Case №2: Structured Products

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1 Intro

In this essay I am going to present my solution of the second case on structured products. Next sections present step-by-step explanations of my work with tasks.

2 Task 1

In this task we consider capital guaranteed VTB product with long binary put USD-RUB option. Payoff approximately looks like that (figure 1):

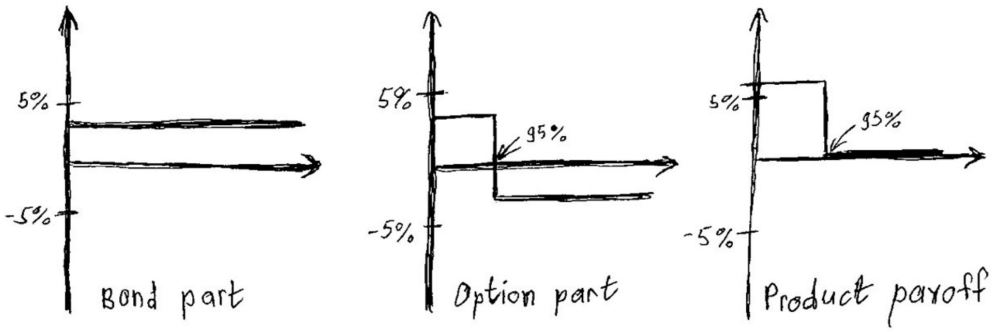

Figure 1. Capital guaranteed product with binary put option

To get the sum we should leave for fixed income part to guarantee the return of invested capital we take the rate from zero coupon yield curve for 0.5 term of maturity and calculate required sum:

$$Bond\ price = \frac{100\%}{(1+0.0411)^{(0.5)}} = 98.01\%$$

Thus, we can calculate discount:

$$Discount = 100\% - 98.01\% = 1.99\%$$

Then we should calculate put option price. In Excel you can find the estimation with the Black–Scholes model and its extension for binary option (cash-or-nothing put in our case). We get 1.45%.

As I understand, we should get about 5% return when execute put option, so we should solve the equation:

$$1.99\% + (5\% - 1.45\%) * participation\_rate = 5\%$$

We get participation_rate = 84.8% (however, VTB can buy 137% of option and maybe take excess percents as commission :)).

So, the price of put with our paticipation rate is $1.45\% * 84.8\% = 1.23\%$, and $1.23\%/98.01\% = 1.25\%$ of bond price.

3 Task 2

In this task we consider 3y Reverse Convertible (figure 2).

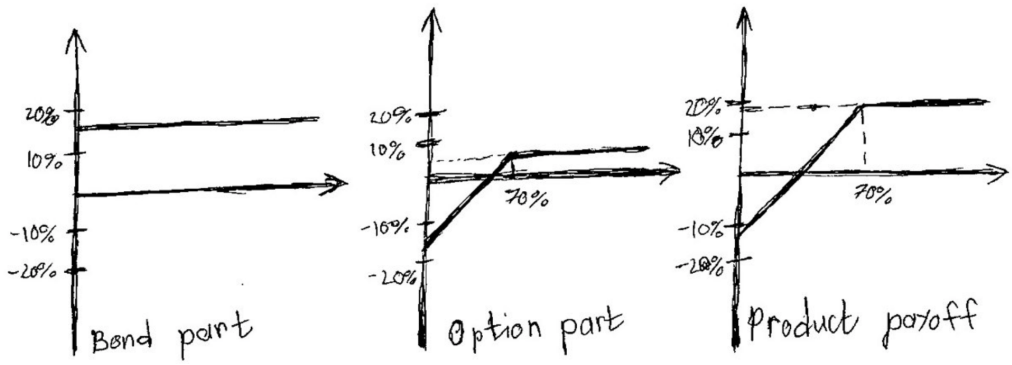

Figure 2. 3y Reverse Convertible

To calculate put option price, we use the Black–Scholes model (in more detail in Excel file) and get 3.52%. It's about $((1+0.0352)^{(1/3)} - 1) * 100\% = 1.16\%$ per annum. Product payoff with this short put option can be seen in figure 2 (max return is 19.7% for all the period and 6.18% per annum) and in Excel file.