Econ 413 Assignment 3

~~I Fixed Income~~

**~~I.I~~****~~Bond price~~**

~~a. Calculate the price of a bond with a par value of $1,000 to be paid in 10 years, a coupon rate of 1.5% paid semi-annually, and a required annual yield of 3%. Using the following formula~~

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***~~Hint: A coupon rate 7% is 3.5% semi-annually, annual yield 10% is semi-annual yield of 5%, number of coupon payments = # years\*number of coupons per year~~***

~~b. Calculate the price of a zero coupon bond with face value $100, maturity in 9 years and spot yield of 7.4%.~~

**I.II** **Bond yield**

You hold a bond with a par value of $1,000 to be paid in 3 years, a coupon rate of 3%annually, and a price $1010.00

~~a. Calculate the current yield~~

b. Calculate the yield(to maturity)***Hint: use the goalseek function***

~~c. Calculate the approximate yield to maturity using equation from Lecture 7 slide 14~~

d. is this bond par, premium, or discount. Give reasoning.

e. Calculate the Macaulay Duration and Modified Duration using YTM in part b

f. What does duration tell us?

g. What is the difference between Macaulay and Modified Duration?

**I.III** **Term Structure of Interest Rates and Yield Curve**

1.***Treasury Yield Curve***

a. Import the [Treasury yield data](https://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yield) for all maturities (1 mo,3mo...30yr) for excel dates

b. plot the Treasury Yield Curve for each of those dates on the same plot.

c. Answer the T/F questions describing the Yield Curves

2. ***Bond price from Treasury rates***

Using the Treasury rates for 1 yr ,2yr and 3 yr from date 7/26/2017 from above

a. Calculate the price of a 3 year bond with 1% coupon rate (annually) with a par value of $1000

b. Is this bond a discount, par or premium bond? Why do you think?

***Hint: remember these Treasury rates are already in %, Treasury rate found is 0.11= 0.11% or .0011***

3. Plot the Treasury yield curve for dates given in the excel from 2006 – 2017. Why do you think the Treasury yield and resulting curves look this way? Do they correspond with major economic events? Do some curves show inverted? Answer the T/F questions describing the Yield Curves.

II Futures

**II.I Basis Risk and the Optimal Hedge Ratio**

1. **Basis**

A farmer in Minnesota is concerned about the propane required to operate his equipment for the harvest season. Propane is a fuel used in many heavy machinery . The farmer estimated a need of 7,000,000 gallons equivalent of propane. Currently there is no liquid futures market for propane therefore the farmer must hedge his price risk of his propane need with a similar futures contract.

a. Import monthly **spot** data for Propane, and the rest of the commodities in the excel sheet.

link: <http://www.indexmundi.com/commodities/?commodity=propane&months=12>

b. Find the Δ Spot Price matrix for each commodity

c. Make a guess which commodity is the best hedge for propane price risk and plot of the 2 commodities

d. Create the correlation matrix for the ΔSpot Price data of for Propane and the rest of the commodities. Highlight which commodity has the highest correlation to Propane?

**2. Optimal Hedge ratio ( monthly)**

e. Use the Propane Spot Prices from II.I #1 and import the [WTI Futures historical monthly](https://www.investing.com/commodities/crude-oil-historical-data) ***Last*** price for same dates

***Hint: Be sure the data is correct in order( i.e. if your spot prices ascend 2016 to 2017 your futures data should ascend 2016-2017***

f. Find the ΔPrice for both Spot Propane and WTI futures

g. find σp,σf , ρ(p,f) for the ΔPrice data

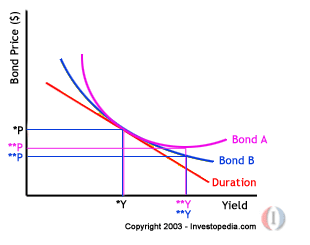
h. Find the optimal hedge ratio (h\*) using equation from Lecture 8 slide 43 , explain what this optimal hedge ratio is.

i. Find the contract unit size for CME WTI futures in gallons

j. find the optimal # contracts to perform the hedge using equation from Lecture 8 slide 43, explain what this means for the farmer.

## Extra

1. **Find the optimal hedge ratio for II.I #2 using regression, make sure your output is on excel**
2. **Research the concept of bond convexity, using your research and graph below answer the questionnaire question**



1. **Read the article :** [**Rising interest rates and Commodities**](https://www.thebalance.com/rising-interest-rates-in-the-us-808940)

**Use the article to answer questionnaire questions.**