Stress Testing Correlation Networks
Stress Testing

Challenge
Understand and attribute the impact of changes/shocks in portfolio drivers.

Current Situation
Use existing risk system such as Riskmetrics.

Solution
Augment existing pricing engine with interactive visual interface. Approximate and visualize stress test impact on the fly with returns based stress testing.

Benefits
Ability to see the results from different angles swift stress testing of portfolio returns as a first order approximation of results.
Visual methods based on networks allow us to:

- understand correlations structures of much larger scale than often done before
- conveniently develop correlation scenarios based on historical structures
- create new correlation structures

-> Correlations become a subjective variable in the stress test
Here we see a correlation map showing the broad global markets. We see different asset classes cluster together, eg oil-energy, precious metals, bonds and equities clustered in the center.
Many people are worried about China. Here we do a stress test shocking Chinese equity markets 4% down.

We see the impact in the network. A shock like this would, based on currently observed correlations, be accompanied by large downward movements in many markets.
The impact would have been worse during the time period of strongest correlations, the August sell-off.
And even worse if we also increase overall correlations from 0.63 to 0.66.
However, had we done this stress test with the correlation structure experience in late 2015, the impact would have been mostly contained to Asian markets.

China became very central in the global markets during 2015.
And even less if we detach China from emerging markets.
1. What is the story with the EU Debt Crisis Dashboard?

2. Design a stress test for Brexit
FNA

Correlation Networks - Scripting Example
Correlations - Create Network

# Import price data

table.import.quandl {
    -table prices.csv
    -codelist codes.csv
    -start_date 2017-01-01
    -authtoken ZpDe8gKuTzofqPtWVynD
}

system.reset_db

# build network

network.build.correlation {
    -table prices.csv
    -returns_method log
    -window 100
}
Correlations - Filter links

# count number of links and drop networks with no links
network.stats.size
network.drop -filter size==0

# calculate distance measure for links
arc.property.set {
    -property distance
    -value 1-abs(pearson_correlation)
    -type Numeric
}

# identify minimum spanning tree and drop links not in it
arc.cluster.spanning_tree -arc_weight distance -type min
arc.drop -filter spanning_tree==false
# calculate network layout
vertex.layout.radial_tree -arc_length distance

# save series on file
series.save -file corr

# create dashboard
dashboard.new
dashboard.view.network -x x -y y
dashboard.mappings.vertex.label -text label
dashboard.mappings.arc -arrow :0
dashboard.save -file corr -series corr
**FNA Dashboard - User Guide**
Guide for reading FNA Dashboards

**FNA Correlations - Analyst Guide**
Step-by-step guide for creating required data for Cross-Asset Dashboard

**FNA Dashboard - Analyst Guide**
Step-by-step guide for creating Cross-Asset Dashboard

### Scripts (need to be run in order):
1. xasset_data
2. xasset_series
3. xasset_dashboard

### Files (need to be uploaded on account):
- Quandl prices: xasset_prices.csv
- Data transformation: xasset_transformations.csv
- Portfolios: xasset_portfolio1.csv, xasset_portfolio2.csv
- Info panel: xasset_info.txt
- Node labels: xasset_labels.csv
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