Asset liability management for Tanzania pension fund

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Introduction

- **Pension** is a generic term for periodic payments which replace the former income in case of reaching a certain age, disability or death of the employee. Pension funds are companies which give pensions.

- **Contributions** is the amount that a member contribute to the fund. It is expressed as a percentage of salary. The percentage is called contribution rate.

- **Defined benefit pension plan** The defined benefit plan specifies a level of benefit, usually salary in relation to the near retirement (final salary), or to salary throughout employment (carrier average salary plans). This level is usually defined according to a benefit formula as a function of the final salary or years of the service. Financial risk associated with defined benefit are borne by plan sponsor. A sponsor is obliged to provide adequate funds to cover the expected benefit (liabilities).
Introduction

- **Asset value** is the investment expressed in market value.
- **Pay-as-you-go pension system** is the system in which the retirement benefits are financed by contributions collected from current workers.
- The **motivation** of our problem is the demographic changes taking place in Tanzania and is expected to continue changing.
- We project a long term planning horizon of 50 years.
Figure: Pension fund population process
Pay-as-you-go defined benefit pension fund

Figure: Pension fund population process
Increase life expectancy

- The fund faces an increase of life expectancy of the members
  - the table below shows

**Table:** Life expectancy of members at different time, by age and sex

<table>
<thead>
<tr>
<th>Year</th>
<th>Men At 20</th>
<th>Men at 40</th>
<th>Men At 60</th>
<th>Women At 20</th>
<th>Women At 40</th>
<th>Women At 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>54.6</td>
<td>37.5</td>
<td>20.8</td>
<td>55.7</td>
<td>39.1</td>
<td>22.2</td>
</tr>
<tr>
<td>2038</td>
<td>57.1</td>
<td>39.2</td>
<td>21.8</td>
<td>58.1</td>
<td>40.4</td>
<td>22.9</td>
</tr>
<tr>
<td>2063</td>
<td>59.7</td>
<td>41.0</td>
<td>22.9</td>
<td>61.2</td>
<td>42.5</td>
<td>24.2</td>
</tr>
<tr>
<td>2088</td>
<td>61.8</td>
<td>42.6</td>
<td>23.9</td>
<td>63.6</td>
<td>44.2</td>
<td>25.4</td>
</tr>
</tbody>
</table>

- Implies the benefit payout will increase
- **Motivation:** We project to see the effect of increased life expectancy of members to the fund.
- We assume the entry age is 20 and retirement age is 60
Using the initial population 673,959, then we project the fund population.

Figure: Members growth
Retirees

- The projected retirees

**Figure:** Retirees growth
The projected members to retirees ratio is

**Figure:** members to retirees ratio
The system is inter-generation contract. Current members contributions’s are used to pay current retirees benefits. The cash flow is given by

\[ N_t = C_t - p a_t \]  

The cash flow trend is as shown

Figure: Cash flows
At the horizon it shows that the asset will only cover 30% of the liability.

Figure: Projected asset to liability ratio
Cash flow to asset value ratio

Figure: Projected cash flow to asset value ratio
Increase the contribution rate to 25 % after 20 years

- Asset value to Liabilities ratio

Figure: Projected asset value to liabilities ratio
Increase the retirement age to 65 years after 20 years

- Active members to retirees ratio

Figure: Active members to retirees ratio
Motivation for using stochastic programming

- The fund is affected much by increased life expectancy
- The alternative reformation does not guarantee permanent solution
- The asset value to liability ratio is decreasing
- In long future, the net cash flow is decreasing
- Increasing Interest rates does not save on side of net Cashflow
- We build a stochastic programming model for Tanzania pension funds using the existing regulation and policies.
Tack så mycket!

Thank you!