**ECON 136: Week 10, Wednesday**

**Discounting and Present Value**

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| --- | --- |
| First name | Group |
| Agatha | 1 |
| Alison | 5 |
| Anisa | 5 |
| Betsy | 2 |
| Finn | 1 |
| Ian | 2 |
| Jenna | 4 |
| Jessica | 3 |
| Johannah | 3 |
| Kelsey | 3 |
| Lisa | 4 |
| Liz | 1 |
| Megan  | 4 |
| Sara | 3 |
| Shamial | 2 |
| Simona | 1 |
| Sophia | 5 |

Open up the [assignment spreadsheet](http://serendip.brynmawr.edu/exchange/files/Week%2009%20Friday%20Assignment_0.xlsx) from Serendip and/or the version you submitted in your spreadsheet program.

Open up this handout in your word processing software.

Interest, present and future

“The” interest rate provides a rate of exchange between current and future income and consumption

Put $100 in the bank at 2% interest (APR or annual percentage rate) and one year from now you get back

 $100 + $100x.02 = $100 + $2 = 102

 PV + PV( r ) = PV(1 + r) = FV1

Leave that money in the bank for another year: $102x(1.02) = $104.04

So long as the interest rate stays the same

 FVt = PV(1 + r)t

Where t is the number of years.

Intertemporal opportunity cost

The interest rate, by relating future value to present value, enables me to measure the opportunity cost of present or future consumption.

Suppose prices stay exactly the same between today and tomorrow, then the interest rate allows me to compare how many units of some product I can consume to day with the number I can consume next year (or at some other point in the future).

Suppose

 The price of mp3 downloads (now and next year) is $ .99

 The interest rate is 2%

 My current and future preferred use for an extra $100 is buying mp3 downloads

Then,

 I could afford to buy 101 downloads today or 103 downloads next year.

 The opportunity cost of 101 downloads is 103 downloads foregone next year.

The opportunity cost of 103 downloads next year is delayed gratification – not having 101 downloads now

Income today and in the future combined with the interest rate creates an intertemporal budget constraint

Present value

Consider a more complicated comparison of cash flows over time

 You invest $2,000 now, receive 3 yearly payments of $100 each, plus $2,500 in the 3rd year.

Comparing contemporaneous values of income or consumption in different periods is no different than comparing dollars to yen or apples to oranges. We need a consistent and common basis for comparison. Most commonly we use the present value

If FVt = PV(1 + r)t

Then

 $PV= \frac{FV\_{t}}{(1+r)^{t}}$

 100 = 104.04/(1.02)2

Homework Problem 1

You invest $2,000 now, receive 3 yearly payments of $100 each, plus $2,500 in the 3rd year.  The interest rate is 10%.   Find the net present value of the investment.

|  |  |  |
| --- | --- | --- |
|   | Contemporaneous | Present |
| Year | Value | Value |
| Now | -$2,000 | -$2,000.00 |
| 1 | $100 | $90.91 |
| 2 | $100 | =C6/(1+0.1)^B6 |
| 3 | $2,600 | $1,953.42 |
|   |   |   |
|   | **NPV =** | **$126.97** |

Homework Problem 2

You invest $2,000 now, receive 4 yearly payments of $300 starting in year 2, plus $2000 in year 6.   The interest rate is 10%.   Find the net present value of the investment.

|  |  |  |
| --- | --- | --- |
|   | Contemporaneous | Present |
| Year | Value | Value |
| Now | -$2,000 |   |
| 1 | $0 |   |
| 2 | $300 |   |
| 3 | $300 |   |
| 4 | $300 |   |
| 5 | $300 |   |
| 6 | $2,000 |   |
|   |   |   |
|   | **NPV=** |  |

Changing the Interest Rate

Changing the Pattern of Costs and Benefits