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ARTICLE

Optimizing the Asset and Liability Management of Telecommunication Company using Goal Programming Model

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ABSTRACT

Since the telecommunications companies experience great competition, high churn rate, data traffic issues during the Covid-19 pandemic and the upgrade to 5G connectivity, the finance management of a telecommunications company should be analyzed to study the volatility and returns in the sector. This paper aims to develop a goal programming model to examine the asset and liability management of a telecommunication company, namely Telekom Malaysia Berhad (TM) in Malaysia. The result of this study shows that TM has achieved all the goals in maximizing assets, equities, profits, earnings and optimum management item while minimizing liabilities over the period of study from 2015 to 2019. Potential improvements on these goals have also been identified through this study. This paper has also contributed to the studies in financial management since past studies have not been done on asset and liability management in telecommunications companies which is rapidly growing and expanding even while the world is suffering from economy crisis during this pandemic.

1. Introduction

The current economy of the world is knowledge-based whereby productivity is enhanced by the sharing of timely and accurate information. This can be made achievable with telecommunication, which is defined as signal transmission and information exchange electronically [1]. Telecommunications industry, consisting of telecommunication infrastructure (fiber networks and telecommunication towers) and network operators (broadband, landline, cloud computing and data center) serves as a bridge that connects humans with humans and humans with machines. As at the end of 2019, the number of active internet users stood at more than 4 billion people across the world. More than 75% of these users are from developing countries [2]. Telecommunications have facilitated computer mediated communication to allow high accessibility to information database and interactions of different levels of employees across an organization. Telecommunication systems allow messages to be encoded, transmitted and decoded [3].

The government of Malaysia, through the Ministry of

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Communications and Multimedia has partnered up with various telecommunications companies in the country to launch and implement the Jalinan Digital Negara (Jendela) plan which aims to transform the country into a high-income digital society. This initiative aims to optimize current infrastructure for broadband, fiber and wireless connections to improve data traffic situations to prepare the country to welcome 5G connectivity in the near future [4]. It is also forecasted that the revenue brought by the telecommunication industry will exceed $9 billion by 2024 [5]. Being one of the selected telecommunication companies under the Jendela initiative, Telekom Malaysia Berhad (TM), is the longest existing telecommunication provider in Malaysia with a very extensive network coverage and offices in many major cities. Moreover, being a listed company under Bursa Malaysia, TM is known for its excellent corporate governance and ethical behaviors to its stakeholders which has positively impacted the company's performance [6].

Telecommunication industry has been experiencing high customer churn rate as the number of players has increased and the market has become highly saturated with the transition of traditional voice and text messages to data-based usages [7]. Even though TM has been dominant in the country, over the years, many new players such as Maxis Communications Berhad, Digi Telecommunications Berhad, Celcom Axiata Berhad and U Mobile Sdn Bhd have entered the industry and segmented the customer base [8]. Moreover, in the current Covid-19 pandemic, remote working has become a norm in the society. Many organizations are moving their working activities, meetings and conferences online which increases the need for telecommunication services. Teachers and students are engaging in online teaching and learning platforms for their daily classes; investors are performing financial transactions using online banking services; governments are sharing information on the number of cases, measures and efforts to contain the virus to the public through their official accounts on social media [9]. Network usage and voice calls soar which then bring down the quality of connection. Consumers, especially business owners and employees place great demand for smooth and unlimited connectivity while telecommunication companies usually offer services with bandwidth caps. As such, telecommunications companies are pressured to be flexible to offer more plans during this period. Such remote working plans have also caused the delay of 5G connectivity delivery which further hampers the future projects and revenue of telecommunications companies [10].

Since telecommunication sector is of tremendous importance, the financial health of a telecommunication company is important to help in future decision making in investments and other financial activities. Financial performance analysis and financial management can be done by interpreting data available in the balance sheet and income statement of the financial statements of a company [11]. Under financial management, the practice of asset and liability management (ALM) to manage a company to coordinate decision making by considering assets and liabilities is often used. The purpose of ALM is to mitigate risk, enhance liquidity and obtain high return from investments [12-13].

Since ALM involves multiple goals, goal programming (GP) model has been proposed to determine the optimal solution. GP is a popular type of multi-criteria decision making (MCDM) model. MCDM involves determining the best solution based on multiple criteria [14-23]. GP model overcomes the limitation of traditional linear programming models which could only solve a single goal. Guijarro and Poyatos [24] used GP model to overcome the limitations of arithmetic and geometric measurements to compute the composite sustainable development goal index. GP has been used for transportation and logistics planning [25,26], supplier selection [27] and location selection [28].

In financial management, multiple objectives have been adopted in developing the GP model, namely total assets, total liabilities, total equities, profits, earnings and optimum management items [29,30]. Based on previous studies, thorough research has not been carried out on the financial management of a telecommunication company using GP model. Therefore, this paper aims to develop a GP model to optimize the financial management for TM based on multiple goals such as total assets, total liabilities, total equities, profits, earnings and optimum management items. The next section of this paper shall be data and methodology, followed by empirical results and finally a conclusion.

2. Data and Methodology

GP model is an improvement from the linear programming model due to the limitation that linear programming is only able to optimize one objective with few linear constraints [31]. In the telecommunications industry, TM is having more than one objective besides maximizing profit in order to satisfy all the other stakeholders such as the administration, competitors, vendors, consumers, stockholders and the public. With resource scarcity problem, TM has to fulfill all these objectives to become more competitive. Therefore, this study shall investigate and optimize the financial management of TM which is

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listed in Bursa Malaysia from the year 2015 to 2019 using the GP model. The goals of the financial management of TM are presented in Table 1.

Table 1. Goals of Asset and Liability Management in TM

Goals	Objectives
1	Maximize total assets
2	Minimize total liabilities
3	Maximize total equities
4	Maximize profits
5	Maximize earnings
6	Maximize optimum management item

In a GP model, the goals shall be expressed as constraints whereby the coefficient of the variable will signify the level of importance of the goal. A higher coefficient value will reflect higher level of significance and vice versa. The GP model can be formulated as follows.

$$minz=w_1G_1+w_2G_2+\cdots+w_iG_i \quad (1)$$

in which i=1,2,3…,n,

subject to

$$\sum_{j=1}^{m}\left(a_{ij}x_j+d_i^--d_i^+\right)=g_i \quad (2)$$

$x_j,d_i^-,d_i^+\geq 0$

where

z = objective functions,

w_i = weightage for i=1,2,3…,n,

d_i^- = the underachievement for i=1,2,3…,n,

d_i^+ = the overachievement for i=1,2,3…,n,

x_j = decision variables for j=1,2,3…,m,

a_{ij} = parameters for decision variables,

g_i = benchmark for i=1,2,3…,n,

d_i^+ and d_i^- are the representations of overachievement and underachievement of the goals which add to the equations. When a goal is to be maximized, goal achievement happens when there is no underachievement value so that the modal value shall be equal to or more than the benchmark value. On the other hand, if a goal is to be minimized, goal achievement is reached when there is no overachievement so that the modal value shall be equal to or less than the benchmark value.

Financial data extracted from the financial statements of TM is represented in Table 2.

Table 2. Financial Data of TM

Goals	Group (RM'000,000)					Total
	2015	2016	2017	2018	**2019**	
Asset	24413	25002	24762	23705	25600	123481
Liability	16374	17169	16995	16689	19047	86274
Equity	8039	7833	7767	7016	6553	37207
Profit	592	613	731	17	557	2511
Earning	1231	1201	1101	376	1300	5208
Total	50649	51818	51355	47802	53057	254680

The coded configurations in developing constraints and equations in the GP model are shown in Table 3.

Table 3. Coded Configurations of the Financial Data of TM

Goals	Group (RM'000,000)					Total
	2015	2016	2017	2018	2019	
Asset	0.024413	0.025002	0.024762	0.023705	0.025600	0.123481
Liability	0.016374	0.017169	0.016995	0.016689	0.019047	0.086274
Equity	0.008039	0.007833	0.007767	0.007016	0.006553	0.037207
Profit	0.000592	0.000613	0.000731	0.000017	0.000557	0.002511
Earning	0.001231	0.001201	0.001101	0.000376	0.001300	0.005208
Total	0.050649	0.051818	0.051355	0.047802	0.053057	0.254680

From equation (2), x_j states the magnitude of each decision variable in each financial year.

Decision variable:

x_1=magnitude of each decision variable in the financial year 2015

x_2= magnitude of each decision variable in the financial year 2016

x_3= magnitude of each decision variable in the financial year 2017

x_4= magnitude of each decision variable in the financial year 2018

x_5= magnitude of each decision variable in the financial year 2019

Therefore, the formulation of the goal constraints in this GP model shall be as follows.

Assets:

$0.024413x_1+0.025002x_2+0.024762x_3+0.023705x_4+0.025600x_5\geq 0.123481$

Liabilities:

$0.016374x_1+0.017169x_2+0.016995x_3+0.016689x_4+0.019047x_5\leq 0.086274$

Equities:

$0.008039x_1+0.007833x_2+0.007767x_3+0.007016x_4+0.006553x_5\geq 0.037207$

Profits:

$0.000592x_1+0.000613x_2+0.000731x_3+0.000017x_4+0.00$

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$0557x_5 \geq 0.002511$

Earnings:

$0.001231x_1+0.001201x_2+0.001101x_3+0.000376x_4+0.001300x_5 \geq 0.005208$

Optimum management item (Total goal achievement):

$0.02649x_1+0.051818x_2+0.051355x_3+0.047802x_4+0.053057x_5 \geq 0.254680$

Assets, equities, profits, earnings and optimum management item shall be maximized while liabilities should be minimized in TM. The deviation variables, both positive and negative, which has to be minimized to indicate high goal achievement, will be included in every constraint to observe the trends of the goals. The GP model is then shown below.

The objective function:

$Minimize = d_1^- + d_2^+ + d_3^- + d_4^- + d_5^- + d_6^-$

Subject to:

$0.024413x_1+0.025002x_2+0.024762x_3+0.023705x_4+0.025600x_5+d_1^- - d_1^+ = 0.123481$

$0.016374x_1+0.017169x_2+0.016995x_3+0.016689x_4+0.019047x_5+d_2^- - d_2^+ = 0.086274$

$0.008039x_1+0.007833x_2+0.007767x_3+0.007016x_4+0.006553x_5+d_3^- - d_3^+ = 0.037207$

$0.000592x_1+0.000613x_2+0.000731x_3+0.000017x_4+0.000557x_5+d_4^- - d_4^+ = 0.002511$

$0.001231x_1+0.001201x_2+0.001101x_3+0.000376x_4+0.001300x_5+d_5^- - d_5^+ = 0.005208$

$0.02649x_1+0.051818x_2+0.051355x_3+0.047802x_4+0.053057x_5+d_6^- - d_6^+ = 0.254680$

$x_1, x_2, x_3, x_4, x_5, d_1^-, d_2^-, d_3^-, d_4^-, d_5^-, d_6^-, d_1^+, d_2^+, d_3^+, d_4^+, d_5^+, d_6^+ \geq 0$

In this study, the computational work is done using LINGO software. LINGO solves linear, non-linear, integer and goal programming model in optimization problem.

3. Empirical Results

The optimum solution of the goal achievement of TM using the GP model is shown in Table 4.

Table 4. TM's Model Value and Goal Achievement

Goal	Benchmark value	Model value	Negative deviation variable	Positive deviation variable	Goal achievement
Asset	0.123481	0.123482	0	0.000001	Achieved
Liability	0.086274	0.086274	0	0	Achieved
Equity	0.037207	0.037208	0	0.000001	Achieved
Profit	0.002511	0.002511	0	0	Achieved
Earning	0.005208	0.005208	0	0	Achieved
Optimum management item	0.254680	0.254680	0	0	Achieved

From Table 4, all the six goals, which are asset, liability, equity, profit, earning and optimum management item are achieved by TM in this study. This result is in line with the past study of Arewa et al. [29] which indicates that the goals or benchmark values are achieved by the company based on the optimal solution of GP model.

According to Table 4, for maximization goals, such as asset, equity, profit, earning and optimum management item, the negative deviation variables are zero which means that these model values are equal to or larger than the benchmark values. The positive deviation variable for minimizing total liability has also recorded a zero value, which means that there is no overachievement in terms of total liabilities. For total liabilities, the model value equals to the benchmark value.

In terms of total assets, TM managed to outperform by RM0.000001 trillion based on $d_1^+ = 0.000001$. Total liabilities will stay constant at RM0.086274 trillion since $d_2^-=0$. There is also potential improvement of RM0.000001 trillion for total equities because $d_3^+=0.00001$. Since all the positive deviation variables stated zero for profit, earning and optimum management item, they shall remain at RM0.002511 trillion, RM0.005208 trillion and RM0.254680 trillion respectively. The result of this study is supported by Halim et al. [32] which shows that the GP model provides insights on the potential improvement on the goals such as equity based on the optimal solution. Furthermore, the result of this study is in line with Halim et al. [32] which indicates that all the goals have been achieved based on the optimal solution of GP model.

4. Conclusion

This study develops a GP model to investigate and optimize the financial management of a telecommunication company, namely TM in Malaysia. Upon formulation and optimization, all the six goals, which are total asset, total liability, total equity, profit, earning and optimum management item, have been achieved. It can be deduced that TM is experiencing a healthy and stable financial performance from the year 2015 to 2019. There are also potential enhancements on these six goals which have been found based on their respective deviation from the benchmark value. As for continuous improvements, the deviations have also helped in setting new benchmark values for the goals. Future studies can focus on the financial management of telecommunications companies in other countries. Regression analysis may also be done to study the relationship of ALM with a firm's financial performance. Canonical correlation analysis may also be adopted to study the ALM strategies adopted by TM to maximize returns and manage risks.

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