Assessing Growth Signals for Asian Public Equities Market

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Company Background

AXA Investment Managers has a net worth of $830 billion assets under management, with 790 investment professionals across 20 investment centers. As a world-class asset manager, they aim to provide systematic and strong sources of financial return and deliver long-lasting value for clients.

They specialize in a large range of asset class spectrum, from equities, fixed income to multi-assets. Our team will be focusing on the Asian Public Equities Market.

Problem Statement

To design a dashboard to fulfil 3 main objectives:

Dynamically analyze the dataset through animated distribution plots to understand a factor and how it evolves over time with cross-sectional treemaps.

Project the returns of a basket comprising of the top 10%/ 20%/ 50% of a factor with monthly rebalancing and compare with the market average with time series analysis to determine the persistence of an equity.

Analyze the factor exposures of a basket comprising of the top 10%/ 20%/ 50% of a selected factor.

Methodology & Tools

1. **Understanding the Data**
Identify key columns required for analysis and differentiate columns with equity specifications from columns of factors.

2. **Data Cleaning**
Remove rows with more than 70% NaNs and obtain categories to be used for filtering using Pandas and Numpy libraries in Python.
pandas NumPy

3. **Data Visualization**
Test out different ways of presenting the data by plotting various visualizations of what we need to show in the dashboard according to the objectives using Plotly and Matplotlib library in Python.
plotly matplotlib

4. **Designing the Dashboard**
Draw the layout of the dashboard and code the dashboard using the Dash library in Python and add CSS styling.
Dash

5. **Implementing Backend Code**
Select the best visualizations, turn them into functions, and place them in the callback function in the Dash framework. This allows dynamic interaction with the dataset to produce interactive plots.
Dash

6. **Test and Gather Feedbacks**
Test the dashboard to ensure plots are accurate and responsive. Present dashboard to our client to gather feedback on both the aesthetic design and the functionalities of the dashboard.

Analysis Tab

Selections:

Date Range 01/01/2007 ➔ 01/01/2012

Country Selection All

Sector Selection All
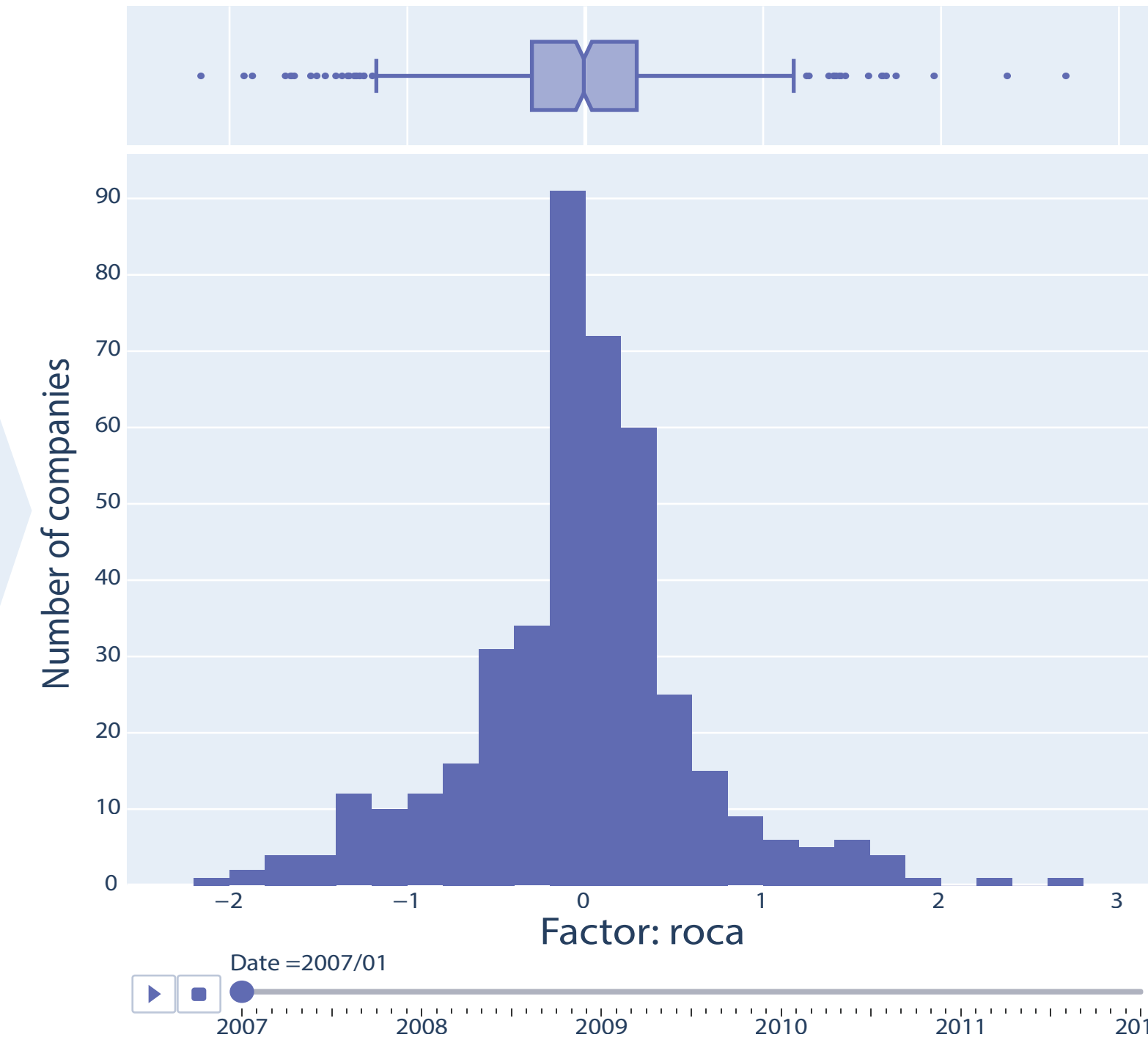
Industry Selection All

Factor roca

Users can select:
1. A starting and ending date to conduct time-series analysis

2. Conduct cross-sectional analysis by using country, sector, and industry filter

3. Select the factor they want to analyze with

Returns Projection Tab

Selections:

Start Date 01/01/2007
Top ○ 10% ○ 20% ○ 50%
Country Selection All
Sector Selection ENERGY FINANCE
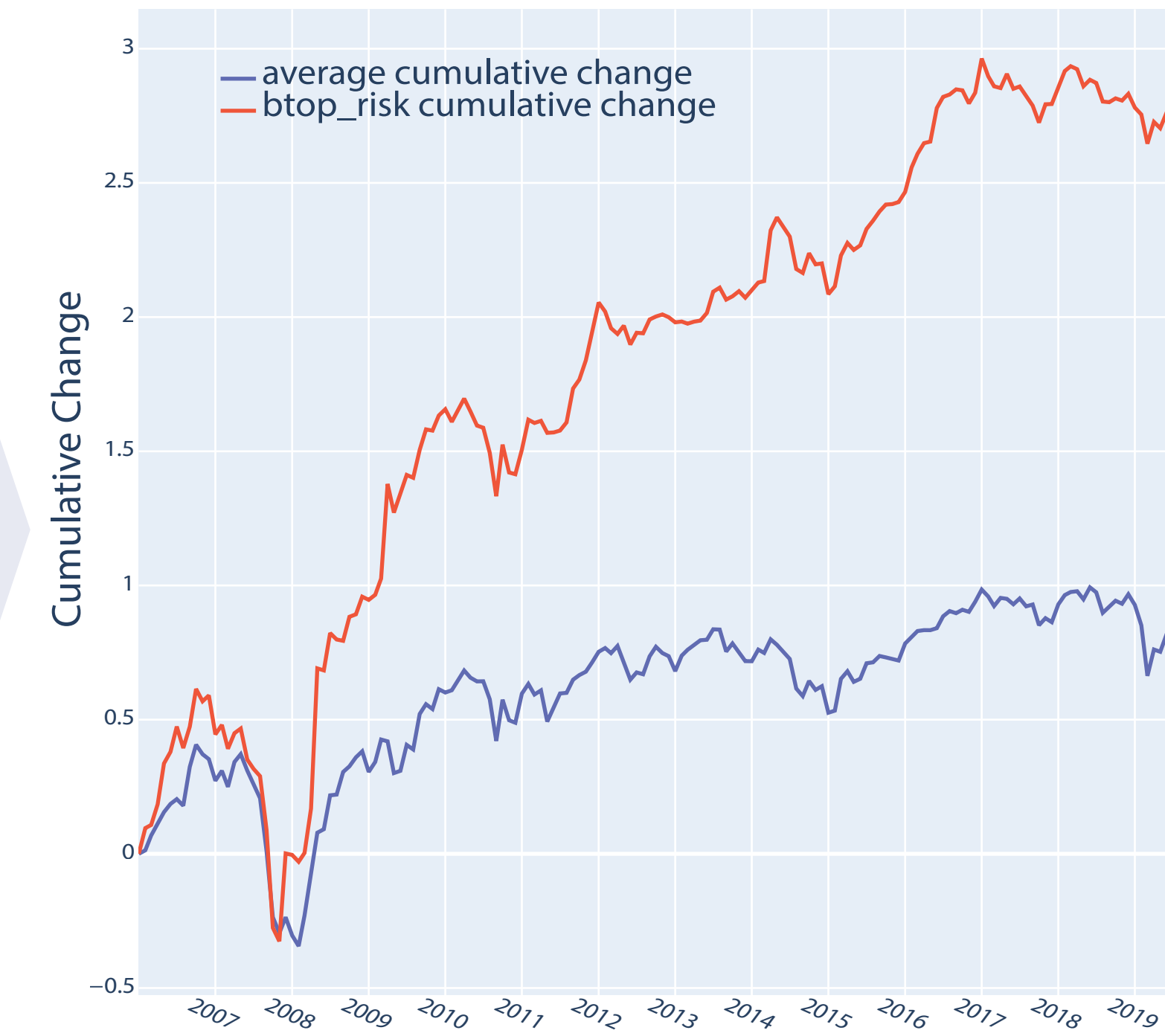Industry Selection All
Factor btop_risk

Users can select:
1. A starting date to project returns from

2. Pick top x% of equity to form the basket of equity

3. Conduct cross-sectional analysis by using country, sector, and industry filter

4. Select the factor they want to pick the basket with

Factors Comparison Tab

Selections:

Start Date 01/01/2007
Top ○ 10% ○ 20% ○ 50%
Country Selection Singapore Malaysia
Sector Selection All
Industry Selection All
Base Factor roca
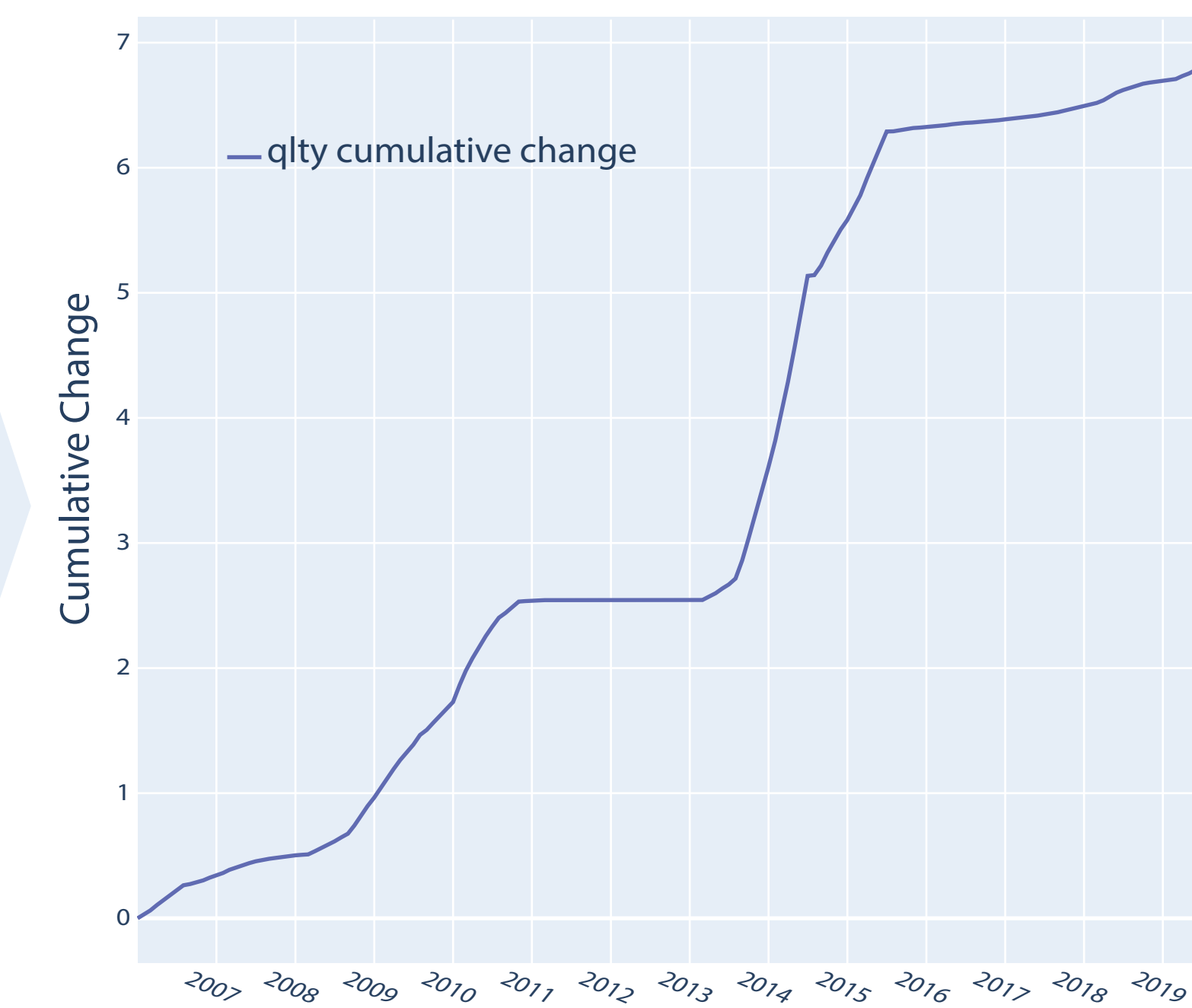Comparison Factor qlty

Users can select:
1. A starting date to analyze a fixed basket from

2. Pick top x% of equity to form the fixed basket

3. Conduct cross-sectional analysis by using country, sector, and industry filter

4. Select the base factor they want to pick the initial fixed basket with

5. Select the comparison factor to see how that factor of the fixed basket changes

Distribution Chart

The cross-sectional distribution chart will be generated together with a box-and-whisker plot. This plot is animated and can be played for the selected date range.

This allows users to see the distribution of companies for the selected factor and analyze the change in distribution over time.

Treemap

The Treemap serves to complement the distribution plot by displaying how each country, sector, and industry is performing for that factor visually through the color scale.

This allows users to quickly get a general idea of how each industry and sector in each country is performing for the selected factor and where they lie on the distribution chart.

Returns Projection

The cross-sectional cumulative change in the returns of both the selected basket of equity and the market average is plotted from the starting date to the last date in the dataset.

The basket of equity is reselected monthly and the returns are weighted by each equity's market capitalization.

This allows users to quickly pick out promising factors that can be used to select a basket of equity.

Persistence Plot

This Persistence plot serves to provide more insights into the basket of equity. It is a heatmap that shows how often an equity is in the selected basket of equity. The number represents the number of months, out of 12, that the equity on the y-axis is in the basket for the year on the x-axis. It is reflected visually as the intensity of blue.

This allows users to see how often an equity stays in the basket of a select factor.

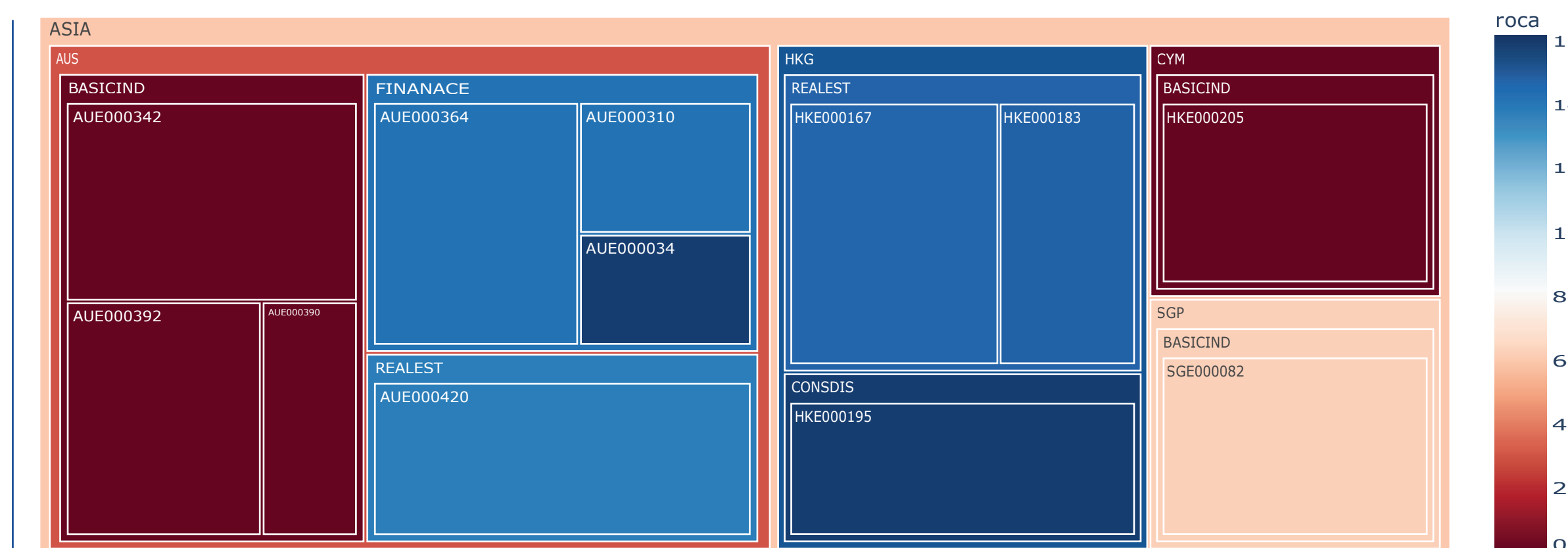|	2007	2008	2009	2010	2011	2012	2013	2014	2015
HKE000156	12.0	6.0	12.0	12.0	12.0	10.0	12.0	12.0	11.0
HKE000108	12.0	9.0	5.0	12.0	8.0	12.0	12.0	12.0	12.0
HKE000212	3.0	9.0	11.0	9.0	11.0	12.0	12.0	12.0	12.0
HKE000138	10.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	10.0
HKE000196	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	6.0
HKE000044	12.0	10.0	12.0	12.0	4.0	9.0	10.0	12.0	12.0
HKE000098	0.0	4.0	10.0	10.0	11.0	12.0	12.0	12.0	12.0

Factor Comparison

The cross-sectional cumulative change of a secondary factor is plotted from the starting date to the last date in the dataset.

The basket of equity is only selected once at the starting date and the change in each equity's secondary factor is weighted by its market capitalization.

This allows users to view the performance for a secondary factor for a basket of equity picked using a primary factor.

Persistence Plot

This Persistence plot serves to provide more information on the data of the comparison factor of the basket of equity. Since the basket is fixed from the start, the years with values less than 12 are months that the equity does not have data for the selected comparison factor.

This provides users with information on the periods where an equity is excluded.

	2007	2008	2009	2010	2011	2012	2013	2014	2015
AUE000010	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
CNE000248	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
AUE000077	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
AUE000128	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
AUE000209	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
AUE000328	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
NZE000011	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0

AXA Equity Dashboard

Limitations

1. The sheer number of data in the dataset would cause the plots in the dashboard to take some time to load as the entire dataset is manipulated with each change in the selection.

2. As the dashboard runs on python, the dataset has to be stored on the computer. Hence, if the user wants to run an analysis on millions of lines of data, the user may be limited by the computer's memory.

3. The python code looks for specific column names and categories. Any change in the name of the columns or mislabelled categories would exclude that data point.
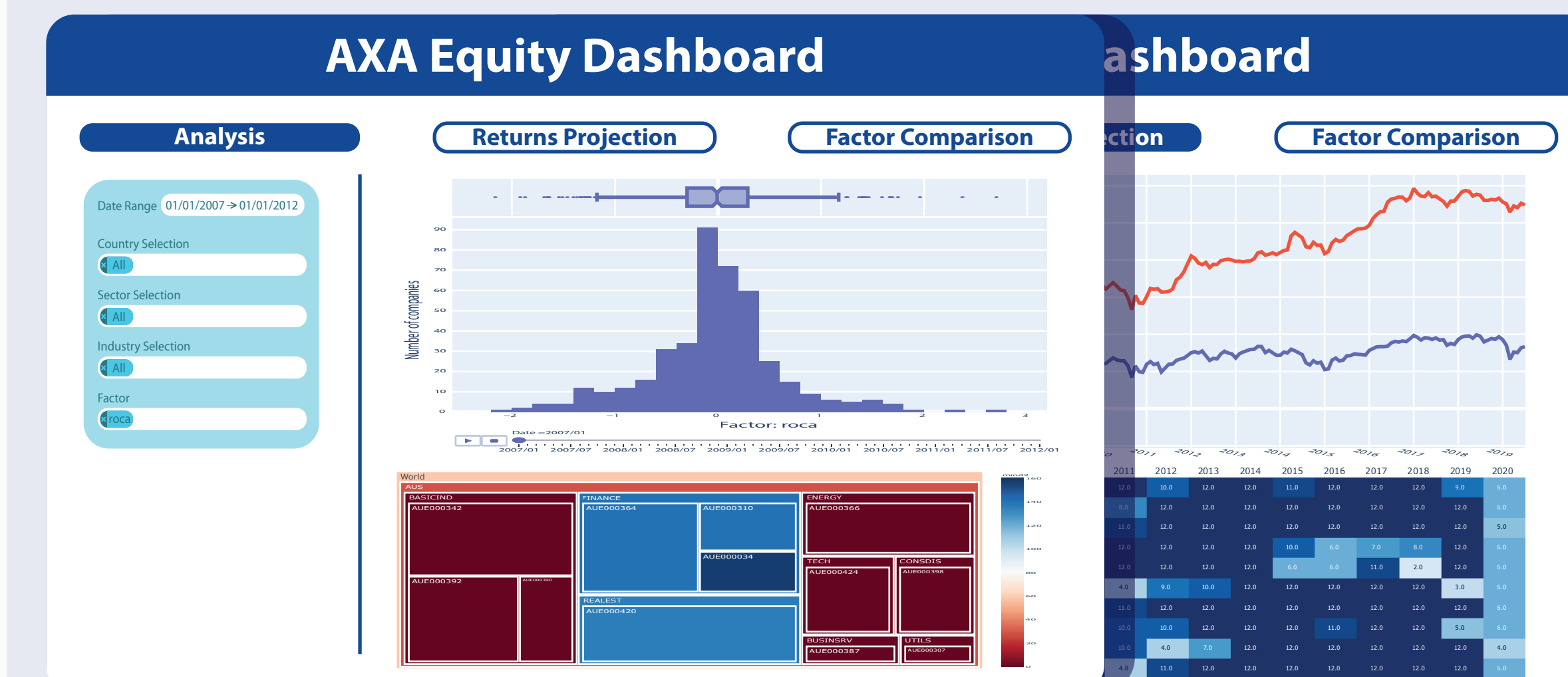
Contributions

With this Dashboard, AXA will be able to:
1. Efficiently conduct cross-sectional distribution analysis, together with time-series analysis with a snapshot of how each sector, industry, and country is performing.

2. Effectively pick out the most promising factors to be used when selecting a basket of equity.

3. Conduct deeper analysis by analyzing other factors associated with top-performing companies for the selected promising factor.