# International Financial Markets

*1st take home assignment*

## Due date: April 18th, 2016

**Exercise n.1**

Compute the future values and the present values of the following cash flow streams.

$$(-2, 96, 23, -15, -2, 65 \mid 0, 1, 2, 3, 4, 5)$$

$$(-1, -5, 44, -30, 265, -20 \mid 0, 1, 2, 3, 4, 5)$$

Compute the Future Values (t=5) and Present Values (t=0) using simple, compound and continuous rate of 5%, supposing that the interest rates remain constant over time.

**Exercise n.2**

The following table shows prices and face values of 9 ZCBs.

| *Time to maturity* | *Price* | *Face Value* |
|---|---|---|
| 1 month | 99.9760 | 100 |
| 2 months | 11.9876 | 12 |
| 1 quarter | 64.7973 | 65 |
| 1 semester | 0.989 | 1 |
| 1 year | 4848.7199 | 5000 |
| 2 years | 11559.8424 | 12500 |
| 3 years | 27524.6819 | 31250 |
| 5 years | 7.4782 | 10 |
| 10 years | 27.5329 | 50 |

- Compute the 9 spot interest rates;
- Plot them against the maturity;
- Which reason can explain the positive slope of the yield curve? (max 10 lines)
- Compute the forward rates f(1m, 2y), f(1q, 5y), f(5y,10y)
- Show that in equilibrium there's only one forward rate f(5y, 10y)
  *hint: to explain the existence of only rate f(5y, 10y) show that one can realize a risk-free arbitrage if…*

**Exercise n.3**

Given that:

- The 1Y ZCB has:
  Price = 9.6
  Face Value = 10
- The forward rate f(1,2) = 2.23%
- The fixed-income bond with time to maturity 3 years, 45 dollars of annual coupon, face value of 500 and price of 495
- The spot rate s(0,4) = 2.32%
- The forward rate f(4,5) = 1.12%

Please compute the spot rates s(0,1), s(0,2), s(0,3) and s(0,5) along with the fair price, and the implied return of a fixed income bond with 5 years to maturity, annual coupon = 12, and face value = 200

**Exercise n.4**

Suppose the following situation:

a) s(0,1) = 1.10%
b) s(0,4) = 1.50%
c) f(1,2) = 1.15%
d) f(2,3) = 1.08%
e) f(3,4) = 1.20%

Check if such a situation offers any possibility of risk-free arbitrage. If yes, show how one can realize it.

**Exercise n.5**

You own a €1000 zero coupon bond that has six years of remaining maturity. You plan on selling this bond in one year and believe that the required yield next year will have the following probability distribution:

| Probability | Required Yield (%) |
|---|---|
| 0.1 | 6.70 |
| 0.2 | 6.85 |
| 0.3 | 7.10 |
| 0.2 | 7.30 |
| 0.1 | 7.55 |
| 0.1 | 7.75 |

a) what is the expected price of the bond at the time of the sale?
b) what is the standard deviation of the bond price?

**Exercise n.6**

Consider the following bonds:

| | 1 | 2 | 3 |
|---|---|---|---|
| Time to maturity | 10 years | 10 years | 10 years |
| Type | Coupon Bond | ZCB | Coupon Bond |
| Coupon rate | 3% | - | 6% |
| Coupon frequency | half-yearly | - | Yearly |
| Face Value | 1000 | 1000 | 1000 |

Suppose that the interest rate is constantly equal to 4%.

a) Which is the price of each bond?
b) Compute, and briefly comment, the duration of each bond.
c) Which is the price variation occurring to the three bonds if the interest rate grows up to 4.5%?