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# Effect of stocks of a major GDP contributing industry of a country on formulation of stock market trading strategies using genetic algorithm

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***Abstract*—This paperinvestigates effect of stocks ofvarious blue chip companies in makingof stock market trading strategies. Thekind of companies in discussion here aremost pivotal to their industries that in turn are most pivotal to the country in terms of their Gross Domestic Product ( GDP) contribution percentage .Now the system here employs simple genetic algorithm on a portfolio of an investor which should contain stocks of giants of the major GDP contributing companies of that country to evolve tradingapproaches , that are tested against the historical data of the companies to getprofit/invested ratio through the technical indicators to ascertain if the evolved strategy is the best one . In this paper algorithm is employed on two portfolios from two different countries , one from Australia and another from India only to find out that the elite trading approaches always contain stocks of the blue chip companies of major GDP contributingindustry of that country . The reason to consider only these two countries is that both are one of the biggesteconomies in the world , and have different major GDPcontributing industry which could give us conclusions close to a more generalized one with less amount of working involved . Future forthcoming work will cater a morerefined and generalized conclusion .**

***Index terms -Genetic algorithm ,technical indicators , Sharpe ratio, crossover, mutation , simple moving average(SMA).***

## I. INTRODUCTION

The efficient market hypothesis(EMH) assertthat one cannot consistently achieve returnson a risk adjusted basis or on a "fixed set oftrading strategies" , since market is selfadjusting . Therefore we need to understandmore parameters, technicalities to evolve newtrading strategies continuously. This is where usage of algorithms leaps in. With numerousparameters and factors in the play , algorithm needed to be used here to evolvetrading strategies should be able to encompass various numerical and theoretical aspects inpermutations to build elite trading strategies.Now this is why genetic algorithm becomesparamount for this kind of study. This algorithmbasically utilizes the concept of natural selection to determine the best solutionfor a problem . The investor always has apropensity to keep stocks of major blue chip companies that carry maximum weight incapitalization weighted indices and belong to the major GDP contributing industry , whichis factually asserted by the concept of herd mentality in behavioural finance. Now this study particularly focusses on implementationof genetic algorithms on the above described kind of portfolio to evolve best trading strategies so that the effect of the most crucial industries of a country on an investors trading strategies could be understood in a generic fashion.

## II. GENETIC ALGORITHM

The genetic algorithm forms the core functionality of the system for handling agent reproduction. Specifically the most successfulagents will be selected and survive to the next generation while the remaining majority willbe replaced by off springs generated as a result of crossover of elites. An approximatediagrammatical representation can be seen in Figure 1. This approach has been previously suggested by Cyril , Brian and Jonathan [1]

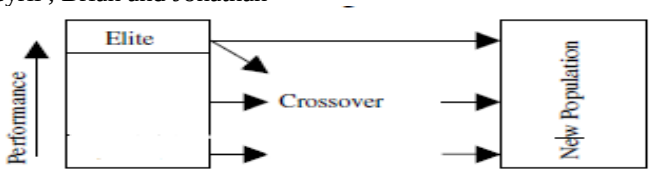


**FIGURE 1**

At each step there will be lot of gene sequences.A comparative parameter will be used to decidethe top 30% at each step. A crossover would beperformed among the top 30% to maintaininflux of new gene pool for the next iteration.This would continue until the comparative parameter has reached a desired threshold.The left 70% would be discarded at the end of each step.

## III. METHODOLOGY

***Step1,***

The algorithm will first create the first generationof "individuals" to form a population of our interest . Each

individual will be assigned a random value to its attributes gene1 , gene2 and gene3.

***Step2,***

The algorithm will put them in thedesignated environment and let them "compete" with each other for survival. Somewill livebetter and some will live with difficulties. Then the algorithm will evaluate eachindividual's situation and give them a score fortheir survival abilities.

***Step3,***

Those individuals with the highest scores (say top 30%) will be selected by the algorithmothers will be eliminated and killed.

***Step4,***

the algorithm will "hybridize" these 30%best individuals to create the other 70% of the population, which will be the second generation of this "species".

***Step5,***

After the new generation is created, the algorithm will repeat the step 2 to 4 again andagain to let the "species" to evolve. After many generations were created and killed, only the"best of the best" are left. The algorithm will then return those survived "individuals" as the values we want to find in the first place, such as the combination of optimal parameters,trading rules, or portfolio allocation weights.

## IV. GENE FORMATION

Gene will be a 7 bits string which looks like 0010100. First 3 bits form Gene_1 , next twowill be called as Gene_2 and last two will standfor Gene_3.

**Gene_1** - Suppose we have 3 companies stocks in our portfolio and it at each place would bededicated to a company . For example if Gene_1 = 010 , then it means we should not trade stocks of the companies at first and lastplace but stocks of the company belongingto first and last place as they are not part of developed strategy since their correspondingbit is 0 but can trade stocks of the company which corresponds to the bit in middle position.

**Gene_2**– The next two bits after gene_1 will be called as gene_2 and will decide at what frequency we should trade .

if *Gene_2 = 01*, our strategy will trade daily

| FREQUENCY | GENE_2 VALUE |
|---|---|
| 1 hour | 00 |
| Daily | 01 |
| Weekly | 10 |
| Monthly | 11 |

**Gene_3 –**

| **MA Type** | **Period** | **Encoded Value** | **Period** | **Encoded Value** |
|---|---|---|---|---|
| Simple MA | 5 | 0 | 30 | 1 |
| | 10 | 1 | | |

For example , if *Gene_3 = 01*, it means our strategy is to buy the stock when 5-period SimpleMoving Average cross 30-period Simple MovingAverage

## V.DECISION PROCESS

In each study we'll take a company each fromthree most important industry sectors of the country in terms of GDP contribution . Using a java program we'll first generate an initialpopulation of say 10 genes . Then based on their frequency of trade and moving average i.e. the gene_3 , we'll analyse their performanceover a given time using historical market data and will use profit/investment **(P/I)** ratio to compare genes. After their performance hasbeen evaluated , top 30% according to P/I ratiowill be forwarded to the next generation.

In the next generation , crossover and mutation would be performed on the top 30% ie the elitesto populate rest of the 70% population and this will continue until the elites of an iteration havereached the fitness level i.e. the **P/I** ratio is at par certain value. Then we will see if the resultant set of elites always have equities of the company that contributes maximum to the GDP. The result generated here would tell the investor if he/she should always have stocks of the companies that belong to major GDP contributing industry of that country in their portfolio while constructing trading strategies .

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## VI. STUDY ON AUSTRALIA

Major GDP contributing industry in this country is **Finance and Insurance**.

Suppose we want to formulate best strategiesto trade Australian equities. TheAustralianindex taken into considerationhere is Australian Stock Exchange Index ( ASX).

First set of equities belongs to Finance Insurance company : **Commonwealth Bank***(CBA.AX)*

Second set of equities belongs to companyof textile sector : **Billabong InternationalLimited***(BBG.AX).*

Third set of equities belongs to an IT firm**Altium Ltd** (ALU.AX).

Initial capital is assumed to be 1000$ and P/I ratio convergence is 0.6.

Using a java program an initial populationof chromosomes is generated . Using technical indicator (simple moving average)gene_3 and frequency of trade (gene_2) elites

were found and program iterated thrice for elites to reach the P/I convergence

The final elites with P/I > 0.6 were found tohave these values
1) gene_1=110 , gene_2=00 , gene_3=11

2) gene_1=110 , gene_2=01 , gene_3=01

3) gene_1=111 , gene_2=01 , gene_3=11

*Conclusion on Australia Test case :*

Four out of 10 final iteration chromosomeshave fitness or P/I > 0.5 and have Commonwealth Bank equities in the gene code (i.e. the first bit is 1) hence based on this case study it can be said that market trading strategies should have equity of companiesbelonging to major GDP contributing industry in Australia.

## VII. Study on India

Currentlymajor GDP contributing industry in this country is **Information technology**in the **service sector**.

The Indian index taken into consideration here is National Stock Exchange Index (NSE).

First set of equities belongs to an IT company: **Tata Consultancy Services** (*TCS.NS*).

Second set of equities belongs to aConglomerate industry:**Reliance IndustriesLimited***(RELIANCE.NS).*

Third set of equities belongs to power industry company : **Birla Power Solutions** (*BIRLAPOWER-EQ.NS*).

Initial capital is assumed to be 100000 INR and P/I ratio convergence is 0.6.

Using a java program an initial populationof chromosomes is generated . Using technical indicator (simple moving average) gene_3 and frequency of trade (gene_2) elites were found and program iterated five time for elites to reach the P/I convergence

The final elites with P/I > 0.6 were found to have these values
1) gene_1=110 , gene_2=11 , gene_3=11

2) gene_1=110 , gene_2=01 , gene_3=11

3) gene_1=011 , gene_2=11 , gene_3=11

*Conclusion on India Test case :*

Two out of ten among strategy chromosomeshave fitness > 0.6 and have TCS stock in thegene code (i.e first bit is 1) hence it can be said that empirically it can be insinuated that market trading strategies are thus affected by equities of the companies of major GDP contributing industry in India as well.

## VIII. Data Sources

Data of all the 6 companies has been taken from their annual report for the past 1 year(2012-2013). References are cited at theend.

## IX. Conclusion

In the conclusion of Australia case studythe P/I values of the chromosomes of lastiteration showed that not only elites butnon elite strategies also had bit of the company of major GDP contributing industry in the chromosome , however inthe India test case this was not the case,only 2 of the 3 elites had first bit as 1.But eventually the India test case alsosupported the Australia test case resultbased on the "majority wins" bases . This review at least ascertains that an investor should always sell with equities of companies of major GDP contributing industry and even include them in 'buying' strategies as well .

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**Dr. DebasisPatnaik** completed **Ph.D** work "Productivity, Growth and Regional Dispersal of All India Industries-1956-95 ” attempted toprovide a framework for simultaneous assessment of equity efficiency relationship and also a methodology for generating an integrated view of industrial development .His published book on a similar title can helpScholars and researchers in the field of Industrial & Microeconomics , Regional Economics, Productivity Economics , industrialmanagement , Application of statistical and econometric tools for Economics & socialscience analysis, Measurement of Technologicaprogress in Economics , Growth & plan ,Economics & Research Methodology and Economics Ethics.

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