Defined Contribution Pension Plan Modelling with "SIMULINK"

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Abstract. The aim of the article is to adapt algorithms for private pension fund additional capital valuation to real time model and to estimate acquired model. We found that in most papers about DC plans are assumed that contributions are defined as fixed part of salary. From one point of view it is very essential because in such assumptions are taken in account grow of yearly salary (according rose of inflation and work experience). Of course from other view we can argue that in such assumption is not observed possible dynamic changes on this fixed percent of salary (According to our assumptions people are ready to pay more money or higher percent of salary when age of retirement is closer).

Blake, Cairns & Dowd have done substantial contribution in this are. In [1] they look on stochastic model in discreet time. They define dynamic of fund as:

$$F_{t+1} = (1 + i(t+1))(F_t + C(t)) \qquad (1)$$

where:

F_t – accrued pension capital at defined time moment

$C(t) = k \cdot S(t)$ – yearly contributions

k – predefined part of annual salary function $S(t)$. This function is stochastic and correlated with investment return

$i(t+1)$ – investment return at defined time moment.

We assume that at the time moment T member of pension plan has reached retirement age x. Then $F(t)$ can be used for purchase of life annuity according current prices on moment $T - a_z(T)$. The price of annuity is dependent of current interest rates $i(T)$ and from current mortality figures. Our aim is to find the stability condition of the future pension capital by the "SIMULINK" procedures.

References

1. Blake D., Cairns A.J.G., Dowd K. Pensionmetrics: Stochastic pension plan design and value at risk during the accumulation phase // Insurance: Mathematics and Economics, 29 - issue, 2001 – p. 187-215.