MAKERERE UNIVERSITY

COLLEGE OF BUSINESS AND MANAGEMENT SCIENCES

SCHOOL OF STATISTICS AND PLANNING

A REPORT ON THE CASH-FLOW MODEL REQUIRED TO ASSESS THE FEASIBILITY OF A CAPITAL PROJECT

BY

GROUP B

Internship project report submitted in partial fulfillment of the requirements for the degree of
Bachelor of Science in Actuarial Science
at
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We finally thank the Almighty God for his provisions and protection.

CONTENTS

DECLARATION

We hereby declare that this report, written in partial fulfillment of the degree of Bachelor of Science in Actuarial science at Makerere University, is our own work and that the contents of this document has never been submitted at any institution.

All references from which additional information was acquired have been duly highlighted herein.

NAME	SIGNATURE
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APPROVAL

This report has been done under my supervision and is now submitted with my approval to the internship office, College of Business and Management Sciences, Makerere University Kampala

.....	.....
DATE	SIGNATURE

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CHAPTER 1: BACKGROUND

Introduction

The purpose of this internship project is to equip students with the required skills needed in the Actuarial Profession.

Objectives of the Internship Project

- To foster collaboration among students since it is impractical to execute all the required tasks due to the vastness of knowledge required in different fields.
- To provide students with exposure to the techniques and methodologies used in the financial industry.
- To provide an opportunity for students to apply the skills gained in practical settings as working professionals.

Project Background

When a company starts a project, an initial investment is made to facilitate it and the company expects to generate cash inflows greater than the initial investment once the project begins.
The cash inflows should be greater than the cash outflows or initial investment for the company to proceed with the project.
The amount of time it takes for the project to recover the initial investment is called the payback period. The discounted payback period is preferred since it considers the time value of money.

For this capital project, we are dealing with a Covid-19 herbal medicine company opening a new outlet in a large town on 1st May 2022.

A cash-flow model is required to assess the feasibility of this capital project.
The cashflow model is a mathematical projection of the payments arising from the financial transactions during the operation of the capital project.

The project life cycle is expected to span 12 years from 1st January 2021 to 31st December 2032 and projected income is expected to be collected from May 2022 until the end of the project.
The cashflow model will enable the company to project its future cash outflows and cash inflows. Feasibility of the project is probable when the Net Present Value is positive.

The Net Present Value is the difference between the discounted cash inflows and discounted cash outflows. The model will also enable the company to determine the Internal Rate of Return and the Discounted Payback Period of the capital project. These are metrics used to appraise the capital project.

CHAPTER 2: ASSUMPTIONS

The following were assumptions made while building the cashflow model:

1) There are no multiple Internal Rates of Return.

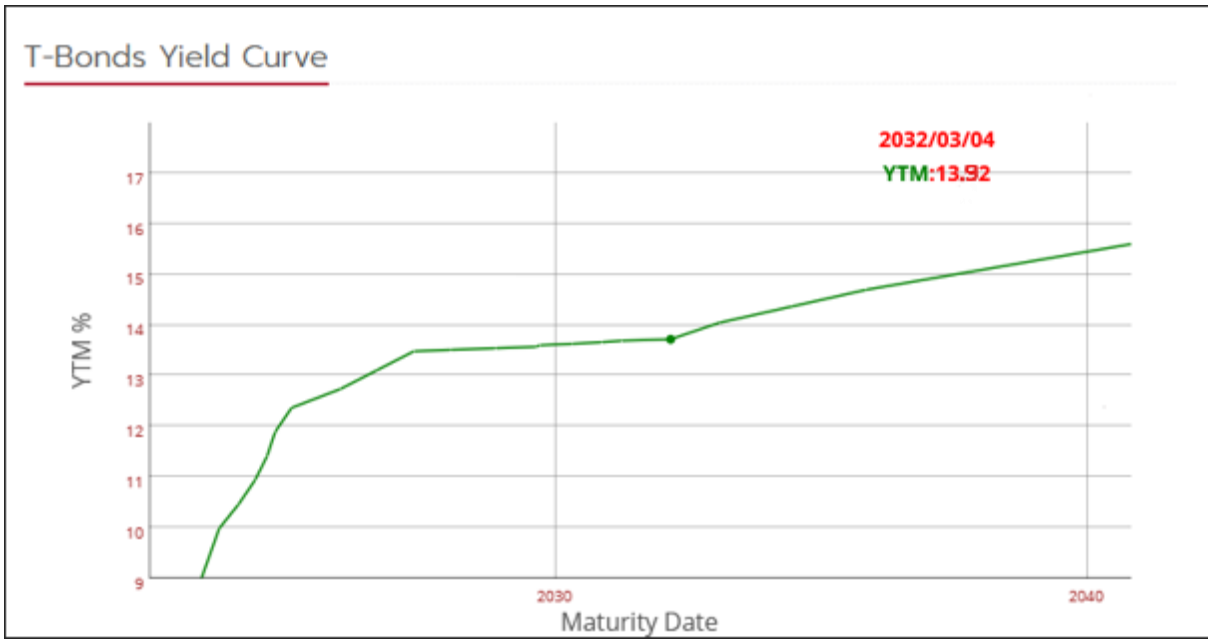
2) The cashflow model projects positive sales throughout the entire period.

3) The risk discount rate taken from the 10-year Uganda bond is fixed at 13.92% as at February 21st 2022 and will not change.

4) Inflation is assumed to be fixed at 2% for staffing and maintenance and fixed at 10% for sales.

CHAPTER 3: METHODOLOGY

The cashflow model used the yield on Uganda's 10-year bond as the risk discount rate of 13.92%.



Required was to construct a Model to calculate the Net Present Value of the proposed store and determine whether the store is profitable.

Cash outflows included Purchase of Premises, Refurbishment costs; and Staffing and Maintenance costs.

Cash inflows were income from sales.

The Net Present Value was the difference between the present values of the cash inflows and cash outflows.

The Present Value of the Purchase of Premises was the same as the cost value since it was incurred at the beginning of the project and required no discounting.

To get the present value of the Refurbishment costs, we had to first compute two discounting factors v and v^*.

$$v = \frac{1}{(1+i)^{1/12}}$$

where i was the risk discount rate.

The formula used for computing v* was

$$PV(B) = Costs * v^*$$

Where $PV(B)$ $is\ the\ Present\ Value\ and\ Costs\ is\ the\ Refurbishment\ Costs$

To get the present value of the Staffing and Maintenance costs, we had to compute a new discounting factor (d/delta) to cater for the continuous payments. We used the equation

$$PV(C) = Costs * v^* * \frac{d}{\delta}$$

where $d = \frac{i}{(1+i)}$, $\delta = \ln(1+i)$,

$PV(C)$ $is\ the\ Present\ Value\ and\ Costs\ is\ the\ Staffing\ and\ Maintenance\ Costs$

From September 2022, in order to account for inflation

$$Costs = Staffing\ and\ Maintenance\ Costs * (1 + i^*)^{n/12}$$

where i^* is the rate of inflation, n is the number of months from September 2022.

To get the present value of the sales, we had to first compute the income per month.

$$Sales = Tins\ of\ herbs\ sold * Price\ Per\ Unit$$

Sales income was received continuously.

$$PV(D) = Sales * v^* * \frac{d}{\delta}$$

Where $PV(D)$ $is\ the\ Present\ Value\ of\ Sales$

Net Present Value was calculated from

$$NPV = PV(D) - [PV(A) + PV(B) + PV(C)]$$

Cumulative Cash inflows were calculated from $PV(D)$ starting May 2022.

The Discounted Payback Period to the nearest month, was calculated using

$$DPP = Number\ of\ months\ before\ recovery\ month + \frac{(Initial\ Investment - Cashflow\ before\ recovery\ month)}{Cashflow\ during\ recovery\ month}$$

$$Initial\ Investment = \sum PV(A) + \sum PV(B)$$

The Internal rate of return was calculated using the goal seek function in Excel. The NPV was set to zero and the corresponding risk discount rate i calculated.

When the company assumed that the price of a tin of the Covid-19 herb inflated at 10% at the start of each calendar year, with the first increase on 1 January 2025, there was no adjustment for inflation required in the Staffing and Maintenance Costs.

From 1 January 2025,

$$Sales = (Tins\ of\ herbs\ sold * Price\ Per\ Unit) * (1 + i^{**})^{n/12}$$

where i^{**} is the new inflation rate, and
n is the number of months from 1 January 2025.

The procedure is the same for calculating the revised net present value.

Chapter 4: RESULTS AND DISCUSSIONS

a) Table of Results

Particular	Results
Net Present Value	UGX 1,136,977,976
Discount Payback Period	34 months
Internal Rate of Return	60.69%
At inflating prices of a tin of the Covid-19 herb at 10%,	
Revised Net Present Value	UGX 1,556,295,050

b) Discussion

Before any changes were made to the pricing model,

1) The net present value of the store was UGX 1,136,977,976 which is a positive figure. This therefore indicates that the store is profitable.

2) The discounted payback period was 34 months rounded to the nearest month. This is roughly approximately 2.8years which is literally a shorty time hence it's worth undertaking.

3) The internal rate of return was 60.69%

By inflating the price of a tin of the Covid-19 herb at 10% at the start of each calendar year, with the first increase on 1 January 2025;

1) The net present value of the store increases from UGX 1,136,977,976 to UGX 1,556,295,050.

2) The discounted payback period remained 34 months rounded to the nearest month.

Chapter 5: SENSITIVITY ANALYSIS

Sensitivity analysis looks into understanding the relationship between input and target variables. It also looks at the effect of isolated changes in inputs, while scenario analysis looks at situations of significant changes. Usually, we would use scenario and sensitivity analysis together to achieve a more comprehensive understanding of the possible outcomes.

THE BASE CASE OF THE MODEL.

The model is designed for a Covid-19 herbal medicine company. The model was designed to determine the NPV and if the store is profitable, the discounted payback period, and the internal rate of return using Microsoft Excel.

The NPV was calculated using the summation of all the present values after discounting at a rate of 13.92% whereby the summation of the present value of the sales (cash inflows) taking into account the effect of inflation minus the summation of the present value of all cash outflows those are the purchase premises(A), refurbishments(B) and staffing and maintenance (C).

The discounted payback period was calculated by determining the interest rate for the continuous cash inflows in order to discount them and obtain the present value of each cash inflow, and determining at what point the cumulated discounted inflows reached and exceeded the initial investment.

The internal rate of return is 60.69%, because this is the only interest rate that gives an NPV of 0.

ONE AT A TIME (OAT) ANALYSIS.

For the case of changing the input variable we determine how the output variable changes such as for new risk discount rate how would the Net Present Value change and by what percentage. Same goes for the discounted payback period with a new inflation rate.

Originally the risk discount rate was 13.92% with an inflation rate of 2%, the NPV as UGX 1,136,977,976 and the discounted payback period as 33.97 months,

For a new risk discount rate of 18.92%, the NPV changes to **UGX 817,224,147** with a new discounted payback period of **33.55 months**.

The OAT analysis is

input variable	output variable	OAT Analysis
36%	-28%	-78.29%

With a decrease in the risk discount rate to 8.92%, the NPV changes to **UGX 817,224,147** and the discounted payback period is now **35.55 months**.

THE OAT Analysis

input variable	output variable	OAT Analysis
-36%	-28%	78.29%

With a new inflation rate of 3% and a new risk discount rate of 15%, the NPV changes to **UGX 1,246,230,183,** and the discounted payback period becomes **32.54 months.**

THE OAT Analysis.

input variable	output variable	OAT analysis
7.76%	9.61%	123.85%

For a lower inflation rate of 1.5% and the same risk discount rate of 8.92% the NPV is **UGX 1,607,111,628** and the discounted payback period is **32.54 months.**

THE OAT ANALYSIS

input variable	output variable	OAT Analysis
-25%	97%	-386.62%

For the IRR,
a higher inflation rate of 3% would give us a negative NPV of **(UGX 411,904)** while a lower inflation rate of 1.5% would give a positive NPV of **UGX 201,537.**

THE OAT ANALYSIS.
We cannot do a One at a Time analysis for the internal rate of return because of the fact that the output variable (NPV) is meant to be 0 and for the original inflation rate of 2%, the NPV is 0 leaving us with an undefined OAT analysis.

A detailed breakdown of the sensitivity analysis is in the table below.

Dependent Variable	Independent Variable	Case	Rate	Result	Description
NPV	Risk Discount Rate	Increase	5%	UGX 817,224,147	An increase in Risk Discount Rate by 5% leads to a decrease in NPV while a decrease in Risk Discount Rate by 5% leads to an increase in NPV.
		Standard	13.92%	UGX 1,136,977,976	
		Decrease	5%	UGX 1,603,745,923	
DPP	Risk Discount Rate	Increase	5%	36 months	An increase in Risk Discount Rate by 5% leads to an increase in DPP while a decrease in Risk Discount Rate by 5% leads to a decrease in DPP.
		Standard	13.92%	34 months	
		Decrease	5%	33 months	
NPV	Inflation rate on staffing and maintenance costs	Increase	2%	UGX 1,127,138,108	An increase in inflation rate by 2% leads to a decrease in NPV while a decrease in inflation by 2% leads to an increase in NPV.
		Standard	2%	UGX 1,136,977,976	
		Decrease	0.5%	UGX 1,139,284,603	
DPP	Inflation rate on staffing and maintenance costs	Increase	2%	34 months	An increase or decrease in inflation rate by 2% leads doesn't cause a change in DPP.
		Standard	2%	34 months	
		Decrease	2%	34 months	
NPV	Price per tin	Increase	UGX 3,000	UGX 3,567,360,073	An increase in price per unit to UGX 5000 leads to an increase in NPV while a decrease in price per unit to UGX 1000 leads to a decrease in NPV.
		Standard	UGX 2,000	UGX 1,136,977,976	
		Decrease	UGX 1,000	UGX 326,850,610	

DPP	**Price per unit**	**Increase**	**UGX 3,000**	**23 months**	**An increase in price per unit to UGX 5000 leads to a decrease in DPP while a fall in price per unit to UGX 1000 leads to an increase in DPP.**
		Standard	**UGX 2,000**	**34 months**	
		Decrease	**UGX 1,000**	**53 months**	
NPV	**Number of herbal tins sold**	**increase**	**20000**	**UGX 1,638,807,564**	**An increase in the number of tins sold increases the NPV while a decrease in the number of tins sold decreases the NPV.**
		standard	**15000**	**UGX 1,136,977,976**	
		decrease	**10000**	**UGX 635,148,387**	
DPP	**Number of herbal tins sold**	**increase**	**20000**	**30.79 months**	**An increase in the number of herbal tins sold reduces the discounted payback period while a decrease in the number of herbal tins sold increases the DPP.**
		standard	**15000**	**34 months**	
		decrease	**10000**	**40.34 months**	

Chapter 6: CONCLUSION AND RECOMMENDATIONS

a) CONCLUSION.

The company is only profitable if the inflation rate is less than 2%, because all inflation rates greater than 2.00% will give a negative NPV.

The discounted payback period increases with increase in the risk discount rate but with the same inflation rate of 2% and reduces with an increased risk discount rate and an increased inflation rate and vice versa.

b) RECOMMENDATIONS

In order for the company to maintain and realize a high profit profile, it should exercise the following:

1). It should either maintain or increase the price per unit of the herbal tins. Especially when the inflation rate exceeds 2.00%. This will guarantee a high NPV hence a high profit.
This will also shorten the discounting payback period of the company.

2). The company should use some of the realized profits to run promotion campaigns like advertising in order to increase the number of herbal tins sold. This will increase sales which greatly and directly affect the profits of the business.

3). The managers should be keen at tracking the trend of the inflation rates on the market and adjust strategies accordingly since an increase in the inflation rate greatly reduces the NPV of the company's earnings leading to low profits.

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