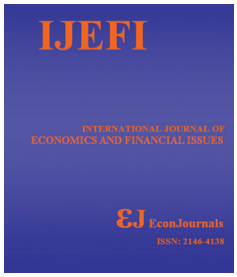

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Inside Local Governance: How Well Is Debt Managed?

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ABSTRACT

Several debates and concerns about local elections focus on whether local governance can take root in an environment where people have a very low trust in their rulers, and deliver the economic goods: A higher rate of investment, more growth and more jobs. In this paper we aim to understand whether local authorities have the financial means and management skills to face these challenges. More specifically, we address the issue of local debt management and propose a scoring system that rates municipalities' credit quality. Our methodology is based on a mix of quantitative modeling and qualitative analysis. Our data set incorporates all the 264 Tunisian Municipalities and spans a period over 7 years (2010-2016). Our results show that the main quantitative factor predicting good debt management is Net Cash Flow. The model shows strong efficiency and reliable predictive power.

Keywords: Local Governance, Default Risk, Debt Management, Credit Risk Factors
JEL Classifications: F30, G28, C50

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1. INTRODUCTION

Decentralization has been in the last few decades the magic word brought up by politicians to fix a large spread of problems spanning from waste collection to fixing infrastructure. The main idea behind their reasoning is that by decentralizing decisions from a central power to local governments, a better management of expenses and resources will be provided. This happens thanks to several phenomena. First, the governors, being closer to the population, will better grasp and address their main issues. Second, the population, by seeing the impact of the efforts done by the governors on their daily lives, are keener to pay their taxes. Finally, the decision making process will be much smoother and flexible to adjust to local environment changes.

After the revolution of 2011, the Tunisian parliament has voted a new constitution in 2014 pushing for the virtue of decentralization. This is was achieved through the vote of a new local communities code and the organisation of the first municipal elections in May 2018 that was won by the islamist party, Ennahdha. Since, most debates on the future of Tunisia tend to focus on whether the Islamist party, following its relative success in the recent local elections, is going to win the presidential election in 2019. Many Tunisians fear that would give the party a hegemonic role in the country's politics.

A more relevant and less discussed issue is whether local governance can take root in Tunisia, increased the very low trust currently people have in their rulers and deliver the economic goods: a higher rate of investment, more growth and more jobs. Without a drop in the rate of unemployment, currently 15.4%, the new local counselors will have to deliver tangible benefits if the country's democracy is to grow deep roots.

Municipal expenditures has traditionally rested on three major taxes: Real Estate Tax, Tax on non-built up land, Business Tax.

Most of the income from these taxes traditionally went to the central government which redistributed it to local authorities. Collecting taxes has been no easy jobs as Tunisians have long been suspicious of how the government spent the money. Lack of transparency and accountability by central government has long been the norm. The main purpose of the rules (Code des Collectivités Locales) endorsed by the parliament in Mai 2018 is one to give more power to local counselors, second to make the process more transparent. The hope is that these new rules will boost the confidence ordinary Tunisians have in the way they are governed.

Many seasoned observers are worried less the new municipalities do not have the financial means of their ambitions. The transition from centralized to devolved power could be proved to be very bumpy. The disparities between Wilayas (provinces), which include very different levels of unemployment, access to social services and infrastructure, fuelled the revolt of 2011 and could provoke further trouble in the future if they are not addressed. These difficulties will be compounded if political polarization in Tunisia continues at its current high level and if one party does spectacularly well in next year presidential and general elections. Such an outcome risks a return to the corruption and lack of transparency of yesteryear. This would end Tunisia recent love affair with democracy. Failure in Tunisia has wider implications for North Africa and European Mediterranean countries.

The great unknown today is whether the new municipal code will deliver faster and more socially inclusive growth across the country where regional disparities have grown alarmingly over the past decades?

A large body of academic research has addressed the question of financial position of governments and local administrations. (Carr and Karuppusamy, 2010) studied the link between local government structure and per capita expenditures through the analysis of 263 Michigan cities. (Wang et al., 2007) tested a measure of financial condition using government-wide information and found that financial condition among states varies greatly and there is a much room for improvement. (Cabaleiro et al., 2013) proposed a method for evaluating the financial health of municipalities based on three broad dimensions of sustainability, flexibility and vulnerability. Using a stochastic multi-criteria acceptability analysis combined with a disaggregation technique, (Cohen et al., 2012) built an operational model for evaluating the financial viability of local municipalities in Greece. (Wang and Hou, 2012) explored the local government savings and the impact of savings on stabilizing expenditures. (Gao et al., 2018) showed evidence that state policies for distressed municipalities matter for local borrowing costs and found that in proactive states, municipal bond yield spreads increase by 3.9 percentage points. (Scott, 2001) studied in details the creditworthiness of South African municipalities using objective standards.

Other studies focused on identifying factors influencing the financial condition of local governments. (Choi et al., 2010) found that population size and density to be positively associated with public spending. (Guillamon et al., 2011) found that population density, the unemployment rate and the level of immigrant population may increase local government debt. (Cabaleiro et al., 2013) examined the relationships between several variables (long term and short term debt, debt per capita, specific weight of debt by type of revenue, tax burden) and the financial health of local governments. Based on an empirical study on 148 Spanish municipalities, (Navarro-Galera et al., 2017) found that a lower population density, less dependent population, falling levels of per capita income and the presence of progressive local government are all risk factors for default by local governments.

To better understand the future, you must understand the past. It is therefore worth considering the causes of local economic failures in recent years in general and the factors that impact local communities default risks in particular. This paper tries to address this issue. In particular, we are interested to analyze the impact of different factors on the default probabilities of Tunisian municipalities. The Tunisian context has several particularities on several levels. First, municipalities have few, if not none, relationships with the financial system in general and the banks in particular. The main source of loans for the municipalities is provided by la Caisse des Prêts et de Soutien des Collectivités Locales (CPSCL). CPSCL is a government organisation that has the monopole of managing the allocation of government funds and development finance institutions (DFIs) resources toward municipalities and local communities. CPSCL was first created in 1902 by the French administration under the name of "Caisse des Prêts Communaux Tunisiens." Its status has since evolved toward more financial and management autonomy and it is under the current name and status (EPNA: Non Administrative State Owned Company) since 1975.

The reminder of the paper is organised as follows. In section II, we discuss the research methodology and model set up. Section III analyses the data used. Section IV displays the results and section V concludes.

2. METHODOLOGY

Our methodology is based on three components:

- Country/Region Analysis: We study the macroeconomic variables that impact municipalities defaults.
- Intrinsic Analysis: We perform a quantitative analysis to analyse the factors impacting municipalities defaults on the microeconomic level.
- Support Analysis: We analyse the factors that come as a support to the municipalities.

Graph 1 describes how the three analysis interconnect between each other.

Our methodology steps could be summarized as follows:

1. We perform the intrinsic analysis based on a quantitative model to assess a quantitative score to each municipality using historical data. The score is computed as follows:

$$\text{Initial Score} = 1000 \times (1\text{-“Default Probability”})$$

2. Adjust the score obtained in 1. using the country, region and support analysis. This analysis is based on qualitative variables. We adjust the score by a notch (positive or negative). The score adjustment and its interpretation are displayed in Table 1.

Graph 1: Scoring analysis scheme

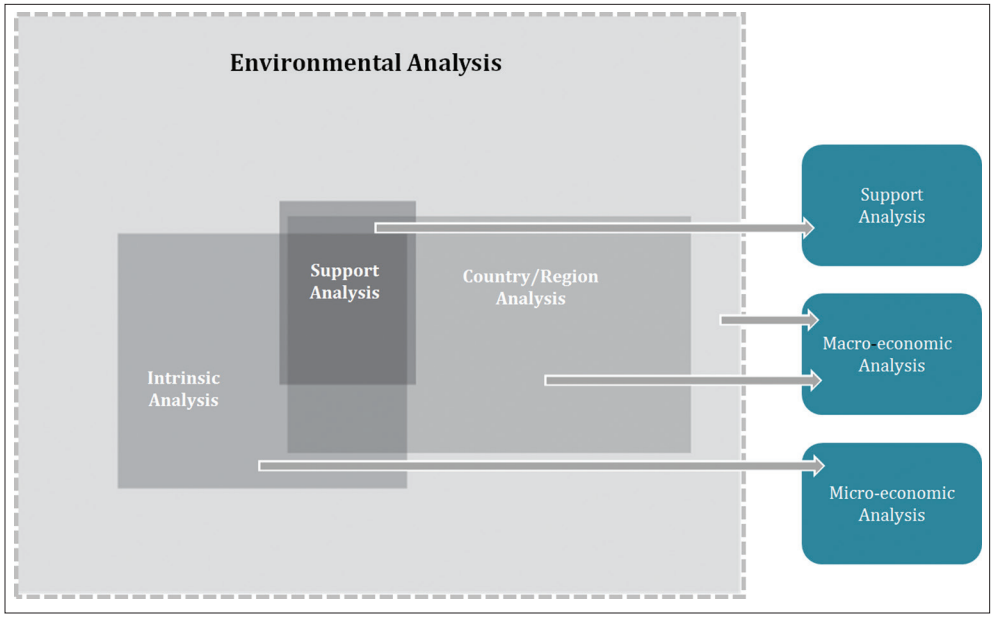


Table 1: Scoring interpretation

Initial score	Adjusted score	Interpretation
950→1000	950→1000	Best credit quality
900→950	800→950	Very good credit quality
850→900		
800→850		
750→800	700→800	Good credit quality
700→750		
650→700	600→700	High Solvency
600→650		
550→600	500→600	Average Solvency
500→550		
450→500	400→500	Relative risk solvency
400→450		
350→400	200→400	Uncertain repayment probability, risk quite high
300→350		
250→300		
200→250		
150→200	100→200	Compromised solvency, fundamental risk
100→150		
50→100	50→100	Selective default
0→50	0→50	Default

2.1. Intrinsic Analysis

To perform the intrinsic analysis, we will be using a quantitative model based on a logistic regression. Let (Ω, F, F, Q) be a filtred proability space endowed with the filtration $F = \{F_t \subset t \geq 0\}$ $F_t \subset F$, associated with Markov processes with left-limit right-continuous trajectories $\{X_{it}, t \geq 0, i \in I\}$ where I is a set index. The filtration F, hence, represents the information flow provided from different variables X. In our context, the process X is defined by 40 variables spanning from financial variables to behaviour variables.

We define the process $Y=\{Y_t: t \geq 0\}$ as a default process. Default is measured by a delay of more than certain days in debt payment (90 days in our context). Default is a binary process that could be written as follows:

$$Y_t = \begin{cases} 1 \quad if\ Default\ at\ time\ t \\ 0\ if\ \ Survival\ at\ time\ t \end{cases}$$

We are interested in computing the conditional expectation of default:

$$EY_t \left| F_t = P\left[Y_t = 1 \right\| F_t \right]$$

One might think of running an ordinary least square (OLS) of the above probability on a set of dependant variable:

$$EY_t \left| F_t = P\left[Y_t = 1 \right\| F_t \right] = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \ldots + \beta_n X_{nt}$$

Unfortunately several issues will be faced when performing an OLS mainly:

- The linear combination of the dependant variables is a real term and not a probability
- In the sample set, we see Y and not the Default probability.
- The OLS hypothesis, mainly homoscedasticity and normality of error terms, could not prevail and hence will impact any inferential statistics (coefficient estimation, etc.)

Therefore, we will use the Logit of $P\left[Y_t = 1 \right\| F_t \right]$ as follows:

$$ln\left[\frac{\Pi(X)}{1-\Pi(X)} \right] = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \ldots + \beta_n X_{nt}$$

Where $\Pi_t(x) = \frac{exp\left(\beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \ldots + \beta_n X_{nt}\right)}{1 + exp\left(\beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \ldots + \beta_n X_{nt}\right)}$ being the cumulative function of the logistic law. Note that $1 - \Pi_t(x) = P\left[Y_t = 0 \right\| F_t \right]$

Hence by performing the logistic regression we are able to estimate the coefficients $\{\beta_0, \beta_1, \beta_2, \ldots, \beta_n\}$ to come up with the final result:

$$P\left[Y_t = 1 \middle\| F_t\right] = \frac{1}{1 + exp\left(-\beta_0 - \beta_1 X_{1t} - \beta_2 X_{2t} - \ldots - \beta_n X_{nt}\right)}$$

The methodology we propose in this paper is to start with a large set of variables (in our case 40 variables) to come up with the significant variables predicting default by through data analysis and logistic regression.

In a nutshell, the steps that we undertake in this paper could be summarized in the Graph 2.

More explicitly, each step is detailed below:

1. Variables quality analysis: Check the quality of data for every variable and only keep variables with reliable data. Perform individual statistical analysis to better grasp the behaviour of each variable (mean, standard deviation, quantiles, etc.).
2. Variables pre-selection: Compute the correlation of each variable with default. We use Spearman rho for continuous variable and Cramer's V for discrete variables. We eliminate the variables that have very low correlation with default.
3. Cross analysis: Perform multicollinearity test for the remaining variables to eliminate the variables that provide the same information. This step allows the model to have more consistent parameters as multicollinearity can cause estimation inefficiency.
4. Logistic regression analysis: Run logistic regression and do significance test for every estimated parameter.
5. Keep only the statistically significant variables.
6. Repeat steps 4 and 5 until getting statistically significant variables

2.2. Country/Region Analysis

For the country or region analysis we focus on four aspects:

- Income levels
- Diversification of the economy
- Economic growth prospects
- Institutional framework

2.2.1. Income levels

Income levels as measured by GDP per capita is a reliable indicator of the economic strength of a local government's revenues or tax base. It also measures the municipalities potential needs for social services, public assistance and welfare. To derive this measure, we can use either local or notional GDP per capita. The decision is based on the composition and sources of local governments revenues, including the proportion of transfers from the central government. For example, if a local government is heavily dependent on central government's transfers, national GDP per capita is a more appropriate measure. Note that it is also the case for municipalities which revenues stem from a far-reaching equalization system (Revenue equalization is the transfer of fiscal resources across jurisdictions with the aim of offsetting differences in revenue raising capacity).

2.2.2. Diversification of the economy

The diversification of a region's economic structure is important to assess the potential volatility of the tax base and its resilience to stress. A well-diversified economy with several strong sectors exhibits usually less volatile tax revenue than an economy with high exposure to a single industry. Hence, we apply a positive adjustment to the municipality score due to an exceptionally broad or diversified economy. Alternatively, we adjust the score negatively due to a concentrated or narrow economic base.

2.2.3. Economic growth prospects

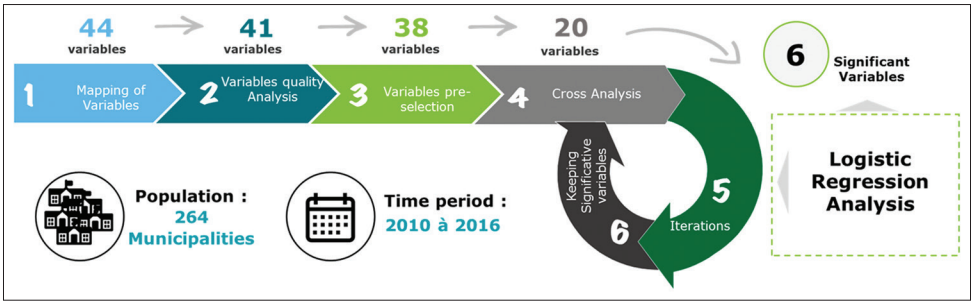
Our economic growth analysis is based on recent and projected trends in output, employment and investments and take into account a region's growth potential. The growth potential is best understood in the context of a region's competitive advantages (or disadvantages) with respect with its peers. This could include geographical location, infrastructure, natural endowments, etc. An adjustment of a municipality score is done depending on the growth prospect,

2.2.4. Institutional framework

The institutional framework is very important for several reasons. First, a stable institutional framework entails a better predictability of the outcome of reforms affecting the division of responsibilities and revenues between the levels of governments in a jurisdiction. Second, a transparent and accountable institutional framework promote the implementation of good practices such as compulsory audits and external controls, proper assessment of external and internal risks, and long-term financial planning.

Every qualitative variable is measured on a scale of four levels: Poor, Medium, Good and Excellent. We strongly advise the use of a scale based on an even number to avoid the tendency to go to the median. Our interviews with several experts from CPSCL showed that the four macro components are equally important. hence we use the same weight for the four different macro variables as shown in Table 2.

Graph 2: Quantitative analysis steps



2.3. Support Analysis

The support analysis assess the likelihood that, in the event of difficulties, a municipality would receive sufficient financial assistance from the government or private owners to enable it to continue meeting its financial obligations in a timely manner. It could be summarized in the expression: "Too big to fail."

3. DATA

The data sample used in this paper is composed of 264 municipalities over 7 year period, from 2010 to 2016, making a total of 1848 data points. For every data point we have a set observations of 40 variables divided over three categories as displayed in Figure 1 and described in Table 3. Default is measured by a delay of >90 days in debt payment. Note that we used moving averages over 3 years to smoothen the data, and this, in order to guarantee a certain stability and to avoid the effects of volatilities (sudden variations) on the model (as example: For the Debt Ratio variable in 2015, we used the average of the values of this variable for the years 2013,2014 and 2015). Table 4 presents some descriptive statistics for each variable.

Table 2: Qualitative variables weights

Variables	Weights (%)
Income levels	25
Diversification of the economy	25
Economic growth prospects	25
Institutional framework	25

4. RESULTS

The first analysis we would like to perform is to see whether the quantitative model can do better than just a random sampling of default. In other words, if we pick randomly defaults by tossing a biased coin, would we do as well as running a quantitative model? Since our data shows that there 54.9% of the loans default and 45.1% survive, the coin bias will be of probability 54.9%. The three statistics (LR, Score and Wald) reject the null hypothesis (H_0 = 54.9%), i.e. the model is statistically different from just a random sampling of default, as it can be seen in Table 5.

Table 6 presents the estimated coefficients of the logistic regression as well as their statistical significance and other statistics of the final model. We reached the final model after 13 iterations with the final model having 3 significant variables. The model is statistically

Graph 3: Normalized Coefficients

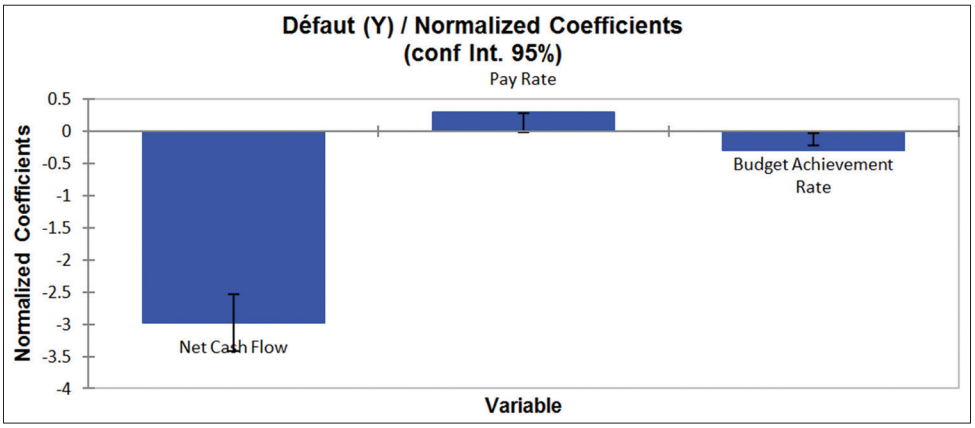


Figure 1: Division of variables by category

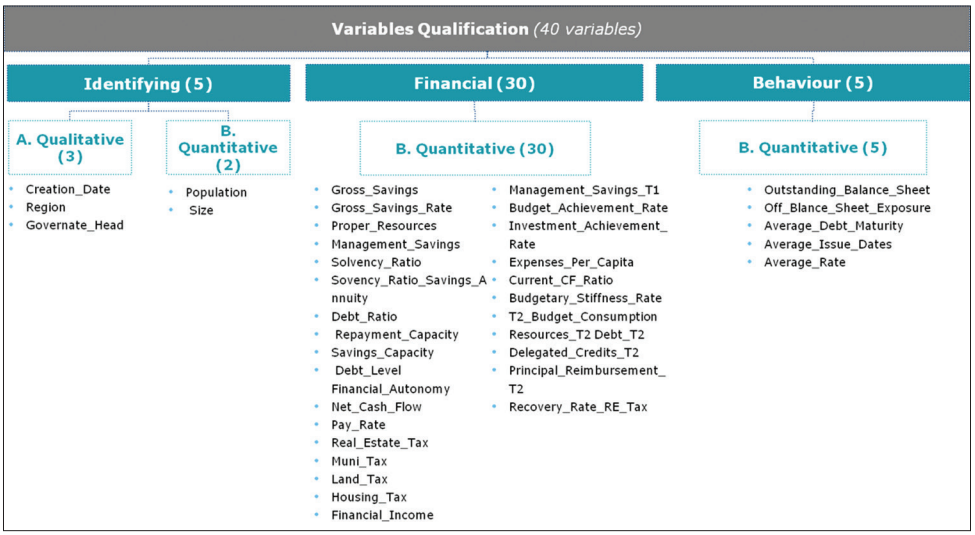
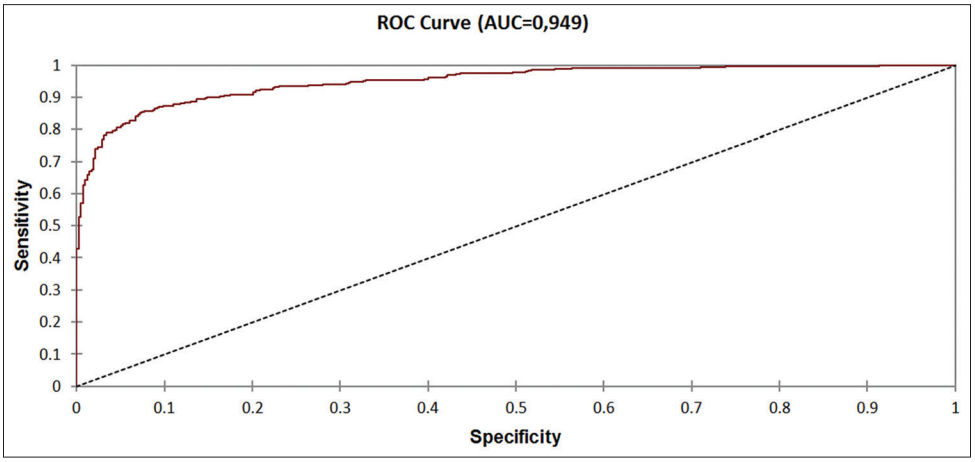


Table 3: Variable description

Variables	Description
Identifying variables	
Creation_Date	Date of creation of the municipality
Region	The region the municipality is from
Governate_Head	Whether the municipality is head of the governate or not
Population	The municipality population size
Size	The municipality size
Behaviour variables	
Outstanding_Balance_Sheet	The amount owed by the municipality
Off_Blance_Sheet_Exposure	Debt that is not on the municipality balance sheet
Average_Debt_Maturity	The average time of municipalities time to maturity debt
Average_Issue_Dates	Average debt issue dates
Average_Rate	Weighted average interest rate applied to the municipality
Financial variables	
Gross_Savings	The gross savings made my each municipalities per period
Gross_Savings_Rate	Gross_Savings/Total resources
Proper_Resources	The municipalities own resources (by substucting governement donations)
Management_Savings	Gross Savings+Interests
Solvency_Ratio	Outstanding debt./Gross savings
Sovency_Ratio_Savings_Annuity	Gross_Savings/Annuity
Debt_Ratio	Outstanding debt./Total resources
Repayment_Capacity	Gross savings/Annuity
Savings_Capacity	Gross savings/Total resources
Debt_Level	Annuity/Total resources
Financial_Autonomy	Proper_Resources/Total resources
Net_Cash_Flow	Gross_Savings – Debt. reimbursement
Pay_Rate	Municipality payable resources/Governement resources
Real_Estate_Tax	Real estate tax/Proper_Resources
Muni_Tax	Municipal tax/Proper_Resources
Land_Tax	Taxes from non built lands/Proper_Resources
Housing_Tax	Housing tax
Financial_Income	Financial income from investments/Proper_Resources
Management_Savings_T1	Management_Savings/Income from T1
Budget_Achievement_Rate	Budget disbursed/Total budget
Investment_Achievement_Rate	Investment disbursed/Total Investment budgetised
Expenses_Per_Capita	Total operational expenses/Number of habitants
Current_CF_Ratio	Net cash flow/Total resources
Budgetary_Stiffness_Rate	(Annuity+Municipality payable resources)/Total resources
T2_Budget_Consumption	T2 disbursed/Total T2
Resources_T2	Resources coming from T2/Income from T2
Debt_T2	Total Debt./Income from T2
Delegated_Credits_T2	Delegated credits/Income from T2
Principal_Reimbursement_T2	Principal reimbursement/Income from T2
Recovery_Rate_RE_Tax	Recovery rate ratio of Real_Estate_Tax

Graph 4: The final model ROC curve



significant and according to the coefficients, one variable has a positive coefficient and two have negative coefficients.

The results show that Net Cash Flow (Gross Savings - Debt Reimbursement) is significant with a negative sign. This is

Table 4: Variables statistics

Statistique	Min.	Max.	1st Quartile	Median	3rd Quartile	Average	SD
Gross_Savings	233 930	532 321 133	95 424	215 749	539 408	855 582	12 426 580
Gross_Savings_Rate	−50.75%	100.00%	11.90%	20.46%	29.24%	21.50%	13.54%
Proper_Resources	–	532 480 623	335 843	642 800	1 688 924	2 096 961	13 383 068
Management_Savings	132 192	532 334 883	120 071	255 924	647 527	956 443	12 447 396
Solvency_Ratio	338,85	920 332,83	1.46	2.79	5.29	657.92	21 840.74
Sovency_Ratio_Savings_Annuity	3	5 019	1	2	3	5	117
Debt_Ratio	0.00%	363.58%	38.00%	58.85%	82.82%	62.07%	35.98%
Repayment_Capacity	2.88	6 867.67	0.81	1.51	2.61	5.75	159.72
Savings_Capacity	−50.75%	100.00%	11.90%	20.46%	29.24%	21.50%	13.54%
Debt_Level	0.00%	48.76%	9.52%	12.82%	16.88%	13.56%	6.00%
Financial_Autonomy	0.00%	100.00%	53.67%	64.43%	73.42%	62.23%	15.08%
Net_Cash_Flow	6 506 862	532 321 133	44 533	131 943	346 634	654 893	12 402 766
Pay_Rate	0.00%	942.55%	52.75%	59.07%	66.51%	60.18%	26.41%
Muni_Tax	0.00%	1516.47%	10.39%	20.17%	32.51%	23.66%	38.12%
Housing_Tax	0.00%	65.09%	0.00%	0.00%	0.05%	1.47%	5.97%
Financial_Income	0.00%	4709.82%	1.75%	8.27%	21.25%	17.06%	110.48%
Real_Estate_Tax	0.00%	35.48%	2.99%	5.69%	9.14%	6.81%	5.16%
Land_Tax	0.00%	44.17%	0.46%	1.30%	3.09%	2.52%	3.63%
Management_Savings_T1	−50.75%	227.20%	15.48%	25.22%	33.76%	25.41%	14.92%
Budget_Achievement_Rate	0.00%	118910.17%	94.48%	103.80%	115.79%	171.58%	2763.85%
Investment_Achievement_Rate	0.00%	91904.54%	0.00%	26.86%	89.68%	326.90%	3160.41%
Expenses_Per_Capita	–	536	46	65	87	71	50
Current_CF_Ratio	0.00%	205.59%	78.03%	87.14%	94.59%	85.14%	14.32%
Budgetary_Stiffness_Rate	0.00%	194.89%	50.48%	59.69%	70.29%	60.76%	16.80%
T2_Budget_Consumption	0.00%	6668.88%	44.63%	67.41%	95.54%	79.19%	166.10%
Resources_T2	0.00%	591.20%	53.25%	76.46%	92.83%	69.45%	32.72%
Debt_T2	0.00%	100.00%	0.00%	6.02%	18.20%	11.18%	14.10%
Delegated_Credits_T2	0.00%	97.59%	0.00%	0.03%	8.83%	7.99%	15.22%
Principal_Reimbursement_T2	0.00%	6437.22%	5.38%	11.47%	22.41%	22.31%	152.07%
Recovery_Rate_RE_Tax	0.00%	512.70%	2.00%	9.10%	17.50%	13.61%	22.46%
Creation_Date	01-janv-57	13-sept-04				10-oct-62	04-août-09
Region	1,0	8,0	2,0	3,0	6,0	3,8	2m4
Population	784	652 432	6 341	11 772	30 000	27 709	52 409
Size	13	4 966 300	400	1 045	2 500	6 810	120 646
Governate_Head	–	1.00	–	–	–	0.09	0.28
Outstanding_Balance_Sheet	–	43 486 517	296 863	611 916	1 349 704	1 238 734	2 572 165
Off_Blance_Sheet_Exposure	–	3 138 665	–	–	50 293	73 202	210 487
Average_Debt_Maturity	10,17	20,00	13,04	13,61	14,09	13,56	0,92
Average_Issue_Dates	05-mai-87	17-juil-12	13-août-03	28-mai-05	19-févr-07	12-mai-05	03-sept-02
Average_Rate	2,00	8,11	5,62	6,82	7,13	6,24	1,27

Table 5: Test of the null hypothesis H0:Y = 54.9%

Statistics	DDL	Khi²	Pr>Khi²
−2 Log (Vraisemblance)	3	748,704	<0.0001
Score	3	421,703	<0.0001
Wald	3	180,504	<0.0001

expected as the higher the net cash flow the lower the default probability. When put into the logistic function, a negative coefficient will decrease the default probability while a positive coefficient will increase it. Hence, having a negative sign for the Budget Achievement Rate and a positive sign for the Pay Rate are expected results as well since the higher the budget achievement rate the lower the default probability and the higher the pay rate the higher the default probability.

However the very high coefficient of net cash flow draw our attention and further analysis needed to be performed. We compute the normalized coefficients to remove the level effects as displayed in Table 7 and Graph 3 the normalized coefficients.

We notice that, although we normalized the coefficients, the net cash flow variable remains the most important variable explaining municipalities default. This result is very important as rulers can primarily focus on analysing municipalities' net cash flows to assess their financial governance. Net cash flow is the fuel that helps municipalities to execute its projects, develop new areas, expand its services, or reduce debt. It is what allows municipalities to conduct their day-to-day business. This is why some people value net cash flow more than just about any other financial measure. Without long-term positive net cash flow, the financial equilibrium is impossible, but a municipality can offset short-term negative cash flow by borrowing. It is important to note that short-term negative net cash flow is not always a bad thing. For example, if a municipality needs to spend cash to build a commercial center, the investment will pay off in the end as long as the center eventually generates more cash than it cost to build. The importance of net cash flow is therefore confirmed by our analysis.

Table 6: Coefficients and statistics of the variables included in the final model

Source	Coef.	Standard deviation	Wald Khi²	Wald lower (95%)	Wald upper (95%)	Pr>LR
Net_Cash_Flow	−15,135	1,161	169,994	−17.410	−12.860	<0.0001
Pay_Rate	2,130	1,234	2,977	−0.289	4.549	0.004
Budget_Achievement_Rate	−0,601	0,225	7,123	−1.042	−0.160	0.008

Table 7: Normalized coefficients

Source	Coef.	Standard deviation	Wald Khi²	Wald lower (95%)	Wald upper (95%)	Pr>LR
Net_Cash_Flow	−2,976	0,228	169,994	−3.423	−2.529	<0.0001
Pay_Rate	0,131	0,076	2,977	−0.018	0.280	0.004
Budget_Achievement_Rate	−0,130	0,049	7,123	−0.226	−0.035	0.008

Table 8: Correlation matrix between dependent variables

Net_Cash_Flow	1.000		
Pay_Rate	−0.433	1.000	
Budget_Achievement_Rate	0.375	−0.049	1.000

Table 9: In sample classification matrix

From\Total	Non-default	Default	Total	% Correct
Non-default	371	46	417	88.97
Default	61	446	507	87.97
Total	432	492	924	88.42

Table 10: Out of sample classification matrix

From\Total	Non-default	Default	Total	% Correct
Non-default	351	48	399	87.97
Default	84	441	525	84.00
Total	435	489	924	85.71

The correlation matrix in Table 8 shows that the correlations between the dependent variables are very small, which confirms that there is no relationship among these variables that would account for the event studied.

As a measure of performance of the model, the receiver operating characteristic (ROC) curve of the model approaches the upper-left corner of the Graph 4 with the area under curve (AUC) coefficient close to 1, which confirms that the model discriminates sufficiently well between groups of municipalities.

Tables 9 and 10 display the classification matrix, i.e. the table of estimated versus observed values, for both in sample and out of sample. Table 9 shows the accuracy of the obtained classification out of sample. We can see that an accuracy of 85.71% is obtained in the correct classification of the database items. The default is predicted with any accuracy of 84% (sensitivity), while survival probability is predicted with an accuracy of 87.97% (specificity).

5. CONCLUSION

Several years after the revolution of 2011, many Tunisian citizens have become frustrated. They compare the relative speed that it took to tear down a regime with the slow labour of building up a democracy and wonder why they cannot yet see the change that the revolution promised. In the 1st years after its independence, Tunisia adopted a business model based on nationalising major industries and centralising government. These practices became fixed over the years but in today's modern economy they are no longer sustainable. The Tunisian parliament has voted a new constitution in 2014 putting the importance of decentralization forward. This is was achieved through the vote of a new local communities code and the organisation of the first municipal elections in May 2018. The first questions that were raised after the local elections: Do municipalities have the financial means and power to perform their duties properly? Do they have the capabilities to manage their financial resources properly? What is behind some of the municipalities financial troubles?

In this paper, we propose a scoring system to rate the municipalities' credit quality. Our methodology is based on a mix of quantitative modelling and qualitative analysis. Our logistic regression shows that default could be explained by mainly three factors: Net Cash Flow, Pay Rate and Budget Achievement Rate. Our model showed strong efficiency and reliable predictive power. Our qualitative analysis, based on experts interviews show the importance of four macro-economic variables: Income levels, Diversification of the Economy, Economic Growth Prospects and Institutional Framework.

The findings of the present article may provide useful information for the rulers as it will allow them to better allocate resources cross Municipalities. More specifically, by being able to compute the default probabilities (DP), the governors can compute the Expected Losses per municipality and hence know how much capital each municipality could consume (in the meaning of Basel III). This is done through the modeling of loss given defaults (LGD) and exposure at default (EAD) by municipality as Expected Loss is the multiplication of DP by LGD and EAD. Once the Expected Loss computed, governors can better allocate resources cross local governments and hence improve its decentralization policy. The modeling of LGD and EAD in the local governance context will be performed in future research.

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