Portfolio shocked by US 10y Treasury Yield +100bp

Portfolio is PCGLUF

My *Interest Rate Shock Model* is a multi factor model with only two factors: the benchmark (B) and the bond index (F for factor):

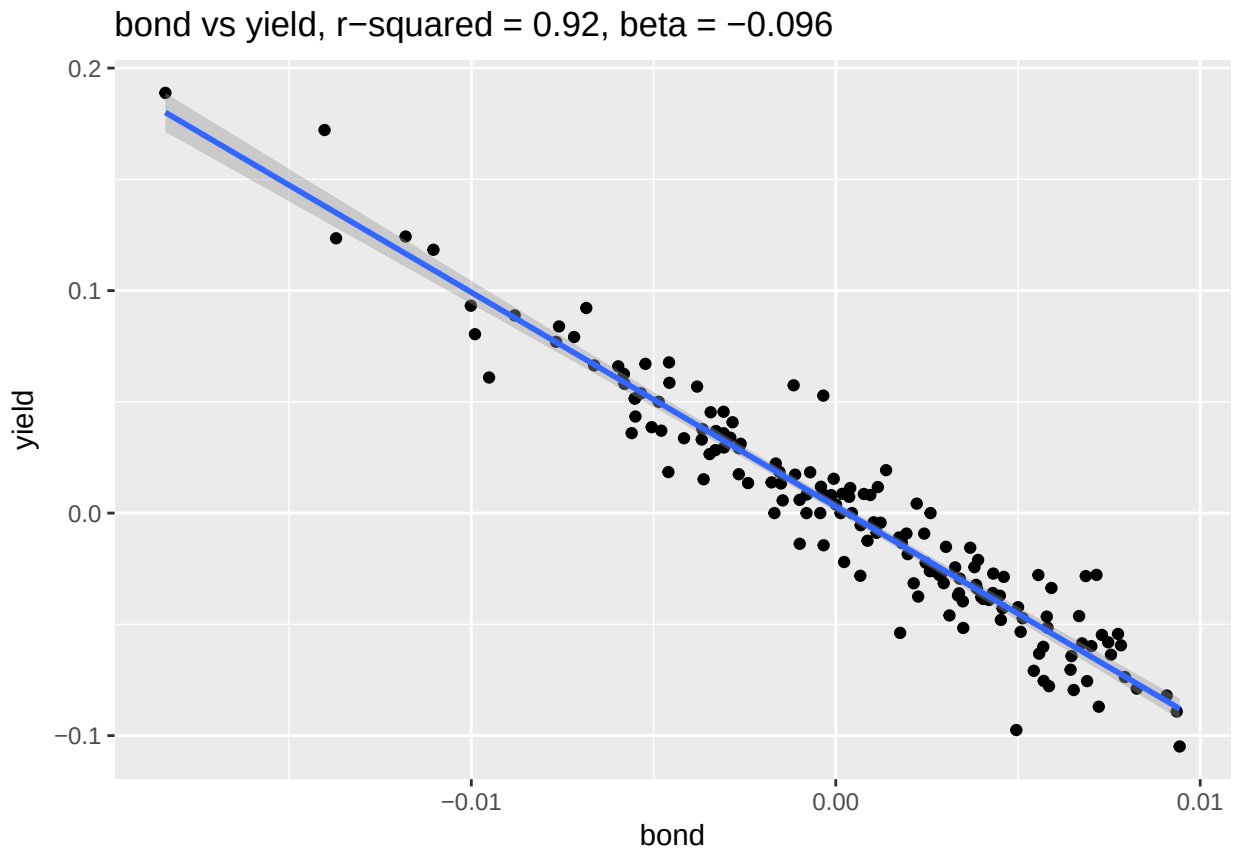
$$r_t = \alpha + \beta_B r_{B,t} + \beta_F r_{F,t} + \theta_t$$

Anyone familiar with the CAPM model might recognise this formula if we drop the F term: $r_t = \alpha + \beta_B r_{B,t} + \theta_t$

For every stock, I run a multilinear regression using three years of weekly historic data to determine the values of α and the two β's. (The θ_t is a residual term which we assume will always average out to zero. The α ought to be very close to zero.)

The result is a simple linear model where, if we plug in returns of the factors, we get an estimated return of the stock. Note that the two factors are correlated: when I say "I shock the yield (or bond)", my model is also estimating a return to the benchmark and plugging it into the above linear model.

For the bond, I use the total return of the *Citigroup US Broad Investment-Grade Bond Index* (as does Northfield). I use the terms *bond* and *yield* interchangeably because they are so closely correlated that saying "The *(return of the)* yield goes up $x\%$" is almost the same as saying "The bond index goes down $-0.096x\%$":



Results

I computed this model for each stock in the PCGLUF portfolio. Then I shock the 10Y U.S. Treasury Yield by +100 bps and calculate the estimated return of your portfolio based on latest weights in the database. I find:

- your portfolio returns 3.13%.
- the benchmark returns 3.73%.
- Therefore, the portfolio underperforms by -0.6%.

I also computed the model over the same timeframe which Barra did for us a couple of months ago (October 2013 to October 2016). I find:

- your portfolio returns +3.0%, while Barra computed +6.4%
- the benchmark returns +4.2%, while Barra computed +8.0%
- My model says -1.2% underperformance, while Barra say -1.6%

The two main differences with a true risk model (by Northfield, Barra or UBS) are:

1. Most risk models use "exponentially decay weighted" observations. This means history has a half-life, and the model puts more emphasis on recent data than older data.
2. Other risk models have more factors, including:
    - GICS Sectors
    - Regions (or countries)
    - All currencies
    - Oil prices
    - The usual quant signals such as size, Value/Growth, etc.