$$NPV(k) = \sum_{j=0}^{k} \Pi_j \, v_r^j$$

$$v_r = \frac{1}{1+r}$$

3. Profit margin: is the ratio of the NPV to the (expected) present value of future gross premiums.
4. DPP: discounted payback period, (break-even period), is the lowest m such that

$$\sum_{k=0}^{m} \Pi_k \, v^r = 0$$

- To calculate the DPP, we must discount each profit starting with year 0 and cumulatively sum the up in the order of the years until we get a non-negative result.

5. Zeroization: of reserves means setting the reserves so that the profit is 0 in each year except the first.

Handling multiple-state models

Process:

1. Calculate net cash flows per policy in force at beginning of each year for each non-terminal state. For the benefit cash flow, calculate the probability of each transition out of the state times the benefit paid for transition out of the state, and sum it up.
2. Calculate profits per policy in force at beginning of each year, $Pr_t^{(i)}$, for each non-terminal state. The profits per policies are the net cash flows minus the increase in reserves. The increases in reserves are the sums of the probabilities of transition to each state (including the starting state) times the reserve in each state, minus the starting reserve in the starting state raised at interest.
3. Calculate the profit signature components Π_t as weighted averages of the $Pr_t^{(i)}$; weight the profits with the probability of being in that state. For t>0: $\Pi_t = \sum_{i} {}_{t-1}p_x^{0i} \, Pr_t^{(i)}$