Reasons why we do not use the risk approach calculations:

- The "risk" involved has every special time profile which projects in general may not exhibit;
- If the normal economic view of risk as variance around an expected outcome is taken, the procedure doesn't deal with risk at all, but rather only with calculating the expected value of the outcome.

CH #3- INVESTMENT APPRAISAL: DECISION-RULES

Discounted Cash Flow Analysis in Practice

Mechanical calculations can now be performed at will, which has theenormous advantage of allowing more project options and alternative scenarios to be consideredthan ever before. However, it should not be assumed that the PC spreadsheet program can assist in the design or setting-up of the framework for the project analysis.

Common to all DCF analysis is the conceptualization of an investment project as a net benefit stream as measured by a "cash flow". Economists define an investment in terms of the decision to commit resources now in the expectation of realizing a flow of net benefits over a reasonably long period in the future. When resources (funds) are given up now, as investment outlays, the "cash flow" negative indicates that there is a net outflow of funds. Once the project begins operations, and benefits (revenues) are forthcoming, the cash flow becomes positive (hopefully), indicating that there is a net inflow of funds.

The process of project appraisal and evaluation can be considered in terms of three aspects of cash flow analysis:

1. Identification of costs and benefits
2. Valuation of costs and benefits
3. Comparison of costs and benefits.

Discounting and the Time Value of Money

There is a need for **discounting** when comparing any flow of funds (costs and revenues or benefits) over time. To consider the process of discounting in practice, consider two investment projects, A and B. The net cash flows of these projects are given as:

Year	**0**	**1**	**2**	**3**
Project A	–100	+50	+40	+30
Project B	–100	+30	+45	+50

If project years are also calendar years, then all costs and benefits accruing during that year are assumed to accrue on 31 December of that year. Therefore, any costs or benefits accruing in the course of the next year, "year 1", are also assumed to accrue on 31 December of that year; i.e. one year from year 0. Similarly, "year 2" refers to two years from year 0, and so on. Of course, there is no reason why the chosen time period need be a year. It could be a quarter, month, week or day – the same principles hold whatever the time period used, but then of course the (annual) discount rate would have to be adjusted accordingly.

Our task is to compare projects A and B. Which would you prefer? A and B both havetotal costs of $100, but A's benefits total $120 while B's benefits total $125. Can we say that B is preferred to A because $125–$100 is greater than $120–$100? Obviously, not as this calculation ignores the *timing* of cash inflows and outflows: they are not the same. We need to discount all future values to derive their equivalent **present values**.
How do we accomplish this? From the previous Chapter we saw that we need to derive the appropriate **discount factor**. What is the present value (PV) of $100 a year from now assuming a discount rate of 10% per annum?

PV = $100 × 1/1.1 = $100(0.909) = $90.9

The value "0.909" in this example is the discount factor. It tells us the amount by which any value *one year from now* must be multiplied by to convert it to its present value, *assuming adiscount rate of 10% per annum*.

Using Annuity Tables
When an investment project produces a cash flow with a regular or constant amount in each year it is possible to calculate the present value of this stream more easily using an **Annuity Table**. Annuity Tables provide us with the values of the cumulative discount factors for all discount rates and years.

Annuity Tables can be used to calculate the PV of a stream of equal annual net benefits occurring over a subset of consecutive years during a project's life. For example, a project may have equal NCF for years, say, 5 to 10 of its life, and different NCF in other years. In this case Annuity Tables can be used for years 5 to 10 and Discount Tables for other years.

Using Investment Decision-Making Criteria

The Net Present Value (NPV) Criterion

The NPV of a project simply expresses the *difference between* the discounted present value of future benefits and the discounted present value of future costs:

NPV = PV (Benefits) – PV (Costs).

A positive NPV value for a given project tells us that the project benefits are greater than its costs, and *vice versa*.