Data Mining Strategies and Methods to Develop Microfinance Market - Case Study Currency Exchange

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ABSTRACT— the intrinsic characteristics of data mining are being inculcated in the market of microfinance. The use case that is brought under our consideration is of Currency Exchange. The idea was conceived and perceived by the current financial crises in the world market in the year 2008-09.The financial recession in world wide compelled individuals to think and start micro businesses rather than macro businesses. In our paper we conceived and designed some algorithms by using data mining techniques to have general micro currency exchange businesses for a developing country. Our algorithm processes two years historical data of currency rates and applies data mining strategies. The "Median Method" and "Rise & Fall Method" with probabilistic approach are being presented. It can be applied to N year's data with unless desired results are achieved. This is to give best choice to micro currency business men to take decision either to buy or to sell currency. Some previous currency rates (i.e. Ups & Down) are also recorded from a popular bank of Canada & currency open markets as a proof of concept using our algorithm. The statistical and graphical analysis are being made on the data .Our algorithm can be efficiently used by all those who wish to initialize a small business (Cottage Industries) with a profitable income with less investment. Our research will lead to a new dimension in the fields of Micro finance and Data mining.

 Keywords—About four key words or phrases in alphabetical order, separated by commas.

I. INTRODUCTION

An experiment on micro business (Cottage Industries by providing loans) [3] carried out by has been proved very promising. Our algorithm is a sequence of his efforts in

new direction with new business approach by using computational science.

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The boarder line to come out of such situation was the main goal of our research, working independently and achieve better results, as the struggle and growth in work was directed towards own interest, this reduces the monetary problems and thus reduces the health related problems. The developed algorithm is simple that can be easily programmed. We all know that human being living on the surface of earth from centuries, and always struggle for the fulfillment of their needs irrespective of the climate conditions. To achieve needs every one has to struggle in different shapes. Mainly in the work place this relation is called employee and employer [1, 2]. This sensitive relation is based on satisfaction and quality of work among both the parties.

A.   Exchange Rates

An exchange rate is the rate at which one currency can be exchanged for another. In other words, it is the value of another country's currency compared to that of your own[5]. For example while traveling to another country, needs to "buy" the local currency. Just like the price of any asset, the exchange rate is the price at which buyer purchase that currency. Traveling to Egypt the exchange rate for USD 1.00 is EGP 5.50, this means that for every U.S. dollar, a buyer pay five and a half Egyptian pounds[5]. Theoretically, identical assets should sell at the same price in different countries, because the exchange rate must maintain the inherent value of one currency against the other [4].

B.   Fixed Rates

There are two ways the price of a currency can be determined against another. A fixed, or pegged, rate is a rate the government (central bank) sets and maintains as the official exchange rate[5]. A set price will be determined against a major world currency (usually the U.S. dollar, but also other major currencies such as the Euro, the Yen, or a basket of currencies). In order to maintain the local exchange rate, the central bank buys and sells its own currency on the foreign exchange market in return for the currency to which it is pegged [5].

C. Floating Rates

Unlike the fixed rate, a floating exchange rate is determined by the private market through supply and demand. A floating rate is often termed "self-correcting", as any differences in supply and demand will automatically be corrected in the market[5]. Take a look at this simplified model: if demand for a currency is low, its value will decrease, thus making imported goods more expensive and thus stimulating demand for local goods and services. This in turn will generate more jobs, and hence an auto-correction would occur in the market. A floating exchange rate is constantly changing[5].

In reality, no currency is wholly fixed or floating. In a fixed regime, market pressures can also influence changes in the exchange rate. Sometimes, when a local currency does reflect its true value against its pegged currency, a "black market" which is more reflective of actual supply and demand may develop[4],[5]. A central bank will often then be forced to revalue or devalue the official rate so that the rate is in line with the unofficial one, thereby halting the activity of the black market.
In a floating regime, the central bank may also intervene when it is necessary to ensure stability and to avoid inflation; however, it is less often that the central bank of a floating regime will interfere [5].

II. METHODOLOGY

The methodology that we are acquiring consist of following steps

Phase 1:
a). Algorithm development [7] based inference to include ideas about new dimension to data mining techniques and decision support environment for business.

b). Finding appropriate tools like VB.Net, Sql Server or oracle, ASP.Net & that historical data support decision environment may be created.

c). Choosing data mining tools and selection of data mining techniques to visualize the decision graph.

d). Testing of algorithm in real market data for authenticity [6].

Phase 2:

a). Questionnaire from general public and business oriented people and organization to caste their opinion and views as a feed back to our system (will be demonstrated in future).

b). Statistical analysis and graphical representation of the public opinion about our software success.

c). Populating database with a bunch of historical records of currency rates e.g. 12000 or 1300 or 50000.

d). Testing of software in real market data for authenticity [6].

A. Theoretical Analysis Approach

If we see the analogy with stock, it has two aspects
   1- Instrument (Security)
   2- Speculation [8]
      a- Fundamental Analysis (Soundness and Health of a Company)
      b- Technical analysis (Decision on Visualization, Fibonacci , MACD (Moving Average CD)

In our paper we will concentrate on the 2-b because it is a micro business on low scale for less/low inverters.

Generally if we analyse the market, the currency rates seems to be directly propositional to Demand and inversely to Supply, keeping external factors constant like oil prices, political situations, etc [9].
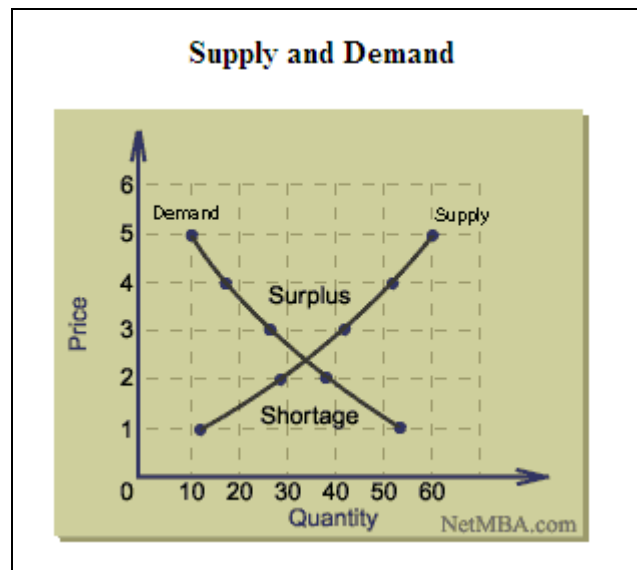

Figure 1: Demand and Supply Graph

From the above definition we derive a simple relation i.e;

$$CR \propto D \qquad \qquad \text{Eq. (1)}$$

Where CR represents Currency Rates and D represents demand, similarly;

$$CR \propto \frac{1}{S} \qquad \qquad \text{Eq. (2)}$$

Where S represents supply.

Equations 1 & 2, both explains that currency rates are directly proportional and inversely proportional, to demand and supply, respectively.

By the combination of equations 1 & 2, we get,

$$CR \cong C * \frac{D}{S} \qquad \text{Eq. (3)}$$

In Equation 3, C represents the constant, i.e., which is variable and changes with the oil price or other factors of the country, such as inflation, political, etc. This equation explains that the currency rates of a specific country with respect to other currency or some standard currencies.

B. Theoretical Findings

Our findings are based on the two data mining techniques i.e,
   a. Stream Data mining (Complex event processing)
   b. Time Series

1. Algorithm

X_i = Yearly data

If $X_{i+1} > X_i$ then
       $YR_j = 1$ else   Rise column vector
       $YFj = 0$ Fall column vector
If $X_{i+1} < X_i$ then
       $YR_j = 0$ else   Rise column vector
       $YF_j = 1$ Fall column vector
     ZR   Weekly rise
     ZF   Weekly fall
For k = 0 To N   N is Early data

For i = 0 To i < 7   Weekly Records
Sum R_i =+ YR_j Weekly Rise
Sum F_i =+ YF_j Weekly Fall

Next
ZR_k= Sum   Assigning
Next
For i = 0 to i < N   'Loop for Comparison
If Zri > Zfi
Decision = "Y"   Y="Yes"
else
Decision = "N"   N="No"

Comparison of Yearly Data:

For i = 0 to i < N
If Decision (2008) & Decision (2007) = "Y"
then
CFD Decision= "Y" 'Combined Final Decision
else
CFD Decision="N"
END

C. Experimental Analysis and Findings

i. Currency Business is stable and secure

Sense of stability and security can be viewed in the Figure 2, given below. Stability and secure business dependents upon the decreases in percent loss.
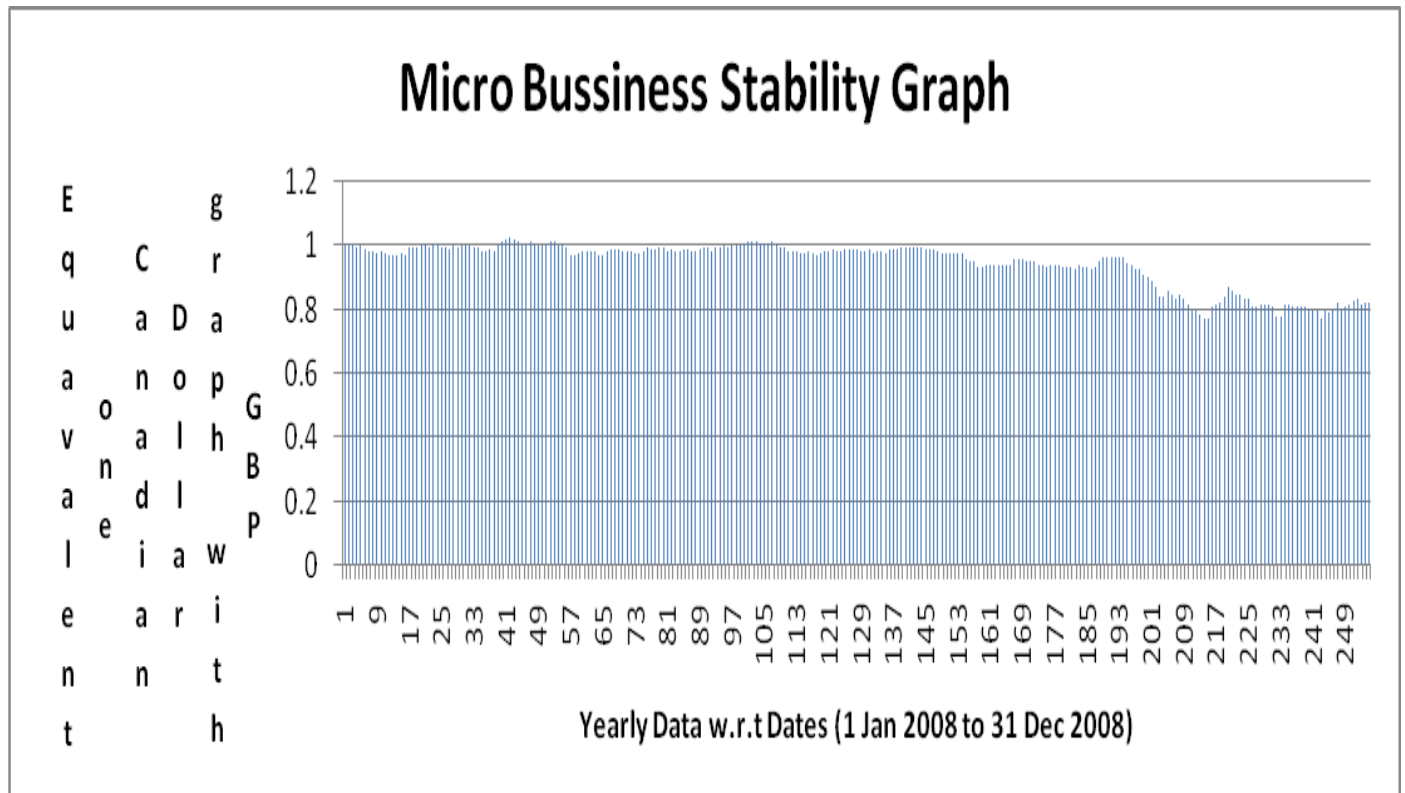
Figure 2: One Canadian Dollar Vs GBP

a. Description of Figure 2.

In Figure 2, the rates rarely go below 0.8 GPB in the whole year 2008. The variation in graph absolutely shows profits and loses yearly wise. Since profit seems less in this business but loss is also minimum. Profit can be increased with large investment. But we are stressing upon the needs of poor people to establish a low scale business with low risk factors.

b. Description of Figure 3.

Median of currency data on weekly basis. Figure 3 below depicts that, it is more likely to have good business if some one buy CAD currency on Wednesday and sell it for GPB on Thursday [10]. The statistical figures from the year 2008 shows that less profit will be gained in a week, if he buys on Thursday and sells it on Wednesday coming week. So this graph can be proved very beneficial for those who deal in

CAD and GBP currency conversion business. Similarly, same graphs with good decision perception can achieved if we have at least one year minimum data.

c. Description of Figure 4

Figure 3 describes various features according to our algorithm Rise and Fall. The first column is about the factual data retrieved from the bank of Canada [6] for year 2008. The second and third column shows the number of rises and falls in data with respect to previous one on daily basis.
The fourth and fifth column are special columns based on our algorithm [7]. It progressively moves by one day to accumulate one week number of rises or falls respectively. Sixth column shows the decision column based on the higher sum value of progressive weekly rise with respect to progressive weekly fall.
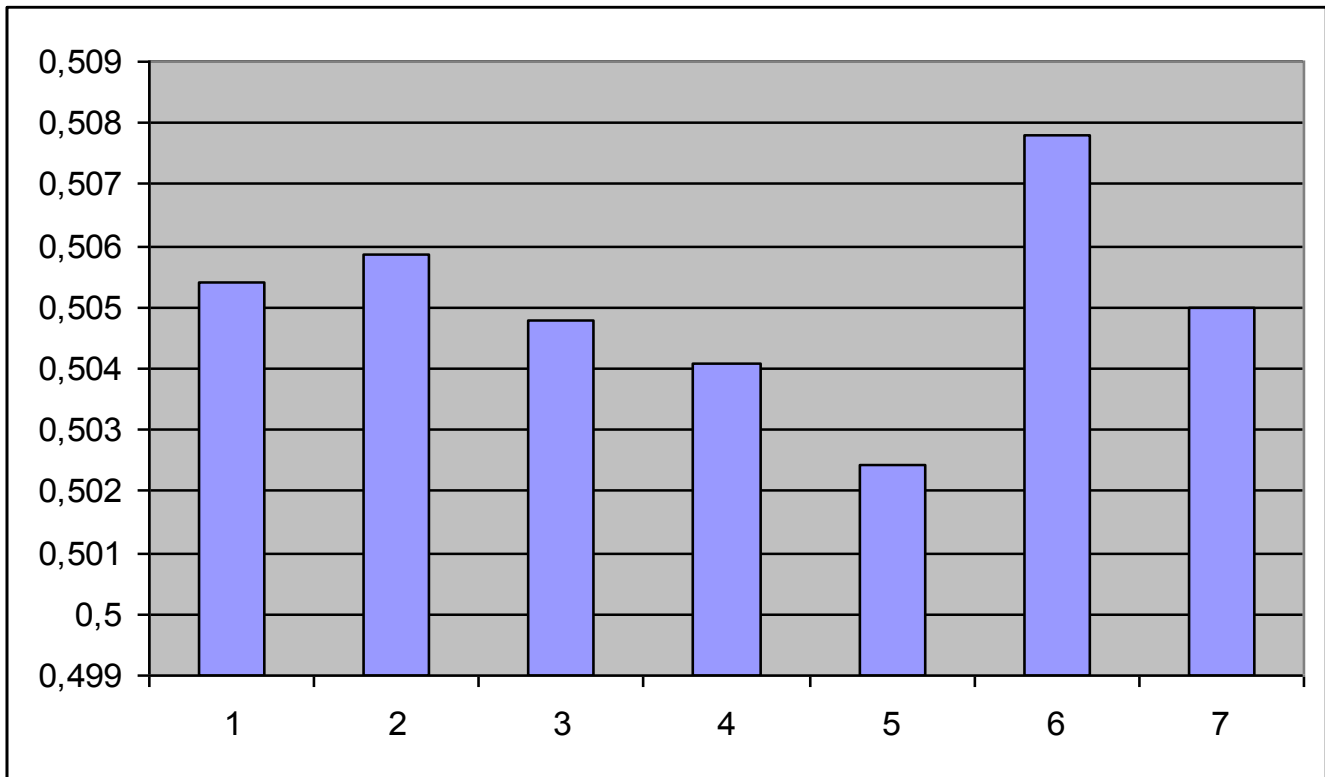
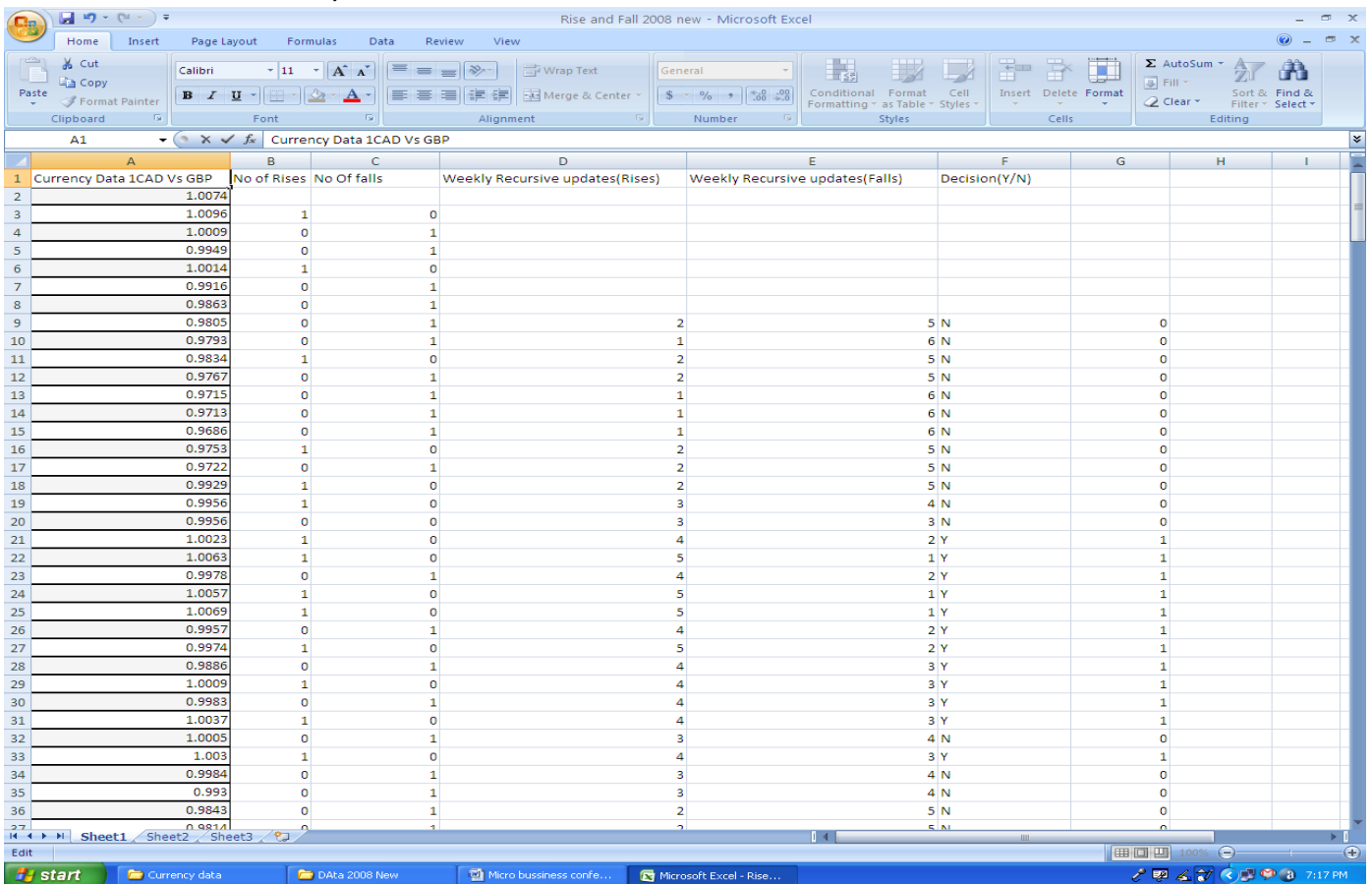Figure 3: Median of Currency Rates (1 CAD Vs GBP) on weekly basis

A	B	C	D	E	F	G
Currency Data 1CAD Vs GBP	No of Rises	No Of falls	Weekly Recursive updates(Rises)	Weekly Recursive updates(Falls)	Decision(Y/N)	
1.0074						
1.0096	1	0				
1.0009	0	1				
0.9949	0	1				
1.0014	1	0				
0.9916	0	1				
0.9863	0	1				
0.9805	0	1	2	5	N	0
0.9793	0	1	1	6	N	0
0.9834	1	0	2	5	N	0
0.9767	0	1	2	5	N	0
0.9715	0	1	1	6	N	0
0.9713	0	1	1	6	N	0
0.9686	0	1	1	6	N	0
0.9753	1	0	2	5	N	0
0.9722	0	1	2	5	N	0
0.9929	1	0	2	5	N	0
0.9956	1	0	3	4	N	0
0.9956	0	0	3	3	N	0
1.0023	1	0	4	2	Y	1
1.0063	1	0	5	1	Y	1
0.9978	0	1	4	2	Y	1
1.0057	1	0	5	1	Y	1
1.0069	1	0	5	1	Y	1
0.9957	0	1	4	2	Y	1
0.9974	1	0	5	2	Y	1
0.9886	0	1	4	3	Y	1
1.0009	1	0	4	3	Y	1
0.9983	0	1	4	3	Y	1
1.0037	1	0	4	3	Y	1
1.0005	0	1	3	4	N	0
1.003	1	0	4	3	Y	1
0.9984	0	1	3	4	N	0
0.993	0	1	3	4	N	0
0.9843	0	1	2	5	N	0
0.9814						

Figure 4: Currency Data with rise and fall and weekly
progressive chain updates (Year 2008)

d. Description of Figure 5

Figure 5 shows a weekly progressively increasing summation for rises in GBP (Great Britain Pound) for 1 CAD (Canadian Dollar). The benefit of the below graph is to take help regarding decision. The more number of Rises more probability to decide in "Y" rather than "N".
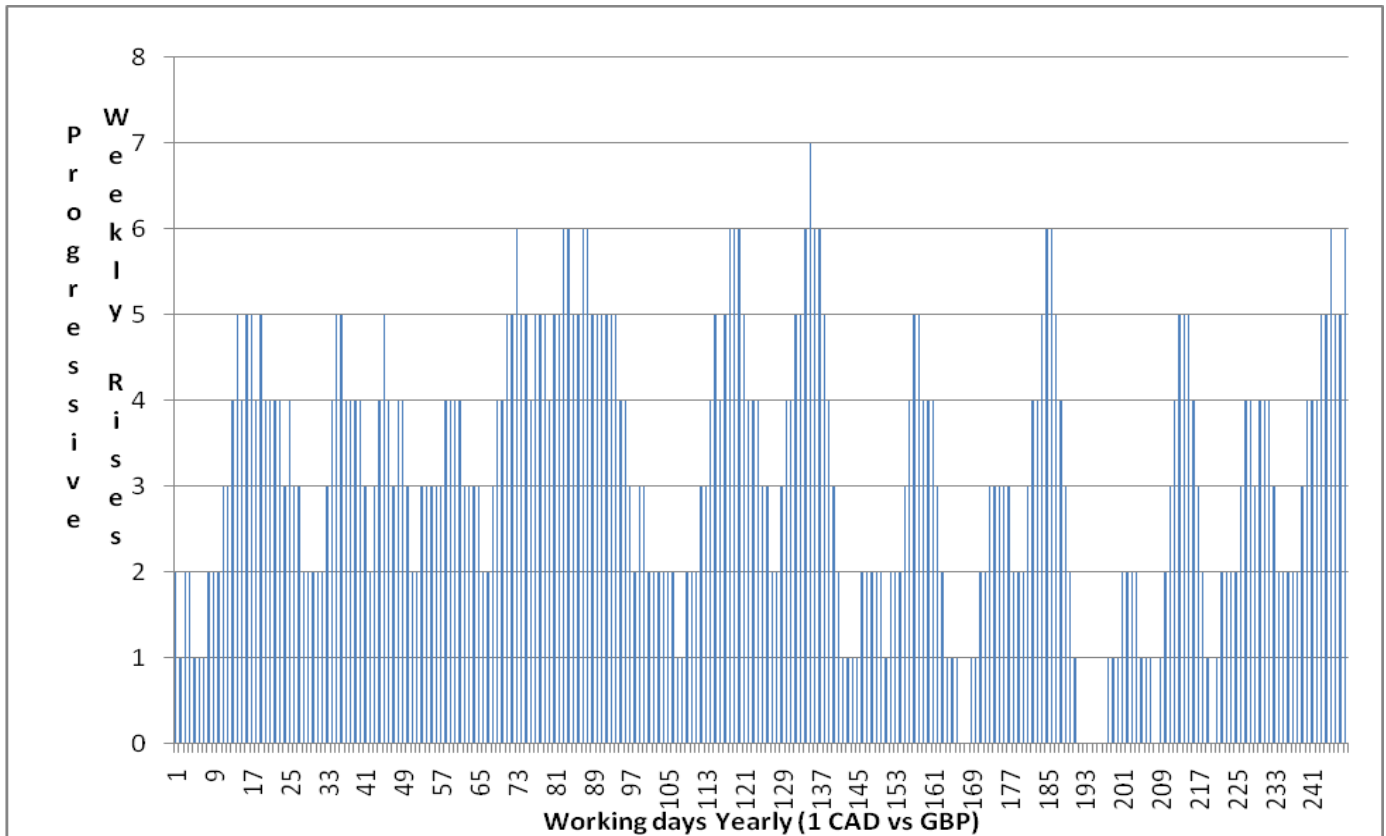

Figure 5: Currency Rises weekly progressive chain for decision making (Year 2008)

e. Description of Figure 6

Figure 6 depicts the falls on weekly bases with one change progressively per week [7]. This graph is opposite of Figure 5 because it represents weekly rises while Figure 6 represents weekly falls. This graph is beneficial to make decision in "Y" if the number of sum falls is less than weekly rises.
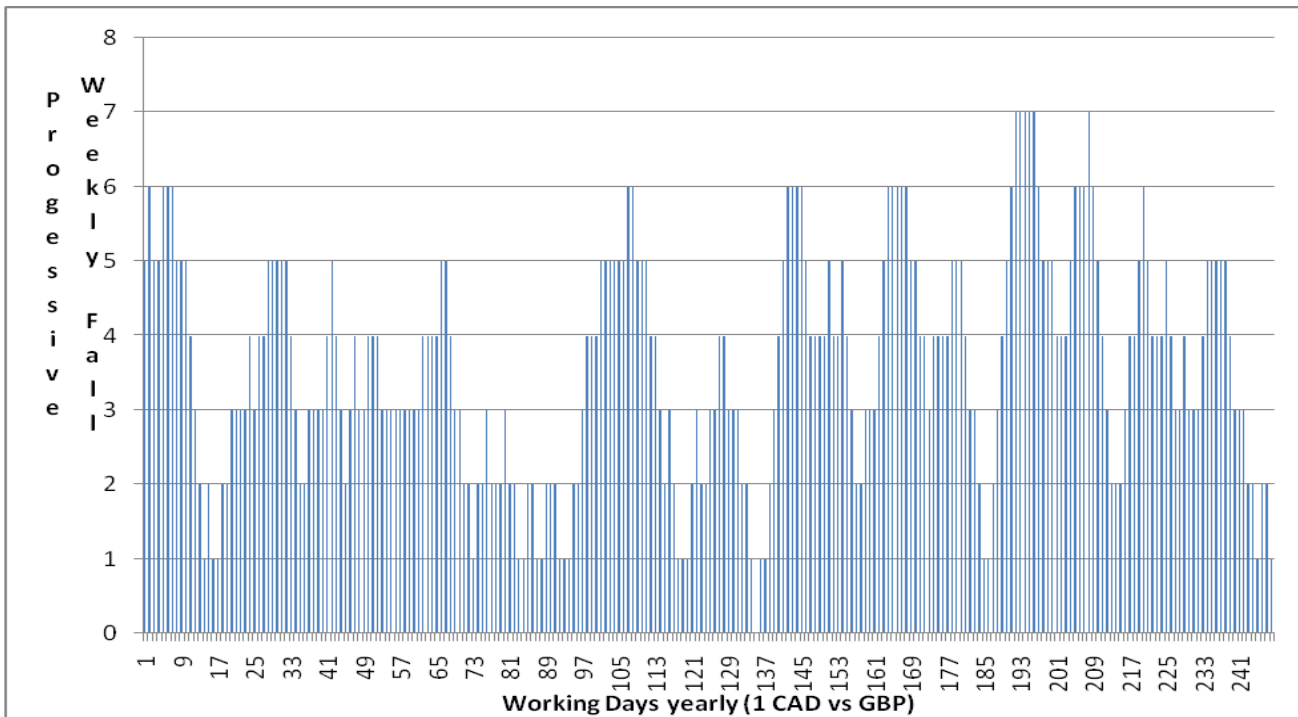
Figure 6: Weekly progressive Falls Chain updates for decision making

f. Description of Figure 7

Figure 7 shows the final decision, whether to buy currency in specific month or week or day in a year based on the previous year data and statistics. This graph gives clue to investors to make decision, which currency to buy and which currency to sell. This graph will benefit more on monthly basis rather than week or day. It can be proved more accurate for week level and day level, if 20 to 30 years data are taken and performed same Rise and Fall test and then compare it with yearly data with each other concurrently.
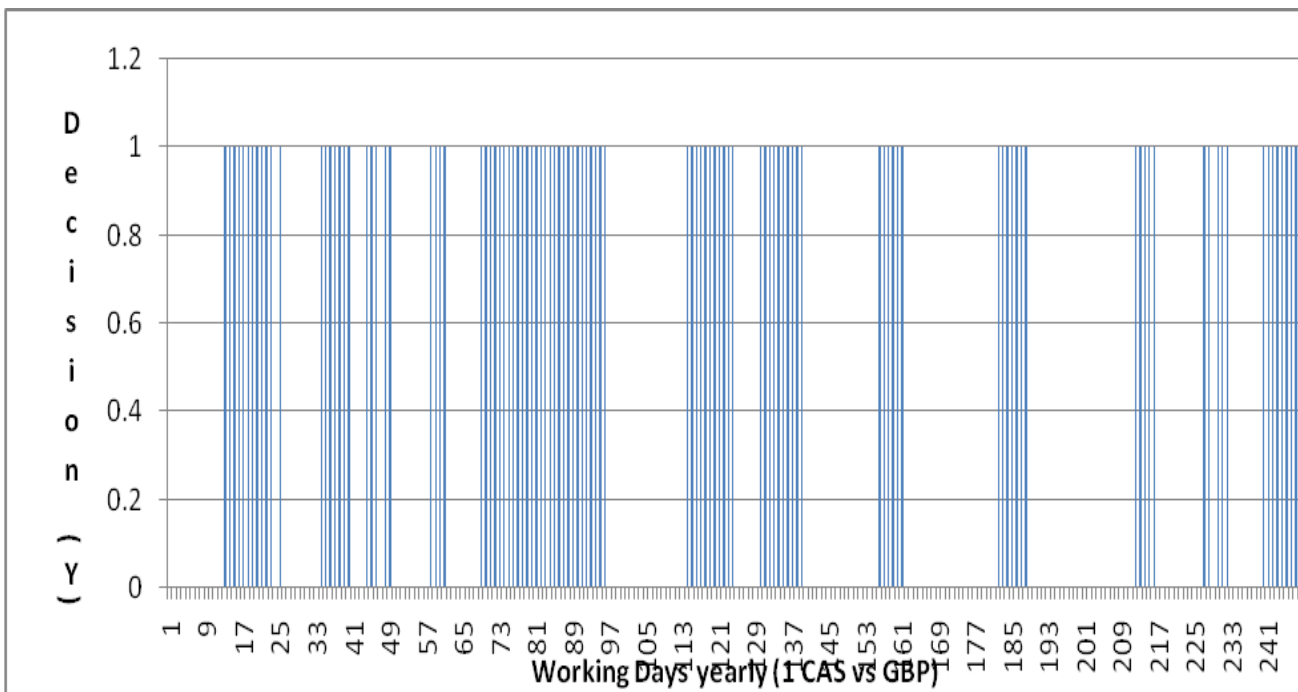

Figure 7: Exact High Level Decision in "Yes" or "No" for inverters in Currency Exchange (Year 2008)

g. Description of Figure 8

Figure 8 is similar to Figure 7; the difference is of data selection on yearly bases (2007). The purpose of this figure construction is to compare it with Figure 7 for year (2008). This will more strengthen and make our decision more accurate.
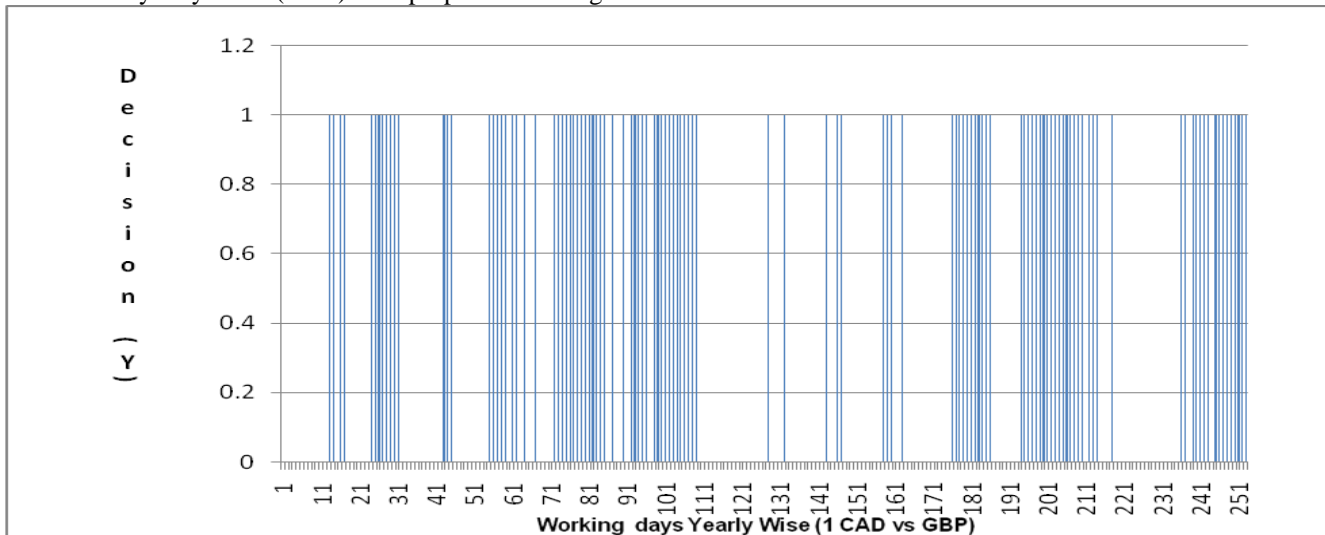

Figure 8: Exact High Level Decision for in "Yes" or "No" for invertors in Currency Exchange (Year 2007)
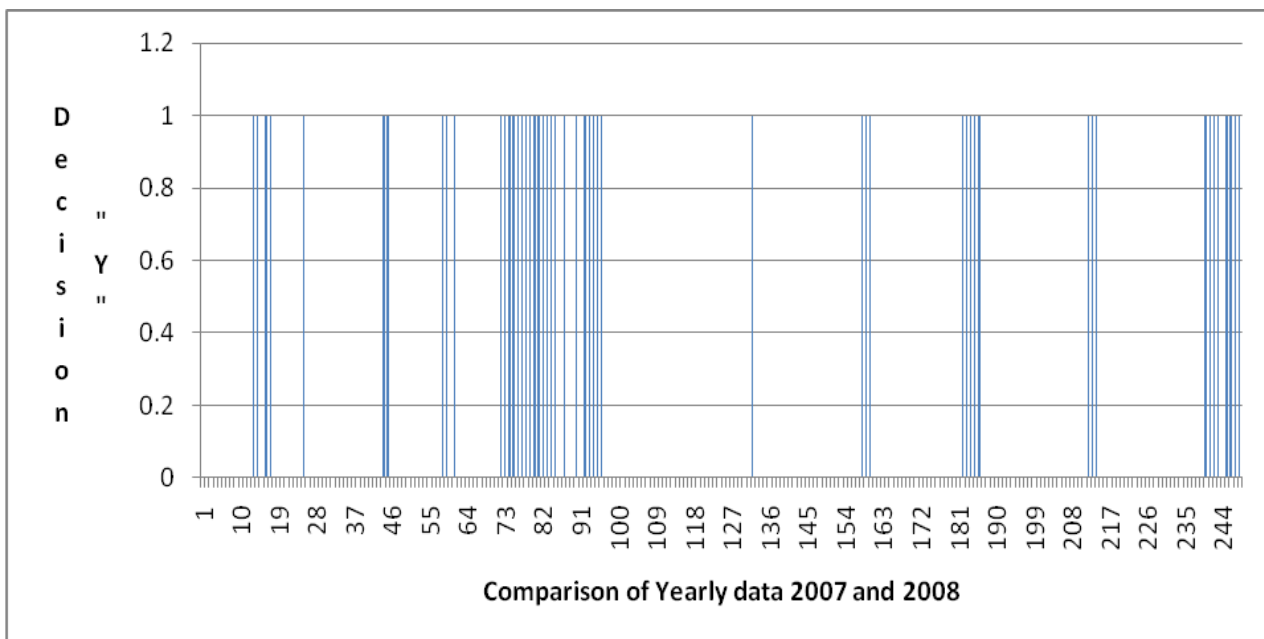

Figure 9: Comparison (Overlapping) of Figures 7 & 8 for more accurate decisions

h. Comparison of Figure 7, 8 &9

The comparison shown in Figure 9 is more accuracy in decision with respect to overlap. Means if both decision in year 2007 and year 2008 are "Yes", we make it yes in Figure 9 as a comparison tool. Based on the results the following approach is adopted as shown in Table 1.

Table 1: Boolean Comparison of Yearly Data

Decision Data For 2007	Decision Data For 2008	Results Yes
Y	Y	Yes
Y	N	No
N	Y	No
N	N	No

*i. Yearly Probability of Yes "Y" & No "N"
   (For Year 2007)*

Sum of Total Number of "Y" = 114
Total Sample Space = 253

Probability of "Y" = 0.450592885

Probability of "N" = 1 - Probability of "Y"
                   = 0.549407115

*j. Year Probability of Yes "Y" & No "N"
   (For Year 2008)*

Sum of Total Number of "Y" = 109
Total Sample Space = 250
Probability of "Y" = 0.436
Probability of "N" = 1-Probability of "Y"
                   = 0.564

III. CONCLUSION

Our paper dealt with touching and elevating issues of the society that is poverty. To eliminate poverty we need to break the shackles of poverty .Businesses are one of dignified solutions rather than social funding and charity at grass root level for common people .The solution is Micro business. The big currency exchanges holding the market and play with the rates of currencies according to their own interest. This type of business is already in progress but it fits/suits only for the big investors, whereas our approach is for a small scale investors/business. Besides the monetary benefits it will help the community and government to create jobs and reduce the crime rate due to involvement of human power in a proper earning place. In short this approach for self employment with less investment will yield high results. The main reason is that human movement, business, education, health care, food etc., all these depends on economy and can not be stop by any means. In the present conditions those who plan and work on these issues they will survive others will eventually vanish from the surface of earth. Our software can be efficiently used by all those who wish to start a small business with a profitable income. We guarantee them to successfully launch their businesses at their homes.

IV. RELATED WORK

The employer and employee is a delicate relation which is based on trust and motivations [11]. The data mining strategies applied to open market is made valuable by introducing it into finance field[12]..Every one has the right to live and earn legally. For example, every one can not erect a 4 or 5 star hotel and even every one can not afford to live in such hotels, so

what is the solution for such an issue. The same goes to other walks of life as well. Therefore, if a person can not reach to the Dow Jones, Nikkei, Ham Sung, etc., that does not means to stop thinking [7,9]. But other alternates must be explored/looked at to find the way out from present economical crisis. Such efforts are put forward while working on the project [5].

V. FUTURE WORK

The algorithm presented in this paper can be implemented in software in any desired tools i.e. VB.Net & Oracle or ASP.Net & Microsoft SQL Server. This will enhance our algorithm with respect to establish a Micro Currency Exchange data ware house.

VI. ACKNOWLEDGEMENT

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