Two-Factor Conditional Grid Approach to Risk Management

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Introduction

There are many ways to interpret risk in investing.

Methodology

Often, one wants to see how a security will react to changes in macro factors like interest rates, inflation, unemployment, etc. When rates are high and inflation is low, how does the Utilities sector react?

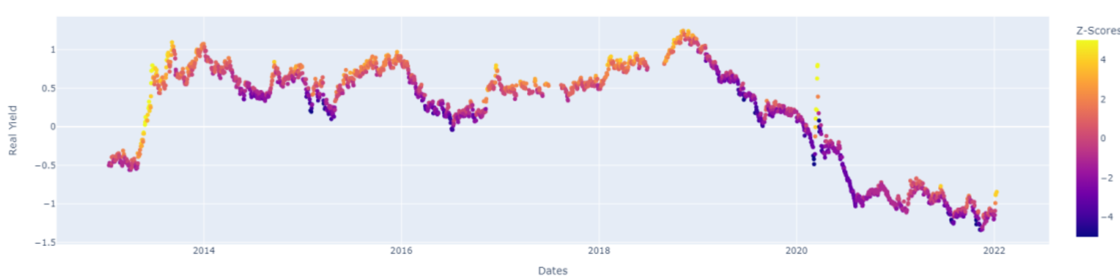
For the purposes of this write-up, we will consider two 'independent series'' which we will characterize, and compare against, and the 'dependent series.'

1.1 - **Characterizing Series Behavior**

Take any time-series. This can be a time-series of interest rates or yield-curves, or anything else.

This series' values will be standardized on a rolling x days basis—it's important to have the values rolled so that you are not conducting a forward-looking analysis. Next, the y-day rate of change of the values in the series will be standardized on a rolling x-days basis (rolling for the same reason).

These two standardized series are then added together to create a time series that represents both the magnitude of the series and the rate of change of the series. Below is a visualization of the total standardization (both magnitude and rate-of-change) on the 10-Year Real Interest Rate from 2013 to 2022. As you can see, the algorithm for standardization does an intuitive job of capturing the behavior of the series.



The values of the standardized series are then rounded to the nearest whole number and **clipped**. The clipping is important, because it is a control of the tail events in the time series. Scores are clipped at a z-score of 3. This means that any datapoint with a z-score of more than 3 is bucketed with the 3 scores. This helps us control the tail events and make the end output more readable.

So, the end-product is a series standardized as above, rounded to the nearest whole, and clipped as above.

1.2 – **Connecting Behavior and Forward Return**

The characterization is done for two independent series', say the 10-Year Real Rate and the 10-to-2-year Yield Curve. We are left with our dependent data. This could be the time-series of a security, an investment factor, etc. We want to know how this series reacts given the standardized behavior of our two independents.

For the dependent series, we will convert each date to a forward return of x-days. Each datapoint will represent a forward return x-days from that specific date. For each date in the time-series, we have two z-scores and a forward return. We can now group our data by the combination of z-scores from the independents. Each group will contain the z-score combo, and the mean of all the forward return datapoints from the given combination of z-scores.

Then, a pivot table is created with the z-scores of the first independent series on one axis and the z-scores of the second independent series on the other axis. The cells will contain the mean forward return (x-days) of the dependent series at each combination of z-scores. The result will look something like this:

This is a representation of the independent series' 10-Year Real Rate and 10-to-2-year yield curve, mapped against dependent series Book-to-Market – Top 10% of Companies, which is a value factor that represents the top 10% of companies and how they have performed. The timeframe that was used was 2010-01-04 to 2023-03-30. So, we are looking at the performance of the top 10% of companies (highest book-to-market value) against Real Rates and Yield Curves from January 2010 to March 2023.

So, given the current z-scores of the 10-Year real yield and the 10-to-2-year yield curve, we can determine, to some degree, what our risks look like in a historical context.