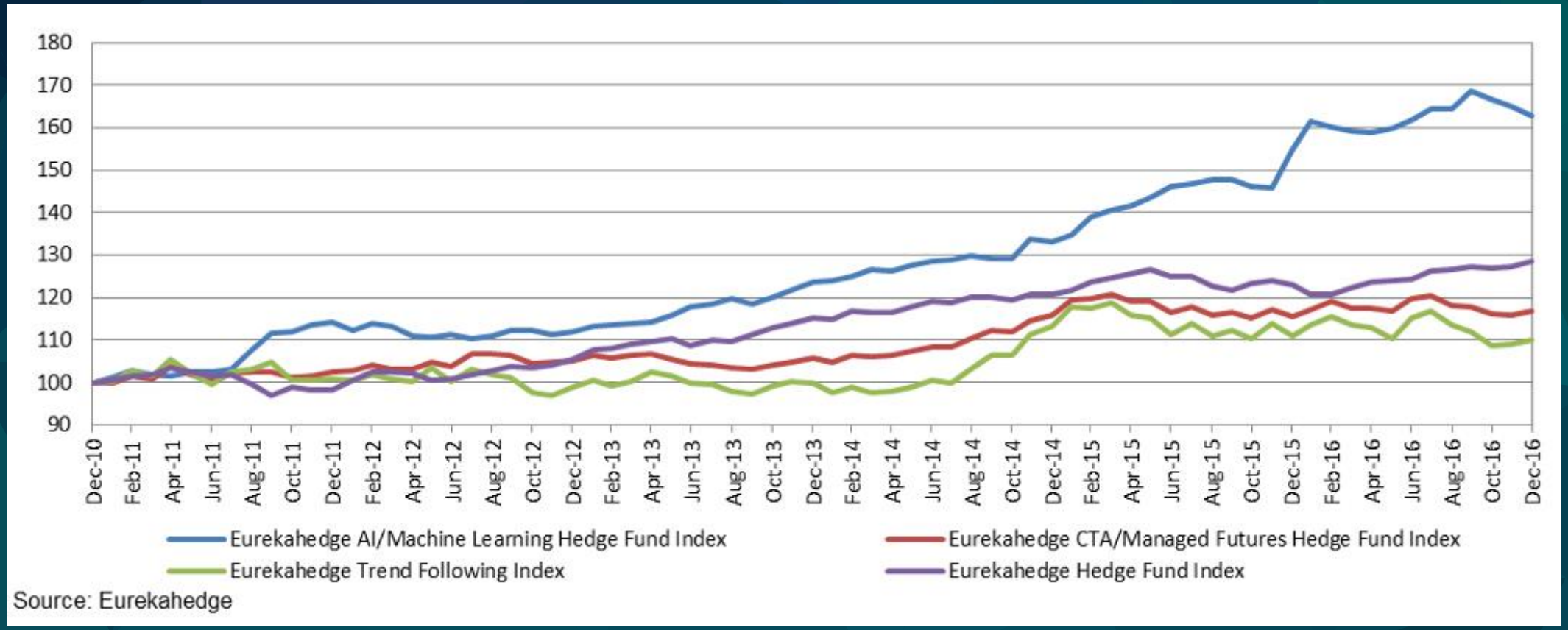
Source: Preqin

Quantitative Funds – Where They Are

- Value created by quantitative funds since the early 80s:
  - statistical arbitrage, convertible arbitrage, trend following and pattern recognition



AI Funds are Outperforming “Typical Quants”



Source: Eurekahedge

Like the human brain, AI turns data into insight

Processes Information

Enables machines to penetrate the complexity of data to **identify associations**

Presents powerful techniques to handle **unstructured data**

Draws Conclusions

Continuously learns not only from previous insights, but also from new data entering the system

Provides **Natural Language Processing (NLP) support** to enable human to machine and machine to machine communication

Codifies Instincts & Experience into Learning

Does not require rules, instead relies on **hypothesis generation** using multiple data sets which may not always appear connected or relevant

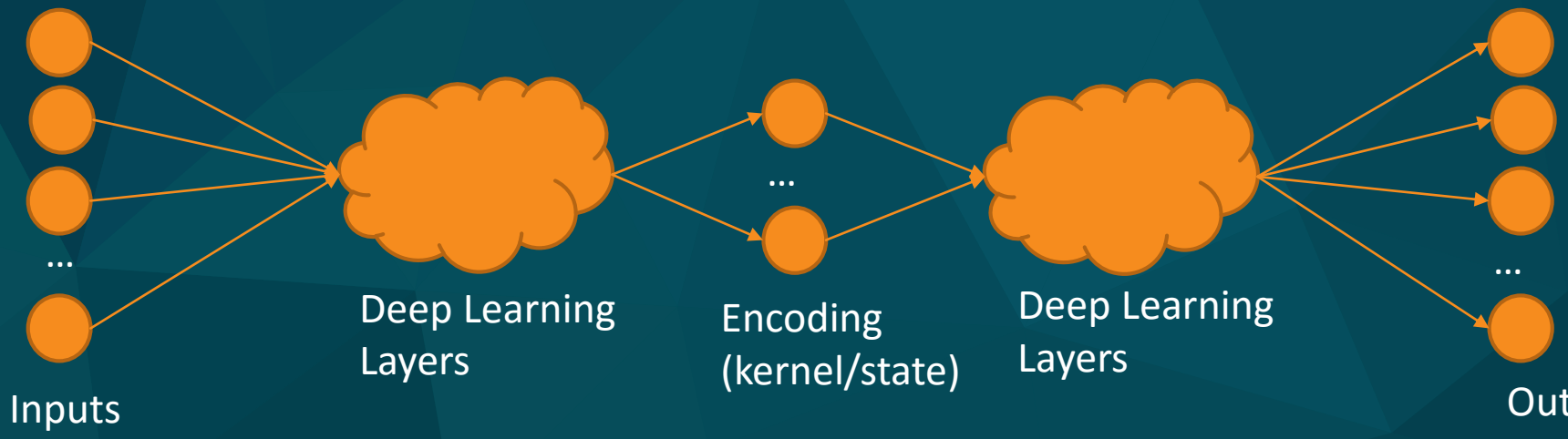
NLP: Natural Language Processing

Autoencoders for Market and Macroeconomic Simulation

- ”Machine learning is the second best way to do anything
- The best way is to fully understand exactly how something works and model it directly
- This is not as easy as it seems, even for things that perfectly obey physics
- For complex, human-driven systems whose behavior is poorly understood theoretically, machine learning makes the problem tractable
- We have a large number of metrics
- Each represents a particular sample taken from one corner of the economy
- Everything is interconnected, so these metrics are related to one another…
- …except when they’re not
- The true “drivers” are latent and cannot be directly measured

Autoencoders

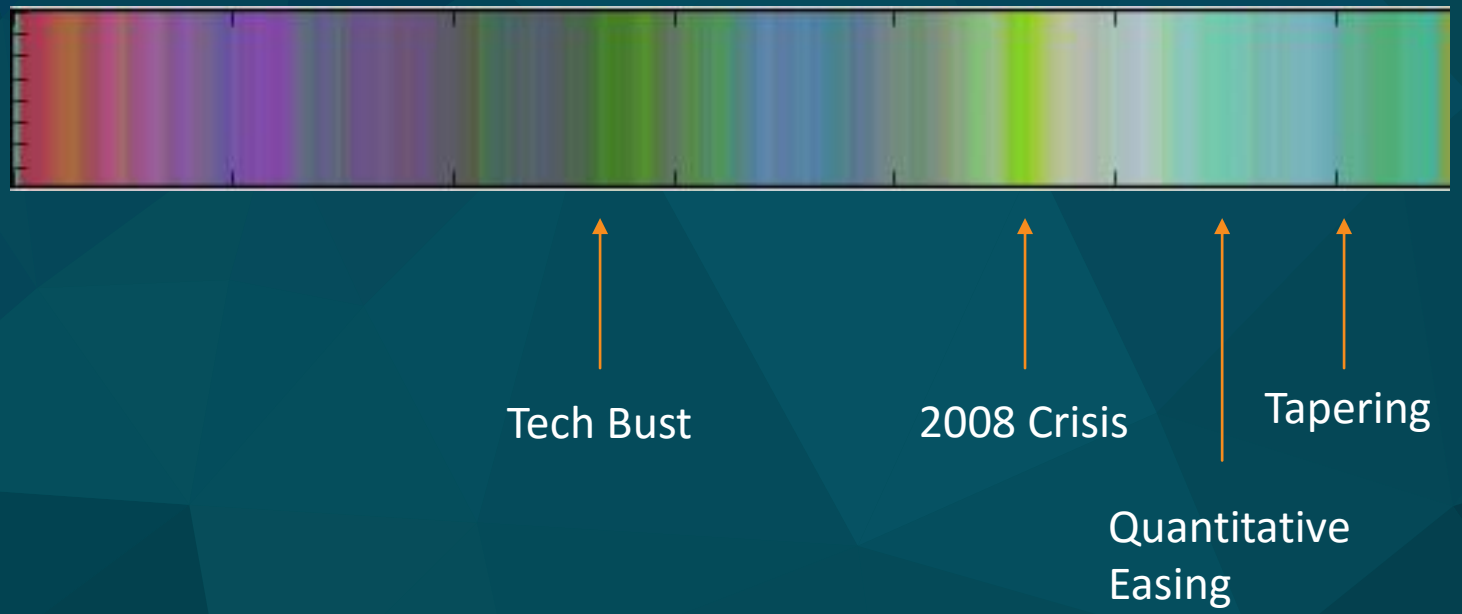
- Autoencoders are designed for exactly this type of situation
- Many inputs condense to a small kernel representing latent state
- Deep learning member of the dimensionality reduction family
  - Nonlinear, abstract relationships
  - Can be recurrent to capture relationships over time



Regime Change Visualization

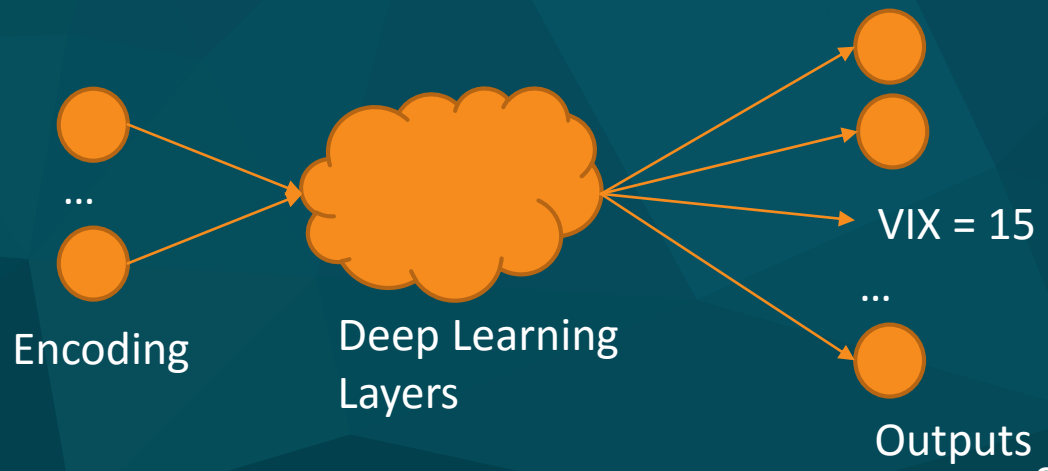
We can watch the values of the components of this kernel over time to detect major state changes

This strip of color represents 30 macroeconomic variables encoded down to 3 which are mapped to red/green/blue channels.

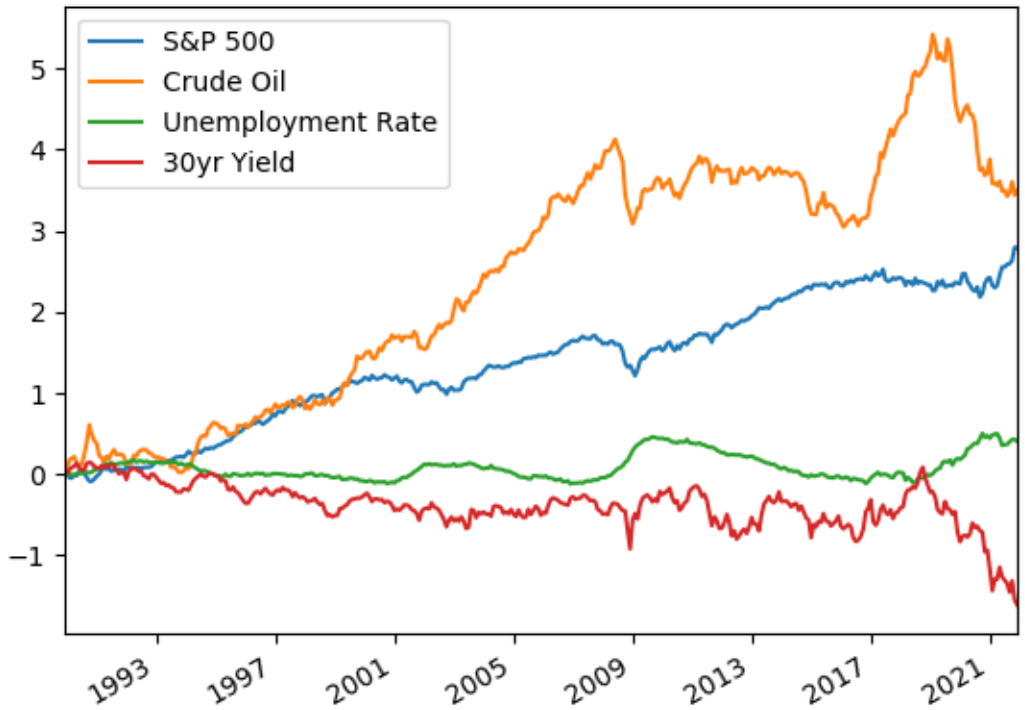


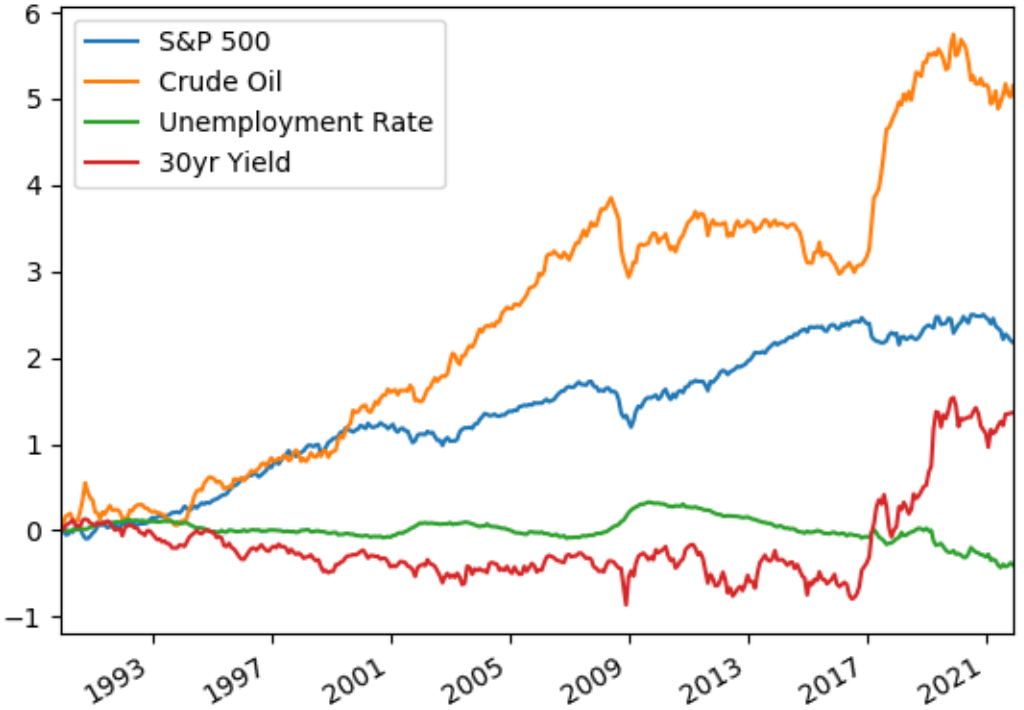
Simulation: scenarios

- The values in the kernel are generally independent of one another
- We can random-walk them to generate plausible scenarios that have not actually happened
- Output variables respect historical relationships but respond to unique latent states
- Instead of a random walk, we may want simulations where a particular metric goes to a certain value
- What happens if oil goes to $70? What if unemployment rises to 7%? Is there a scenario where both stocks and the VIX go up?
- Given a trained autoencoder, we can solve for latent states that result in metrics at specific values



Oil Price Demand side shock (ala 2006-2007) versus Supply Shock (ala 1973): Deflationary versus Inflationary Impact





Autoencoding “So What?”

- Improved robustness across a wide range of trading models. An encoding provides input that contains a maximal amount of information within the smallest footprint in the model. It gives context with minimal noise.
- Similarity measures: What company today looks most like Apple in 2001?
- Analogies: given situations that look similar to now and what happened six months later, what might happen six months from now?
- What-if capabilities: What might happen to other macroeconomic indicators and the markets if next month’s GDP number comes in higher than expected.

Building Deep Neural Nets on the Fly with Data: AMB in Action