***Calculation Example: Futures Price and Payoff at Maturity***

**Question:** Calculate the futures price of a 2 year futures contract written on the following stock. Assume that the futures contract matures just after the stock pays its dividend in year 2.

The stock has a current price of $5. Its next annual dividend of $1 will be paid in one year, and the dividend will continue to be paid annually forever and will grow at 10% pa.

The stock’s required total return is 30% pa. The perpetuity equation is suitable for valuing this share. All rates are given as effective annual returns. There are no storage costs from holding stocks.

Last modified 18.1.17 KW

**Answer:** The futures price will be equal to the expected stock price in 2 years since there’s no storage costs.

The dividend yield is 20%: $r\_{div,eff}=\frac{C\_{1}}{S\_{0}}=\frac{1}{5}=0.2$

$$F\_{T}=E\left[S\_{T}\right]=S\_{0}.\left(1+r\_{total,eff}-r\_{div,eff}+r\_{cost,eff}\right)^{T}$$

$$F\_{2}=E\left[S\_{2}\right]=5×\left(1+0.3-0.2+0\right)^{2}$$

$$ =5×\left(1+0.1\right)^{2}=6.05$$

So the futures price will be $6.05. So if you agree to buy this futures contract, you will lock in to pay $6.05 for this stock in 2 years.

**Question:** Will you receive the dividends at time 1 and 2 if you buy this 2 year futures contract now? Remember that the futures contract matures just after the dividend at time 2.

**Answer:** No, you will not receive the dividends at time 1 and 2 since the futures contract doesn’t mature until after the dividend at time 2 is paid. If the future is physically settled rather than cash settled, then from time 2 onwards you will own the stock and you will be entitled to any dividends.

**Question:** If the underlying stock price at maturity in two years turns out to be $5.80, what will be your payoff at maturity from the futures contract?

**Answer:**

$$f\_{T,LF}=S\_{T}-K\_{T}$$

$$f\_{2,LF}=5.80-6.05$$

$$ =-0.25$$

Therefore you will have lost $0.25 on your long futures contract.

Your counterparty who has the short futures position will have gained $0.25.