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## Parameters for Evaluation for the Choice of a Sustainable Financial Network: Using Bayesian Algorithm

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**Abstract** Many a times as an individual we often take hasty decision that leads to wrong choices in life as human without looking at the consequences of making that choice. In future, every choice we make as individuals will definitely have either a negative or positive effect on us. This is applicable in the areas of financial networks when it comes to choosing a more sustainable financial network for investment, there are key parameters that we will considering when choosing any financial network that are on the internet ,which are the main reason for this research work. In this research paper will we discussed briefly the various financial networks like MMM Nigeria ,Givers Forum, Ultimate cycler, Get help worldwide, Twin Kas, Mysure Cash, Naira Propeller , Clarritta and Wonderful Helpers. The research work revealed that some of the parameters like recommitment of participant, Guilders required, referral bonuses required, high interest rate on return on investment, financial network popularity and security in terms of participant by linking the financial network to participant ;various bank accounts that must be verified as a salary account during registration on the website will be useful to determine the choice of a sustainable financial network. We will also use these parameters to build the decision support system using Bayesian algorithm to determine the choice based on security of financial network that links the participant bank account with the financial network system deployed on the internet before investing in it is dependence on the highest posterior probability calculated for a given predictor in predicting sustainability of the financial network before investing. Finally, it will be implemented using MATLAB.

**Keywords** Financial Network, Provide Help, Get Help, Sustainable, Participant, Guilder, Database, investment and Parameters

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### Introduction

One of the most difficult things in life is the ability of man to make choice not just choice but making an effective choice that will be sustainable. This point to the fact that choice making is always done quickly without considering implication of that decision making, these choices may lead to in future; as a results this choices will end up not meeting our targeted goals as an individual(s) or organization as the case may be. This is also applicable to areas of financial network which is a platform of people rendering financial assistant to one another through a financial application network that is deployed on the internet. The purpose of this research work is to determine which of this financial network can stand the test of time that is the sustainability, so that one can invest in it without losing their money. The question then arise how can one determine which financial network to look out for, that is/are sustainable before venturing into the subscription by registration on their various website and investing in it.



### Statement of the Problems

The problems that are associated with wrong choice of investment on financial networks are stated and explained below:

- Most families have lost their live due to investment on a wrong financial network that is not sustainable.
- Increase in poverty rate due to loss of money to financial network
- Lack of program structure and policies to recommit participants that are on the financial network.

### Aims and Objective

The main aim of this research work is to develop a decision support system based on these parameters to assist in choice of sustainable Financial Network.

The specific objectives are as follows:

- To investigate the causes of financial network failures
- To determine the strength and weakness of various financial networks
- To analyze these various financial networks in terms of its features as geared towards sustainability.

### Literature Review

The literature on financial networks, in turn, as noted in Nagumay A [3], dates to the classical work of Quesnay (1958) who depicted the circular flow of financial funds in an economy as a graph. It has yielded a wealth of models, supported by a variety of methodological tools (cf. Nagurney [4] and the references therein), that aim to not only capture the economic behavior of the various decision-makers involved in the allocation and uses of funds but also allow for the computation of the optimal/equilibrium financial flows and prices.

MMM was a Russian company that perpetrated one of the world's largest Ponzi schemes of all time, in the 1990s. Bigg, Claire [1] by different estimates from 5 to 40 million people lost up to \$10 billion. The exact figures are not known even to the founders. In 2011, MMM re-opened as "MMM Global" with up to 110 subsidiaries per country, it became widely popular in various African countries like South Africa, Nigeria, Zimbabwe and Kenya [2]. The problem that is associated with this ponzi scheme is that it does not make it compulsory for participant to Provide Help after they must have gotten help, too many money is used to service the guilders, also there is no mandatory policy to checkmate the activities of fraudster on this platform and finally, the participant do not have a functional salary account that will be link to the MMM website through their various bank account which can make payment at the end month via the platform link created such that if any participant register with them. He or she cannot leave after getting help from other participants because the system will automatically create a provide help for you without you creating a provide help base on your initial provide help.

Other financial network like twinkas give high rate of return on investment of up to 50% as interest rate after providing help and you want to get help this is not good for the system sustainability because when the return on investment is high it will cause the system to crash. Also other financial networks like Givers Forum, Ultimate cyler, Wonderful Helpers, My sure Cash, Naira Propeller and Clarritta fall short of recommitment on the part of participant except Get help worldwide that participants are made to provide help again after getting help else the system short you from the platform. Above all the financial network fail to address the problem of security for a more sustainable financial network in terms of not linking the bank account to the platform thereby making it compulsory for registered members to provide help after getting help.

### Financial Network

This is simply a community of people providing help to one another by registering in any financial network on the internet and investment by providing help of a certain amount within a stipulated time frame as specified by the financial network; you are then matched to another participant(s) or pair on the same platform who need help of certain amount base on the network investment, percentage are calculated on the amount invested which is computed and then added to your initial capital total which then make up your interest.

## **Parameters for Evaluation for the Choice of a Sustainable Financial Network**

In the determination of a good financial network which will be sustainable we will discuss and critically look at these various parameters based on the strength and weakness which is explained below:

### **1. Recombitment of Participant**

This is one of parameter which will used to evaluate the sustainability of a financial network, in the case it is the process whereby a participant in a given financial network is able to provide help after getting help from other member or participant in the financial network. But unfortunately most financial networks do not incorporate that into their website while developing the site example is MMM Nigeria, Clarrite, Giverforums and ultimatercyer all these network will certainly not be sustainable because most participant will just come provide help and get help back and run away the system do not recommit participant after getting help. When a participant leaves the financial network it reduces the number to provide help to other participant which is the weakness. On the other hand the runaway participant is at advantage to the detriment of the other participant. But financial network like Gethelpworldwide incorporate recommitment of participants in their financial network platform otherwise the participant is otherwise they are permanently block from the platform.

### **2. Guilders Required**

Guilders are people(s) that control group of participants in a financial network during online registration, the system automatically assign them to guider just as the name suggest the guider guides other participant in a network by given them the necessary assistant need, the financial network automatically give them some percentage based on the work they do example of such network that have a guildier is MMM Nigeria. As a result of this financial network assigning other participant to pay its guildiers this will limit the system strength because most of the participant will be made to paid guildier without the guildier themselves investing in the network. However other network like Claritta, Gethelpworldwide, Giverforum and Nairapropeller do not have guildier this will increase in turn not limit their system strength.

### **3. Referrals Bonuses Required**

It is also another parameters to be used for the evaluation of the financial network, it is a situation whereby a participant will register other participant under him/her and the system will be given him 10% bonuses of whatever other participant(s) invest in the financial network without him/her investing regularly in the network he/she can be withdrawing bonuses by getting help from the financial network without him/her making further investment from the network by so doing it will reduces the number to provide help to other participant there causing the system to crash examples of such financial network is MMM Nigeria. Claritta, Giversforum and others which they give different percentage of interest rate based on the return on investment.

### **4. Security of the Financial Network by linking their bank account**

Security of the financial network is the process of linking participant(s) bank account to the financial network which is one of the most effective parameters to consider while choosing any financial network to invest into. If financial network is able to collaborate with participant banks to link the financial network website to the participants banks account which is to be verify during registration of participant(s) that has a salary account that is functional before validating the participant registration and also ensure the financial network is able automatically make payment at the end of the month to participant that need help. just as the system automatically assign other participant(s) to provide help. But un-fortunately all these financial networks so discussed in this research work fail to do this. This is a major weakness.

### **5. Popularity of the Network**

Popularity of the network is also another parameter to look at. Here it has to do with how people are familiar with any financial network because when groups of people are familiar to any financial network it will definitely pull a lot of other participant to invest into that particular network. One of the major strengths of a network is the number of the participant in that given network. But on the other-hand if the financial network fails to



address the issues of other parameters like guilder required and referral bonuses by allowing this guilder and referral bonus parameters to be part of the system this will in turn become the weakness to that financial network which will make the financial network to crash. An example of financial network that is popular to the people and has many participants is MMM Nigeria. Infact, this popularity of the network makes the system to survive for a little while before going down completely.

## 6. High Interest Rate on Return on Investment

It is one of the parameters to consider when choosing a financial network. It has to do the interest that a particular participant gets on return on investment when he/she invest in a particular network by providing help to others participant in the same network. The total interest is calculated based on the financial network return on investment. Financial network like MMM Nigeria gives interest rate of 30% initially before increasing it to 40%, 50% and 100% while other networks like twinkas gives 50%. When interest rate on return on investment is increase or decrease it has it strength and weakness. If the return on investments (ROI) is increase more people will register and participate to invest in that financial network due to the high rate of interest on return on investment this is good for the system because it will increase the number of participants which is healthy for that financial network. On the other hand if ROI is increased more participants will be pair to provide help thereby reducing the number of people that will want to provide help to other participant that needed help.

## Bayesian Algorithms

This is a classification technique that is based on 'Bayes' theorem with an assumption of independence among predictors. In simple terms, a Naïve Bayes classifier assumes that the presence of a particular feature in a class is unrelated to the presence of any other feature. For example, a fruit may be considered to be an apple if it is red, round, and about 3 inches in diameter. Even if these features depend on each other or upon the existence of the other features, all of these properties independently contribute to the probability that this fruit is an apple and that is why it is known as 'Naïve'. In addition, Naïve Bayes algorithm is easy to build and particularly useful for a very large data sets along with simplicity. Naïve Bayes outperform even a highly sophisticated classification method.

The term *Bayesian* refers to Thomas Bayes (1702–1761), who proved a special case of what is now called Bayes' theorem in a paper titled "An Essay towards solving a Problem in the Doctrine of Chances"[5]. In that special case, the prior and posterior distributions were Beta distributions and the data came from Bernoulli trials. It was Pierre-Simon Laplace (1749–1827) who introduced a general version of the theorem and used it to approach problems in celestial mechanics, medical statistics, reliability, and jurisprudence [6]. Early Bayesian inference, which used uniform priors following Laplace's principle of insufficient reason, was called "inverse probability" (because it infers backwards from observations to parameters, or from effects to causes) [7]. After the 1920s, "inverse probability" was largely supplanted by a collection of methods that came to be called frequentist statistics [7].

In the 20<sup>th</sup> century, the ideas of Laplace were further developed in two different directions, giving rise to *objective* and *subjective* currents in Bayesian practice. Harold Jeffreys' *Theory of Probability* (first published in 1939) played an important role in the revival of the Bayesian view of probability, followed by works by Abraham Wald (1950) and Leonard J. Savage (1954). The adjective *Bayesian* itself dates to the 1950s; the derived *Bayesianism*, *neo-Bayesianism* is of 1960s coinage [8]. In the objectivist stream, the statistical analysis depends on only the model assumed and the data analysed by Bernardo, J.M. [9]. No subjective decisions need to be involved. In contrast, "subjectivist" statisticians deny the possibility of fully objective analysis for the general case.

In the 1980s, there was a dramatic growth in research and applications of Bayesian methods, mostly attributed to the discovery of Markov chain Monte Carlo methods, which removed many of the computational problems, and an increasing interest in non standard, complex applications [10]. Despite the growth of Bayesian research, most undergraduate teaching is still based on frequentist statistics [7]. Nonetheless, Bayesian methods are widely accepted and used, such as in the field of machine learning.



The formula for Bayesian theorem is given by calculating the Posterior Probability as stated below:

$$P(c|x) = \frac{P(x|c) P(c)}{P(x)}$$

Likelihood
Class Prior Probability

↓
→ Posterior Prior Probability

Posterior Probability

Source: [http://www.saedsayad.com/naive\\_bayesian.htm](http://www.saedsayad.com/naive_bayesian.htm) [11]

Where:

$P(c/x)$  is the posterior probability of *class (target)* given *predictor (attribute)*.

$P(c)$  is the prior probability of *class*.

$P(x/c)$  is the likelihood which is the probability of *predictor* given *class*.

$P(x)$  is the prior probability of *predictor*.

**Algorithm for the Choice of a Sustainable Financial Network**

- Step 1: Generate the data set into frequency table
- Step 2: Convert the data set into frequency table
- Step 3: Create a likelihood table in table 2 to 3 by finding the probabilities

**Table 1:** Table showing the financial network parameters choice sand Participants Responses

Parameters for the Financial Networks	Participants Responses
Recommitment of Participants	Yes
Guilder Required	No
Recommitment of Participants	Yes
Security in terms of Bank account linkage to the financial network	Yes
Guilder Required	No
Security in terms of Bank account linkage to the financial network	Yes
Guilder Required	Yes
Security in terms of Bank account linkage to the financial network	Yes
Guilder Required	Yes
Security in terms of Bank account linkage to the financial network	No
High Interest Rate on Return on investment (ROI)	Yes
Security in terms of Bank account linkage to the financial network	Yes
High Interest Rate on Return on investment (ROI)	Yes
Security in terms of Bank account linkage to the financial network	Yes
High Interest Rate on Return on investment (ROI)	No
High Interest Rate on Return on investment (ROI)	Yes
High Interest Rate on Return on investment (ROI)	No
High Interest Rate on Return on investment (ROI)	Yes
Popularity of Financial Network	No
High Interest Rate on Return on investment (ROI)	Yes
High Interest Rate on Return on investment (ROI)	No
Popularity of Financial Network	No
Referrals Bonus Required	No
Popularity of Financial Network	No
Popularity of Financial Network	Yes
Popularity of Financial Network	Yes
Popularity of Financial Network	Yes
Referrals Bonus Required	Yes
Popularity of Financial Network	Yes
Referrals Bonus Required	Yes

**Table 2:** Table showing frequency for the total number of Yes or No in each financial network parameter choice

Financial Network Parameter Choice	No	Yes
Recommitment of Participants	0	2
Guilder Required	2	2
Security in terms of Bank account linkage to the financial network	1	5
High Interest Rate on Return on investment (ROI)	3	5
Popularity of Financial Network	3	4
Referrals Bonus Required	1	2

**Table 3:** Table showing frequency for the total number of Yes or No in each financial network parameter choice and calculated probabilities in each row and column

Financial Network Parameter Choice	No	Yes	
Recommitment of Participants	0	2	<b>2/30</b>
Guilder Required	2	2	<b>4/30</b>
Security in terms of Bank account linkage to the financial network	1	5	<b>6/30</b>
High Interest Rate on Return on investment (ROI)	3	5	<b>8/30</b>
Popularity of Financial Network	3	4	<b>7/30</b>
Referrals Bonus Required	1	2	<b>3/30</b>
	<b>10/30</b>	<b>20/30</b>	

Step 4: Apply the Bayesian equation to calculate the posterior probability for each class in table 3 above. The case with the highest posterior probability is the outcome of the prediction that is used to determine the sustainability of the financial network.

**Results**

**Table 4:** Table showing the financial network parameter choice and Posterior Probabilities

Cases	Financial Network Parameter Choice	Posterior Probabilities
1	Guilder Required	0.3387
2	Security in terms of Bank account linkage to the financial network	0.5645
3	High Interest Rate on Return on investment (ROI)	0.4234
4	Popularity of Financial Network	0.3871
5	Referrals Bonus Required	0.5081

From table 4 above show case 1-6 their corresponding financial network parameter choice with it calculated posterior probabilities which are shown in sample output of figure 1 below:

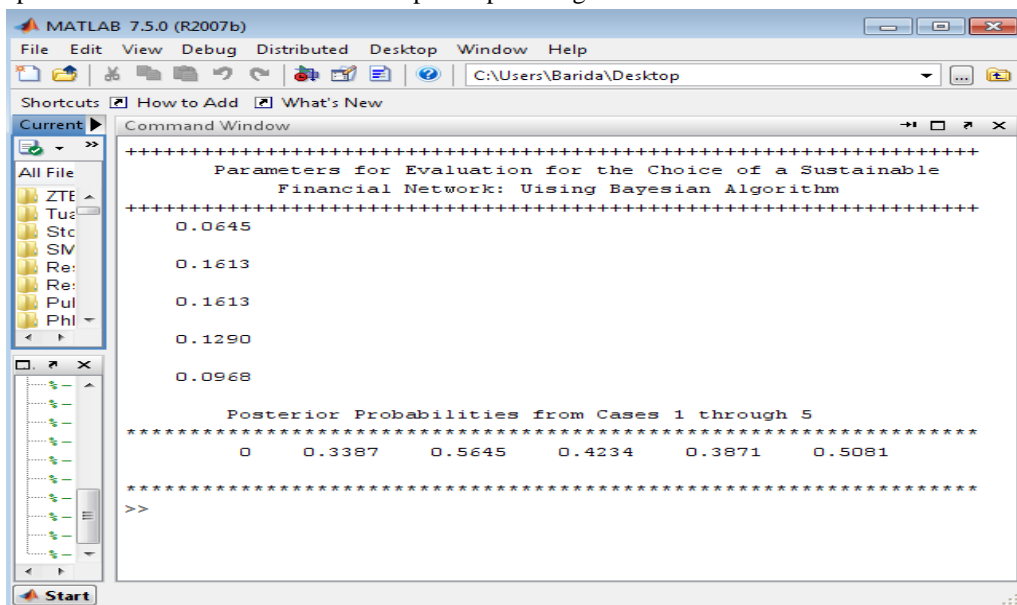


Figure 1: Snapshot of the Posterior Probabilities Calculated from Cases 1 to 5

### Conclusion

Conclusively, based on the calculated probabilities in each of the cases, from case 1 through to case 5, the highest probability is security in terms of bank account linkage to the financial network which is at case 2 which indicate that participant that want to invest in to any of these financial network must choose the financial network that has the ability of linking participant bank account with the financial network because this determine the sustainability of the financial network in terms of it security compare to other parameters as discussed above.

### Recommendation

We recommend that financial network must collaborate with various bank to develop financial network that will link various banks account for participant that have a functional account which must be salary owners with financial network as this will sustain the system in terms of security of the platform and also the system must be able to automatically provide help to other participant without the participants doing it by him or herself just as all the other financial network discussed above automatically assign other participants to get help.

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