

- *Subject-Model Documentation Analysis*
- **Subject Code-PUSASQF503**
- **Roll no.-710**
- **Date-20/10/2021**

Summary Report

Q2.

A. Purpose of the project and Data

Purpose

Pete is the chairman of Hilltop, a children's charity and one of our clients. The balance sheet of Hilltop showed a deficit as at 1st January 2020. On 1st January 2020, Hilltop launched a new campaign through which it aims to increase its profile. Pete expects to receive significant new donations, which should ideally help Hilltop to reduce its balance sheet deficit.

The donations will continue as long as the campaign continues. Pete would like QC Ltd. to assess the position of his balance sheet after 15 years and whether the charity's campaign is enough to provide sufficient donation.

Pete was informed that the campaign's donations aren't enough to move out of a deficit hence he wants us to undertake investigation for 2 scenarios-

- What level of additional donation would be required at the start of the year 2020 such that when they increase in line with inflation to the end of 2035, the deficit comes down to zero?
- What level of investment returns would the assets need to achieve for the deficit to be 0 in 15 years? This return would be additional to the NBI yields and would be fixed.

Data

The data provided to us contains the details of balance sheet items of Hilltop including-

- Present value of liabilities as at 1st Jan 2020
- Value of assets as at 1st Jan 2020
- Anticipated donation for 2020 which will increase with inflation
- Anticipated annual outgo

The statistics department at QC Ltd. has provided-

- Forward yields for NBI for each of the next 15 years with an effective date of 1st January 2020

The data has been checked for reasonableness by checking the count of the entries to be 15. Minimum, maximum and average values of the given data are also computed and they seem reasonable. Overall, the provided parameters and data look okay.

The trends of the forward yield and annual outgo are plotted which seem reasonable and there is no reason to doubt the figures hence they are left unchanged.

B. Assumptions taken while modelling

1. The data provided by Pete and the statistics department are correct.
2. Inflation is assumed to remain constant each year over the course of the projections.
3. Hilltop's assets are assumed to achieve NBI Index returns in line with their aim.
4. Cashflows are assumed to occur, on average, half way through the year.
5. There are no other annual outgo arising from the new campaign.
6. No other unexpected outgo will arise in the next 15 years which can give rise to a reduction in assets and increase in liabilities. Hence, we are ignoring the possibility of Hilltop campaigning for other causes in future.
7. The investment strategy throughout the 15 years remains constant except for when we are modelling the additional returns scenario
8. The National Bond Index (NBI) is an accurate indicator for the returns on the assets of Hilltop in the next 15 years
9. The anticipated inflation rate is accurate and the donations will increase in line with the expectations.
10. Hilltop will be able to increase the donation amount in the coming years and would be able to achieve it as expected.

C. Methodology

Scenario-1

Campaign's projected deficit

The assets and liabilities of Hilltop are modelled for the next 15 years allowing for receipt of donation, annual outgo and investment returns of the assets.

Assets are project for 15 years in the following manner-

- The assets at the start of all future years are equal to the assets at the end of previous year
- The investment returns are computed as- $(\text{Assets at the start of the year} - \text{half of the outgo} + \text{half of the donation}) * (\text{year's investment return})$
- The expected donation for year 1 is equal to the expected start of the year level. After this, it is increased in line with inflation for each subsequent year.
- Value of asset at the end of the year = $\text{Value of the asset at the end of the previous year} - \text{Expected outgo} + \text{Expected donation} + \text{Expected investment return}.$

Liabilities are project for 15 years in the following manner-

- The expected outgo is provided by Pete
- Liability at the start of the year is as provided by Pete
- Interest on liabilities = $(\text{liability at the start of the year} - \text{half of the outgo}) * \text{that year's interest rate}$
- Liabilities at the end of the year = $\text{Liabilities at the start of the year} - \text{Outgo} + \text{Interest}$

The deficit at the start and end of the year are calculates as the liabilities minus the assets at each point in time and projections are made for 15 years.

New donation target

A new donation target is required such that the deficit at the end of year 15 is 0. For this the liability projections remain the same as the campaign projections scenario. However, the donation amount changes and hence the asset value changes so as to give a deficit of 0 at the end of 2035. The new donation amount is computed by setting the deficit at the end to 0 by using goal seek and altering the donation level.

Additional Returns

The next scenario requires us to compute additional returns that would arise as a result of an increase in the risk in the investment strategy. The donations are as before and increase in line with inflation. The liabilities remain the same as with the campaign scenario.

The investment returns are computed again which now has two components, the returns linked to the NBI Index as before and an additional return component. The additional yield is computed using goal seek by setting the deficit at the end of 2035 to 0.

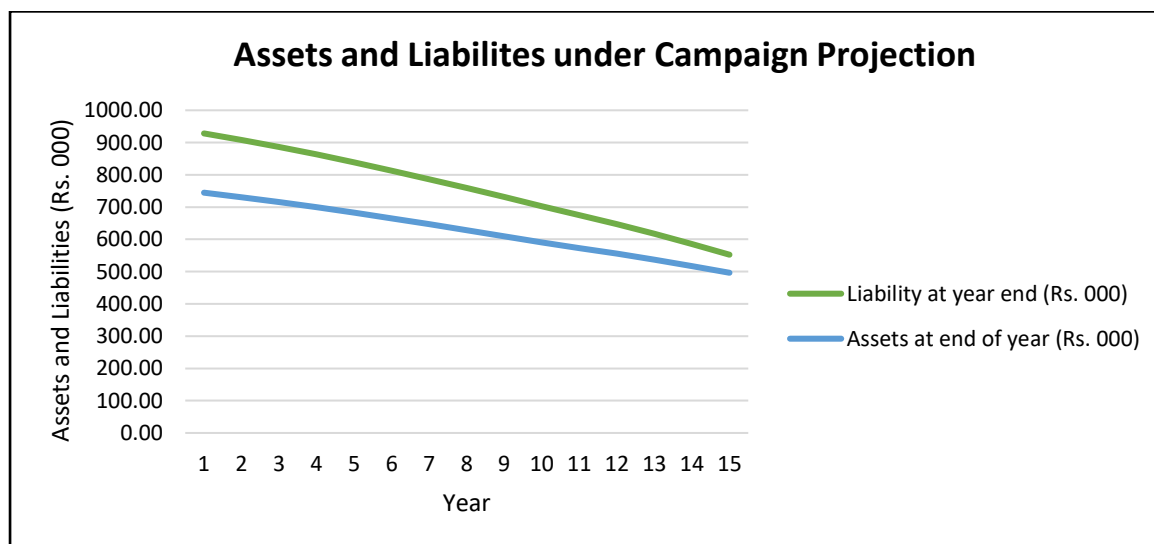
Q3.

A. Results of Various scenarios: Including comments, charts and conclusions

Results

Campaign's projections:

The following graph shows the projected assets and liabilities under **the campaign projection** for the next 15 years.



- As observed in the graph, the liabilities are always higher than the assets for Hilltop. This implies that hilltop is in a position of deficit for all of the future years.
- At the end of the 2035, Hilltop's deficit stands at 56k which is lower than the deficit at the start of 2020 which is 190k. This implies that the assets have reduced slowly over the years.
- The fall in assets is slower than in liabilities due to the existence of donation income and the investment returns.

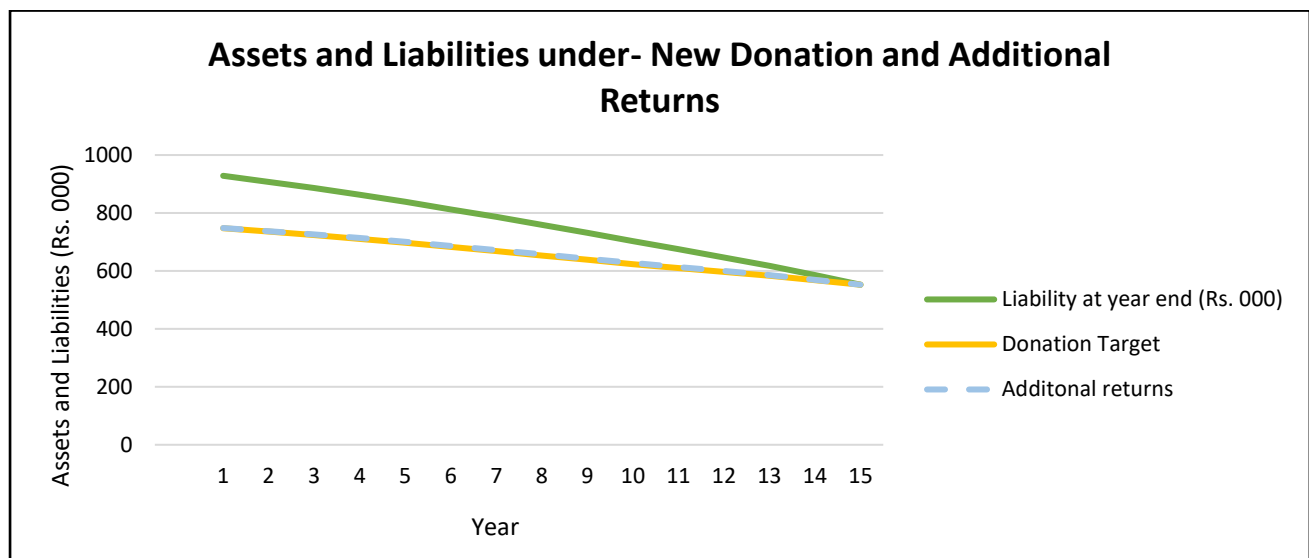
New donation target

In order to set the deficit at the end of 15 years to 0, the new donation target has to be set. The new donation at the start of the year is 12.6k which is an increase of 2.6k from the original amount of 10k. The additional donation of 2.6k when adjusted for inflation and investment returns comes out to be 56k which is equal to the amount of the deficit that must be eliminated. ($2.5\% + 2.5\% = 5\%$, average duration is received in 7.5 years, *therefore* $2.6k * 15 * 1.05^{(7.5)} = 56k$)

Additional Investment returns

In order to set the deficit at the end of 15 years to 0, with donations at the same level as in the campaign scenario, an additional yield has to be earned. On computation, this additional yield came out to be 0.4724% as a constant rate every year. This small increase is enough to cause a fall in deficit to 0.

The following graph compares the projected assets under the new donation and additional returns scenario with the liabilities under each case for Hilltop-



As observed in the above graph, all figures eventually meet since assets become equal to liabilities when deficit is 0.

The liabilities are unchanged in both the cases.

All the three lines show a downward sloping trend but the reduction in assets is slower due to the existence of donations and investment returns.

It is worthy to note that the additional donation and investment returns both cause an equal impact on the assets of the company since in both the cases the same amount of deficit is brought down to zero. This is why the lines in the graph coincide as the assets become equal.

Conclusion

- Initial donations of 10k are insufficient to cover the deficit at the end of 15 years
- There either has to be an increase of 2.6k in the level of donations or an additional yield of 0.4724% has to be earned every year in order for deficit to be 0
- The actual movement of the cashflows and the position of the deficit will depend on the actual outcomes in the next 15 years, especially of the investment movement.

B. Next steps

1. The data should be confirmed to make sure it is accurate especially the assumption of investments growing in line with the NBI index.
2. The risk appetite of the company should be assessed to ensure that they are willing to take on the additional risk that comes with the additional returns' scenario.
3. Market study should be conducted to make sure that if the donation level is increased then people would still be willing to donate to the charity.
4. The possibility of new campaign and hence new outgo and donation must be incorporated in the model.
5. One off outgo must be included to give a clear picture of how the balance sheet would perform under stress scenarios
6. Tax implications must be taken into consideration
7. Allow for inflation rates to vary over time so that it gives a more realistic picture of the donation's amount in real terms
8. The time period should be reduced to see the level of donation that can give a deficit of zero earlier and maybe even a surplus by the end of 15 years.
9. Changes in the pattern of donation receipt because of positive and negative factors such as pandemic, holiday season, increased awareness, etc
10. Change the parameters in order to test the sensitivity of the figures.
11. Obtain a peer review of the work conducted so far.