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#!/bin/bash
# command line: eco <pmax> <eg> <iter>
#pmax=0.5 交易優勢
#eg=0.00 成長比例
#iter=300 交易次數

pmax=$1
eg=$2
iter=$3

n=2000
ds=20
percent=5

gawk -vPMAX=$pmax -vEG=$eg -vN=$n -vITER=$iter -vDS=$ds '
function winloss(asset) {
    a=asset;
    if (a > UB)
        a = UB;

    #th = 0.5+(a-F)*(PMAX-0.5)/(UB-F);
    th = (1-PMAX)+(a-F)*(2*PMAX-1)/(UB-F);

    if (rand() < th)
        return 1;
    else
        return 0;
}

BEGIN {
    srand(10);
    F=1000;    # initial asset
    UB=F*10;   # parameter for calculating advantage
    D=0.02;    # ratio of asset to invest each time
    total=N*F; # total asset
    DS = 20;

    for (n = 0; n < N; n++)
        m[n]=F;

    for (i = 0; i<ITER; i++) {
        wn = 0;    # number of winner
        wt = 0;    # total asset of winners
        wl = 0;    # total asset of losers
        # throw the dice
        for (n = 0; n<N; n++) { # for each person
            ww = winloss(m[n]);
            if (ww==1)
                wt += m[n];    # total asset of winners
            else
                wl += m[n]*D;   # total lost amount
        }
    }
}

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        worl[n] = ww;
    }

    # economic growth
    w1 += total*EG;
    total = total*(1+EG);
    F=F*(1+EG);
    #UB=UB*(1+EG);

    maxm = 0;
    # redistribute gain/loss
    for (n = 0; n<N; n++) { # for each person
        if (m[n] > maxm)      # find max asset
            maxm = m[n];
        if (worl[n] == 1)
            m[n] += w1 * m[n]/wt;
        else
            m[n] = m[n]*(1-D);
    }
}

# print asset
for (n = 0; n<N; n++)
    printf("%.2f\n",m[n]);
}' | sort -r -n > data.txt

cat data.txt | gawk -vPMAX=$pmax -vEG=$eg -vN=$n -vITER=$iter -vDS=$ds -vPC=$percent '
BEGIN {
    i=0;
    total=0;
    topn=N*PC/100
} {
    m[i]=$1;
    total+=$1;
    i++;
    if (i==topn)
        topsum=total;
}
END {
    maxm=m[0];

    # print distribution
    LS=log(maxm+100)/DS;
    for (i = 0; i<=DS+1; i++) {
        bin[i]=0;
        count[i]=0;
        cc[i]=0;
        acc[i]=0;
    }
    # bin[]:區間裡的總值, count[]:區間中人數
    for (n = 0; n<N; n++) {

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        idx=int(log(m[n])/LS);
        if (idx < 0)
            idx = 0;
        bin[idx] += m[n];
        count[idx]++;
    }

    # cc[]:區間中人數 ,count[]:累進人數(低bin往上)
    for (i = 0; i<=DS; i++) {
        cc[i] = count[i];
        count[i] += count[i-1];
    }

    # acc[]: 累進財富(高bin往下)
    for (i = DS; i>=0; i--)
        acc[i]=bin[i]+acc[i+1];

    # 中位數在那一個區間
    med=int(log(m[N/2])/LS);
    ratio=maxm/m[N/2];
    dm=log(ratio)/(DS-1-med)
    minx=-dm*med

    #printf "a*(med=%d)",med;
    #printf "(maxm=%.1f,medm=%.1f,ratio=%d)",maxm,m[N/2],maxm/m[N/2];

    for (i = 0; i< DS; i++)
        printf("a%.2f %.2f %.5f %.2f %.2f (bin=%.1f,count=%d)\n",exp(minx+dm*i),100*bin[i]/total,
100-100*count[i]/N, 100*acc[i]/total, 100*cc[i]/N, bin[i],cc[i]);
    printf("a*中位數區間=%d\n",med);
    printf "a*最大財富值:%.1f,中位數:%.1f\n",maxm,m[N/2];
    printf("aa*Iteration:%d\n",ITER);
    printf("aa*交易優勢設定:%d%%,紅利增長率設定:%.1f%%\n", (PMAX-0.4999)*100,EG*100);
    printf "aa*前%d%%人口擁有%.1f%%財富\n並且是中位數的%.1f倍
\n",PC,100*topsum/total,topsum/(m[N/2]*topn);
}' > raw.dat

# process drawing
cat raw.dat | grep -v "#" | cut -c2- > stat.dat
cat raw.dat | grep "a#"
LB=`cat raw.dat | grep "a[0-9]" | sed -e 's#a###' | gawk
'BEGIN{i=0}{if($1!=0.0){printf("%d\n", (i==0)?0:i-1);exit;};i++;}'`
LB1=$((LB+1))
cat stat.dat
echo =====
filename=`echo P${pmax}_E${eg}_I${iter}`
echo $filename
echo =====
#echo "set terminal png" > plot.cmd
#echo "set output '${filename}.png'" >> plot.cmd
msg=`cat raw.dat | grep 'aa#' | sed -e 's/aa#/g'`

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echo "unset label" > plot.cmd
echo "set label \"\$msg\" at ${LB1},60 font \"Sans,15\"" >> plot.cmd
echo "set xrange[${LB}:]" >> plot.cmd
echo "set key at ${LB},90" >> plot.cmd
echo 'set terminal qt 0 font "Sans,12"'
set grid
set xtics rotate by 45 right
set xlabel "財富和中位數的比值"
set ylabel "百分比"
plot "stat.dat" using 2:xticlabels(1) with boxes title "區段總財富", "stat.dat" using 5 with
linespoints lw 2 lc "green" title "區段人數", "stat.dat" using 3 with linespoints lw 2 title "累進人數", "stat.dat" using 4 with linespoints pt 7 lc rgb "red" title "累進財富"
' >> plot.cmd

cp stat.dat ${filename}.dat
cat plot.cmd | sed -e "s#stat.dat#${filename}.dat#" > ${filename}.cmd
cat plot.cmd
exit
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