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THESES OF DOCTORAL (PhD) DISSERTATION

FORECASTING INSOVENCY OF HUNGARIAN LOCAL GOVERNMENTS

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1. INTRODUCTION

1.1 Topic and personal motivation

Knowing the future and the forecastable nature of future were always in the focus of human interest. It is enough if one thinks about the ancient Greek Delphic Oracle, the magicians and prophets that appeared time to time accompanying the Rulers of the Medieval Ages. This is not elsehow even today, since the result of a democratic election may change the fundamentals of the economic processes. Therefore, knowing the future or the possibility of calculating it with a high probability is of fundamental importance for each company and institute independently of their being private or public.

In spite of the fact that future telling, as an activity, as a result of cultural presentations, is usually associated with a kind of doubt and irrationality – simply they may just say that future tellers are crazy – nevertheless the activity itself has been closely integrated into the economic processes of our days. It is sufficient if we think about the optimal, realistic and pessimistic scripts that are included in the business plans, or if we think about the stock exchange, where they attach prices to the events before their occurrence. We call this phenomenon in economics expectations, forecasts, or early warning signals.

In the so-called "Big Data" era – as a result of the experiences and the technological development of the period that went by since the political system transformation – the public sector has to also place an increasingly greater emphasis on perceiving in due time the non-desired processes and as far as possible to intervene prior to their occurrence in order to save significant amounts of taxpayer moneys.

During the years I spent at the university and during my close to three years of work experiences gained at the State Audit Office and the National Bank of Hungary each, I had the chance to get acquainted with the practical aspects of fiscal and monetary policy from the viewpoint of an auditor, who inspects the observation of the provisions of law and also from the overseer viewpoint, who analyses mostly the system risks. Therefore, the creation of the model forecasting insolvency in respect of a local government system, presented in my doctor thesis, may be interpreted as the joint enforcement of both of these views.

1.2 The main aim of the dissertation

As the primary task of the thesis, I wish to answer the question whether it is possible to prepare a model forecasting insolvency covering the local government sector based on the indices that are especially applied in respect

of local governments and the corporate indices that may be applied in the case of local governments, based on the data that are obtained from the elementary financial reports.

1.3 Objectives

The objectives set for my research correspond well to the creation of an insolvency forecasting model, and they ensure the evaluation of the model in an appropriate environment. For this end, I defined the following detailed targets[1]:

- Introduction of the development of the Hungarian local government system;
- Introduction of the Hungarian settlement structure;
- Introduction of the economic significance of the local government level;
- Exploring the development of the revenue structure of local governments;
- Elaboration of a framework system for evaluating local government self-financing;
- Introduction of the autonomy of the local government level (economic independency);
- Introduction of the creditworthiness and indebtedness of the local government sector;
- Creation of the model that forecasts local government insolvency.

1.4 Hypotheses

I summarised the problems phrased above in the following four hypotheses. I wanted to answer these hypotheses in my doctor thesis.

H1: The indices derived from the data included in the elementary reports of the local governments are suitable for creating an insolvency forecasting model.

H2: Defining more strict borrowing rules after 2011 that are applied in respect of the domestic local governments was justified.

H3: In the period that lasted from 1995 until 2011, simultaneously with the spreading of the resource oriented local government management approach, the direct exposure of the local governments to the economic cycles increased.

H4: The subsidy system of the local governments that existed between 1995 and 2011 was adapted to the self-financing capability that was defined on the basis of the revenue side of the local government budget.

[1] it is not according to the order of importance

2. MATERIAL AND METHOD

Both primary and secondary research methods were applied during the dissertation.

2.1 Primary research

I used the interview tool as for primary research method in the following fields:

1. As the main objective of the dissertation is to examine whether it is possible to prepare a forecasting model for insolvency of local governments, so I made an interview with Miklós Virág. He was made the first Hungarian bankruptcy forecasting model that was assessing Hungarian companies in the early 1990ies. Since then Dr. Virág has made a number of scientific work related to bankruptcy forecasting.
2. I made interviews to risk managers of several Hungarian or Hungarian settled financial institutions about the risk categorization issues of local governments (OTP, CIB, Deutsche Bank, KELER, KELER KSZF, Pátria Savings Cooperative, Corvinus International Investment Bank and MNB).
3. In matters concerning local governments, I had the opportunity to consult with Sándor Varga (former deputy director of the State Audit Office) and László Kékesi (former Deputy Secretary General of the State Audit Office). They shared their experiences of their work at State Audit Office which less commonly found in the grey literature.

In addition to the above, my dissertation supervisor's valuable thoughts and guidelines can be also considered as an interview series.

2.2 Secondary research

The main purpose of the doctoral dissertation is to determine whether it is possible to predict insolvency in the local government sector. Taking into consideration that historical data and historical backgrounds are essential to be well-known for the correct interpretation, I therefore rely heavily on the literature published at or about the examined period that is between 1995 and 2013.

Besides the literature, I used five main datasources:

1. Local government data collected by Hungarian State Treasury;
2. Hungarian Central Statistics Office;
3. Central Bank of Hungary;
4. National Regional Development and Territorial Information System
5. Data collected by The State Audit Office during the 2011 audits

2.2.1 Processing of data

During the dissertation I combine the possibilities and benefits of several IT sollutions. When collecting the data, I used a SAS database management system while the data was organized and quality assured using MS Excel and MS Access programs. The insolvency prediction model was created using IBM SPSS. Graphing data and tables was created using MS Excel and QuantumGIS.

Both descriptive statistics and mulitvariate methods were employed.

2.2.2 The framework of analysis of local government data

The analysis was reduced mainly to the revenues of local governments. In parallel, I accept the view of several authors that the reporting and book-keeping standard used by the local government in the examined period was not suitable for assessing precisely the economic situation of induvidual local governments. (Kassó, 2008; Pál and Szilágyi, 2007; Simon, 2008). I also accepted to be partly valid the argument that the compulsory tasks of the local governments was not in line with the available resources (Bujdosó, 2008, Kecső, 2008, Pál and Szilágyi, 2007, Paróczai, 2007, Pitti, 2008). This latter argument is accepted for the smaller local governments where the economic-of-scale operation could not achieved as for the compulsory tasks.

Given that revenues from taxation is essentially linked to local governments and not to related institutions, only the local governments under 1254 sector-code appear in the analysis. The local minorirty governements and the budgets of associations of local governments uder 1251 sector-code are not included into the analysis.

Last but not least, the time span of the analysis was set in the period between 1995 and 2013. However, in many cases, I took only the period between 1995 and 2011 because of the fact that after 2013 the reporting standard of the local government system had changed. This first elements of this reporting standard change appeared in the financial report structure of local government in 2012. In order to be consistent with the data the examined peirod had to be set at 2011 in many cases. Besides, the data of 1998 and 2002 are estimated because the data were not available - in these cases the average of the previous and next years' data were used.

2.2.3 Insolvency forecasting model - the framework

This subsection details the tasks undertaken to accept or reject the hypothesis insolvency predicting model for local governments from the build up of the database up to the preparation of the logistic regression calculation.

Determining the required data

As far as I know, for local governments, no insolvency predicting model has been built. The main reason for this is that, following the theories of public choice, market participants consider the local governments to be risk free (unlike other economic theories and regulatory intentions). All market participant thinks that the local governments will be saved by the central government (the debt of local governments will be paid back by the central government).

The approach of the risk managers of the credit instutions is rational from the viewpoint of the credit instutions. However, this apporach is not neccessarily considered appropriate from the viewpoint of the social optimum since the local governments have essential role in providing public goods. In other way, it can be said that the early warning systems should become increasingly important in the public sector. Thus, the undesirable economic processes can be stopped before realization or the effect of the process could be mitigated.

Defining insolvency criteria

In Hungarian practice there is no such case when a local government go into bankruptcy - instead, a debt consolidation procedure is in place. In other words, we cannot talk about real insolvency. However, for an insolvency forecasting model, we need an indicator that divides the local governments into two groups (insolvent and solvent).

During the 2011-12 audits of the local government sector executed by the State Audit Office 304 Hungarian local governments was examined. The audit was partly focues on outstanding unpaid debts of the local governments. This outstanding unpaid debt served as a basis of categorization of the local governments into categories. The categories were the following:

- 1-30 day payment delay
- 31-60 day payment delay
- 61-90 day payment delay
- 91-365 day payment delay
- more than a year payment delay

This categorization is similar to those used by the credit instituitions.

Samples used for bankruptcy models are usually assembled to include the same number of bankruptcy and survival organizations. To this end, I first looked how long the outstanding debt was present at the local governments. If the outstending debt (regardless its value) was presen during a half year period then the local government was categorized as a debted one. The lenght ot the outstanding time provided above was the base for categorization. Table 1 shows the number of towns belonging to each categories.

Table 1. Local governments and unpaid debts

Unpaid debt	Count of cities	Cummulative value
nincs	74	74
1-30 days	58	132
31-60 days	36	168
61-91 days	20	188
91-365 days	62	250
more than a year	54	304
total:	*304*	

Source: own construcet based on the data porvided by The State Audit Office of Hungary

As it can be seen in Table 1, 168 out of 304 cities (55 percent), have no payment delay over 60 days. If 60 days is choosed as a criteria for insolvency, means that nearly half of the local government are in bankrupty while the rest are surviver. This way the proportion of the two type local governments included in the sample is nearly half-half.

On the basis of the above, the local governments are considered insolvent where the outstanding debt is constatntly exist durint a half-year period and the length of payment delay exceeds 60 days. This is the criterion of latent bankruptcy of local governments.

Indices

The insolvency predicting models are usually based on indicators containing complex information. Various bankruptcy models have been developed for companies operating in different sectors. The final models includes the indices about the capital structure, liquidity, indebtedness and profitability (Virág, 2004; Arutyunjan, 2002; Kristóf, 2008).

The interpretation of the financial indicators may differ significantly in case of local governments from the interpretation of the same indicators applied on corporations. For example, the profitability indicators cannot be calculated in case of local governments. With these in mind, I collected 69 indices form the available literature (Béhm, 1996, Bíró et al., 2001; Szántó et al., 2002; Takács, 2006) that may relevant for the local governments and can be created from the financial report of the local governments.

Preparation work on the gathered data

After querying the database, I calculated the values of the indicators using Microsoft Access. The indicators are marked with v1, v2 ... v69.

When sorting data, I found that there was no data available for one local government, and in case of two local governments the value of the equity was negative. This three local govermnets, therefore, was excluded from the further calculations. The sample size was thus reduced to 301.

To ensure the quality of the data, I examined each of the indicators to see if their values were realistic and I also checked that there was no data gap between the metric values. Last but not least, I have examined whether I can convert (encode) the value set of the variables to another variables for which there is a significant lack of data or the negative values influencing the further analysis potential.

During the preparation of the data, 13 of the 69 indicators had to be excluded, and 11 were recoded, so I worked with 56 indexes on 301 local governments. This 301 is 86.9% of 346 Hungarian local governments. The following figure shows the location of the local governments whose data were used when making the insolvency prediction model (Figure 1).

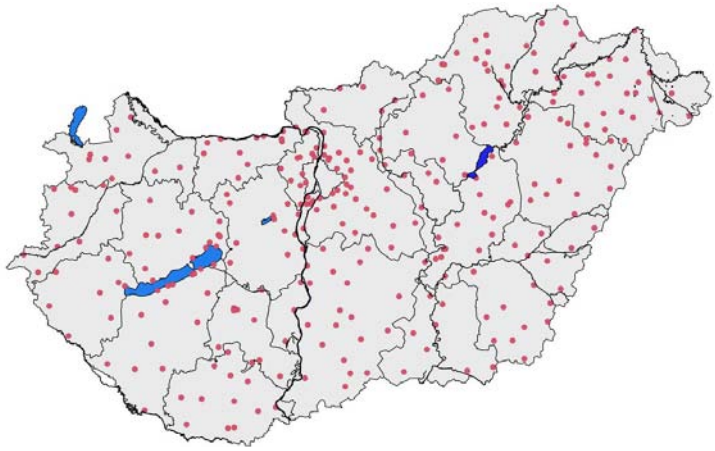


Figure 1: Spatial distribution of local governments involved into the examination

Source: own constructed

The spatial distribution of the local governments is well covered by the country map. However, it can be seen that Pest county (arund Budapest) is slightly overrepresented.

Reduction of the indices

The bias existing between the methods used for bankruptcy estimation is eliminated if principal component analysis is performed prior to the logistic regression calculation (Kristóf, 2008) - the correlation will be moderated between independent variables this way (Info-Datax , 2006).

Three more variables (v6, v48, and v67) were excluded as a result of preparaition for principal component analysis. V6 and v48 was rejected because of their negative eigenvalue, which resulted in a failure to perform the KMO-Bartlett test (this metric indicates how well the data can be used for principal component analysis). The v48 variable was excluded from the analysis because it significantly reduced the strength measured by the KMO-Bartlett test.

As a result of KMO-Bartlett test, the database created is moderately suitable to make principal component analysis. (Table 2).

Table 2: Result of KMO and Bartlett's Test

KMO and Bartlett's Test

Kaiser-Meyer-OlkinMeasure of SamplingAdequacy.		,621
Bartlett's Test of Sphericity	Approx. Chi-Square	20324,922
	df	1378
	Sig.	,000

Source: SPSS output

The principal component analysis was executed several times, with different a priori criteria. The outputs were examined case-by-case whether the variables that make up the components can be considered as related in their economic context. Regardless of the number of the components, there were indicator groups (eg. liquidity indicators) that were always "together". However, in almost all cases there were also some indicators that included into the components, but I have not expected to belong to that component based on the economic content of the indicator.

Given that the variables of the database were only moderately suitable for principal component analysis and the components were not sharply separated by their economic content, then I followed the Kaiser criterion (the number of components is determined by the eigenvalues greater than one). In practice, this means that the 56 variables were concentrated in 16 components, thus the explained variance reached 73.95 percent.

Sajtos et al. (2007) offers three options to further work with the output components. The first option is to perform further calculations with the saved component values. The second option is to combine the values of the saved components into a new variable (eg, averaging the values) and work with the new values. The third is the so-called substitute variable method, where the component is represented by the most correlating variable (the highest factor weight). Given that the third method provides repeatability in addition to its simplicity, I used the substitute variable method.

3. RESULTS

3.1 The economic significance of local governments

Examining the revenues of the local governments I established that at nominal value the revenues of the local governments increased annually with 14.37 % on the average between 1995 and 2003 – this growth rate decreased to 2.28 % between 2003 and 2011 with smaller fluctuations. As regards real value, growth occurred until 2005, subsequently with smaller fluctuations the revenue of the local governments decreased. The revenues of the sector also decreased after 2011, as a consequence of the reshaping of the local government tasks. Compared to the GDP, the level of the revenue with smaller fluctuations produced a continuously decreasing tendency since 1995, although with smaller fluctuations (the GDP related ratio decreased from 11 % to 9.75 % by 2011, and then after 2011 it dropped to 6.16 %). In spite of the fact that the ratio of the revenues of the local governments compared to the GDP decreased, the local government sector may be considered to be still significant from economic aspects (Figure 2).

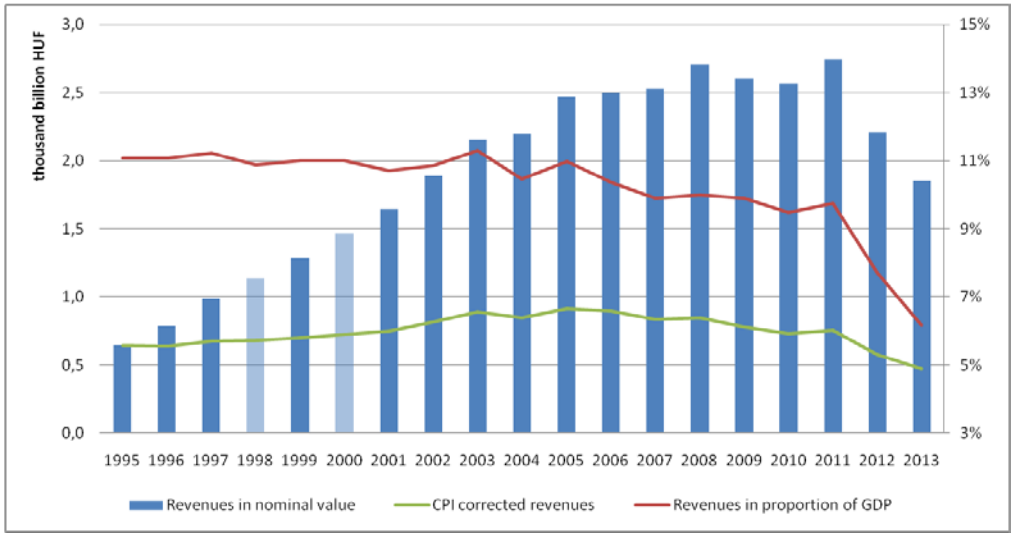


Figure 2: Revenues of the local governments between 1995 and 2013
Source: own constructed

Figure 3 presents the revenues of the local governments on the basis of their composition. The greatest proportion of the revenues of the local government system are represented by its operational revenues, *the majority of which consists of local tax revenues*. This is followed by the subsidies that are provided by the central budget for the local governments. As regards operation related revenues a relatively significant decrease may be seen from year 2007 until year 2008 and from year 2012 until 2013. In both cases the mitigation of the extent of assigned central taxes contributed most significantly to the decrease. As regards the subsidies, the sudden change of 2008 and the continuous decrease that lasted till 2013 were both primarily caused by the changing of the resources that were received by the local governments on normative basis.

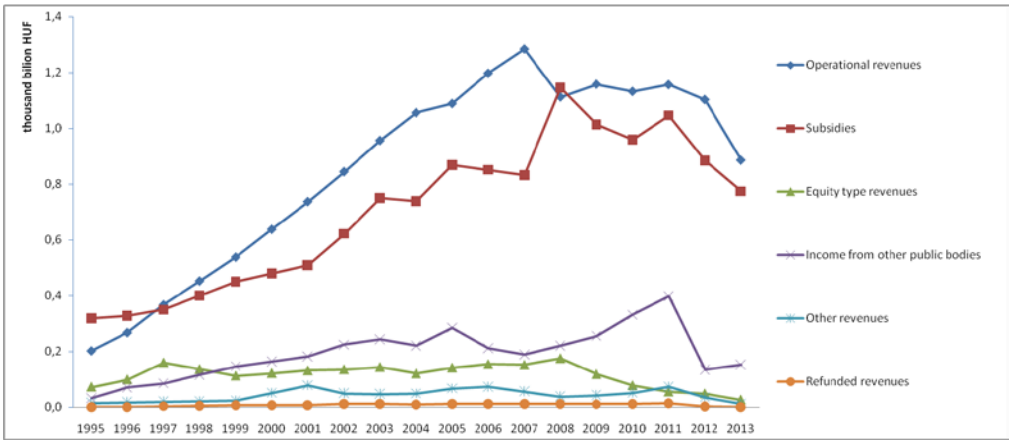


Figure 3: Composition of local government revenues between 1995 and 2013
Source: own constructed

From the data of Table 3 it is obvious that 31.55 % of the revenues came from operational revenues and 49.44 % were subsidies in 1995. This ratio significantly changed by 2011, since by this time the majority of the revenues (42.16 %) was already represented by the operation related revenues, and subsidies became only second – their ratio became 38.14 % only, within the total revenues of the local governments.

Table 3: Composition of local government revenues (1995, 2011)

year	title	capital	districts of capital	county	central cities	other large cities	other cities	large village	village	total
1995	Operational revenues	39,60%	43,13%	15,77%	32,82%	35,85%	30,26%	29,14%	26,20%	**31,55%**
2011	Operational revenues	41,21%	66,88%	13,88%	49,03%	43,00%	43,11%	41,46%	36,94%	**42,16%**
	change	1,61%	23,75%	-1,89%	16,21%	7,15%	12,85%	12,32%	10,74%	**10,61%**
1995	Subsidies	32,78%	31,81%	73,87%	50,16%	48,14%	54,96%	50,02%	54,74%	**49,44%**
2011	Subsidies	34,14%	23,33%	76,86%	36,15%	31,31%	33,94%	37,29%	36,30%	**38,14%**
	change	1,36%	-8,48%	3,00%	-14,01%	-16,82%	-21,02%	-12,73%	-18,44%	**-11,30%**
1995	Equity type revenues	24,81%	21,82%	4,93%	12,86%	12,39%	8,45%	7,12%	2,86%	**11,28%**
2011	Equity type revenues	2,33%	4,20%	0,31%	2,33%	5,16%	1,75%	1,05%	1,27%	**2,00%**
	change	-22,48%	-17,62%	-4,62%	-10,52%	-7,23%	-6,70%	-6,07%	-1,60%	**-9,28%**
1995	Income from other public bodies	1,61%	2,45%	4,72%	2,79%	2,66%	3,85%	7,29%	11,50%	**5,13%**
2011	Income from other public bodies	15,51%	4,33%	7,23%	10,69%	14,43%	17,63%	17,85%	22,24%	**14,52%**
	change	13,90%	1,88%	2,51%	7,90%	11,77%	13,78%	10,57%	10,74%	**9,39%**
1995	Other revenues	1,20%	0,77%	0,69%	1,03%	0,77%	2,36%	5,70%	4,64%	**2,43%**
2011	Other revenues	6,60%	0,72%	1,22%	1,27%	2,10%	3,04%	2,10%	2,99%	**2,66%**
	change	5,40%	-0,04%	0,52%	0,24%	1,33%	0,68%	-3,61%	-1,65%	**0,23%**
1995	Refunded revenues	0,00%	0,02%	0,03%	0,34%	0,19%	0,12%	0,73%	0,06%	**0,17%**
2011	Refunded revenues	0,22%	0,53%	0,50%	0,52%	4,00%	0,53%	0,25%	0,26%	**0,52%**
	change	0,22%	0,52%	0,48%	0,18%	3,81%	0,41%	-0,47%	0,20%	**0,35%**

Source: own constructed

Comparing these figures with the theory we may say that the target that was phrased at the time of the 1990 political system transformation, that is, moving from the expenditure oriented system to the resource oriented system started nicely and quietly.

3.2 Self-financing capacity of local governments

Self-financing, as a theoretical definition may be misleading, since linguistically it assumes that the local governments finance all their expenditures from local financing resources. At the same time, this is not desirable according to the relevant literature and in practice either, since it would lead to a significant welfare loss, because the central or regional governing co-ordination activity could not be enforced, which among others has the task of mitigating the external impacts. Therefore, the optimal ratio of self-financing[2] has to be defined in another way. In view of the fact that there is no accepted definition even in relevant literature, we may simply adapt the fiscal golden rule that is applied in the United Kingdom (Chote et al., 2009).

This golden rule means from the aspect of the Hungarian local governments that we may consider them to be self-financing, if they are able to ensure minimum 60 % of their income without central government resources in the long term.

At the same time it is not sensible to state that local governments, who generate more than or close to 50 % of their own revenues themselves cannot be considered self-financing, and therefore there is another limit that should be taken into consideration as well, and this limit is 40 %. If a local

[2] The issue of self-financing defined based on the revenue side of the local government budget.

government is able to generate less than 40 % of its own revenues, then from economic aspect it is not independent.

Table 4: Proportion of operational revenues in total revenues by local government type

Proportion of operational revenues	capital	districts of capital	county	central cities	other large cities	other cities	large village	village	total
over 60%		20		1		27	11	267	**326**
between 50-60%		3		6	1	39	17	326	**392**
between 40-50%				10	3	75	27	415	**530**
under 40%	1		19	1	1	164	64	1 109	**1 359**
total	**1**	**23**	**19**	**18**	**5**	**305**	**119**	**2 117**	**2 607**

Source: own constructed

Table 4 presents on the basis of the adapted golden rule that in year 2011 there were 326 subnational governments that could be considered self-financing (10.16 %), and an additional 922 local governments were in the buffer zone (28.72 %). The spattal distribution of the local governments that may be considered self-financing is presented by Figure 4.

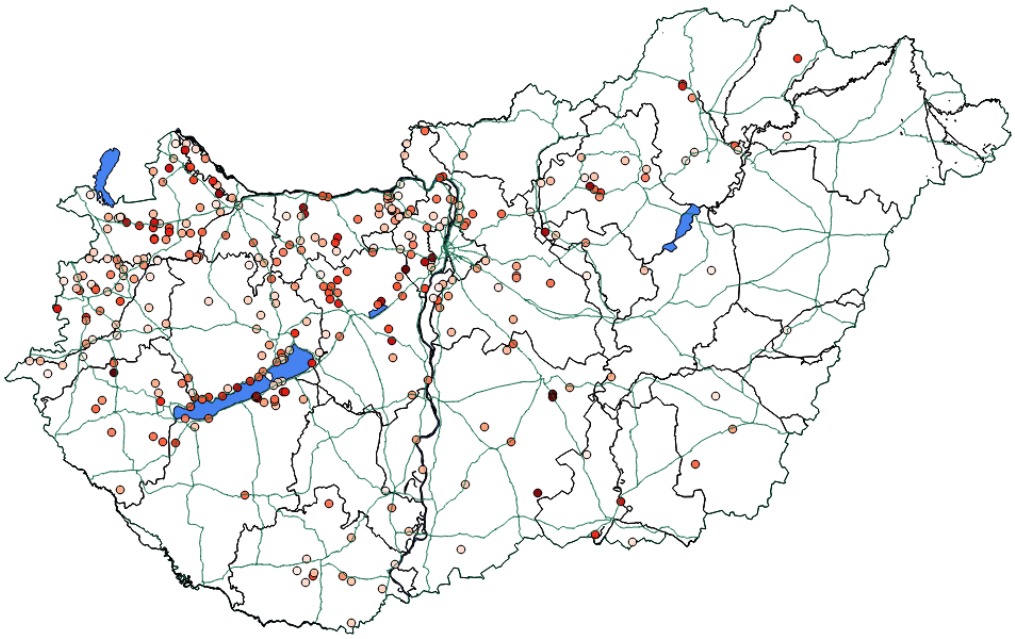


Figure 4: Spatial distribution of self-financing local governments (2011)
Source: own constructed
Note: Red-filled circles represents the local governments while green lines represent the main road system

3.3 Local tax revenues

The local taxes represented altogether 7.22 % of the local government revenues in year 1995. However, this ratio increased with close to one % year-by-year (with 0.84 basispoints on the average), therefore by 2011 close to 21 % of the revenues of the local governments were represented by local tax revenues (Table 5). With the reshaping of the local government tasks in 2011 and with the reduction of the central budget resources provided for funding the decreasing tasks, this ratio continued to increase, and thus in year 2013 its value approached 35 %, that is, it increased with more than 14 % in two years.

As regards the development of the composition of local tax revenues, it is worthwhile to analyse the development of the tax types that are defined in the relevant literature section, that is, (1) the user fees, (2) the income taxes, (3) the property taxes, (4) the per capita taxes, (5) the sales taxes, and (6) the other local taxes.

It is important to note that the local business tax from technical aspect may be considered to be a sales tax, since similarly to VAT, it is expressed as a percentage of the sales revenue. At the same time the local business tax, due to EU compatibility, is included among the income taxes in the present thesis.

Table 5.: Proportion of local tax revenues in total revenues between 1995 and 2013

year	Types of local governments								
	capital	districts of capital	county	central cities	other large cities	other cities	large village	village	total
1995	13,88%	13,01%	0,00%	7,36%	11,70%	8,47%	4,10%	1,82%	7,22%
1996	17,02%	16,23%	0,00%	10,66%	14,39%	12,10%	6,43%	3,21%	10,29%
1997	16,10%	17,92%	0,00%	13,87%	14,69%	13,21%	7,72%	3,67%	11,27%
1998	19,25%	20,98%	0,00%	17,60%	19,61%	14,64%	9,22%	4,62%	13,39%
1999	22,40%	24,04%	0,00%	21,33%	24,54%	16,07%	10,71%	5,57%	15,52%
2000	22,51%	28,30%	0,00%	21,58%	24,35%	15,85%	11,34%	5,50%	15,86%
2001	22,62%	32,56%	0,00%	21,83%	24,16%	15,63%	11,96%	5,43%	16,21%
2002	23,07%	32,15%	0,00%	21,20%	21,71%	14,55%	11,67%	5,33%	15,74%
2003	21,72%	31,56%	0,00%	18,66%	20,20%	14,50%	11,22%	5,22%	14,99%
2004	23,81%	33,86%	0,00%	20,23%	23,85%	15,49%	12,13%	5,81%	16,27%
2005	22,42%	31,71%	0,00%	19,33%	21,42%	15,57%	13,63%	6,48%	16,19%
2006	30,29%	36,20%	0,00%	20,09%	22,30%	17,07%	14,67%	7,09%	17,99%
2007	29,98%	38,49%	0,00%	23,14%	23,84%	19,71%	15,33%	8,11%	20,04%
2008	25,00%	39,44%	0,00%	24,13%	24,27%	21,11%	12,45%	8,94%	20,49%
2009	32,70%	42,11%	0,00%	24,25%	25,31%	21,74%	12,77%	9,12%	21,81%
2010	33,01%	44,63%	0,00%	23,34%	23,82%	19,61%	12,23%	8,79%	21,21%
2011	26,73%	45,10%	0,00%	26,99%	22,52%	20,80%	13,57%	9,56%	20,68%
2012	38,98%	50,88%	0,00%	30,92%	28,70%	26,01%	14,90%	10,61%	27,42%
2013	79,35%	70,50%	0,00%	40,33%	40,77%	27,66%	17,76%	13,66%	34,91%

Source: own constructed

Based on Figure 5, we may say that most of the revenues of the local governments were obtained during the examined period from the local business tax (that was indicated as an income type of tax).

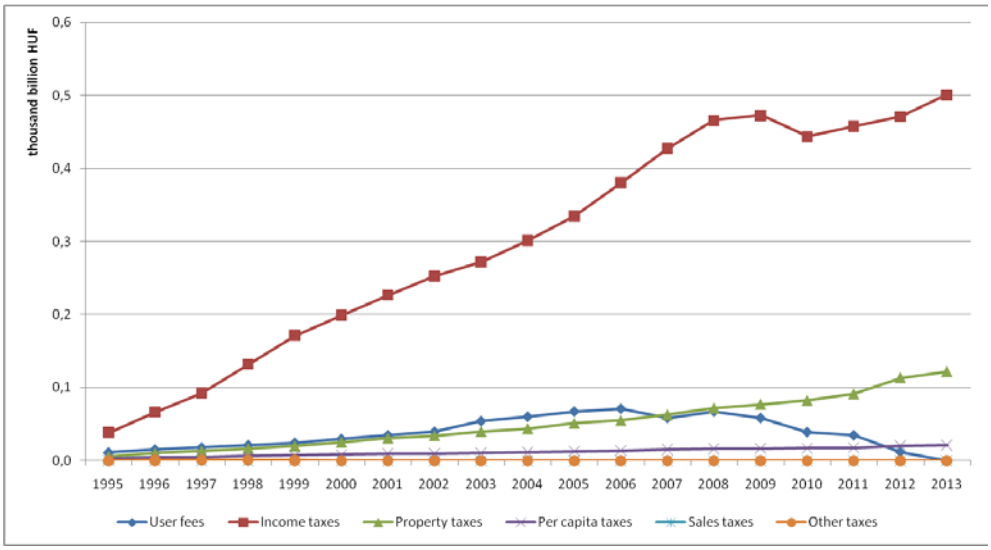


Figure 5: Composition of local tax revenues between 1995 and 2013
Source: own constructed

When carrying out evaluation according to the Sanford-criteria, it is not too good that the majority of the revenues were obtained from the local business tax, since the extent of this revenue depends significantly from the performance and the cyclicity of the economy, meaning that it does not provide a reliable source of income in the long term. On the Figure 5 above, the relative "uncertainty" of this tax type can be also seen after the crisis of 2008, since in year 2009 the increasing of this revenue source practically stopped and by year 2010, due to its drop, its value approached the level that prevailed three years before. This directs attention to the risk factor that during a long term economic recession (lasting several years) the local government level may require additional resources. According to another type of approach, the local governments have to have plans along which they will be able to ensure for the population the public goods that have been provided before (or their part that has to be mandatorily provided).

In view of the fact that the majority of local tax revenues is represented by the local business tax and its ratio continuously increased in the years examined, this also means that the local government revenues are increasingly exposed to the enterprises that reside in their settlements. The local business tax is a revenue element that is directly connected to consumption. Therefore, it does also change simultaneously with the economic cycles. Based on these facts, **I consider it to be confirmed that during the period lasting from 1995 until 2011, simultaneously with the spreading of resource oriented local government management approach, the direct exposure of the local government sector to the economic cyclicity increased.**

The extent of risk that is generated by the tax type that ensures most of the local tax revenue may be derived from the price and income flexibility of demand existing for the products and services of the enterprises that operate within the given settlement, meaning that this will be of different extents by settlements. Similarly to investments, those settlements will have lower risks, which specialised on making some products or services that are inflexible as regards the price and income of demands, or which are capable of attracting an entrepreneur class that provides appropriately diversified products or services. In view of the fact that only the larger settlements (cities) have such diversified portfolios, the risk appears primarily in the smaller settlements in the short term – however, this risk also appears in the large cities in the medium term.

3.4 Subsidies

In addition to the operation related revenues the other significant part of the revenue resources of local governments is represented by subsidies received from the central budget. As regards the extent of these subsidies, differentiation may be observed not only by settlement types, but within the specific categories as well. This may be best presented with the extent of subsidies provided per capita (Figure 6).

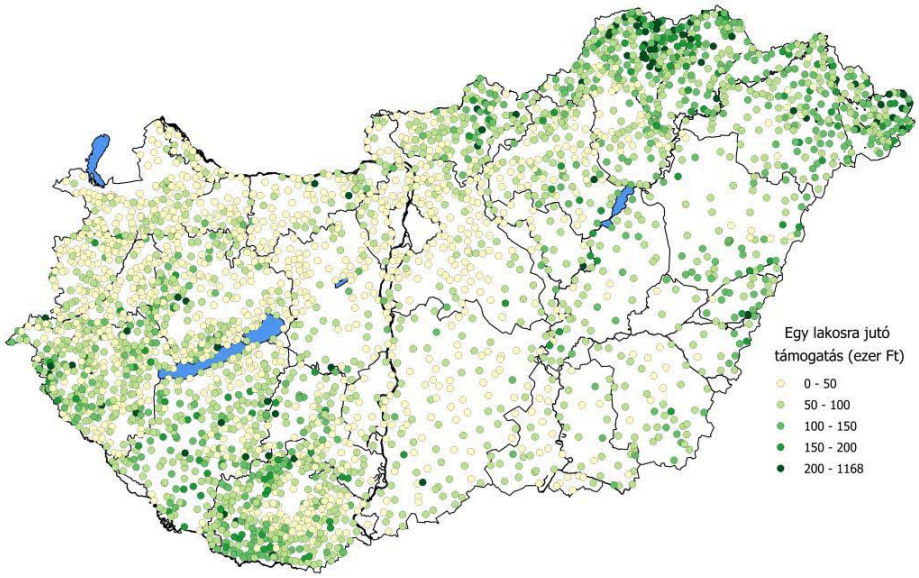


Figure 6: Subsidies per capita 2011
Source: own constructed
Note: the subsidy per capita was 188.000 HUF in Budapest

It is worthwhile to examine whether the extent of the subsidies and the previously declared self-financing capability derived from the revenues of the local government are correlated or not.

There is correlation between the extent of subsidies per capita and the self-financing capability. The greater the self-financing capability of a settlement was, the less subsidy per capita it was able to get. The result of cross-table analysis also supports this relationship - the Pearson Chi square is significant (N=3165; X2: 1556.9; sig: 0.00), that is, there is a relationship, while the value of Phi is 0.7 (Phi=0.701; sig: 0.00), meaning that there is a strong relationship between the two dimensions. Based on this we may say that **the subsidy system of the local governments adapted itself to their independent income generating capabilities**. If we exclude from the examination the settlements that have less than 300 residents, even then the value of Phi does not decrease significantly (Phi=0.693; sig: 0.00), meaning that the relationship remains valid.

3.5 Interpretation of credit risks and creditworthiness in the case of local governments

Kornai (1980) originally phrased in respect of state owned companies that their budget limit is soft. We may interpret (adapt) this for local governments as well, that is, the local governments do have soft borrowing limits, since the state does inevitably save the local governments involved in the case of a debt crisis.

If we add to this the domestic credit institution practice[3], according which the risk classification of local government debts is identical (Kovács, 2008) or close to identical with that of the state, we may conclude that the resources provided for the local government sector involve practically a credit portfolio improvement from the aspect of the credit institutions, that is, the credit institution sector is definitely interested in providing credits for this sector. This is true in spite of the fact that in the Debt Settlement Act[4] it is presented in an implicit manner that the state does not warrant the debts that are undertaken by the local governments (Gál, 2010; Vígvári, 2009). Vígvári (2004) characterises this as follows: the budget limit of the local governments is hard compared to the central government, but it is softer than that of the companies due to the prohibition of their liquidation.

Ter et al., (1997) differentiates four models based on the special situation of the subnational government level, that is, based on their credit risk reduced to

[3] Based on interviews conducted with credit institution risk managers.
[4] Act XXV of year 1996 on the debt settlement procedure of local governments

zero. The first one is the system that is regulated by the market, in which the creditors are well informed and the local governments make rational decisions concerning the drawing of each credit. The second model is the centrally restricted model, where a permit is required from a higher level public administration unit for drawing a credit. The next one, the third model, regulates the drawing of credits basically through budgetary rules. The fourth, the so-called co-operative model, where the local governments make their borrowing decisions jointly with the central government.

In view of all the facts, based on the models that are defined by Ter el al. (1997) we may say that the Hungarian system theoretically belonged at the examined period to the third model, that is, the model that is based on rules. However, in practice the first model existed that is controlled by the market players, since the local governments rarely got to the point of the application of the debt rule. After the transformation that took place in year 2011 the debt rule based approached had been maintained, at the same time due to the irresponsible market and local government behaviour that was also mentioned by Gál (2010b)[5] the drawing of credits became tied to permits as regards the future.

3.6 The indebtedness process of the Hungarian local government system

Figure 7 shows the way the indebtedness of the local government sector developed between 1989 and 2015. It can be well seen, that indebtedness appeared in two significant waves. The first wave started after the turn of the millennium and it manifested itself characteristically in respect of long term loans. This local government debt type had spread gradually until 2011, when its value approached HUF 554 billion. Its value increased with HUF 45 billion on the average each year between 2000 and 2011. The second wave started in 2006 with the issuing of long maturity bonds.

The sector's debt that arose from the issuance of bonds reached its peak in 2010 with close to HUF 610 billion. This means that they issued securities of the value of HUF 120 billion each year between 2006 and 2010, that is, the rate of securities based indebtedness increase was close to 3 times that of long term loan based indebtedness increase. These securities were subscribed most frequently by the account managing credit institutions (Gál, 2010).

[5] The author probably thinks about investments that had not been prudently thought over.

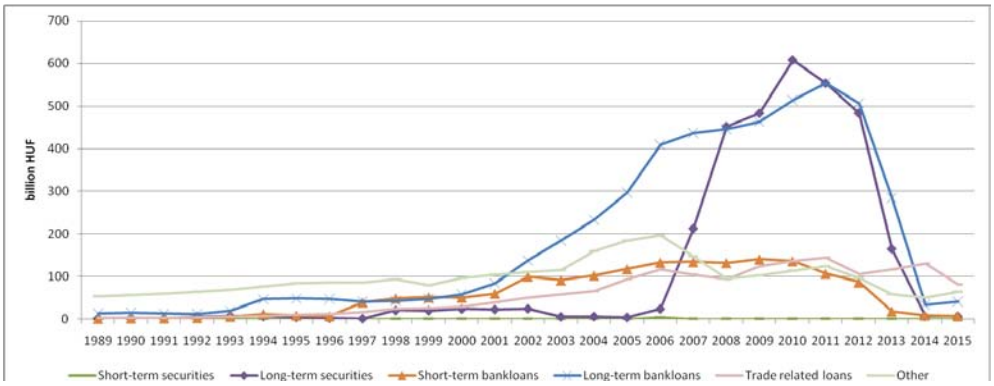


Figure 7: Indebtedness of local governments (1989-2015)

Source: own constructed

If we examine the local government liabilities and the financial assets that were available to the local governments (Fiugre 8), we may see that as a result of local government indebtedness that became intensive after the turn of the millennium the total liabilities of the sector exceeded the financial assets in 2009, and they already also included participations in local government assets. This means that the foundations of local government operation were in danger. Moreover, it can be also well seen that the ratio of local government financial assets calculated without the participations was close to one third of the extent of the liabilities in year 2010, the year of peak indebtedness.

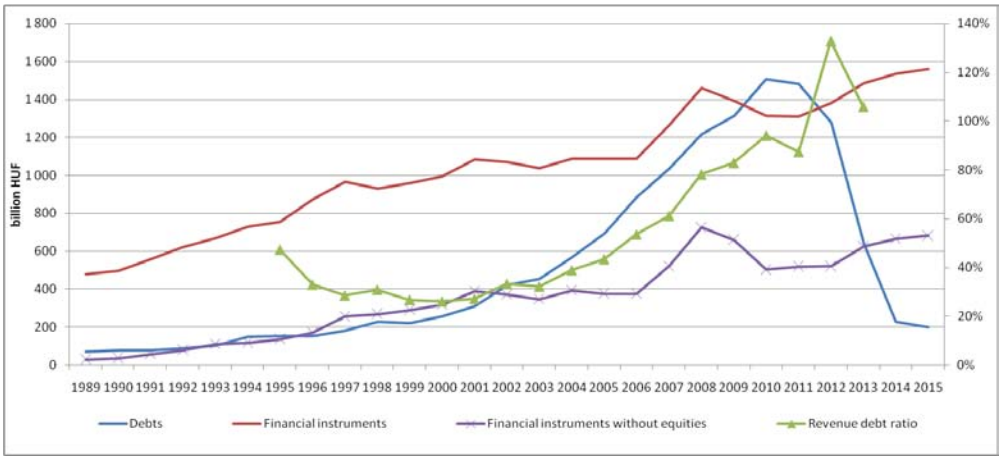


Figure 8: Assests and debts and revenue debt ratio of the local governmentes(1989-2015)

Forrás: own constructed

It is worthwhile to summarise the reasons of the local government indebtedness in a couple of points:

- To prevent tensions that arise from the resource oriented system (the difference between the financing demand of the local government tasks and the centrally provided resources);
- "Soft" debt generating limit (the regulations did not perform their role);
- The lending “hunger” of the banks between 2006 and 2008 (it is an interesting fact that the State Audit Office in the course of its 2012 audit also found local government basic assets among the bank collaterals);
- Credit institutional information asymmetry;
- Ensuring the own funding related ratios of European Union resources (it was found out in a number of cases that the investments had not been prudently thought over);
- The spreading of PPP arrangements;
- Adjustment of the investment cycles to the political cycles;
- Decreasing of central budget resources provided for the local government sector;
- High ratio of voluntarily undertaken tasks;
- The government submitted law proposals in year 2006 that restrict borrowing by the local governments;
- Realisation of the exchange rate risk of foreign exchanges.

"Establishing and maintaining harmonies between the performance of the economy and the resources that are spent on services and financed by the state budget are prerequisites of societal-economic stability" (Kovács and Halmosi, 2012). Knowing the wide range of tasks that had to be implemented by the local governments in the examined period and the restricted nature of the central budget resources that were provided for carrying out the tasks, we may say that practically the reasons listed in connection with indebtedness acted as catalysts of the indebting process. And finally the extent of debt, due to its magnitude, endangered not only the stability of the local government sector.

Borrowing limit

I introduced above that the credit institution sector practically considers the local government sector to be risk free. The consolidation of the debt of the sector that followed year 2011 only strengthened this attitude. From credit institution risk management aspect, providing credits for local governments in addition to its appearance as a sure revenue source, may even improve the credit portfolio, therefore through its smaller amount of capital requirements it ensures possibilities for additional credit providing activities. Since the financial sector managed the local government bonds in a uniform manner as being risk free, the credit institution itself bought the securities. In addition to

the above mentioned positive properties, the bonds issued by the local governments also served as collaterals for covering the credit risk of inter-bank deals. Moreover, the credit institutions may disregard even the rules that refer to the local governments (e.g.: surpassing the local government debt limit, accepting the basic assets as collateral). There is a significant incentive in operation for providing credits to the local government sector. In view of the fact that the increasing of the debt portfolio of the local government sector could not be prevented by the former debt rule, **according to my opinion increasing the strictness of the local government borrowing limit after 2011 was justified (from several aspects).** It is an interesting fact that binding borrowing to permits appeared already at the time when the local governments were established in Hungary, therefore this was a kind of returning to a former practice. Agreeing with the arguments of year 2009 of Csapodi, I have to mention that limiting local government indebtedness in itself would have meant only a superficial treatment of the problem.

3.7 The bankruptcy forecasting model

I applied for creating the local government insolvency forecasting model the method that is based on the most frequently used logistic regression supplemented with the principal component analysis that is recommended by Kristóf (2008) and Info-Datax (2006). It is an advantage of the method selected that it allows the usage of metric and non-metric independent variables.

I used as the dependent variable of the model the bankrupt or non-bankrupt classification of the local governments, which expresses whether the given local government has a outstanding debt exceeding 60 days or not (latent bankruptcy criterion). On the other hand, the variables that were obtained as the result of the main component analysis served as the independent variables.

Dependent variable:

vCSŐD - insolvent local government (yes/no)

Independent variables:

v13 - Indebtedness ratio
v58 - Revenue flexibility index
v38 - Liquidity II.
v26 - Expenses coverage ratio
v3 - Proportion of fixes assets in all assets
v2 - Proportion of immaterial assest in all assets
v31 - Reliability index of planing expenses
v65 - Proportion of staff in all operating expenses
v59 - Expenditure flexibility index
v7 - Proportion of financial clains in receiveables

v56 - Credit repayment coverage
v52 - Depreciated value of fixed assets
v21 - Interest on financial assets
v30 - Reliablity of local tax revenues
v64 - Late in interest payment (yes/no)
v62 - Proportoin of other accured and deferred payment in total total financial assets

I used for the model the data of all the local govenrments that remained in the sample (301 settlements).

Table 6: The insolvency forecasting model

Variables not in the Equation

			Score	df	Sig.
Step 0	Változók	v13	1,183	1	,277
		v58	6,175	1	,013
		v38	8,977	1	,003
		v26	5,561	1	,018
		v3	,008	1	,931
		v2	,000	1	,998
		v31	9,947	1	,002
		v65	,007	1	,932
		v59	2,257	1	,133
		v7	1,014	1	,314
		v56n	30,595	10	,001
		v56n(1)	,331	1	,565
		v56n(2)	3,308	1	,069
		v56n(3)	4,295	1	,038
		v56n(4)	1,042	1	,307
		v56n(5)	3,698	1	,054
		v56n(6)	,387	1	,534
		v56n(7)	,470	1	,493
		v56n(8)	1,886	1	,170
		v56n(9)	,130	1	,718
		v56n(10)	14,192	1	,000
		v52	1,082	1	,298
		v21	3,070	1	,080
		v30	,728	1	,394
		v64(1)	8,053	1	,005
		v62_1	1,474	1	,225

Source: SPSS calculation

In the above table I marked with light green those variables that are significant (Column 6), and I marked with dark green those that were introduced into the model. There is a difference between these two in this case, because variable v56 – while it individually exerted an impact on the dependent variable – its jointly measured simultaneous impact already did not (marked with red). Since the impact of variable v56 measured according to the Wald-statistics was not significant, I did not include in the equation the specific elements (marked significant) of this variable.

You can find below the insolvency predicting model for Hungarian local governments based on the model calculation:

$$\ln(odds) = 7{,}034 - 3{,}159 * v58 - 0{,}15 * v38 - 2{,}069 * v31 - 0{,}894 * v64$$

Involved variables:

- v58 - Revenure flexibility index
- v38 - Liquidity II.
- v31 - Reliability index of planing expenses
- v64 - Late in interest payment (yes/no)

$$z = \frac{odds}{1 + odds} = \frac{e^{b_0 + b_1 * x_1 + \cdots + b_n * x_n}}{1 + e^{b_0 + b_1 * x_1 + \cdots + b_n * x_n}}$$

If based on the model from the data of a city local government a value that is greater than 0.5 is obtained for "z", then within one year it is highly probable that it will have a supplier debt that will have lasted longer than 60 days, therefore, it may be considered to be insolvent.

3.7.1 Model validation, robustness

The classification table presents the extent the classification done based on the model is better than classification that is based on pure random (Table 7**. táblázat**). In the initial table the accuracy of the estimate was 55.1 %. Based on the logistic regression model the probability of a successful hit was 19 % points better, it increased to 74.1 %. This means that using the model increased the probability of correct classification.

Table 7: Classification table

Classification Table[a]

Observed			Predicted		
			csod		Percentage Correct
			0	1	
Step 1	csod	0	129	37	77,7
		1	41	94	69,6
	Overall Percentage				74,1

a. The cut value is ,500

Forrás: SPSS calculation

Usually the Hosmer-Lemenshow test is used for examining the matching or expressed otherwise, the robustness of the model. This test shows to what extent the model is capable of good classification. The test compares the predicted and the observed numbers of the specific cases and it examines

whether it is possible to establish a significant difference between the two or not. The null-hypothesis of the test is that there is no difference between the predicted and the observed values. Based on Table 8, since the value of Chi-square is not significant, we sustain the null-hypothesis and we declare that the model is appropriate (fits well).

Table 8: Result of the Hosmer-Lemenshow test

lépés	Khi-négyzet	df	Sig.
1	12,405	8	0,134

Forrás: SPSS calculation

The AUROC[6] analysis also shows the robustness of the model, since the ROC curve is suitable for presenting graphically the classification accuracy of the model (Figure 9).

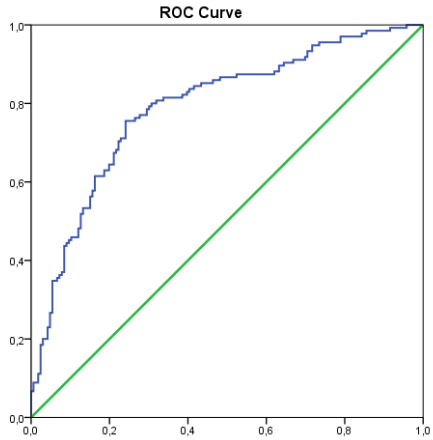


Figure 9: ROC-curve
Source: SPSSplot

When implementing evaluation on the basis of the ROC curve, we consider a model the better the further away it is located from the 45-degree straight line (towards the left top corner). This is a subjective category. However, we may use the AUROC index - that is closely connected to the curve – which defines the classification accuracy of the model on the basis of the size of the area that is located under the curve. The value of AUROC may be between 0.5 and 1, where 0.5 means a completely random classification (45-degree straight line), and '1' represents perfect classification. The AUROC value of our model is 0.741. In practice, they consider the performance of a model to be acceptable in the case of a value that is around 0.7, while in the case of a value of 0.8-0.9

[6]AreaUnderROC

its performance is outstanding (Kristóf, 2008). In our case this means that the performance of the model is acceptable.

In addition to the above, the robustness of a model may be also tested by the bootstrap algorithm. The essence of this method is that it creates samples from the original sample with random selection (with the method of putting back the element selected). From the medians of the samples that are generated randomly a calculated distribution is made. If the difference between the original data and the data received as the resultant of the bootstrap procedure is not significant, then our model may be qualified as being appropriate as well. In the case of logistic regression (that is, in our case) the method is more complex, since several variables have to be managed and inserted into the model simultaneously. SPSS presents the results in a manner that is similar to logistic regression, in order to allow the comparison of the results (Table 9).

Table 9: Robustness of the insolvency predicting model

Forrás: SPSS calculation

The level of significance of the v64 variable obtained as a result of the 1000 random sample based bootstrap procedure was above 0.05, while the rest of the variables (v58, v38, v31) performed well.

In view of the fact that from among the three procedures concerning the validity and robustness of the model in the case of two the model performed well, and even in the case of the third test three variables proved to be significant and even the v64 variable crossed only minimally the 5 % error limit defined, we may classify the model as being acceptable.

Finally, it is worth to examine to what extent the model performs compared to the models that are used in the relevant literature for forecasting the bankruptcies of companies (Table 10).

Table 10: Accuracy of bankrupty predicting models

Modell	Predicting power
Altman (1968)	95%
Deakin (1972)	97%
Altman-Lorris (1976)	90%
Altman-Halderman-Narayanan (1977)	93%
Dambolena-Khoury (1980)	96%
Zmijewski (1984)	76%
Zmijewski (1984)	97%
Altman-Izan (1984)	92%
Barth-Brumbaugh-Sauerhaft-Wang (1985)	87%
Altman-Fydman-Kao (1985)	94%
Pantalone (1987)	95%
Platt-Platt (1990)	90%
Virág (1990-91) (first Hungarian model)	**73,4%**
Arutyunjan (2002)	77,6% és 91,8%
Kristóf (2008)	94%
Béres (2011) (local governments)	**74,1%**

Source: own constructed based on Virág (2004), Arutyunjan (2002) and Kristóf (2008)

I highlighted with bald in the above table the measured forecasting accuracy of my own forecasting model and the forecasting model of Dr. Virág achieved as regards the data of 1990-1991. During the interview made with Dr. Virág it was revealed that the creation of the first Hungarian model was actually an experiment, the opportunity for preparing it was provided by the introduction of the Bankruptcy Act in 1991. The purpose of the experiment was to establish whether it is possible to apply a bankruptcy forecasting model under the Hungarian circumstances. This early work provided foundations later on

for developing the forecasting of the bankruptcies of the Hungarian companies. The fact that with the first model developed for the local government sector a forecasting accuracy of 74.1 % was achieved indicates that there are further opportunities in implementing research for forecasting local government insolvency.

3.7.2 Options for further developing the model

The above introduced insolvency forecasting model for local governmentes is not perfect, therefore it is worthwhile to say a couple of words about its further development options and the limits and restrictions of the model created.

The first thing that has to be mentioned is the definition of local government bankruptcy that was applied (criterion of latent bankruptcy). Within the frameworks of present doctoral dissertation, the criterion of bankruptcy was the existence of a supplier debt exceeding a period of 60 days. I adapted this criterion to the local governments based on the models that are applied in the case of companies. However, this also raises the possibility that one may apply a different criterion as well, which may potentially lead to a better result.

Several people phrased critics in the relevant literature, highlighting that the indices developed for company analysis and company evaluation are not suitable or suitable only with restrictions for analysing the economic activities of the local governments. Agreeing with these critical comments only partially, I think that indices that fits better the specialties of local government operation (e.g. the number of micro, small and medium sized and large companies that pay local business tax, or revenues realised by groups) would probably increase the accuracy of the estimating model. However, it has to be noted, that the newly introduced indices do not have to be necessarily derived from local government book keeping, the relevant regional economic indices could be also involved in the analysis (e.g.: the number of persons travelling to and out from the settlement, the distance measured from the motorway/highway, etc.).

The model is based on the data of 2010-2011. This is good on one hand from the aspect that the debt of the sector was at its peak at this time. However, on the other hand, the transformation, the debt consolidation of the local government system in 2011 and the introduction of the local government debt undertaking permit issuing procedure could possibly emphasise the role of other indices at present.

Finally, but not lastly, the predictive character of modelling could be also improved, if there would be data suitable for evaluation available not only for the cities, but for a wider range of settlements. The criterion of bankruptcy

was based on the data that were collected by the State Audit Office of Hungary in the course of its audit that involved the cities. Therefore, I was not able to increase the number of the elements of the sample in the framework of present thesis.

4. CONCLUSIONS AND RECOMMENDATIONS

In my doctoral dissertation, I developed - as the first person - an insolvency forecasting model for local governments. In the course of developing the model I examined the related processes of the local government sector as well. The purpose of the present section of my thesis is to present recommendations in the interest of improving the stability of the local government system.

Development of early forecasting systems for the public sector

The insolvency forecasting model developed for the local governments is not the only area for which it may be worthwhile to develop forecasting models. Another area could be for example the assessment of the factors that contribute to the successfulness or unsuccessfulness of local government projects. Another important area may be the forecasting of the extent of the expectable local business tax revenue, since the self-financing capability of the local governments is mostly defined by this factor at present.

It is also possible to define intervention thresholds based on the forecasting systems, and this way it may be unambiguous and at the same time objective when and in which areas the central government should be able to intervene.

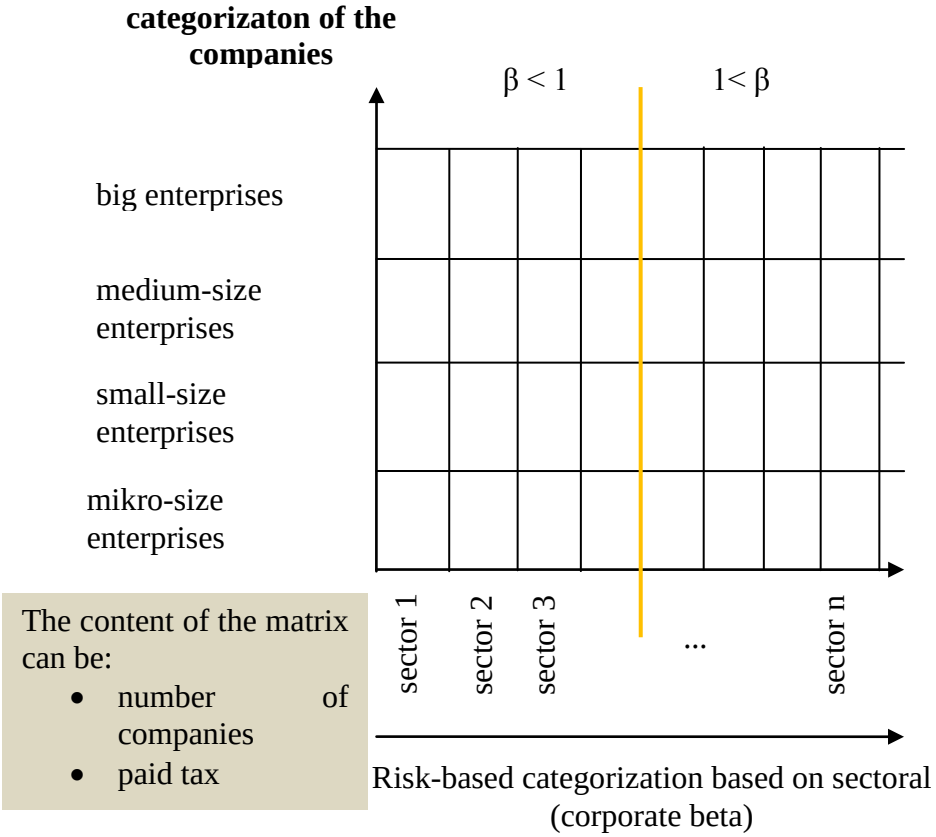
Measurement of the self-financing risk of the local government system

The revenues of local governments include the operation related revenues, and within these they include the local taxes, from among which an outstandingly important one is the local business tax. In the course of examining the system level transformation of the local tax revenues we could see that as a result of the 2008 crisis the size of revenue collected from the local business tax fluctuates since it is the resultant of the economic cycles. Due to this, it may be worthwhile for the local governments capable or partially capable of self-financing[7] to prepare their own exposure map, based on which they could prepare themselves for the changes of the economic performances of the companies that operate within their territories (that is the changes that are primarily due to the volatility of the local business tax). Otherwise, this may become one of the means of bankruptcy prevention.

[7] Self-financing capability as defined within the frameworks of present thesis.

We may obtain the system level risk by aggregating the specific maps. This is true, in spite of the fact that the exposure map cannot be applied in the case of local governments that are incapable of self-financing. This is so, because in the case of these local governments the local business tax represents a lower share anyway within the revenues, therefore leaving them out does not cause a significant change in the risk level.

The exposure matrix actually is nothing else, but a matrix, the 'y' axis of which represents the companies of different classifications (e.g.: micro, small, medium and large sized enterprises), while its 'x' axis represents the entrepreneur sector sorted according to increasing risks (Diagram 11. ábra).



10. ábra: Local tax exposure map of local governments
Source: own constructed

The extent of the risk may be given by the corporate beta value defined for sectors, since this value shows to what extent the given company reacts to the changes of the market. The smaller the value of beta in the given sector, the local government may obtain the more stable revenue. Contrarily, the local business tax revenue obtained from companies that may be characterised with

big betas will be big in the case of the prosperity, while during recession a large part of these revenues may disappear from the budget of the local government.

The aggregate of the maps that are prepared for the specific self-financing or partially self-financing local governments at the same time also represents the financial projection of the system risk of the sector. This method may be good while the local business tax represents a significant part of the local government revenues.

The exposure map may be also good - in addition to the above - for tracking the impacts of local policies (e.g.: impact of a enterprise settlement program), and it may also represent a part of the conscious risk management activity that is missed by Domokos and his author partners (2015).

5. NOVEL AND NOVEL-LIKE SCIENTIFIC RESULTS

1. **I certified in the thesis that it is also possible to prepare an insolvency forecasting model for the local governments.**
   Based on the data of the State Audit Office of Hungary, the Hungarian State Treasury and the Central Statistical Office, as well as the data that may be obtained from the National Regional Development and Territorial Information I compiled a database of local governments details. This database contains the data that are required for calculating the corporate index applied or applicable to that 69 local governments, based on which it is possible to build an insolvency forecasting model. The model obtained as a result of the calculations had proven to be acceptable even after the validation procedure, therefore I consider it to be proven (H1) that it is possible to prepare an insolvency forecasting model with the aid of the indices that are based on the data that may be obtained from the elementary financial reports of the local governments.

   Involved variables in the model:
   v58 - Revenure flexibility index
   v38 - Liquidity II.
   v31 - Reliability index of planing expenses
   v64 - Late in interest payment (yes/no)

$$\ln(odds) = 7{,}034 - 3{,}159 * v58 - 0{,}15 * v38 - 2{,}069 * v31 - 0{,}894 * v64$$

$$z = \frac{odds}{1 + odds} = \frac{e^{b_0 + b_1 * x_1 + \cdots + b_n * x_n}}{1 + e^{b_0 + b_1 * x_1 + \cdots + b_n * x_n}}$$

If on the basis of the data of a city local government a value for "z" that is greater than 0.5 is obtained, then its supplier debt longer than 60 days will occur within one year with a high probability (latent bankruptcy criterion), therefore it will be possible to consider it to be bankrupt.

2. **In the course of my research, I have proven that the introduction of stricter borrowing limits after 2011 was justified in the local government sector.**
   Examining the indebtedness of the local governments from the side of credit institution risk management, I established that the credit institution sector is interested in financing the local government sector from several aspect. This interest is primarily due to the local government sector being considered to be risk-free – in practice, the risk classification of the local governments is the same as that of the state. The deficiencies of the previously applied debt rule led to the accumulation of the local government debt portfolio. In view of the fact that the credit institutions are still encouraged to provide credits for the sector, according to my opinion it is justified and it is also proven that it was necessary to introduce stricter borrowing restrictions after 2011 (H2).

3. **Examining the composition of the settlement local government revenues, I certified that with the spreading of the resource oriented management approach between 1995 and 2011, the direct exposure of the local governments to the economic cycles increased.**
   The sector level local government revenues increasingly depend on the local business tax revenues. The size of the local business tax revenues depends on consumption to a great extent, which may even change significantly along the economic cycles. This also means that the local governments are directly exposed to the cyclicity of the economy, up to a greater extent than previously (H3). The reshaping of the local government tasks after 2011 and the simultaneous decreasing of the subsidies that are provided by the central budget to the local government sector (*and thus the increasing of the ratio of revenues obtained from the local business tax within the total revenue of the local governments*) further increased the local business tax revenue exposure of the sector.

4. **I phrased a recommendation in connection with the increasing exposure of the local governments to economic cyclicity for measuring the self-financing risk of local governments, to which I elaborated a methodological framework system (exposure map).**
   The increasing local business tax dependency of those settlement local governments that may be considered to be self-financing or partially self-financing, and the fact that the local business tax cannot be considered a

stable local government revenue source makes it necessary to have deeper information as regards the reliability of the revenues obtained from this tax type. This may be obtained with the aid of the local government exposure map. The map is able to define - with the aid of applying the sector (corporate) beta factor known from corporate finance - the way the revenues of the companies resident in a given local government (or the aggregated revenues on sector level) will react to the cyclicity of the economy, whether they will increase or the other way around they will mitigate the impacts of the economic cycles. The local business tax revenue of a local government may be considered to be more stable if more such companies have settled within its territory that belong to a sector that has a sector beta value that is smaller than one. Since in this case the movements on the market are reflected less in the revenues of the enterprise. At the same time the recovery of the economy encourages the settlement of companies that may be characterised with bigger sector betas.

5. **My research also confirmed that the subsidy system of local governments adapted itself to the self-financing capability of the local governments between 1995 and 2011.**
   During preparing the thesis, in deviation from the usual practice (in a unique manner), I examined the local governments through the revenue side. As a consequence of this, I also defined the self-financing framework system of the local governments in a special way. As a result of the analysis, I concluded that altogether 10.16 % of the local governments (326 local governments) may be considered to be self-financing, and an additional 28.72 % of them (922) may be considered to be partially self-financing. With the aid of applying a cross table analysis concerning the subsidies provided for the local governments and the self-financing capabilities, I established that there is a strong relationship between the two dimensions. Based on this, I considered it to be proven that the self-financing capability expressed through the classification of the revenue side of the local governments was in harmony in the examined period with the subsidies that were provided for the local governments (H4).

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