

Proposal for Pediatric Health Centers in Uganda

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Abstract—Pediatric health has been linked to the continued welfare of a population, and measures promoting it can lead to significant positive social outcomes, which is especially needed in third world countries like Uganda. While the methods of building and maintaining infrastructure related to pediatric health are well established, there lies a problem of such infrastructure requiring a significant amount of resources. We aim to build a fund that will properly address the necessary accumulation of the resources required for a pediatric health facility and 15 satellite clinics within a 100 mile radius of the city of Kampala, Uganda. This will be done with an endowment fund, the initial start up investment of which will be provided by the Bill and Melinda Gates Foundation. In doing so, this money will be put towards the purpose of building a self maintaining institution regarding pediatric health needs in and around Kampala, Uganda.

I. INTRODUCTION

Children’s health is a significant concern in Uganda, resulting from various negative factors like HIV, malnutrition, lack of sanitation, vaccinations, insufficient drugs, and an insufficient number of motivated healthcare workers. Therefore, enhancements on local healthcare situation are meaningful to the local development and people’s life quality improvement.[1]

On solving this task, we simulated the situation of establishing sustainable pediatric healthcare facilities in Uganda driven by a grant from the Bill and Melinda Gates Foundation, including a central medical facility and fifteen satellite clinics staffed with employees like doctors, physician assistants, facility managers and janitors.

In this report, a robust financial strategy is introduced, which encompasses the project cost estimation, long-term investment strategy and post-project plan to ensure continuous operation. The investment portfolio is constructed and evaluated based on simulation results aligned with the historical risky asset pricing data. According to the simulation, the portfolio highly outperforms the SPY benchmark in actual data during our first year and the proposed investment strategy is theoretically able to ensure permanent operation on the constructed facilities.

II. RESULTS

We observe in Figure 1 that not only will our planned investment portfolio provide necessary and sufficient resources for the building and maintenance of this operation with the initial funding of 95 Million USD from the Bill and Melinda Gates Foundation, but also for the continued funding and growth of our base endowment fund. We see here an expected positive trend for our investment portfolio, and for our overall operations. The initial gain is the actual gain of the portfolio so far in 2023, while the subsequent years’ gains are calculated

using an expected 10.5% gain for our chosen portfolio to be reallocated. This initial trend culminates at the end of the first 10 year period, at which point the endowment is repaid, but by then enough capital gains have been reinvested that continued growth is possible, despite costs.

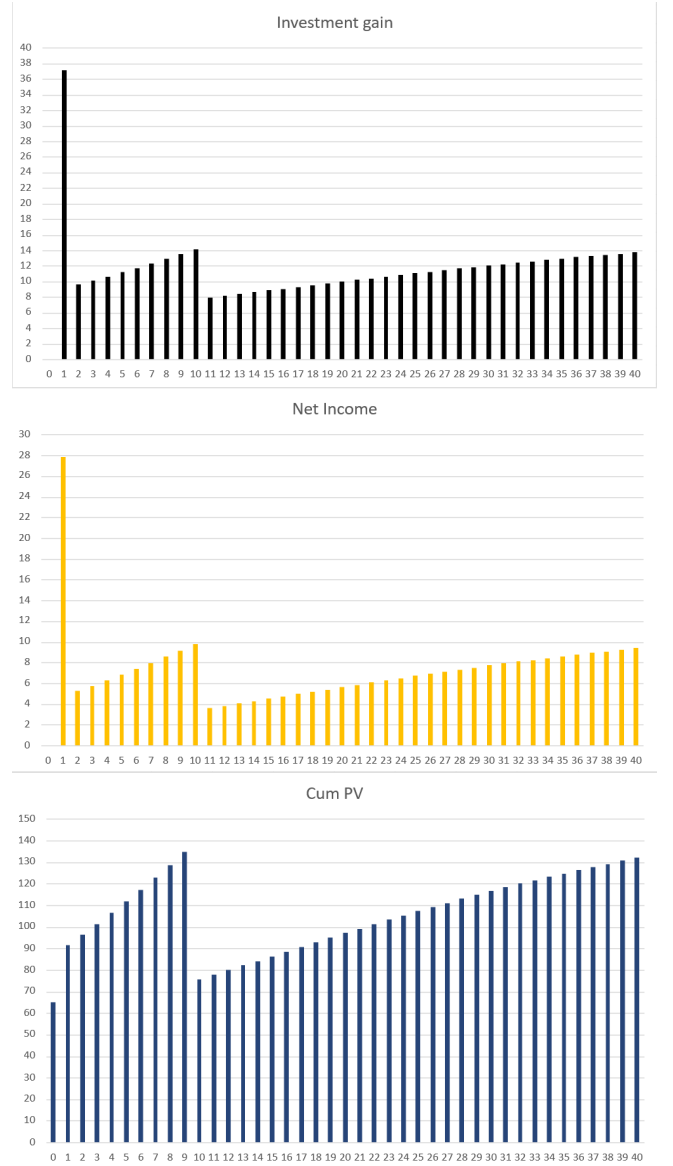


Fig. 1. These graphs show the expected trends through time for the investment gain of our portfolio, eventually transferred to 30 Year Treasury Bonds after the initial 10 years, the Net Income over a period of the first 40 years of this operation which takes into account the costs of the operation, and the Net Present Value of our operation at every year over the next 40 years which shows consistent growth even when costs are factored in.

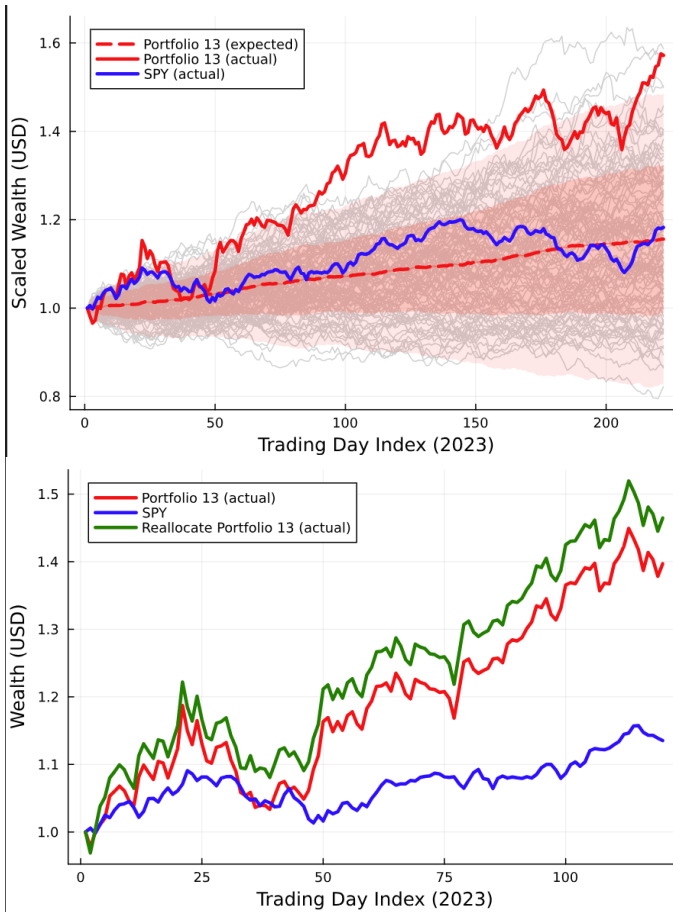


Fig. 2. We see that for the first year, our investment portfolio greatly exceeds our expectation and thus also our need. Dynamic reallocation is imbued into the portfolio among stocks of AMD, NVIDIA, Microsoft, Intel, Google, and Amazon. We also see from the top graph that this portfolio has an expected excess return of about 5.5% or a total expected return of 10.5%

III. DISCUSSION

The discussion should be three paragraphs (or less). We see that our strategy provides an action plan for this operation. The initial seed fund will provide the required funds to get the operation up and running, which we estimate to take about 1 year, after which we will assume normal operation. During the first 10 year period we will address the pediatric health needs of the local population while reinvesting any funds gained from our portfolio performance that was not used to cover the cost of operations into our portfolio. We designed this strategy so after 10 years, the funds provided by the Bill and Melinda Gates Foundation can be repaid in full.

Our chosen portfolio had an expected return of 10.5%, but it outperformed on the first year, reaching a 57% yield and significantly beats SPY. For investment return calculation, we used the actual return (57%) for the first year and expected return (10.5%) throughout the rest of the nine-year period. After 10 years, we realized that we can still keep the growth by investing (and re-investing) our excessive money in the US Treasury bond. As stock markets are volatile, and the stock movements after ten years are quite hard to predict, a lower-risk US Treasury bond option seems to be a safer choice as

the project continues. Therefore, we decided to invest all of our excessive money in the US Treasury bond when the 10-year period is over. The reinvested funds are pooled into 30 Year US Treasury bonds to provide a consistent return that will continue to cover the costs of operation. This 'risk-free' fund will also follow the same strategy of covering costs of operation and subsequent reinvestment, and is expected to still return a net positive growth in our available funds even after taking costs of operation into account.

There is however a concern for an exponentially growing costs. A long term project such as this that increases the well being of people by such a wide margin can have a positive social impact that results in the upwards development of a nation, which in turn would lead to staff needing to be paid more as time goes on as they would eventually no longer be paid salaries expected of workers in a third world country if our project helps Uganda develop and no longer be a third world country. We attempt to supplant the negative consequences of this possibility with a growing income even after the initial 10 year period.

IV. MATERIALS AND METHODS

We compiled a number of sources to determine the costs of building and maintaining this operation. The building and supplying of all infrastructure was understood to be an initial cost of 5 million USD. The cost of labor for doctors, physicians, secretaries, janitors, hospital administrator, medical malpractice insurance, and the operation of a central hospital, along with the operation of the clinics at the understood 10,000 USD a month totals to a yearly expense of just under 4.35 million USD.

For the operation of the portfolio, we chose various the stocks of various stable firms with histories of high performance. We implemented these stocks into a dynamic reallocation scenario, and accounted for the fact that we will pay back the face value of the seed fund generously provided to the Bill and Melinda Gates Foundation after a course of 10 years. Upon this, the remaining reinvested funds will be allocated towards into 30 year US Treasury Bonds which currently show an return interest rate of 4.750% in order to provide a continuous 'risk free' source of funding for our operation.

V. DATA AND MODEL AVAILABILITY

The model equations were implemented in Julia and the needed resources were calculated with an amalgam of resources that were compiled in the Ugandan Endowment Data Microsoft Excel sheet. The model code and Excel sheets are available at https://github.com/trs-code/CHEME-5660-Ugandan-Endowment-Fund-Jonathan_L-Tafadar_S-Ningyuan_Z

REFERENCES

1. Casimir, G A hybrid model of anaerobic *e. coli* gjt001: Combination of elementary flux modes and cybernetic variables. *Frontiers in Pediatrics* 7, 993–1006 (2019). (July). (23).