Fixed Income Analysis
Exercise Sheet 1

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Please hand in your solutions on Wednesday 25.09.2019 at the beginning of the lecture.

Exercise 1 Consider a forward rate agreement (FRA) with current, expiry and maturity time $t < T < S$, respectively, and cash flow to the lender:

- At time T: $-K$,
- At time S: $Ke^{R^*(S-T)}$,

for some predetermined principal K and interest rate R^*.

a) Compute the value $\Pi(t)$ at time t of the cash flow above in terms of zero-coupon bond prices.

b) Show that in order for the value of the FRA to equal zero at t, the rate R^* has to equal the forward rate $R(t;T,S)$.

1 point

Exercise 2 Suppose the short rate is constant over time and equals $r = 2\%$. If you invest in the money market account, how many years does it take to double your investment?

2 points

Exercise 3 Find the relationship between the instantaneous forward rate $f(t,T)$ and the continuously compounded spot rate $y(t,T)$. Show that, if the spot rate curve is increasing (i.e., $\frac{\partial y}{\partial T}(t,T) > 0$), forward rates will exceed spot rates.

2 points

Exercise 4 Consider two coupon bonds with notional 100CHF, time to maturity 3 years and an annual coupon rate of 5% and 10% respectively. The first bond is trading at 95CHF and the second bond is trading at 108CHF.

a) Compute the continuously compounded spot rate $y(t, t+3)$.

b) Suppose you also know that a zero-coupon bond with maturity 1 year and notional 100CHF is trading for 92CHF, what would the present value be of an instrument with a cash flow of 20CHF, 35CHF and 60CHF in 1 year, 2 years and 3 years respectively?

3 points

Exercise 5 Suppose the price $P(t, T)$ of a zero-coupon bond drops by 20% (relative change) when the continuously compounded spot rate $y(t, T)$ rises by 3% (absolute change). Calculate the time to maturity $T - t$ of this zero-coupon bond.

2 points