

# TA Review 3

# Schedule

## 1. Homework 3

- VaR and CVaR

## 2. Performance Evaluation, Hedging, Tracking

- Collinearity
- Performance Evaluation
- Hedging vs. Tracking: Alpha?

## 3. Tips for the Midterm

- Flexible functions
- Unittests

# Homewor 3

## Factor decomposition of return variation

A **Linear Factor Decomposition (LFD)** of  $\tilde{r}^i$  onto the factor  $\mathbf{x}_t$  is given by the regression,

$$\tilde{r}_t^i = \alpha + \beta^{i,x} \mathbf{x}_t + \epsilon_t$$

- ▶ The **variation** in returns is decomposed into the **variation** explained by the benchmark,  $\mathbf{x}_t$  and by the residual,  $\epsilon_t$ .
- ▶ These factors,  $\mathbf{x}$ , in the LFD should give a high R-squared in the regression if they really explain the **variation** of returns well.



# The problem of collinearity

# When should we be most worried about collinearity?

- Evaluating performance
  - Tracking
  - Hedging

# Evaluating Performance

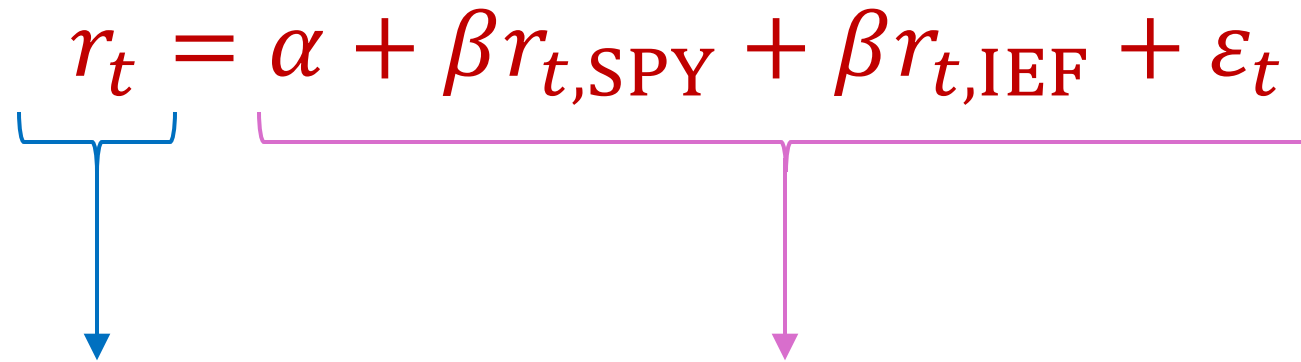
$$r_t = \alpha + \beta r_{t,SPY} + \beta r_{t,IEF} + \varepsilon_t$$

What is alpha in this regression?

- Timing
- Selection
- Luck? Problem of small sample sizes

Is this alpha any good? Look at IR and  $R^2$

# Hedging vs. Tracking

$$r_t = \alpha + \beta r_{t,SPY} + \beta r_{t,IEF} + \varepsilon_t$$


Hedge: **invest** in  $r_t$

Tracking: **no access** to  $r_t$

Hedge: remove **unwanted** risk from “factors”

Tracking: **get** risk from  $r_t$  investing in “factors”



**Hedge**

**Track**

**Where do invest?**

Buy left side, sell right

Buy right side

**Volatility of the error**

Basis risk

Tracking error

**If I include alpha, what  
should I hope for in the  
out-of-sample?**

Big alpha, small error

Small alpha, small error

# Hedging vs. Tracking

$$r_t = \alpha + \beta r_{t,\text{SPY}} + \beta r_{t,\text{IEF}} + \varepsilon_t$$

Should I include alpha?



## Include an intercept?

In regression for optimal hedge ratio, should we include a constant, (alpha?) Depends on our purpose...

- ▶ Do we want to explain the total return (including the mean) or simply the excess-mean return?
- ▶ In short samples, mean returns may be estimated inaccurately, (whether in  $r^i$  or  $\tilde{r}^i$ ), so we may want to include  $\alpha$  (eliminate means) to focus on explaining variation.



# Regression Simulation