

PREVENTION OF ILL-ADVISED DEBT ELIMINATION PROCESS OF NATURAL PERSON AND IT'S FUZZY (DE)SIMILARITIES IN COMPROMISE SET - CASE STUDY FOR CZECHIA

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Abstract:

The complex views of insolvency proceedings are unique, poorly known, interdisciplinary, and multidimensional, even though there is a broad spectrum of different insolvency instruments. With a focus on natural persons regarding debt relief in the insolvency proceedings, the question arises whether it is possible to satisfy at least partially the creditor while maintaining the debtor's social and economic status. If so, is there a set of tools and their error rate or similarity of these possible instruments? For this purpose is chosen fuzzy multidimensional reasoning. The result can be a compromise set depending on the defined purpose functions without a detailed quantitative description. Measures such as creditor satisfaction and the socio-economic decline of the debtor, including other instruments used in the insolvency proceedings situation, are hard to quantify. The result of the study is a compromise set of tools that suit both parties involved.

Key words:

fuzzy, insolvency, qualitative, compromise set, natural person

JEL: G33, G34

1 Introduction:

Insolvency mechanisms are among the key parameters of the development of the whole economy and significantly impact the banking sector. A transparent legal environment ensuring creditor's enforceability of their claims is crucial for sound economic growth, mainly because of the impact of insolvency law on the behavior of entities in regular economic operation, i.e., before bankruptcy (the scope of ex-ante legislation). Moreover, functioning insolvency proceedings increase the willingness of creditors to lend and allow over-indebted persons to become economically active again and further stimulate the economy.

The Czech Insolvency Act (69/2011) regulates the resolution of the debtor and the impending bankruptcy of the debtor by legal proceedings in one of the prescribed ways to arrange property relations with persons affected by the debtor's bankruptcy or imminent bankruptcy. With the increasing number of insolvency proceedings, there are growing efforts to streamline processes and identify connections between majority creditors (Mrázová & Zvirinský, 2015). Data opening studies show various ways of solving insolvency proceedings. Moreover, those approaches show different effects in regions of Czechia. (Mrázová & Zvirinsky, 2014). More and more professional research deals with the reasons why the number of insolvency proceedings of both legal and natural persons is increasing (Paseková et al, 2014) as well as the determination of the rate of creditors satisfaction (Crhova et al., 2015). Some studies are focused on the description of the domestic market to monitor the period after the introduction

of the insolvency law (Smrčka et al, 2013), or any effects on practice have new and proprietary legislation that addresses the issues of truth in insolvency decisions (Richter, 2013). Insolvency proceedings are subject to the influence of many factors from the whole economic environment. Some elements (determinants) cannot quantify. Therefore, it is not possible to use basic statistical models.

Eastern European countries are characterized by insolvency laws, which are still under development, many of which are emerging countries (Czechia, Hungary, Poland). The insolvency law in these countries was often issued according to the rules of developed countries and their adaptation to specific economic conditions in the country. The most representative examples are insolvency rules in Romania or Poland originating in German legislation. In Romania, Bulgaria, Poland, Hungary, Czechia, and Slovakia, the lack of liquidity and the company's inability to pay current debts; it is the main reason for insolvency proceedings. Therefore, according to the German model, Eastern European countries have introduced debt as a criterion for opening bankruptcy/insolvency proceedings, which is the case with Bulgaria, Czechia, Poland, and Slovakia.

In the first year (2008) of putting the insolvency law into practice, about 5200 insolvencies were opened in Czechia (Svobodová, 2013). However, this figure has increased significantly in the coming years, as the impact of the global financial crisis has also manifested itself in Czechia - industrial production fell by 13.4%, and many areas witnessed massive layoffs.

Household debt is a problem that has been a problem not just for the natural person in Czechia as in the whole EU for a long time. However, most of the attention is paid to solving insolvency in terms of legislative changes or research into social factors leading to a progressive increase of that negative factor. The increasing number of distraint processes during the current economic boom is alarming (Della Setta et al, 2020). It, therefore, is crucial to increase public awareness of possible debt elimination within the Insolvency Act. To set the integrated picture of debt elimination is essential to determine impacts on both sides in the process, as is a debtor and a creditor. As a follow-up to previous research on insolvency, its tools, and its impacts on the professional public (Poláček, 2017), this study will focus on preventing the economic and social decline of the debtor in debt elimination while trying to satisfying the creditors claim.

As the term from above, "economic and social decline" represents one of the objective functions in further research: personal life goals. As the outcome of ill advise of debt elimination where the results can be resumption as "evidence of this decline is revealed in high levels of unemployment, slow rates of economic growth, a lack of innovation, complacency and labor market rigidities" (Corbacioglu, S., 2011). According to the study of debt and its impact on the psychological aspect of life (Ong et al., 2019), a significant aspect of undefined variables that affect chronic debt impairs behavior. If this objective function has a harmful directive, it is evident that it impacts critical macroeconomic variables.

Insolvency proceeding-related problems decisions represent a broad spectrum of complex tasks challenging to observe. Moreover, they are often unique and of interdisciplinary nature. Therefore, different tools are used to analyze them – statistical analysis, fuzzy or rough sets, genetic algorithms, or trend analysis (Poláček, 2017).

The impacts of the insolvency proceedings are vast. It can be divided into the effect on a single individual or implications for society as the study of Canadian researchers (Allen & Basiri, 2018) examines the impact of the Insolvency Act on consumer insolvency decisions associated with social degradation. After all, individuals form society. If there is a need to have a healthy and prospering economic system (Scholl, 2018), it is essential to have an economic and social stable population at a time of cheap money.

This paper deals with insolvency proceedings and its options for the natural person within the EU legislation and, more specifically, the Czechia Insolvency Act. Such processes are often described by non-numerical quantifiers, e.g., words – low, medium, high. However, the transfer of such verbal values into fuzzy sets is very subjective, see, e.g. (Hu & Tseng, 2007). There is a direct proportionality confirmed by experience / common sense reasoning:

Vague statements free of mathematical basis are more versatile. (1)

It means that a numerically based statement is definite. A statement based on words is more versatile than the analogical statement based on numbers, see e.g.

Natural persons who are not in the process of debt elimination are more prone to falling into debt spirals than those they are. (2)

Determining the optimal instrument for eliminating a natural person's debt is always very individual and dependent on the decision of the insolvency administrator and creditors. Therefore, the needs of decision making are generally known that insolvency administrators seek to maximize the return of creditors claims and minimize the society's economic decline of the debtor. The set of decisions of the process is based on legal options for individuals to amortize debt using qualitative fuzzy methods and determination of ideal options for compromise choice of solutions. For this case study, it is omitted the dishonest intention of the debtor, and all legal-specific matters may differ. The purpose is to study the fuzzy sets and compromise set of the debt elimination instruments to satisfy the creditor and prevent the partial social decline of the debtor. This statement implies a hypothesis:

H₀: A wrong choice of debt elimination instrument has a significant impact on the economic and social decline of the debtor. (3)

Not many previous researches that deal with that specific aim as its debt elimination for the natural person from the economic and social point of view using the qualitative tools as are the fuzzy logic and non-numerical quantifiers. Awareness of the possibility of using qualitative methods in this direction was in studies using fuzzy reasoning within legal entities to predict bankruptcy. Determining probabilities of bankruptcy (Özari, 2017) or risk assessments (Chou et al, 2017). The highlight of qualitative methods is that they can make an exact conclusion from fuzzy data sets. Unclear data describing the debt elimination process as can be seen in the study (Boratynska & Grzegorzewska, 2018) where bankruptcy prediction in agribusiness entities are in comparison with classical quantitative and qualitative methods. More specific is the use of fuzzy reasoning mentioned in the study based on neural network (Zhao et al, 2018) and its further utilization in medical specialization (Bocklisch & Hausmann, 2018), texture modeling (Martínez - Jiménez, et al, 2018).

Fuzzy reasoning is a versatile tool in many fields and valuable in problems where some variables are vague or hard to quantify. Fuzzy sets generally reflect the way people think about issues. Primarily the approximate form of a fuzzy set can be designed easily and quickly. Later, after testing and other experiences, we can modify its detailed characteristics. The finding above is the fuzzy multidimensional reasoning is a suitable tool for determining compromise sets in debt elimination.

2 Methods

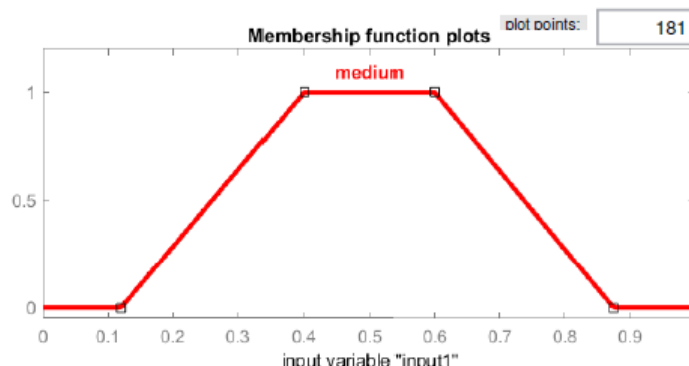
To test the hypothesis is crucial to choose an ideal methodology. For the debt elimination process as a more vague process than an accurate numerical one is a suitable methodology of fuzzy multidimensional reasoning completed by similarity graphs and determination of compromise area.

There are many different fuzzy reasoning, see, e.g. (Dubois & Prade, 1997). Unfortunately, most of the published reasoning algorithms are prohibitively complex and unsuitable for routine applications of insolvency proceedings experts. The concept of fuzzy sets was introduced relatively recently (Zadeh, 1971; 1965). However, fuzzy logic is a relatively well-established formal tool (Prato, 2007). In its most basic sense, a fuzzy set is a set where objects have a gradual transition from membership to non-membership, see, e.g. (Kaufmann & Bonaert, 1977).

A linguistic value is a value given by words, e.g., *high, Low, Medium, Approximately 12 per cent, old, new*, etc. A linguistic value is transformed into a fuzzy set by the specification of a grade of

membership. For example, a Medium of creditor's satisfaction (SAT) is transferred into a fuzzy set by the degree of membership function given in Fig. 1.

Figure 1: Fuzzy set Medium SAT – Grade of membership function



Source figure: Own calculation

The SAT belongs to the fuzzy set “Medium” with the grade of membership equal to pre cent

$$\mu_M(SAT) \tag{4}$$

Where SAT is the creditor satisfaction, index M is Medium, and μ is the grade of membership.

There are two fuzzy intervals, namely

$$\begin{aligned} a_M < SAT < b_M \\ c_M < SAT < d_M \end{aligned} \tag{5}$$

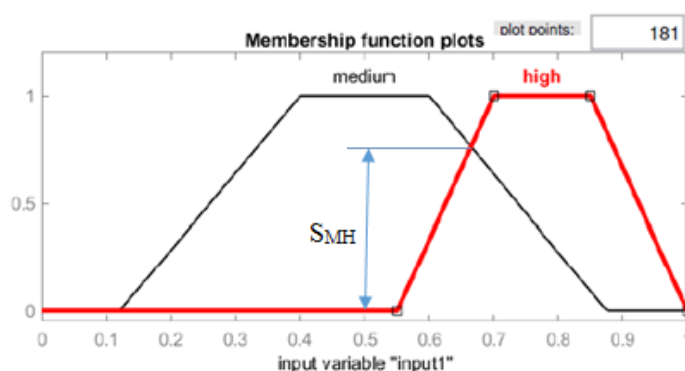
The intervals(5)represent the SAT that belongs to the fuzzy set Medium partially.

There are different definitions of fuzzy similarities of two fuzzy sets for the same variable, see, e.g. (Rosenblad, 2009). Fig 2 demonstrates the simplest possible definition of a similarity s of the fuzzy sets M Medium and H High for the variable creditor's satisfaction (SAT).

$$S_{MH} \tag{6}$$

$$S_{(M, H)} = S_{MH}$$

Figure 2: Graphical definition of fuzzy similarity



Source figure: Own calculation

A fuzzy model, as it is used in this paper, is a set of m n-dimensional conditional statements:

$$\begin{aligned} & \text{if } A_{1,1} \text{ and } \dots \text{ and } A_{1,n} \text{ then } B_1 \text{ or} \\ & \text{if } A_{2,1} \text{ and } \dots \text{ and } A_{2,n} \text{ then } B_2 \text{ or} \\ & \dots \dots \dots \\ & \dots \dots \dots \\ & \text{if } A_{m,1} \text{ and } \dots \text{ and } A_{m,n} \text{ then } B_m \end{aligned} \tag{7}$$

The variable A represents the individual elements of the fuzzy set. Transform B can be described as possible states of a defined fuzzy set. Where fuzzy sets (see Fig. 1) can be easily specified or/and modified using the relevant points (very low, low, medium, high, very high). These values there represent the breaking points of the graph The evaluation of fuzzy sets A is a task for a team of experts.

2.1 Similarities Graphs

The similarity is one-dimensional, i.e. a similarity based on SAT. However, a multidimensional similarity quantifies the similarity of multidimensional set, e.g. similarity of two n-dimensional fuzzy sets Ω_1 and Ω_2 , see (8),(9):

$$\begin{aligned} \Omega_1 &= A_{1,1} \text{ and } \dots \text{ and } A_{1,n} \\ \Omega_2 &= A_{2,1} \text{ and } \dots \text{ and } A_{2,n} \end{aligned} \tag{8}$$

There are n one-dimensional similarities

$$\begin{aligned} s_1 &= s(A_{1,1}, A_{2,1}) \\ s_2 &= s(A_{1,2}, A_{2,2}) \\ &\dots \\ s_n &= s(A_{1,n}, A_{2,n}) \end{aligned} \tag{9}$$

The n-dimensional similarity $\lambda_{1,2}$ of two n-dimensional fuzzy sets Ω_1 and Ω_2 is:

$$\lambda_{1,2} = \min (s_1, s_2, \dots, s_n) \tag{10}$$

The similarity of the first two A segments of the conditional statements (10) can be easily modified for the similarity of any pair of A segments of v-the and w-th statements (11).

$$\lambda_{v,w} \tag{11}$$

A similarity graph G is an oriented graph, has m nodes. It is edgiest pairwise similarities λ . The similarity $\lambda_{v,w}$ represents an edge leading from node v to node w.

2.1.1 Compromise Area

A model M

$$G = M(X), \tag{1}$$

is a relation between a set X of v decision variables, a set of t goals (objective functions)

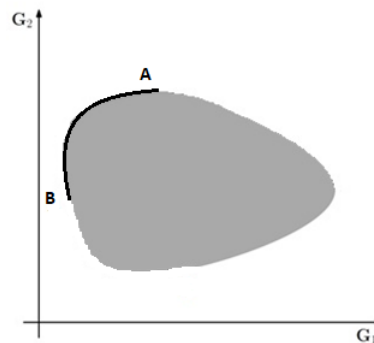
$$\begin{aligned} X &= (X_1, \dots, X_v), \\ G &= (G_1, \dots, G_t). \end{aligned} \tag{2}$$

There are decision variables X constraints. E.g., a concentration cannot be negative. Typical constraints are upper and lower limits for all variables

For example, the different case studies of debt elimination instruments can have many different objective functions G and no decision variables X (2).

The two-dimensional problem, $t = 2$ (3), is graphically presented in Fig. 3. The set of all possibilities sets is a grey area.

Figure 3: Two-dimensional compromise area



Source figure: Own calculation

To simplify the definition, let us suppose that the very nature of one objective function (e.g. Creditors' satisfaction, Social-economic decline) G_2 is to be maximised and the second one is to be minimised G_1 see, e.g. (3).

$$\begin{aligned} \text{Max } G_2(X), i = 1, 2, \dots, t. \\ \text{Min } G_1(X), i = 1, 2, \dots, t. \end{aligned} \quad (3)$$

It is a simple task to eliminate all such elements of the set, which do not represent a compromise. Hence, this rule is considering (14),: for a pairwise compromise.

A real-life insolvency proceedings tasks are often based on a significant number of objective functions, and the insolvency administrator or creditor is often interested in a specific point of view, e.g. economics, sociology. That is why one of the objective functions can be relevant from the economy and the other from sociology. However, to simplify the optimisation algorithm, let us suppose that each subset of objective function G_i is unique. Therefore, the following intersections are empty.

$$G_i \cap G_j = \emptyset, i, j = 1, 2, \dots, s \quad (4)$$

Therefore the set G is subdivided into s subsets

$$G = G_1 \cup G_2 \cup \dots \cup G_s. \quad (5)$$

3 Paper results

The case study hypothesizes that the insolvency administrator participating with a creditor must choose between a strictly financially oriented instrument or a sustainable social-economical status for a debtor. A team of insolvency administrators and academic researchers developed a fuzzy model using traditional knowledge bases for fuzzy expert systems. The model is 4 dimensional $n = 4$ and there are 8 instruments $m = 8$ (10).

There are eight chosen instruments for relief of debt moreover to consolidate their declining financial situation. Each tool is selected depending on legislation, specific natural person insolvency proceeding, or insolvency administrator procedures. Generally, it is possible to choose any of those eight insolvency instruments among the European Union Insolvency law system. The debt elimination instruments were accordingly selected to Czech Insolvency Act and its novelization late in 2019.

The instruments of debt elimination can be divided into two main categories. First is selling the debtor's assets (SOA) and paying the debt, considering the percentage of the total debt. The second category is a combination of selling off assets and repayment schedule to satisfy a creditors claims with preservation of debtors social and economic status (RP1-3). That means to minimize a decline of debtors' wellbeing. Those subcategories are divided accordingly to the time horizon of repayment and final percent satisfaction for the creditor. In the list of debt, elimination instruments include options outside of the insolvency act but have a similar goal. The first is the possibility of Distraint (DIS). This option is the one that is the worst-case scenario for both interesting subjects due to minimization payoffs and maximizing the social-economic decline of the debtor. However, at some point, this is only a possible option of how creditors can claim their outstanding debt. To preserve this situation, the debtor can use the options mentioned above through the Insolvency Act or have another person who takes over the debt (TOL) liability, such as a family member or another close person. The option outside of the Insolvency act to deal with a debt spiral is to use an offering of any bank institution in the choice of debt consolidation (CON). The additional way of dealing with has been chosen a Debt elimination within legal boundaries to avoid a debt repayment to the creditor (DLO).

In table 2 is the list of debt elimination instruments as mention-above that can be used for a natural person to satisfy a creditors claims and preserve a social-economical decline in a specific ratio.

A used case study can be an example from the insolvency register. The debtor has more than one creditor (at least two), has three of his debts for more than 30 days after the due date, and therefore the debtor is unable to pay its debts (it is insolvent). To meet this debt elimination condition, the debtor must have income corresponding to - wage, salary, income from a business, remuneration from work or work agreement, pension (any), maternity, parental, unemployment benefit, sickness, annuity, retirement allowance, rental income, etc. If the payment is too low or even none, the debt elimination can also be repaid through a third-party contribution, the so-called donation or pension contract. Alternatively, the owned property of an appropriate value - e.g., real estate, vehicle, savings, valuable movable property, securities, shareholding, etc.

The paper omitted the dishonest intention of the debtor and all legal-specific matters that may differ. The purpose is to study the fuzzy sets and compromise set of the debt elimination instruments to satisfy the creditor and prevent the debtor's partial social decline.

Table 1: List of Debt elimination instruments

1	SOA	Selling of assets
2	RP1	Regular payment 1
3	RP2	Regular payment 2
4	RP3	Regular payment 3
5	DIS	Distraint
6	CON	Consolidation
7	TOL	Take-over a liability by another person
8	DLO	Debt elimination law optimisation

Source table: Own calculation

Relevant fuzzy sets used in the model Tab. 1 are further extended in tab. 2. For example, the SOA variable has little effect on the COS variable, but the expert has chosen a large weight. The values in Tab. 3 is a result of open discussion among insolvency administrators and academic researchers. However, the chosen scaling for the variable RP2 indicates that the use of fuzzy sets itself is problematic for this variable, because it shows the same relationship in the whole matrix. For comparison with other variables, however, this shortcoming does not matter, see Fig. 7)

Table 2: Defined fuzzy model of debt elimination options to a membership grades

	COS	SED	SAT	TCOS	Debt elimination instruments	Weight of instruments
1	VLO	VHI	HIG	LOW	SOA	1.0
2	LOW	HIG	HIG	LOW	RP1	1.0
3	MED	MED	MED	MED	RP2	0.7
4	HIG	MED	LOW	HIG	RP3	0.9
5	LOW	VHI	VLO	LOW	DIS	0.6
6	HIG	LOW	MED	LOW	CON	0.5
7	MED	LOW	HIG	LOW	TOL	0.4
8	HIG	LOW	VLO	MED	DLO	0.2

Source table: Own calculation

Tab 3 is defined as fuzzy memberships for chosen observe variables in the process of debt elimination for the natural person.

Table 3: Grades of fuzzy memberships

COS - Costs

Fuzzy Values		a	b	c	d
VLO	Very low	0	1	9	11
LOW	Low	10	12	15	16
MED	Medium	15	17	19	20
HIGH	High	19	21	23	25
VHI	Very high	24	26	30	35

SED – Social-economic decline

Fuzzy Values		a	b	c	d
VLO	Very low	0	3	5	5.5
LOW	Low	5	6	6	7.5
MED	Medium	6.5	8	9	9.5
HIGH	High	9	10	10	12
VHI	Very high	11	13	16	20

SAT – Creditors' satisfaction

Fuzzy Values		a	b	c	d
LOW	Low	0	0.1	0.3	0.4
MED	Medium	0.3	0.4	0.6	0.7
HIGH	High	0.6	0.8	10	11
UN	Unknown	0	0.1	1	1.1

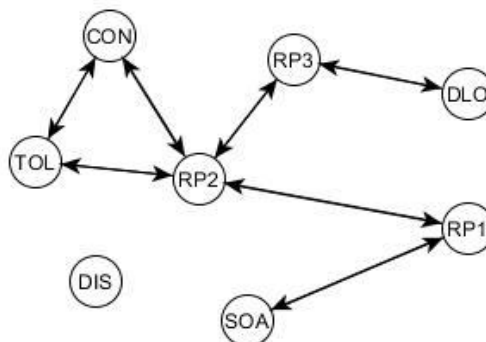
TCOS – Time costs

Fuzzy Values		a	b	c	d
NOO	No	0	7	11	15
PYE	Partial Yes	12	16	20	23
YES	Yes	21	24	30	35

Source table: Own calculation

The result of the modelling process is the similarity graph where it is possible to observe similarities and relationship among the debt elimination instruments.

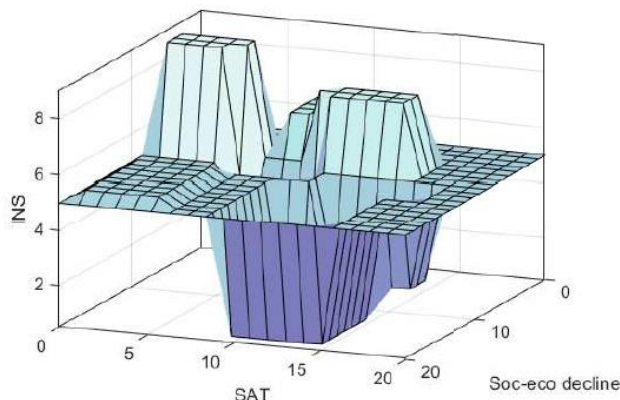
Figure 4 – The Similarity Graph based on the eight statements, see Tab. 2



Source figure: Own calculation

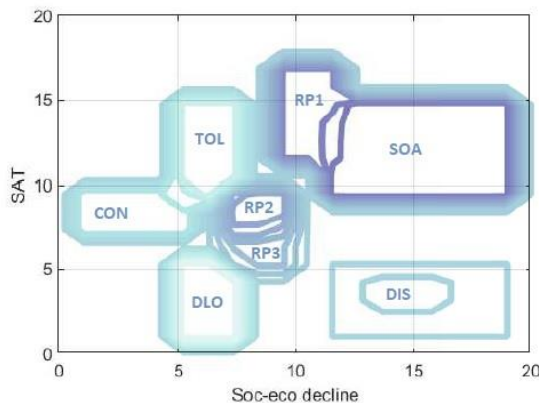
Using the surface viewer can be seen in Fig 4, the three-dimensional graph of debt elimination instruments based on the weight of their options see, e.g. Tab 2. The graph is related to inputs of variables Social-economic decline (SED) and Creditors' satisfaction (SAT). The graph below is observable all eight debt elimination instruments depend on two objective functions. The first variable is the maximization of the creditor's satisfaction. The second one is the minimalization of the debtor's socio-economical decline. The figure represents the weight defined in Fig. 2.

Figure 5 – Graphical surface 3-D viewer of debt elimination instruments (left)



Source figure: Own calculation

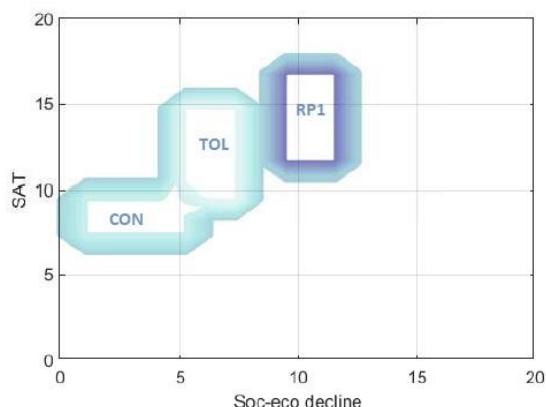
Figure 6 – Graphical 2-D surface viewer of debt elimination instruments to chose a compromise set



Source figure: Own calculation

After modifying the three-dimension graph of debt elimination instruments to a two-dimensional graph Fig. 5, it is possible to determine the compromise set of possible ideal debt-relief options accordingly to $H_0(3)$. In other words, there is an effort to minimize a variable on axis X the Soc-eco decline and maximize the variable on axis Y the SAT as Creditors' satisfaction. The depth and saturation of the graph's color design indicate the weight of the selected option; the darker the area is, the higher the weight is. The following Fig. 7 represents the compromise area (see, e.g. Fig 3) SAT versus SED, according to Fig. 5 see, e.g. Tab 2.

Figure 7 – Compromise set in the debt elimination process with both objective functions



Source figure: Own calculation

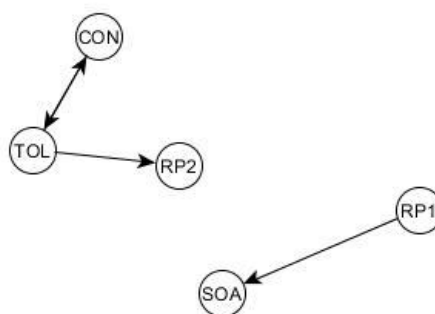
The similarities of RP1, CON, and TOL are not very high; see Tab. 4. For example, the highest similarity is RP1, and SOA is 25 percent. It means that if the decision-maker decides to use one of the instruments that prevent the social decline, it is not the assurance of creditors' satisfaction and otherwise. Also, the result of this similarity determination is that every chosen debt elimination instrument has a specific process and outcome.

Table 4: Similarities of RP1, TOL and CON

Chosen Instrument	Instrument	Similarity Percentage
RP1	SOA	25.0
TOL	RP2	17.0
TOL	CON	14.3
CON	TOL	14.3

Source table: Own calculation

Figure 8 – Transition graph of the similarities in Table 4 for the variables SAT, SED



Source figure: Own calculation

Investors with social responsibility goals need to compare funds based on financial and non-financial criteria, see, e.g. (Rosenblad, A., 2009). One result of the case study is that financial and non-financial criteria lead to mutually exclusive investments.

4 Discussion

Due to the novelty of the research approach, the purpose has not to usages limit. On the contrary, it can set a paradigm and supplement the knowledge of insolvency proceedings. The whole economic policy gain new approaches contain effectivity tools for description vaguely formulated problems.

In light of the case study results, the debt elimination has a compromise set of instruments on how to confirm the hypothesis (3) set in the introduction of this paper. The hypothesis of the options in the debt elimination process to partially satisfy the creditor and protect the debtor from social decline can compromise three possible instruments that can partly help the creditor and protect the debtor. With that finding, the individual approach of debtors and their conditions are globally fair (Coetzee, 2016). The significant results are that only one instrument in the compromise set is a specific part of the Insolvency act and part of globally legal instruments that are part of Insolvency proceedings. The instrument within the Insolvency act is Regular payment¹ - RP1, a set of the legal procession of selling assets and a regular payment schedule, which is in the competence of insolvency administrator and interested creditors. The other two instruments are outside of the legal framework of insolvency act as consolidation is the tool that can only be advised to debtor from insolvency administrator. The consolidation as a financial tool from the third person as a Bank institution, where the debtor consolidates all the active debts to one and carries on with regular payments – but it must pay it. The third option of instruments is Take-over, a liability by another person – TOL. This instrument is not so probable as other instruments (in the model has almost the lowest weight) see, e.g., Fig. 5. Take-over a liability is, can be said, a win-win situation for both interested sides when the third side pays the debt (for example, family member). This instrument is also outside of the Insolvency act legal framework.

Compared with other studies mentioned in the theoretical part of the paper that deals with a similar topic, this one is unique for considering debtor social status. Effective on debt elimination globally focuses on poorer countries from a macro point of view. Sholl defines its influence on economic growth (Scholl, 2018). Another study (Kubálek et al, 2017) is proven that low economic growth has a significant impact on increasing personal bankruptcies of a natural person. This area has consequences for the government policy and the country's financial system.

On the other hand, a few studies have focused on the debtor as the natural person and its threat of falling down the debt spiral and defining factors that precede the personal bankruptcy (Paseková, 2014). Close to similar results is the study of Allen, J., Basiri, K. where is focus on psychological aspects of impacts of the debt on a natural person. However, none of the studies implies the remaining social status of the debtor as the significant micro variable for the macro view of the economy.

5 Conclusion

Insolvency proceedings are complex, integrated processes with microeconomic and macroeconomic environments overlapped to law practice and law sciences. On this basis, the finding is difficult to determinate exact variables and their range with a significant impact on the process. For this reason, it is appropriate to use non-statistical methods that take into account the variability of selected variables.

The presented approach is only one of many possible modifications on accommodating all features of insolvency proceedings flexibly; that is why it is necessary to implement the fuzzy modification. But, unfortunately, there is no general methodology for inventing the best possible formalization of fuzzy knowledge.

This study's benefit is the "thinking outside of the box" to consider including the possibilities to satisfy creditors with the help of the third side (TOL, CON) see, e.g., Fig. 7.

The second significant result is the determination of the similarity of the used instruments of debt-relief proceedings. Where it can be seen how specific tools of debt elimination are substitutable for one another. As in Fig. 8, the relations between chosen instruments from compromise set see, e.g., Fig. 7 and Table 4.

The results of this study are that there are instruments of debt elimination on how to partially satisfy creditors and remain debtor economically active that combines aspects from the legal framework of the Insolvency act and third sides options on personal bankruptcy. The use of multidimensional fuzzy reasoning shows that it is possible to satisfy creditors partially. The main focus is on minimalizing the debtor's life decline. The closures can be different since they can select the function and input variables according to the current conditions. In any case, the hypothesis examined is confirmed because, with a poorly chosen instrument for debt elimination, the debtor's financial situation and social status may change significantly to the worst.

Moreover, at the same time, the return to the creditor may not be directly proportional. One of the main problems of debt elimination of a natural person and the whole insolvency proceedings may be hidden in the branch division. It is explicitly a problem of law theory and practice, which could be used economic analysis and possible multidisciplinary synthesis of law and economic sciences to obtain new conclusions for future amendments to insolvency acts. As was said, the insolvency proceedings are complex topics with an enormous impact on the monetary policy of the whole because it is individual that is important for the society.

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