# Life Insurance Report and Results Comparison

## Agam Case Study

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**Abstract: This report consists of a detailed explanation of the life insurance excel sheet with its implementation details,the relation -ships between the fields and the comparison of the results. The given life insurance policy has an initial premium of 100,000 USD with a term length of 40 years(max), it starts when the person is 60 years old and has defined fee structure.**

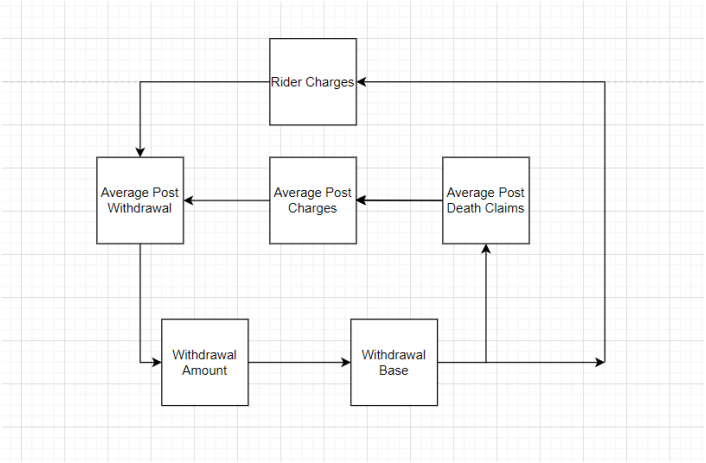
***Introduction***

### *1. Basic Analysis of the Given Report*

The insurance variables are defined in the report with Initial premium being $100000, step up rate being 6%, step up period being 10 years, rider charge is 0.85%, first withdrawal age being 70 years, annuity commencement age being 80 years, last death age is 100 years, mortality is 0.5%, withdrawal rate being 3%, fixed allocation funds automatic rebalancing target being 20% and risk free rate is 3% with 0% as volatility. The report calculates different fund values yearly with different charges/fees including and excluding. Returns from the plan are also calculated, withdrawal amount and withdrawal base are calculated for each year respectively. After 10 years, the rider is involved who gets continuous returns based on the value of fund at particular time(here it is 10 years). The report also shows the charges of the term plan and the net return the user/buyer can get.

### 2.*Relationships between Variables/ Columns*

In the report, some columns show that they are related to each other in a circular fashion. These columns are average post withdrawal, average pre-withdrawal, rider charge, average post-death claims, average post charges, withdrawal amount and withdrawal Base. The other columns/fields are derived or calculated using these fields. The circular relationship between them is shown below.




### 3. *Implementation Details*

The fields which are in a circular relationship are calculated using a recursive approach where they are passed and calculated iteratively until one of them converges to a particular value. After calculating these variables, one of the values is directly saved and then the rest of the values are calculated. The other columns are either independent or

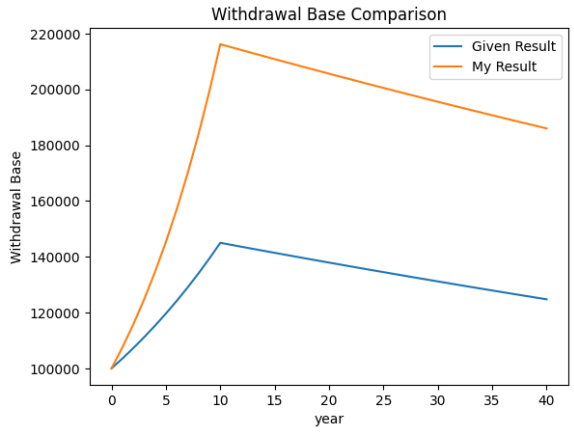
they are calculated using these fields, for each of them a function is written which takes input parameters and computes the value. Different classes are built that hold various values/fields, like Insurance class is defined that holds all necessary features of the insurance, charges class is defined that stores details of any product/life insurance.

**Improvements in Implementation:**

The entire code can be further divided into subsegments and classes, For example "LifePay Plus Rider " class can be created which would contain the fields associated with it(as structured in the report). A utility class can be designed which would contain all the functions(formulas) for calculating different fields. Fund class can be created for calculating different kinds of funds.

***Results and Comparisons**:*

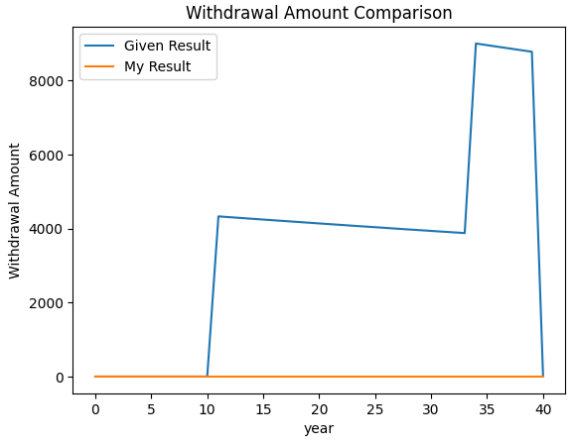
(i) Withdrawal Base comparison: The withdrawal base for the given report and my report have been plotted in the below figure:




The two show similar curves, only the difference is that in my case, withdrawal base is large as compared to the one given in the report, after the step up period withdrawal base starts decreasing in both cases.

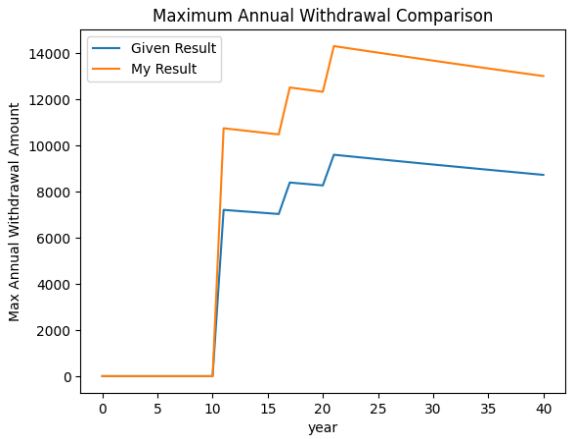
(ii) Withdrawal Amount Comparison

The withdrawal amount for the 2 cases have been plotted below.

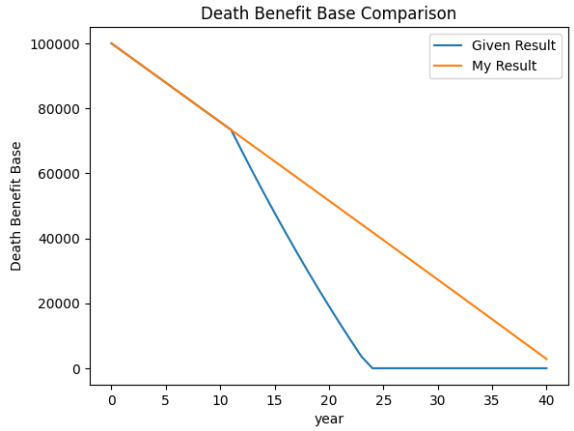



In the case of the actual report, withdrawal amount overall increases and goes to 0 as term length is complete but in my case, its always 0,this is because of the recursive function in which withdrawal amount always converges to 0.

(iii) Max Annual Withdrawal Amount Comparison: In both the cases, max annual withdrawal follow the same characteristics only the difference is that in my case the amount is greater because of the fact that withdrawal base is large here. The results are plotted below:




(iv)Death Benefit Base Comparison: The result for the 2 cases are plotted below:

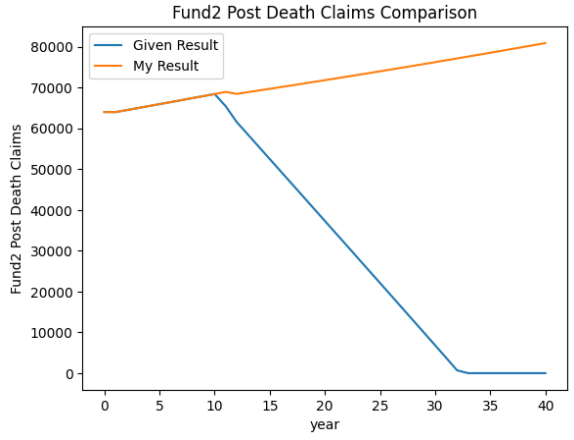



In the actual report, after some period of time, it starts decreasing at a much faster rate while in my case, it is decreasing linearly.

(v)ROP Death Base: It is the same in both cases.

(vi) Fund2 Post Death Claims:

This field is plotted below for the actual case and my case:

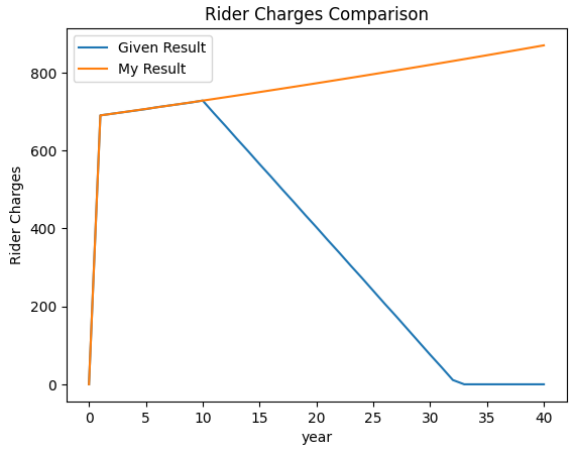



In given case, it goes to 0 but in my case it keeps increasing as it indirectly depends on the withdrawal base which becomes very large during the step up period.

The same relationship is mimicked by fund1 post death claims, fund1 post rebalance and fund2 post rebalance, average post death claims, average post charges, fund1 post charges, fund2 post charges, average post withdrawal and its corresponding fund1 and fund2 component, average pre fund and its corresponding fund1 and fund2 component.

(vii) Death Payments : This comes out to be same in both the cases

(viii) Rider Charges for the 2 cases is plotted below:




Till the step up period in both the cases it follows the same characteristic while in my case it keeps on increasing after the step up period as it is calculated using average post withdrawal and it also keeps increasing. The above characteristic is followed by M&E charges as well.

***Conclusion:***

Due to the circular relationship between some variables there is difference between the given report and the generated report(my report). This is due to the fact that withdrawal base doesn't converge to the value given in actual report but at a larger value which makes other fields/variables to follow other characteristics than the characteristic followed by variables given in actual report.