STOCK MARKET FUZZY DECISION MAKING

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Abstract

There are different methods used as supports for decision-making processes. Nowadays the new theories of soft computing are used for these purposes. The article deals with the application of the decision making on the stock market where fuzzy logic model serves as a support for decision making of investors.

1   Introduction

The applications in economics, and finance have specific features in comparison with others. The processes are focused on private corporate attempts at money making or decreasing expenses; therefore the details of applications, successful or not, are not published very often. The decision making on the stock market belongs among these processes. The fuzzy logic enables to work with vague terms often used in economics, finance, and also stock market.

2   Case Study

The article deals with the build-up of a model that solves the problem of decision making in capital markets: whether to trade in the stock market or not. The model build up in the MATLAB environment is presented in Fig. 1. The input variables and their attributes are as follows: *Interest Rate* (low, medium, high), *Margin* (insignificant, significant), *Market Strength* (low, medium, high), and *Trend* the course of time series (deterministic, stochastic).
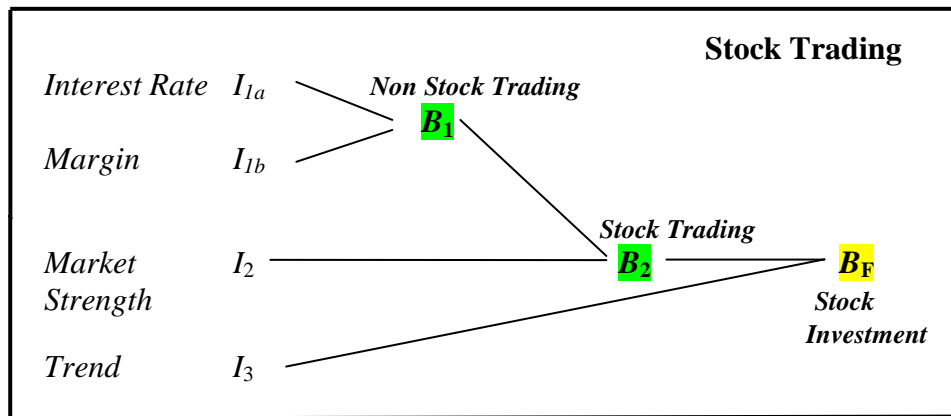

Figure 1: Fuzzy logic – model

The rules and attributes are as follows: the box *Non Stock* Trading (unsuitable, neutral, suitable) determines the rule of desirability of depositing money in a stock market; the block *Stock Trading* (yes, no) evaluates whether trading in the market is suitable from the point of profitability of investment and the strength of the market; the block *Stock Investment* (yes, no) gives the decision for trading when the time series is stochastic, meaning that there is no possibility to make a good prediction of future development of time series. The output variable *Stock Investment* evaluates whether to trade with share, index, commodity, or currency ratio.

It is necessary to set up the membership function for all inputs and outputs. It was used the functions in the shape of Λ, Π, Z, S. The rule box must be set up with rules and their weight among

inputs and outputs. The weight of rules can be changed during the process of optimization. The build-up model can be used for the evaluation of investment on stock market as a support for decision makers. The course of membership function and the weight of rules DoS can be set up by means of neural network in case when the data are at disposal. The fuzzy logic model was built-up (fig.1) with box B_1 (fig.2), B_2 (fig.3) and B_F (fig.4).
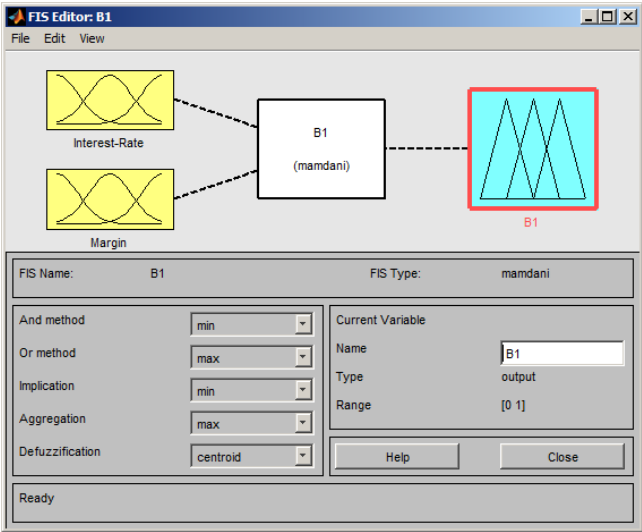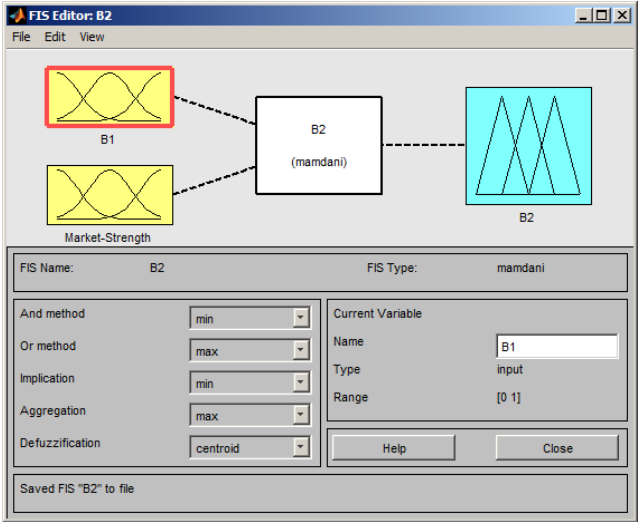
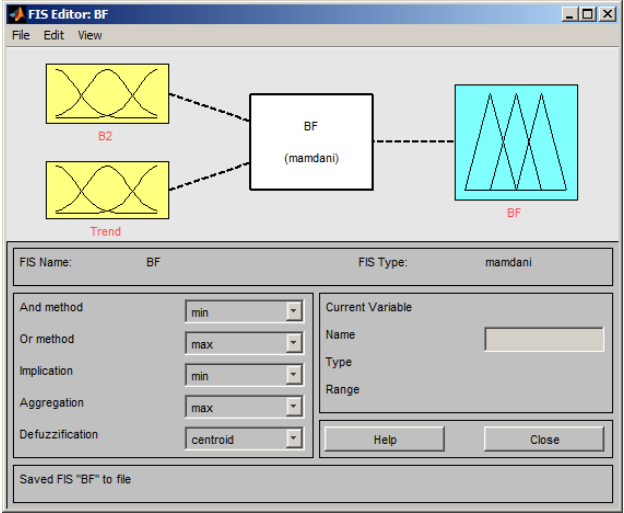

Figure 2: Box B_1

Figure 3: Box B_2

Figure 4: Box B_F

The M-file *BF.m* provides the calculation. See Prog. 1.

```
clear all
B1v = readfis('B1.fis');
UdajB1 = input('Input values in the form [I1a; I1b]: ');
VyhB1 = evalfis(UdajB1, B1v);
B2v = readfis('B2.fis');
UdajB2(1)=VyhB1;
UdajB2(2) = input('Input values in the form [I2]: ');
VyhB2 = evalfis(UdajB2, B2v);
BFv = readfis('BF.fis');
UdajBF(1) = VyhB2;
UdajBF(2) = input('Input values in the form [I3]: ');
VyhBF = evalfis(UdajBF, BFv);
if VyhBF<0.3 'No Stock Trading'
elseif VyhBF<0.6 'Monitor Stock Trading'
else 'Yes Stock Trading'
end
fuzzy(BFv)
mfedit(BFv)
ruleedit(BFv)
surfview(BFv)
ruleview(BFv)
```

Program 1: M-file *ST.m*

The results of the calculation are presented by inputs I_{1a}, I_{1b}, I_2, I_3 with values 0, 1, and 0.5. The results are No Stock trading, Yes Stock Trading, Monitor Stock Trading. See Res.1. It was tested tens of cases that lead to the conclusion, that the model is usable in practice.

Input values in the form [I1a; I1b]: [0;0]
Input values in the form [I2]: [0]
Input values in the form [I3]: [0]
ans =No Stock Trading

Input values in the form [I1a; I1b]: [1;1]
Input values in the form [I2]: [1]
Input values in the form [I3]: [1]
ans = Yes Stock Trading

Input values in the form [I1a; I1b]: [0.5;0.5]
Input values in the form [I2]: [0.5]
Input values in the form [I3]: [0.5]
ans =Monitor Stock Trading

Results 1: M-file *BF.m*

3   Conclusion

The presented example mentioned above supports decision making on the stock market. The model is usable in practice. The key role plays the correct set up membership functions and fuzzy rules.

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