

Present and Future Value

, You've just won the lottery. Woo hoo!

You are offered a lumpsum of \$120 million now,

or \$195 million paid out continuously over 20 years.

(a) Which option gives a larger total value if

interest rate is 6% compounded continuously?

We compare present value of both options. Lump sum has $P = \$120 \text{ mill.}$

The income stream gives $\frac{195}{12} = \$16.25 \text{ mill per year.}$

So this option has present value $P = \int_0^{20} 16.25 e^{-0.06t} dt$

$$= \left[-\frac{16.25}{0.06} e^{-0.06t} \right]_0^{20} = \left[-\frac{16.25}{0.06} [e^{-1.2} - 1] \right]_0^0 \approx \$113.556 \text{ million.}$$

So the lump sum payment of \$120 mill is better.

b) Which option gives better value if interest rate is 3% compounded continuously?

Now, the income stream has present value

$$P = \int_0^{20} 16.25 e^{-0.03t} dt = \left[-\frac{16.25}{0.03} [e^{-0.6} - 1] \right]_0^0 \approx \$146.636 \text{ million.}$$

So in this case, the income stream is a better option.

(c) What assumptions are being made in these calculations?

Mainly, you are assuming that interest rates will remain constant for the next 20 years.

You are also ignoring the effect of taxes.