Quantitative Strategy

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Introduction

Analysts and investors looking at global markets have thousands of variables to make sense of: equity and commodity prices, various interest rates and interest rate spreads, currency exchange rates, as well as derivative data like volatilities and correlations. Familiarity with vectors and vector subspaces allows you to translate that vast and varied universe of data into insight that can drive trading and investment decisions.

The Principal Component Analysis (PCA)-based models you will develop in this program are broadly representative of how most financial firms look at risk. Our goal is not only help you to understand established industry practices, but also to build on them.

Key traits

We would encourage you to take part in this competition if you possess and would like to further develop the following key traits:

- Quantitative talent — It takes considerable talent to intuitively understand and effectively explore patterns and relationships in high-dimensional data.
- Practicality — You should be able to discern which points in your analysis would be most interesting to your audience (risk and portfolio managers). In contrast to academia, you will be expected to communicate only those points instead of providing a comprehensive summary of everything you have done.
- Resilience — Knowledge gaps will inevitably come up – you should be able to work to fill them or be willing to ask for our help.

Your assignment

Overview

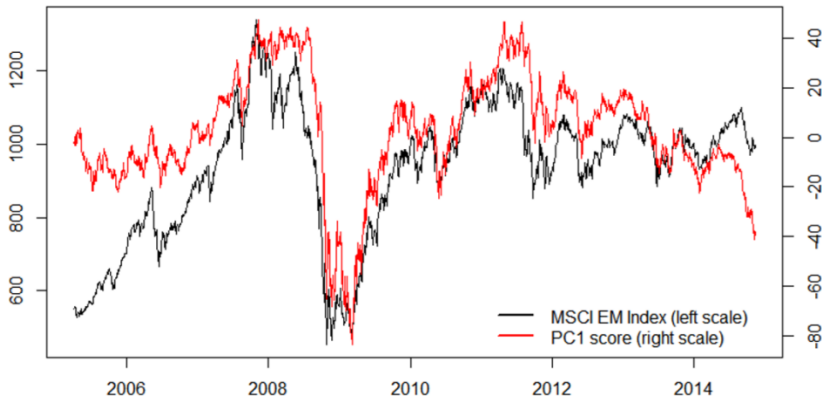
Currency exchange rates are a good place to start in building your understanding of the global macroeconomic environment: they are a direct measure of the relative strength of countries' economies. We have posted daily cross-rates for 19 currencies **here** (171 crosses in total). Your task consists of the following:

- Running PCA on this data-set.
- Identify 3-5 of the most significant risk factors – that is to say, the principal components explaining the most variance.
- Figure out which benchmarks or combinations of benchmarks best match those factors.
- Produce a write-up explaining which risk factors are currently driving global currency markets right now.

Knowing key risk factors allows us to be more precise in taking on risk. For example, a position in the EUR/USD exchange rate may have significant exposure to a factor which has nothing to do with either the US or Europe; being able to identify and quantify that exposure allows us to negate ("hedge") that risk with a position in another instrument.

Sample Analysis

Helin Gao, an undergraduate student at Stanford and the winner of last year's Quant Competition, found that first factor from her analysis was was very closely linked to the MSCI Emerging Markets Index, which can in turn be tracked via the Exchange Traded Fund with the ticker "EEM":



Knowing a particular exchange rate's exposure to PC1 would allow you to hedge out EM risk exposure by taking a position in the EEM ETF.

Instructions

The output from your analysis should be a 2-3 page write-up identifying and explaining the key factors driving global currency markets right now. We expect it to take at least 3-4 hours to complete, but you are welcome to spend as much time on it as you deem appropriate; feel free to **contact us** if you feel you have hit a dead end.

You are encouraged to demonstrate the three traits described above. **Authors of impressive submissions will be highlighted to Morgan Stanley's recruiting team.**