Recitation I: Financial Management

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July 23, 2003

I. Net Present Value Methodology.

• **Definition**:

$$NPV = CF_0 + \frac{CF_1}{(1+r_1)} + \frac{CF_2}{(1+r_2)^2} + ...$$

$\hookrightarrow$ In determining cashflows, must take into account all revenues, costs, and risks involved.

$\star$ Example: Calculate PV of one unit of stock in XYZ Corp. What does the investor need to know or forecast? What are the relevant cashflows assuming the investor buys the stock and holds it forever? Should different investors use different discount rates?

• **Intuition for NPV Method?**

$\hookrightarrow$ The name says it all... we're converting a stream of potentially risky cashflows spread over time into a certain one-shot cashflow today producing equal enjoyment. That is, individuals are indifferent between receiving NPV today and nothing afterwards and receiving the cashflow stream $CF_0, CF_1, CF_2, ...$.

$\hookrightarrow$ The advantage of expressing cashflow streams by the NPVs is that sure payments today are easy to compare. People prefer more to less and, as a result, presumably prefer a higher NPV to a lower one and won't undertake negative NPV projects.

II. NPV Example - Qualitative.

... For this example, let's focus on cashflows.

• **Compensation Policy Changes.**

↪ Fixed income group compensation at Salomon Brothers in early 1990s.

↪ Before: Bonus, based solely on individual performance, represents large fraction of a bond trader's compensation.

↪ Problems: 1) Compensation policy doesn't reward cooperation among different traders and fixed income desks. 2) Lots of competition and fighting within firm for resources and profit recognition. 3) Desks or traders don't care how their decisions (e.g. misbehavior) might adversely effect other parts of the FIG (e.g. by hurting the reputation of the firm).

↪ After: Fixed percentage of bonus pool to be allocated in a trust the purchases Salomon stock under employee's name. Employee forced to hold this for 5 years.

↪ How does this change address the aforementioned problems? How effective do you think this change will be?

↪ Can we use the NPV method to evaluate the merits of this compensation change? What are some of the benefits of this change? Some of the costs?

III. PV Examples - Quantitative.

... For this example, we focus on the discount rate.

• **Basic Bond Pricing.**
$\hookrightarrow$ Let's price the 30 year T-bond example from class assuming it's August 2003.
$\hookrightarrow$ Issued in May 2000, maturity in May 2030, face value of $1000, and semi-annual coupon rate of 6.25% (i.e. a coupon of $31.25).
$\hookrightarrow$ Assume a fixed annual discount rate of 4%.
$\hookrightarrow$ We don't consider payments made in the past when calculating PV, only future ones.
$\hookrightarrow$ Since the first future payment will be made in November 2003, we need to know the quarterly discount rate.
$\hookrightarrow$ Since the period between payments is 6 months, we also need the semi-annual discount rate.
$\hookrightarrow$ What's the PV of the bond? How might you expect this to relate to the price of the bond? Why?

• **Constant Discount Rates?**
$\hookrightarrow$ Explicitly assumed in the PV formula given in class. Is this reasonable?
$\hookrightarrow$ No. This is especially the case if the risk involved in cashflows changes over time (more on this later).
$\hookrightarrow$ However, these rates even change when risks are held constant. How do we know this? One way to infer this by looking at the implied discount rates of U.S. Treasury strips (i.e. riskless zero coupon bonds).

IV. Some Present Value Mathematics.

... For each of these formulas, we will assume that the discount rate is constant.

$\star$ **Perpetuity:** A security that makes a fixed payment every period (e.g. year) forever starting next period.
$\hookrightarrow$ PV derived using formula for a geometric series:

$$0 \leq x < 1 \Rightarrow a + ax + ax^2 + ... = \frac{a}{1-x}.$$

This implies that:

$$PV(\text{perpetuity}) = \frac{P}{1+r} + \frac{P}{(1+r)^2} + ... = \frac{\frac{P}{1+r}}{1-\frac{1}{1+r}} = \frac{P}{r}.$$

$\star$ **Annuity:** A security that makes a fixed payment every period starting next period for a finite number of periods.
$\hookrightarrow$ PV derived from subtracting one perpetuity from another.

$$PV(\text{annuity}) = \frac{P}{1+r} + ... + \frac{P}{(1+r)^T} = \frac{P}{r}\left[1 - \frac{1}{(1+r)^T}\right].$$

• Also have formulas for *growth perpetuities*, *growth annuities*, and many others.
$\hookrightarrow$ But for most practical purposes, you will use a program like Excel to create spreadsheets that calculate present values.

V. PV Examples - Quantitative.

• Let's complete the bond pricing example from page 3...

↪ We can think of the bond as consisting of two familiar cashflow components: 1) One face value payment of \$1000 in 26.75 years, and 2) An annuity that makes 54 payments of \$31.25 (once every 6 months starting in 3 months). We value each stream seperately.

↪ Face Value Payment:

$$PV(\text{FV}) = \frac{1000}{(1.04)^{26.75}} = 350.23.$$

↪ Annuity:

$$PV(\text{A}) = \frac{31.25}{0.0198}\left[\frac{1}{1.0099} - \frac{1}{(1.0099)^{107}}\right] = 1009.92.$$

↪ Present Value of the Bond: It's simply the sum of the two components...

$$PV(\text{Bond}) = 350.23 + 1009.92 = 1360.15.$$

• Let's also price a basic perpetuity. Assume a constant annual discount rate of 5% and an annual payment of \$100. How much is this asset worth?

↪ Now, assume you promise to give your child one such perpetuity every year starting this Christmas and will continue to do this forever. However, your child (also known as Finance Phenom Jr) proposes a change in the gift giving routine. He offers to exchange his perpetuity of perpetuities starting next Christmas for a lump sum payment of \$35000 to be paid immediately. Should you except the exchange on a pure PV basis? Why might you not accept this exchange (be creative, funny, etc).

V. Continued...

$\hookrightarrow$ Assume you don't want to make the exchange because you use the promise of this gift to encourage good behavior on the part of Jr during the rest of the year (i.e. he understands that Santa only brings gifts to the good kids).

$\hookrightarrow$ After hearing your decision, Jr is noticeably saddened. He explains that all he wanted to do with the lump sum payment is buy one of the new Sony electronic dogs (cost: \$2000) and put the rest of the under his pillow or in an index fund (he doesn't seem to care about the residual - which makes you question his nickname).

$\hookrightarrow$ Of course, this breaks your heart and you begin to think if of a way to get Jr his beloved dog while not exceeding your current PV of promised gifts and maintaining your child's good behavior. You think about it and conclude that promising him perpetuities that pay slightly less than \$100 each year might continue to achieve this last goal. How might you want to restructure your gifts and under what condition would it be acceptable to you?