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Econometric Analysis of Budgetary Executions of the Decentralized Territorial Collectivities

Tsikomia Amaïde Arsan Miriarison
tsikomia@yahoo.fr
University of Toliara, Madagascar

The focus on the budget management of local authorities does not seem successful in terms of forecasting and execution, since it only requires an analytical comparison of the administrative accounts of an ex-ante achievement in order to predict ex-post. The externality of political and economic instability and of the local government model (in terms of the choice of fiscal policy, investment and control system) chosen by the elected representative, must be taken into account in the 'development of an analysis and forecasting model, also taking into account economic variables or parameters (crisis, growth, inflation and fiscal pressure). Therefore, it is preferable that the analysis of the local finance budget is established by a reliable method, using an adapted and parameterized prediction model, knowing that all economic and political variables will be considered. The econometric analyzes were made on observations of the administrative accounts from 2002 to 2019 of the economic capital of Madagascar (Urban Commune of Toamasina - I) resulting in eleven econometric models: equilibrium or global model (income and expenditure), model of decentralization effect (local tax revenues and budget shocks), room model for implementation of operating expenses, model of budget execution performance, model of budget structure, model by nature of the budget (revenue from operation, investment income, operating expenditure, investment expenditure). The absence of data on the consolidation of local authorities in Madagascar has not made it possible to establish the macroeconomic dimension of the local authorities' budget. Given the quality of the tests carried out, the results are not free of bias. Bias can have several sources. As much, they can be linked to the fact that we measure the budgetary performance of the Communes from the administrative account, of which the political choices of the authorizing officer or the local elected representative are, the size of the commune (in terms of the number of population and sector of existing activity) are different and that the redistribution system (grants and allocations) are unfair. They can also come from the political orientation position of the central state, on public investment, favoring an imbalance in the dynamics of local development. So, although improbable, a modification of State-local authority relations would undoubtedly not be without effect on the behavior of budget forecasting.

JEL code: B23, C01, C13, C52, H72, P43, P47

Keywords: Econometric analysis, Budget of decentralized territorial communities, Quantitative economy, Economic modeling, Numerical simulation.

1. Introduction

During a period of stability[97] when economic growth increases must have an increase in revenue. In a study analyzing the administrative accounts of the Urban Commune of Toamasina - I from 2002 to 2019 (CUT), the analysis of the variation in economic growth

[97] *[...] A narrow relation exists between the low level of the returns and the indicators of governance (weakness of the right state, political instability) and notably of corruption in the developing country (Attila, Chambas, Combes and 2008).*
Quoted by Carlo COTTARELLI, "Mobilization of the returns in the countries in the development ", IMF, 2011, p. 10, 99 pages.

and revenues are not correlated: *corr(revenues, growth) = 0.16*[98]. Likewise, the analysis with expenditure showed a very weak correlation. We observe that spending always remains very stable and varies little in a recession period and economic growth: *corr(spending, growth) = -0.001*[99]. It also means that economic growth does not induce or induce the increased investment and other spending. So, the variation in the volume of the budget does not coincide with economic growth but only caused by the effect of the partisan policy of the elected official in terms of transfer and assistance from the State which compensates for the budget [100] estimate. Obviously, the actual expenditure will depend on the revenue available. It is "*the scissors effect between expenses and revenues*".

However, the externality of political and economic instability and of the municipal administration model (in terms of fiscal policy choice, investment and control system) chosen by the elected representative, must be taken into account. in developing a forecasting model, also taking into account economic variables or parameters[101] (crisis, growth, inflation, fiscal pressure), and decision models[102]. As James DANIEL, Jeffrey DAVIS, Manal FOUAD and Caroline Van RIJCKEGHEM underlines that " *[…] As a general rule, fiscal policy must always be assessed in terms of public administrations and public enterprises - financial or not - which constitute a significant risk for financial balance. If some administrations (eg local authorities) are limited by the obligation to maintain balanced budgets, we can possibly extrapolate from data in their accounts, to perform certain specific analyzes*[103]". The budgetary management of the Decentralized Territorial Collectivities (CTD) does not escape this rule, for which the management of the collected resources constitutes a real instrument of the forecast management policy.

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98 Amaïde Arsan Miriarison TSIKOMIA, "To Optimize the budgetary performance of the Territorial Collectivities Decentralized: Research of a model ", Thesis of Doctorate in economics. Public Economy, University of Antananarivo, 2017, p. 161, 536 pages.

99 Amaïde Arsan Miriarison TSIKOMIA, "To Optimize the budgetary performance of the Territorial Collectivities Decentralized: Research of a model ", Thesis of Doctorate in economics. Public Economy, University of Antananarivo, 2017, p. 163, 536 pages.

100 Amaïde Arsan Miriarison TSIKOMIA, "To Optimize the budgetary performance of the Territorial Collectivities Decentralized: Research of a model ", Thesis of Doctorate in economics. Public Economy, University of Antananarivo, 2017, p. 166, 536 page.

101 *[...] This fundamental principle of the good budgetary management requires that one leaves on good bases. (.). It is necessary in addition to the reliable and up to date information to permit a real mastery of the expenses that evolves with the macroeconomic conditions. Due to a lack of these bases, even the best policies will fail, the objectives of reduction of the budgetary deficit won't be reached, the arrears of payment will continue to accumulate and the priorities of expenses won't be respected.*
James DANIEL, Jeffrey DAVIS, Manal FOUAD, Caroline Van RIJCKEGHEM, "The budgetary adjustment as instrument of stability and growth ", International Monetary Fund. IMF, Set of the booklets, n° 55-F, Washington, 2006, p. 61.

102 *[…] The operational research and the organizational development seem more efficient when they apply quickly to complex systems, changing and probably agents on the science.*
Richard BECKARD, " The development of the organizations: Strategy and models ", Dalloz Management, France, 1975, p. 27.
According to ROY H., *[…] the use of the application of the graph theory proposed per H. ROY, who solves to the problems of rolling fund management. The cycle of current exploitation can be represented by a diagram noting the fluxes and the points of retention depending the some of the other. Such a representation of the rolling fund permits to put in evidence of the different internal fluxes intervening on the level of the liquidities.*
Henri ROY", financial Analysis and normative method ", Dunod, Volume 2, Paris, 1971, p. 299 -392.

103 James DANIEL, Jeffrey DAVIS, Manal FOUAD, Caroline Van RIJCKEGHEM, " The budgetary adjustment as instrument of stability and growth ", International Monetary Fund. IMF, Set of the booklets, n° 55-F, Washington, 2006, page 18.

In addition, the focus of CTD budget management does not seem successful in terms of forecasting and execution, since it only requires an analytical comparison of an ex-ante achievement in order to predict ex-post.

Even if there is the effectiveness of an Annual Work Program (PTA), drawn up by the various municipal departments and services of the CUT, budget executions are not always efficient. In the CUT's administrative accounts, we can see a large difference in budgetary achievements (low budget execution ratio), frequent budgetary adjustments during a financial year (transfer over and under to certain line of credit in the budget[104]), over-achievement of other headings where we observed a budget execution of more than 100% for some budget lines. So, the budgetary efficiency of the Municipality remains dependent on the economic performance of the local economy, the electoral cycle and the behavior of the elected official.

In the context of cash management, to the extent that the financial room for implementation was up to an insufficient period, or lack of free funds, the efforts of communities, as public administrations, were more oriented towards an external improvement (addition of new revenue headings, and an increase in expenditure to improve the services offered) than towards greater internal operating efficiency (method and technique of administration and management control). Such a policy has since proved to be highly penalizing for many of the Communes, since they now have to pay the previous excesses (arrears of expenditure to be paid). So, the vote in the form of "*program authorization*" for investments can lead to significant carry-overs of "*still to be done*" from one financial year to another, when the multi-year plan is used (*program budget*). This approach causes an error in the method of evaluating the execution ratios because the ratios are evaluated for one year but not the average during the multi-year plan, that is to say that we must evaluate by a ratio or progressive indicator over the period of a program budget.

How then can the ineffectiveness of the techniques used to achieve optimal budget performance be resolved in terms of both forecasting and execution? Knowing the ineffectiveness of the techniques used and the managerial policy of the elected representative, a prediction model would then be necessary to solve the forecasting problems and a treasury simulation system to solve the fund management problem. free.

Therefore, it is necessary to have an analysis of the budget prediction models ex-post. This is how *Rationalization of Budget Choice* (RCB) [105] can be achieved.

The modeling was carried out using specific prediction software developed during a municipal budget[106] modeling research study.

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[104] Amaïde Arsan Miriarison TSIKOMIA, "To Optimize the budgetary performance of the Territorial Collectivities Decentralized: Research of a model ", Thesis of Doctorate in economics. Public Economy, University of Antananarivo, 2017, p.151, 536 pages.

[105] The RCB is a set of techniques that consisted in introducing the economic calculation in the political decision-making process. It consists of optimizing the allowance of the public funds as holding counts the preferences of the administration and verify the consistency of the lens, actions and programs (MAP) to the level of the public organisms. But the techniques based on the rationality and the economic calculation is very with difficulty applicable to the budgetary principles of the CTD.

[106] The RCB is a set of techniques that consisted of introducing the economic calculation in the political decision-making process. It consists of optimizing the allowance of the public funds as holding counts the preferences of the administration and verify the consistency of the lens, actions and programs (Madagascar Action Plan or MAP) to the level of the public organisms. But the techniques based on the rationality and the economic calculation is very with difficulty applicable to the budgetary principles of the CTD.

2. Regression

According to Francis BACON, in his work Novum organum (true science is the science of causes), 1620, " *[…] To do science is to look for repeated patterns. To detect anomalies is to identify values that do not follow repeated patterns. For the one who knows the ways of nature will more easily notice her deviations and, on the other hand, the one who knows her deviations will more precisely describe her ways. You learn the rules by observing when the current rules fail* ".

To forecast budgeting, there are a number of methods that can be used, including mathematical modeling, index, normative projection, and equilibrium, among others.

The first of these, *the mathematical modeling process* is based on the use of economic and / or mathematical models which allow a large number of interrelated factors influencing the budget items to be taken into account. They also allow leeway in determining the technique of budget forecasts, and choosing among several budget variants, the optimum corresponding to the socio-economic development strategy of the country, and the fiscal policy pursued.

The index or indicative method is based on various indicators characterizing the socio-economic development of the Municipality. The indicators link spending decisions, with expected returns from that spending, and their effectiveness. *This concept is also used to assess the quality of budget control in order to improve the efficiency of the management of financial resources in the Commune.*

The normative method is based on progressive and financial budgetary standards, the standards necessary for calculating budget revenue on the basis of established tax rates and a number of macroeconomic factors, such as tax burden, budget deficit, municipal debt…. *This method was used to determine the budgetary capacity to pay*.

The equilibrium method which makes it possible to maintain the balance between revenue and expenditure, and to maintain the measurement of the budget structure (investment and operating ratio) *to achieve structural treasury at time*.

The evaluation from budget data carried out in the past, when the trends of certain forecasting processes have not been well determined, the achievement gap too high, *and it is necessary to use special calculations using the methods of statistical forecasting and economic prediction.*

Decision trees and rule bases are very easy to interpret. However, these techniques only recognize clear boundaries of discrimination. The regressions are a little finer. However, taking into account the additive character of their functions (of type $ax + by$), they cannot take into account multivariate relations. The existence of an interdependent relationship between the variables leads to a decrease in the performance of the model. Neural networks, by their ability to integrate relationships between variables, have a high predictive power. However, this progress leads to a loss of readability, given the complexity of the underlying mathematical model.

Classically, a regression, whether simple or multiple, consists of constructing the line (linear regression) which makes it possible to best represent the k examples of the learning base, for which the pairs (inputs, outputs) are known.

The objective of the regression is to predict a variable Y, called the explained variable or criterion, using a set of variables $X_1, ..., X_p$ called explanatory or predictor variables. All these variables are quantitative, continuous. In general, we want to determine a function φ such that $\varphi (X_1,…, X_p)$ is as close as possible to Y.

The most common and most important regression model in practice is the linear model (linear dependence between Y and the explanatory variables). Recall that in the case of simple linear regression, i.e. with a single explanatory variable X $(p = 1)$, the model sought is of the form:

$$Y = \alpha + \beta X + \varepsilon$$

" *[...] The problem is to estimate a, β as well as the variance of the residue ε. This estimate is made on the training sample Ω using the least squares method [Saporta 90]. Multiple linear regression generalizes simple linear regression, and its practice remains quite delicate. The objective of a multiple linear regression model is to find the hyperplane that adjusts*[107] *to best fits the scatter plot formed by the values of the examples for all the variables (X_1, ..., X_p and Y). Therefore, the model will look for the coefficients of the equation, such that the square of the deviations of the points on the hyperplane is minimal, it is always the criterion of least squares that is used. Readers interested in these methods will find more details and explanations in the books [Tomassone et al. 88] and [Saporta 90]* [108]".

Regression methods are widely used in prediction, but their particularity is that all variables are continuous quantitative. An extension to qualitative explanatory variables is possible, but the explained variable Y for its part always remains quantitative.

3. Variables used

The explanatory variables are presented in Table 01 below. Short-term stability (CT) variables are variables where their values can be influenced by socio-economic variables. Those of medium term (MT), due to a frequent evolution (for example, an increase in housing which modifies the titles issued of the property tax on built properties (IFPB), annual evolution of the investment, change of the political strategy or the status of the elected (non-partisan to partisan or the reverse), the annual balance of the budget, the budget transfer due to the change of objective and of the program, ... and those of long term (LT) during the entire program budget execution process.

Table 1: The explanatory variables

Description of variables	Variable code	Stability	Influence of explanatory variables on the budget
Expenses (DEP): Investments[109] (DEPINV)	DEPINVAUTRES	LT / MT	Directly affects investment income
Other investment expenses	DEPARRINV	LT / MT	Changes the structure of

[107] *[…] Multiple models of choice of the local public property exist. All are not however susceptible to be confronted to the facts and therefore to act as support to a statistical test. (...) The standard model privileges the solution to the democratic choice founded on the theorem of the median voter. The democratic model applies for, on the one hand, a dominant objective of reelection for the local authorities and, on the other hand, the elector's decisive role having the pseudo median demand function for the public property, or more precisely for an amount aggregated of local public property. No model offers a varied satisfactory treatment of the range choice currently and variable of local public property. (…) If the model of the median causes numerous questionings, or even of the critiques sometimes vigorous, its explanatory capacity of the disparities observed of expenses and impositions between local collectivities proves to be in general to the relatively elevated and superior experience to the alternative models. From where its dominant use in the applied literature. Besides, the econometrics thus permits to identify, in an endogenous way, of the homogeneous "clubs" of local collectivities characterized by different springiness (GUENGANT and TAVERA 2000). The improvement of the adjustment methods contributes in return to reinforce the explanatory power and the consistency of the model.*
Guy GILBERT, Alain GUENGANT, " The local public economy fifteen years after: between space and territory ", January 2001, p. 84, pp. 157. 182.157.htm, consulted May 29 2016.

[108] Najeh NAFFAKHI, " Training supervised for the classification of the pictures with the help of the P-tree algebra", Superior Institute of Management of Tunis, University of Tunis, February 2004, Tunisia, p. 28, 84 pages.

[109] *[...] The part of the local collectivities in the national economy: more this part is big, more the local activities have macroeconomic impacts.*
Jens BLOM-HANSEM, "Methods of evaluation of the needs of expenses of the Local Collectivities and evaluation methods of the returns estimable "s, Report of the leading Committee on the local and regional (CDLR) democracy, 26th meeting, Editions of the Council of Europe, Townships and regions of Europe, n° 74, December 4-6 2000.

Description of variables	Variable code	Stability	Influence of explanatory variables on the budget
Investment expenditure arrears			the budget: increased capital expenditure
Operations (DEPFONC) Mandatory on operation (DO) Salary Fuels and lubricants Other expenses Arrears of operating expenses Other operating expenses	 SAL CARBUR OBLIGOTSFUNC DEPARRFONC DEPUTES	 MT MT MT LT / MT CT	Reduces room for implementation of other operating expenses (monthly frequency); Short-term free fund variation, reduction in treasury (frequency in time *t*) and favors decentralized service in the event of an increase
Recipes (REC): Operations (RECFONC) Own or exclusive taxes (tax revenue) Property tax on land Property tax on built property[110] Other tax revenue[111] Other operating income Operating grants (DOTA) Arrears of operating receipts Sum of tax revenue	 IFT IFPB_TAFB RECFISCOTHER RECAUTRESFONC CHOCRECFONC RECARRFONC RECFISC	 LT MT CT CT CT MT MT / LT	Stabilizes free funds: increase in seasonal revenue Modifies the revenue structure (depends on macro and microeconomic variables)
Investment (RECINV) Other investment income Investment grant (SUB) Arrears of investment income Sum of grants and endowments Sum of tax revenues, subsidies and endowments (effect of decentralization)	 RECINVAUTRES CHOCRECINV RECARRINV RECCHOC RECDECENT	 MT MT MT CT/MT CT/MT/LT	Promotes LT investments and changes the budget structure
Budget balance (RELIQUAT): Balance on investment Balance on operation	 RELIQUATINV RELIQUATFONC	 MT MT	Changes the budget structure
Macroeconomic variables (MACRO): Economic and political crisis LOLF economic growth rate LOLF tax pressure rate Average consumer price index	 CRISIS GROWTH TAX RATE IPCINFLA AUGSAL	 MT MT MT CT LT/MT	Modifies the structure of the budget and variation of the free short-term fund

[110] Including household garbage removal fee (ROM).

[111] Different from the shared taxes (shared tax: one only speaks here to the level of the CTD), including the part to the returns or sharing of the tax (come back sharing): generally the fiscal plate and the tax rate are determined by the superior echelon that cashes the tax, but a stationary proportion of the fiscal returns is allocated to the collectivities belonging on a lower government scale. Two methods of sharing exist in function (1) of the fiscal product that has been discerned in the collectivity in question according to the criteria of origin (that one calls as principle of derivation); either (2) of a distribution key that includes different elements as the population or that aims to reduce the differences of potential fiscal (in this last case, one then speaks about adjustment of resources).

Description of variables	Variable code	Stability	Influence of explanatory variables on the budget
Average annual rate of salary increase			
Microeconomic variables:			
Category of elected official (partisan or non-partisan)	PARTISAN	MT	
Elected type (nominated or elected universal suffrage)	TYPEELU	MT/CT	
Commitment deadline	DELENG	CT	Modifies the structure of the budget and variation of the free short-term fund
Authorizing officer deadline	DELORD	CT	
Accounting deadline	DELCOMPTA	CT	
Free Fund:			
Precautionary cash	ENCPRECAU	CT	
Desired transaction cash	ENCDESIRE	CT	
Equalization coefficient (CTD fiscal pressure)	TAX RATE	MT	The increase in the local tax rate can lead to a decrease in overall allocation
Description of variables	**Variable code**	**Stability**	**Influence of explanatory variables on the budget**
Budget performance: evaluation method			Improves budget execution: reduction of the balance, reliable budget volume, sufficient treasury, reduction of expenditure arrears and close to zero revenue, favors decentralized basic service
Managing for results	GAR	LT/MT	
Public finance assessment	PEFA	LT/MT	
Current self-financing coefficient threshold	R_1	MT	
Threshold coefficient of tax mobilization	R_2	MT	
Structural stiffness ratio threshold (or leeway)	R_3	MT	
Budget structure ratio threshold	R_4	MT	
Budget volume:			
Investment expenses	SOMDEPINV	LT/MT	Changes the structure ratio
Operating expenses	SOMDEPFONC	LT/MT	
Investment revenue	SOMRECINV	LT/MT	Increases funding budget and structure ratio
Operating recipes	SOMRECFONC	LT/MT	
Total operation and investment	VOLBUDGET	LT/MT	Changes the structure ratio

Source: Author, 2018

The application of the outlook for the development of expenditure (increased investment) and revenue (tax rate) depends on the form of decentralization chosen by local elected officials.

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Table 2: Forms of decentralization

Forms of decentralization	top-down = become local	bottom-up = stay local
Goals	• shift the budgetary constraint to the local level (deferral of charges rather than devolution of powers)	• increase the potential • innovation at the local level
	• increase allocative efficiency (better adapt the supply of collective goods to local preferences)	
Evaluation criteria	•contribution to the objectives set by the center	• protection of local communities against the center and maximization of local choices
Dominant model	• dominance of vertical relations between center and regions (center and municipalities, respectively regions and municipalities) • domination of the preferences of the principal model center (the center) - agent (the regions or the communes) • asymmetry of information in favor of the center	• central/local conflict (if the society is heterogeneous, local decisions differ from those preferred by the center) • dominance of local self-government • subsidiarity • cooperation and competition • domination of local preferences

Source: Bernard DAFFLON, Thierry MADIÈS, "Decentralization: some principles from the theory of financial federalism", University of Friborg (Switzerland), French Development Agency (AFD) - Department of Research, 2008, p. 14, 118 pages

Unlike fiscal federalism[112], the choice of the parameters of the elected representative's behavior in the process of evaluating budgetary resources depend on the choice of maximizing local choices by pressure from the local population, that is to say meeting basic needs. Population. " *[…] According to a recent study carried out in Colombia, Faguet and Sanchez (2007), showed that the decentralization process resulted in the significant development of essential public services in most of the small towns which were neglected. by the central government: the local authorities then concentrate on basic services because it is on these that the pressure of the population is felt. The real reasons for decentralization in developing countries are then found in the need to take into account local or tribal particularities. It also appears in a number of countries that voting, when it exists at the local level, does not necessarily express a preference on the part of the citizens. It is sometimes done, under threat, that if the result is not in accordance with the will of the center, the latter can take budgetary sanctions, in particular by reducing in a discretionary way the financial resources in the jurisdiction considered as opposing or bad voter*[113]."

4. The different models

The budget forecast model is derived from the modification of the CA_{j-1} achievements. The forecasting model is influenced by several variables. Therefore, we use a multiple regression of the period j_0 until *d-1* and estimate the variables (or explanatory factors).

[112] It is not of the quite certain that in the poorest countries, it is the individual preferences that guide the offer of goods and local services as the thurifiers of the financial federalism supposes it.
Bernard DAFFLON, Thierry MADIÈS, " Decentralization: some principles descended on the theory of the financial federalism ", University of Fribourg (Switzerland), Agency French of Development - Department of Research, 2008, p. 28, 118 pages.

[113] Bernard DAFFLON, Thierry MADIÈS, " Decentralization: some principles descended on the theory of the financial federalism ", University of Fribourg (Switzerland), Development French Agency - Department of Research, 2008, p. 28, 118 pages.

Indeed, the scissors effect on public finances requires us to estimate, at the outset, expenditure relative to revenue. The models can all be calibrated by the factors of crisis, the decentralization policy and the elected representative's management policy, the political party of the elected official, and the electoral cycle.

Let M be the chosen model, the calibration can be carried out:

- as an independent criterion:
  {TYPEELU}, {CRISE}, {PARTISAN}, {CYCLEELECTORAL}
- in combined criterion:
  {TYPEELU,CRISE,PARTISAN,CYCLEELECTORAL},
  {TYPEELU,CRISE,CYCLEELECTORAL},
  {TYPEELU,PARTISAN,CYCLEELECTORAL},
  {TYPEELU,CYCLEELECTORAL},
  {CRISE,PARTISAN,CYCLEELECTORAL},
  {PARTISANAL,CYCLEELECTORAL},
  {PARTISANAL,CYCLEELECTORAL},{CRISE,CYCLEELECTORAL}

The analysis of CA is from 2002 to 2019: The combinations of criteria or independents will have the effect of reducing this observation. Their observations are very weak. It is thus impossible to model on these samples of very small size, i.e. three for economic crisis (2001, 2009, 2011) and seventeen for the stability of the political and economic crisis, five for elected appointed (or President of the Special Delegation - PDS) and five for the elected by universal suffrage, three for an elected representative of the central power and one for the non-partisan, twelve for the infra-annual cycle of the elected, and eight for post-electoral[114]. The analysis of the models, in relation to these criteria, will be carried out during an econometric simulation of each administrative account.

We came up with different types of model to look for, which are classified by the nature and component of the budget, the concept of decentralization, and the characteristics of the theoretical model[115]. As a result, we obtain the models on:

– the balance between revenue and expenditure;

– the effect of decentralization (fiscal equalization, transfer and financial assistance);

– the operating expenditure room for maneuvers (compulsory expenditure and other operating expenditure);

– the performance of the execution budget (variation of arrears and the remainder to be recovered from the ex-ante execution budget);

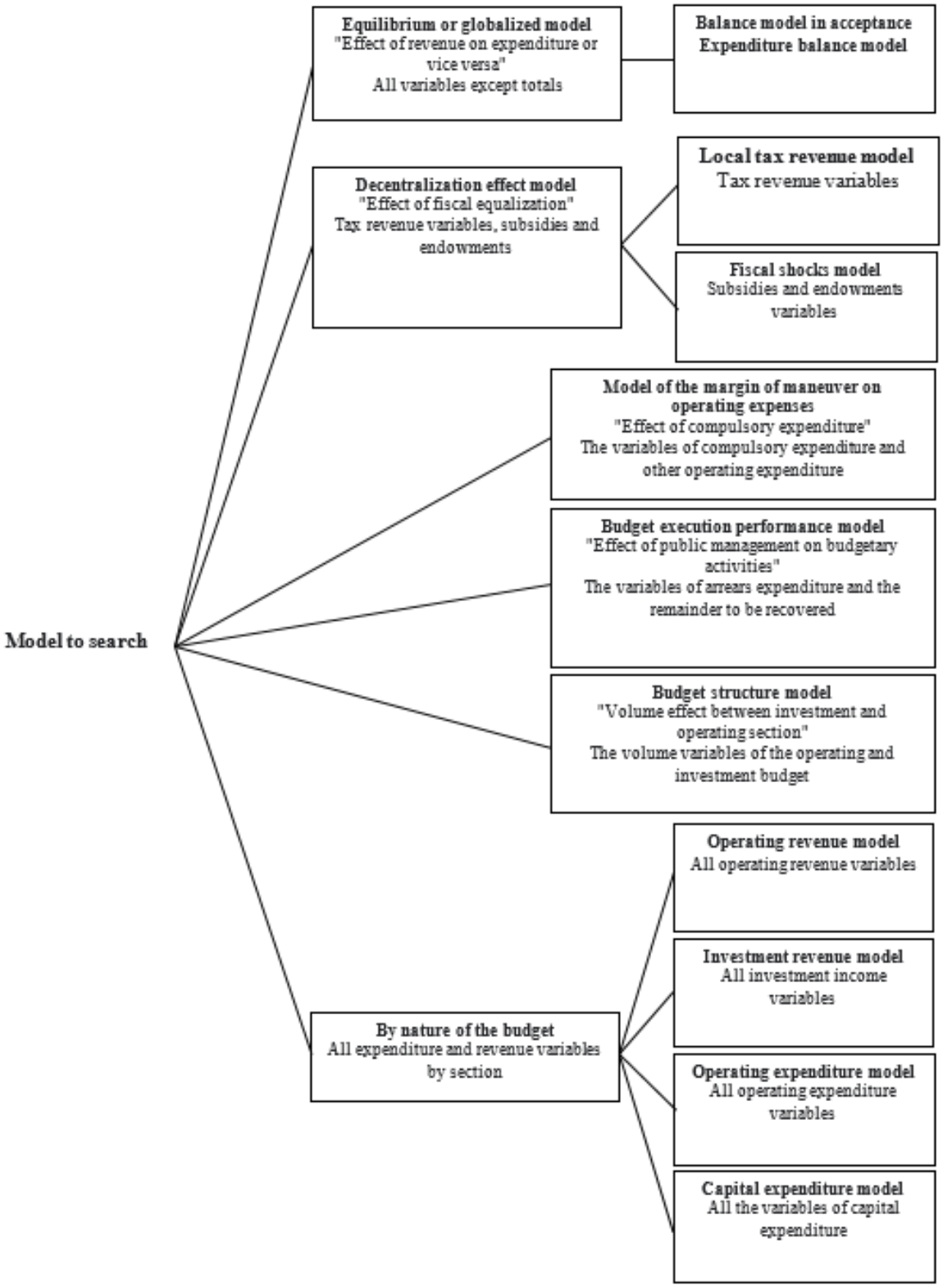
– and the different types of budget (operating and investment expenses, operating and investment income).

Thus, we summarize the types of models in the following figure n ° 1.

[114] 2001-2003 mayor, 2004 PDS, 2005-2006 Mayor, 2007 PDS, 2008-2010 Mayor, 2010-2011 PDS, 2012-2015 PDS, 2015-2019 Mayor, 2019-2020 PDS, 2020 Mayor.

[115] These are the structural components (variables growth, inflation, rate of fiscal pressure (LOLF and CTD)), and the middle rate of growth of the salary (effect of the obligatory expenses) that will be used in the phase of simulation of a primitive budget.
Amaïde Arsan Miriarison TSIKOMIA, " To Optimize the budgetary performance of the Decentralized Territorial Collectivities: Research of a model ", Thesis of Doctorate in economics. Public Economy, University of Antananarivo, 2017, p. 238-241, 536 pages.

Figure 1: List of models to search



Source: Author, 2018

4.1. Equilibrium (or globalized) model

It consists of estimating the variables of the balanced budget equation:

$$\sum R_{N-1} = \sum D_{N-1}$$

• *Expenditure balance model:*

REC = DEPINVAUTRES + DEPARRINV + SAL + CARBUR
+ OBLIGAUTRESFONC + DEPAUTRES + DEPARRFONC (1)

The fog of the model generated R^2 (0.9851), with an overall model in expenditure of:
log (*rectotal*) = 0.0097log (*arriereedepfonct*) + 0.0904log (*otherdepfunction*) -0.01002log (*autresdepobligatoire*) -0.0225log (*depcarbur*) + 0.8072log (*depsalaire*) -0.0065log (*arriereedepinv*) + 0.0192log (*depinv*) +3.5681.

Residue analysis confirms the normality of the error (p-value well above zero skewness (0.9860), kurtoses (0.8425) and Lamda (0.9247)). None of the values of the square of the correlation matrix come close to the value of R^2, except capital expenditure and salary are strongly correlated. This justifies that the increase in salary expenses (compulsory expenses) reduces the elected official's room for maneuver of other expenses, and modifies the structure of the budget (I/F). But an atypical observation is noted for the year 2018 (value of the studentized residual RSTUDENT (20.8340)). Hence the need to calibrate the model. In addition, the overall significance of the regression is very low (F test (18.92)). There are coefficients which are not significant.

After removing the atypical observation, we performed the backward procedure. The least relevant variable is eliminated, in the sense of Student's t (the square of the weakest Student's t), if it is not significant at the 5% risk. We start again with the remaining variables. The process must be interrupted when it is no longer possible to delete a variable. Thus, we obtain the optimal equilibrium model.

After calibrating the model, we have R^2 (0.9505), with an optimal model of:

log (*rectotal*) = **0.7923log**(*depsalary*) - 0.0297log (*depcarbur*)
- 0.0117log (*autresdepobligatoire*) + 0.1607log (*autresdepfonct*)
+ 0.0185log (*depinv*) +2.6811.

} Effect of leeway on the free fund

Spending on salaries and other operating expenses which largely favors the estimation of the budgetary revenues volume. Investment spending has little influence. Spending on fuel and other compulsory expenses are the effect of the reduced room for maneuver of the elected official, due to the very high payroll. The authorizing officer only has a margin over the rest of the availability of compulsory expenditure to cover other operating expenditure. It is then necessary to control the volume of the wage bill, to increase other expenses. Social recruitment must be avoided and the profitability of the labor factor should be increased, as there is little work force with a high productivity of the labor factor.

• *Balance model in acceptance:*

DEP = IFT + IFPB_TAFB + RECFISCAUTRES + CHOCRECFONC
+ RECARRFONC + RECINVAUTRES + CHOCRECINV
+ RECARRINV (2)

The model is as follows: R^2 (0.9719), log (*deptotal*) = 0.0632log (*arriereerecinv*) -0.0094log (*arriereerecfonct*) -0.3218log (*chocrecfonct*) -0.0205log (*chocrecinv*) -0.0262log (*otherrecfisc*) + 0.6032log (*ifpb_tafb*) -0.0125log (*ift*) +17.3948.

The *arriereerecinv* variable is not significant, no collinearity and outliers found. Looking at the CUT Boards, the achievements of capital expenditure are very low. Hence, a low investment income. The optimal model is then: R^2 (0.7788):

Effect of fiscal equalization: Subsidy and endowment

log (*deptotal*) = **- 0.0466log**(*chocrecfonct*) -0.0134log (*chocrecinv*) -0.0034log (*arriereerecfonct*)
+ 0.2906log (*otherrecfisc*) -0.0176log (*ifpb_tafb*) + 0.1461log (*ift*) +15.7012.

The presence of budget shock variables reduces the volume of the expenditure estimate (subsidies and grants are still not paid by the central government). And the arrears of receipts due to the lack of control system and fiscal pressure (the coefficient of tax receipts (*ifpb_tafb* and *ift* is very low)). We can also see that the effect of fiscal equalization constitutes a "*negative lever for transfers and assistance from the State*".

4.2. Effect model of decentralization

The decentralization effect model is the model based on local tax variables and transfer funds (local development funds or FDL, grants and endowments). In the context of political[116] administration and fluctuating economic conditions, it is very important in this model to see the model of fiscal shocks separately.

- *Effect model of decentralization:*

RECDECENT = ((IFT + IFPB_TAFB) x TAUXFISCALCTD) +
((RECFISCAUTRES) x TAUXFISCALLOLF) + CHOCRECFONC +
CHOCRECINV (3)

We assigned grants and endowments as a budget shock variable. This choice is due to their effect on the estimated volume of the budget, at the level of the investment and operation section. However, the existence of zero values in the budget execution (administrative accounts) really modifies the estimate of revenue and causes an imbalance in the financing of expenditure. For this purpose, we have replaced these zero values by their average, without modifying the value of the variable of the *recdecent* and *recchoc* total receipts.

The fog model is R^2 (0.9407), log (*recdecent*) = - 1.1150*tauxfiscallolf* + 0.0089*tauxfiscalctd* + 3.8405log (*chocrecfonct*) + 2.4451log(*chocrecinv*)+ 0.4735log (*autresrecfisc*) - 1.3002log (*ifpb_tafb*) + 0.3775log (*ift*) -6.7564.

The correlations between the tax pressure rates of the CTD and other tax revenues are negative and very weak. In 2009, a period of crisis, there was an atypical point. We then have the optimal model with R^2 (0.9986):

[116] According to a survey achieved in 2001-2002 by the European institute of public administration in Belgium on the situation existing in four European countries: France, Netherlands, United Kingdom and Sweden: " *[…] The administration is considered there like a device subordinated to the political power, which decides alone of the public policies and confide the execution of it then to the administration. (…) But this model doesn't verify itself indeed to the test of the facts, the relation being more of dialectic nature that subordinate. Because of the technicality and the increasing complexity of the problems to treat by the political authorities, the high commissioners are brought to interfere in the sphere reserved to the politician while playing a role in the development and the hold of the decisions. Reciprocally, the political authority doesn't go without, when his interests are at stake, to intervene to the margin or manner more pronounced according to the countries. in the management of the administrative device.*"
Christian of VISSCHER, "Authorities political and high administration: a dichotomy done reconsider by the NGP? ", International magazine of politics compared, n° 2004/2, Volume 11, pp. 205-224.

$$\log(recdecent) = \overbrace{0.1119\,(tauxfiscalctd) - 2.0122\,(tauxfiscallolf)}^{\text{Tax pressure rate}} \overbrace{-0.6773\log(otherrecfisc) - 11.3944\log(ifpb\_tafb) - 0.0276\log(ift)}^{\text{Own tax revenue}} \overbrace{+ 2{,}7326\log(chocreciny)}^{\text{Investment grant}} + 296.9439.$$

In fact, the revenues do not follow the tax pressure rate of the LOLF but only the trend of the tax pressure rate of the CTD. Own revenues are very low. In order to carry out the execution of investment expenditure, due to the electoral promise of the elected representative and that of the objective of the PCD, the CTD maintains in its budget the value of the investment subsidy (expectation of the part of the state transfer). This is how the partisan politics of the elected official or his ideological behavior will play a big role in local development.

• *Tax revenue model:*

Like the State, local authorities have the possibility of resorting to taxes to finance their expenditure. The insufficiency of own resources obliges the CTD to find or establish a new resource. However, the volume of tax revenue depends on the local economic situation (rate of tax pressure stated by LOLF). Tax revenue is revenue from the issuance of securities. It is thus necessary to introduce the variable of arrears *recarrfonc* and *fiscal LOLF rate*. The objective is to define a forecast of a tax pressure rate for the CTD, in order to be able to balance or optimize an average rate to be voted in the municipal councilor (or CSM). It will make it possible to define an indicator of the revenue likely to be collected, that is to say the actual revenue calculated in relation to the potential revenue.

$$\begin{aligned} TAUXFISCALCTD = {} & IFT + IFPB\_TAFB \\ & + ((RECFISCAUTRES)\ x TAUXFISCALLOLF) \\ & + RECARRFONC \end{aligned} \qquad (4)$$

The first regression gave the following result: R^2 (0.6725), *tauxfiscalctd* = 8.7893*tauxfiscallolf* + 0.4773log (*arriereerecfonct*) -8.5315log (*autresrecfisc*)+ 7.9768log (*ifpb_tafb*) - 1.5076log (*ift*) -6.0405.

The coefficient of the variable LOLF tax rate (0.11) and other tax (0.28) is not significant. After successive estimation by removing the variable one by one, we have the optimal model: R^2 (0.4252), *tauxfiscalctd* = $\underbrace{0.8823\log(arriereerecfonct)}_{\text{arrears N-1 paid in N + 1}}$ +10.5932 + log (*ifpb_tafb*) + 5.6436log (*ift*) - 251.9223.

The volume of other tax revenues is very low compared to property tax revenues. We also see that the optimal model did not take into account this *autresrecfisc* variable which follows its trend with the *fiscal LOLF rate*. If we try to take into account the impact of the *autresrecfisc* variable on the model, the significance of the regression coefficient remains stable (R^2 = 0.4260), a presence of atypical points for the 2004 observation and especially collinearities, the square of the correlation matrix is greater than R^2, *ifpb_tafb* (0.4616) and

autresrecfisc (0.5458). To a large extent, the revenues of the CTD are then provided by the housing tax.

Thus, we also see that arrears of receipts are an integral part of the model. This means that there is a weak system of control over local tax revenues.

• *Fiscal shocks model:*

RECCHOC = CHOCRECFONC + CHOCRECINV (5)

The model is optimal, R^2 (0.8992), log (*recchoc*) = 3.2189log (*chocrecfonct*)+ 2,2097log (*chocrecinv*) -67,1941. In times when there is no crisis, the R^2 (0.9127), as a partisan of central power the R^2 (0.8989), and one elected by universal suffrage R^2 (0.9032), are all significant. The higher the coefficient R^2 of the model is the fiscal years in political and economic stability. This justifies that the political administration influences the administrative decisions of the central power.

4.3. Model of the room for maneuver on operating expenses: social recruiting charge for elected officials

The constraints weighing on elected officials are therefore so broad that operating expenses absorb most of the budgetary resources.

By F. MARTIAL, F. ABEL (2005), the productivity of public services obliges elected officials to recruit more staff and outsourcing decreases. But the social concerns expressed by elected officials sometimes create an excess in human resources, without worrying about the financial situation of the CTD, even if the elected official is aware of the decisions to be made, and his responsibilities to be assumed, in terms of management. Staff. This principle, increased staff costs (compulsory charge to be paid), reduces the room for maneuver on other operating expenses. It is important to define a model that will limit personnel costs, relative to the desired margin for other accrued expenses.

DEPAUTRES = DEPFONC- (SAL + CARBUR + OBLIGAUTRESFONC) (6)

Arrears of operating expenses are not considered, because they are charges from previous years (year N-1) but not those from the forecast of room for maneuver (year N).
For the formula in ratios mode:

$$DEPAUTRES = \frac{DEPFONC}{SAL+CARBUR+OBLIGAUTRESFONC} \quad (7)$$

The optimal model is R^2 (0.9527):

Effect of the social recruitment of the elected official or the authorizing officer

log (otherfunction) = **- 3.2618log** (*depsalaire*)
+ 0.0362log (*autresdepobligatoire*) + 0.3104log (*depcarbur*)
+ 3.3736log (*somdepfonct*) +9.8101.

4.4. Budget performance model

The economic and political crisis that is shaking the political administration in Madagascar has left its mark on the budget of the CTD. This is the case for the increase in expenditure arrears for fiscal year 2002, 2008 and 2009. For the other fiscal years, the expenditure arrears data are very variable (normally: *Forecast N = Forecast of expenditure for the*

year N + Arrears of expenditure for year N-1), or even zero. These are due to poor management and instability of the municipal administration (lack of control and continuity of service[117]).

Good budget management should not have a balance on the expenditure to be paid, and none on the remainder of revenue collection. So, the objective is to achieve better budget execution where the balance is closer to zero, that is to say:

RELIQUAT≥RECARRINV + RECARRFONC-DEPARRINV-DEPARRFONC. This is how the performance term is calculated by the following formula:

RELIQUATINV + RELIQUATFONC = RECARRINV + RECARRFONC-DEPARRINV-DEPARRFONC (8)

RELIQUAT = RECARRINV + RECARRFONC-DEPARRINV-DEPARRFONC (9)

The model integrating the estimate of all the variables is R^2 (0.4112), log (*reliquat*) = 0.6407log (*arriereedepfonct*) -0.8576log (*arriereedepinv*) + 0.3697log (*arriereerecfonct*) + 0.5811log (*arriereerecinv*) +3.7901. The square of the correlation matrix of the backward variable (0.7329) is greater than R^2. After calibration, the optimal model, we obtain R^2 lower, that is to say R^2 (0.3158) after removing the variable *arriereedepinv*. However, it is impossible to eliminate all the backward variables and the variable *arriereedepinv* is also insignificant. The optimal model is not then meaningful.

The model is very insignificant. This is the effect of the trivialization of expenditure commitments, the lack of control and the imperfection of administrative accounts. We see that among the observations, arrears exist for the previous year and non-existent for the next year. We see them especially in the transition phase or crisis. In addition, it is the effect of accounting and management imperfections at the CUT level (absence of an accounting book of commitments, and annex accounting of assets and liabilities). We see them especially in a phase of elected official transition or political and economic crisis[118].

As the performance ratio is the ratio between forecast and budget achievement. The solution to achieve performance is then:

- either recover the arrears of receipts for year N-1 and liquidate as much as possible the unpaid bills for year N-1, without however neglecting the commitments for year N;
- either maintain an optimal forecast of the revenue level (forecasting method based on a reliable prediction model) and liquidate up to the net treasury threshold;

These two solutions must take into account the results-based management (or GAR) indicators for each line of credit to have a reliable assessment of budget execution and to make adjustments to the forecast and/or effort on the executions.

[117] The incoming organizer disregards the ascription of the expenses hired by the retiring organizer to liquidate his own expenses that he hires during his mandate.

[118] Amaïde Arsan Miriarison TSIKOMIA, "To Optimize the budgetary performance of the Territorial Collectivities Decentralized: Research of a model ", Thesis of Doctorate in economics. public Economy, University of Antananarivo, p.322, 2007, 536 pages.

4.5. Strategic model of the budget structure

The budget structure (I/F) [119] makes it possible to judge the policy of the elected official on long and medium-term strategies. If he tends to increase his investments (I>F), the elected representative hopes for a long-term vision of local development. Otherwise (I<F), the elected official is satisfied with the general functioning of local activities. The objective is then short or medium term. The latter choice is the effect of the lack of investment resources. For large Communes which have an investment infrastructure (high investment income and expenditure or larger scale investment), and for small Municipalities, low investment income and expenditure hoping to fill their budget volume by the investment subsidy (small municipalities are worried about their capacity to invest). This structure then depends on the size of the Municipality.

Balancing the budget allows us to use two identical options:

DEPINV = RECINV and DEPFONC = RECFONC, then the budget structure for year *k* (S_k) is written:

$$S_k = \frac{DEPINV}{DEPFONC} \text{ or } S_k = \frac{RECINV}{RECFONC} \quad (10)$$

The impact of budget surpluses or the effect of the additional budget N-1 on the original budget N increases gross savings (self-financing: transfer from section $fonctionnement_{N-1}$ to investment $_{N+1}$). However, the structure S_k is established at the level of the original budget. S_k is written:

$$S_k = \frac{DEPINV - RELIQUATFONC}{DEPFONC} \quad (11)$$

or

$$S_k = \frac{RECINV - RELIQUATINV}{RECFONC} \quad (12)$$

The estimate concerns the variables noting the fraction between I/F (or volume budget of the investment/volume of the operating budget) for period *k-1*, i.e. the corrected original budgets (initial + additional + credit transfer + corrigendum). The fog of the starting model R^2 (0.8771), *r structure* = -0.0310log (autresdepfunction) -0.0016log (*autresdepobligatoire*) + 0.01429log (*depcarbur*) + 0.0385log (*depsalaire*) + 0.03273log (*depinv*) -0.0015log (*reliquatfonct*) -0.0044log (*arrriereedepinv*) + 0.0026log (*arrriereedepfonct*) -0.0960.

After removing the atypical point of the year 2018 and the non-significant variables (*autresdepfonct*), the model is R^2 (0.5905), *rstructure* = -0.0030log (*reliquatfonct*) -0.0033log (*autresdepobligatoire*) + 0.0089log (*depcarbur*) + 0.0706log (*depsalaire*) + 0.0428log (*depinv*) -0.0064log (*arriereedepinv*) + 0.0037log (*arriereedepfonct*) -1.4601 and the coefficient of the variable *depinv* volume of the investment becomes insignificant (0.1915). However, this variable is the primary variable in the calculation of the budget structure ratio. The model of the budget structure cannot be optimal. That means :

- that there is no strategy used by the elected representative for his investment expenditure due to the low investment income and the imbalance in the volume of execution the budget section (investment subsidy not received);
- that investment arrears accumulate;

[119] I: investment and F: Working.

– and that the operating expenditure forecast is mainly based on the value of compulsory expenditure (significant coefficient).

The model has a very low and almost zero coefficient (0.0030) of the operating balance and does not take into account the investment balance. This means that the policy of budgetary management of cash holdings is the principle of zero budgeting[120].

Thus, the policy of reducing compulsory expenditure (coefficient 0.0706 for *depsalaire* and 0.0089 for *depcarbur*) will increase the budget structure ratio.

Model by type of budget

The resources of the Municipality are temporary resources (revenues to finance investment expenditure: borrowing if there is access) and definitive resources (direct[121] and indirect[122] local taxation: taxes and duties, state assistance).

While the government is worried about the drift of public debt, it is appropriate to mention the evolution of arrears of local authorities (in revenue and expenditure).

It should also be noted that following the economic crisis, the decline in revenue collections caused a sharp decrease in expenditure execution. In this respect, the model is akin to a change in economic situation. Even if the number of observers is minimal, it is also necessary to verify the effect of the crisis on the nature of the budget.

Investment revenue model

It consists of estimating the variables of the following investment revenue equation:

RECINV = CHOCRECINV + RECINVAUTRES + RECARRINV + RELIQUATINV (12)

The model estimate gave R^2 (0.7915), log (*nat_somrecinv*) = 0.0076log (*reliquatinv*) + 0.0041log (*arriereerecinv*) + 0.2613log (*autresrecinv*) + 0.0266log (*chocrecinv*) +14.1337 . There are atypical points for the year 2002 and 2009. After the calibration procedure, the optimal model is R^2 (0.7259), log (nat_*somrecinv*) = 0.3106log (*reliquatinv*) -0.2593log (*arriereerecinv*) +0 , 1643log (*autresrecinv*)

+ 0.3093log (*chocrecinv*) +10.7762. This last model is the model without economic crisis, otherwise R^2 is more significant (0.7853) but the *chocrecinv* variable is no longer in the model: log (*nat_somrecinv*) = - 0.0220log (*reliquatinv*) + 0.0241log (*arriereerecinv*) + 0.2657log (*autresrecinv*) +14.5489.

This justifies that in times of crisis the transfer and assistance of the state decreases, or even zero.

4.6. Operating revenue model

The equation is written:

RECFONC = IFT + IFPB_TAFB + RECFISCAUTRES + RECAUTRESFONC
+ CHOCRECFONC + RECARRFONC + RELIQUATFONC (13)

The fog of the model gave R^2: (0.99), log (*nat_somrecfonct*) = 0.0051log (*reliquatfonct*) + 0.0027log (*arriereerecfonct*) + 0.1021log (*autresrecfonct*) -0.0539log (*chocrecfonct*) + 0.2845log (*autresrecfisc*) + 0.2182log (*ift*) -0.0555log (*ifpb_tafb*) +12.4248.

[120] Increase of the payment's operations number of the expenses from the month of December until the complementary day to liquidate to the limit of the clean treasury or the free fund.

[121] Taxes voted.

[122] Tax or dues.

After deleting the two non-significant variables *arriereerecfonct* and *reliquatfonct*, we obtained the optimal model R^2 (0.9979), log (*nat_somrecfonct*) = 0.5523log (*autresrecfonct*) + 0.7004log (*chocrecfonct*) -0.1394log(*autresrecfisc*) -0.0699log (*ift*) + 0.1094log (*ifpb_tafb*) -2.5059.

4.7. Operating expenditure model

In operating expenses, especially compulsory expenses, increase faster than their revenues, the Municipality then sees its financial situation deteriorate. Insufficient income to cover their expenses gradually increases the arrears of expenditure.

However, the local elected officials, criticized by the General State Inspectorate (frequent change of the elected authorizing officer), for their laxity in terms of expenditure control. However, they were not enough.

Of course, because of the backlog, operating expenses continue to increase. The operating expenditure equation is then written:

$$DEPFONC = SAL + CARBUR + OBLIGAUTRESFONC + DEPAUTRES + DEPARRFONC \quad (14)$$

The overall estimate gave as result R^2 (0.9957), log (*nat_somdepfonct*) = - 0.0025log (*arriereedepfonct*) + 0.2717log (*autresdepfonc*) -0.0096log (*autresdepobligatoire*) -0.0836log (*depcarbur*) +0 , 9530log (*depsalaire*) -2.2763.

The significance of the coefficient R^2 decreased (0.9179) for the optimal model. The *autresdepfonc* variable is not significant. This justifies the authorizing officer's limited room for maneuver: log (*nat_somdepfonct*) = - 0.0048log (*arriereedepfonct*) -0.0140log (*uatresdepobligatoire*) - 0.2622log (*depcarbur*) + 1.4138log (*depsalaire*) -2.9884.

4.8. Investment expenditure model

Capital expenses are the combination of all capital expenses, including arrears of capital expenses.

$$DEPINV = DEPINVAUTRES + DEPARRINV \quad (15)$$

Indeed, local decision-makers being individuals at the discretion of their constituents, their investment behavior is in part dictated by political considerations. Investment expenditure after the first year following the local elections is, for obvious technical reasons, little developed, but those preceding the local deadlines are deliberately increased. As a result, the explanation of the behavior of short-term financing of investments reveals an uncertainty (whether or not the liquidation of arrears of investment expenditure is covered). In the medium term, local elected representatives, if they have maintained their mandate, try to make investments in the medium and long term, to support the following mandate. So, the arrears of investment spending are widely criticized.

The equation is then written:

$$DEPINV = DEPINVAUTRES \quad (16)$$

Hence, independent research of this model compared to other types of budget is irrelevant. It is best to combine it with other budgetary resource variables, for the sake of long

or medium term[123] profitability. To solve this problem in the simulation phase the volume of DEPINV = RECINV.

In summary, table n ° 3 below shows the different models found to carry out the simulations of a forecast of a primitive N + 1 budget taking into account the evaluation criteria (GAR or Public Expenditure and Financial Accountability (PEFA)) N + 1 administrative accounts.

Table 3: Summary estimate of the simulation models of a primitive budget

	Estimates of models M1 to M11										
Variables	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**
reliquatinv	-	-	-	-	-	-	-	-	-	0,3106	-
arriereerecinv	-	NS	-	-	-	-	0,5811	-	-	-0,2593	-
autresrecinv	-	-	-	-	-	-	-	-	-	0,1643	-
chocrecinv	-	-0,0134	2,7326	-	2,2097	-	-	-	-	0,3083	-
arriereedepfonct	NS	-	-	-	-	-	0,6407	0,0037	-	-	0,0048
autresdepobligatoire	-0,0117	-	-	-	-	0,0362	-	-0,0033	-	-	-0,0140
depcarbur	0,0297	-	-	-	-	0,3104	-	0,0089	-	-	-0,2622
depsalaire	0,7923	-	-	-	-	-3,2618	-	0,0706	-	-	1,4138
autresrecfonct	-	-	-	-	-	-	-	-	0,5523	-	-
chocrecfonct	-	-0,0466	NS	-	3,2189	-	-	-	0,7004	-	-
autresrecfisc	-	0,2906	-	-	-	-	-	-	-0,1394	-	-
ift	-	0,1461	-0,0276	5,6436	-	-	-	-	-0,0699	-	-
Ifpb_tafb	-	0,0176	-0,0276	10,5932	-	-	-	-	0,1094	-	-
autresdepfonct	0,1607	-	-	-	-	-	-	NS	-	-	-
depinv	0,0185	-	-	-	-	-	-	0,0428	-	-	-
arriererecfonct	-	-0,0034	-	0,8823	-	-	0,3697	-	NS	-	-
tauxfiscallolf	-	-	2,0122	NS	-	-	-	-	-	-	-
autresrecfisc	-	-	-0,6773	NS	-	-	-	-	-	-	-
somdepfonct	-	-	-	-	-	3,3736	-	-	-	-	-
arriereedepinv	NS	-	-	-	-	-	-0,8576	0,0064	-	-	-
reliquatfonct	-	-	-	-	-	-	-	-0,0030	NS	-	-
constant	2,6811	15,7012	296,9439	-251,9223	-67,1941	9,8101	3,7901	-1,4601	-2,5059	10,7762	-2,9884
R^2	0,9505	0,7788	0,9986	0,4252	0,8992	0,9527	0,4112	0,5905	0,9979	0,7259	0,9179

List of microsimulation models (or mms) for the prediction of a primitive budget (NS: not significant):
M1: Balance in expenditure
M2: Balance in acceptance
M3: Effect of decentralization
M4: Tax revenue
M5: Budget shock
M6: Room for maneuver on operating expenses
M7: Performance of budget execution
M8: Budget structure
M9: Operating recipes
M10: Investment income
M11: Operating expenses

Source: Prex-B[124] software, simulation for a primitive 2020 budget

[123] For example: loan and expense of investment, subsidy and expense of investment, raw saving turned to the recipe of investment and expense of investment.

[124] A specific software for the budgetary modelling of the CTD called Prex-B: Forecast and Budgetary Execution developed by the author in 2017 coins Embarcadero Delphi RAD Studio XE 10 and SQLite database.
Amaïde Arsan Miriarison TSIKOMIA, " To Optimize the budgetary performance of the Decentralized Territorial Collectivities: Research of a model", Thesis of Doctorate in economics. Public Economy, University of Antananarivo, 2017, p.151, 536 pages.

The tax revenue model is not significant. The rate of direct tax revenue is not an optimal tax rate because it cannot be explained by the tax revenue collected. The proposal and vote on the tax rate therefore does not have an in-depth statistical database, but a unilateral[125] choice by municipal decision-makers. When the volume of CTD revenues decreases, largely CTD revenues, it fails to cover the expenses. The performance of the execution budget decreases. The budget performance model is not significant because of accounting and management imperfections at the CTD level (lack of an accrual accounting book and the ancillary accounting of assets and liabilities).

4.9. Modeling of cash holdings: effect of the delay on cash authorities

For the month of December of each fiscal year, there are few transactions. It is due to the overcrowding of files at the level of the CTD accountant in the Treasury. The data is not updated until the end of the additional[126] day (on January 15 N + 1). This working method modifies the cash[127] structure of the APULs and influences an early management of the expenses incurred (payment of additional expenses attached to the year N + 1 mandated to during the year N).

It can also generate an injunction for expenditure already deemed unacceptable at the level of control and approval by decision-makers (availability of additional time for rectification and constitution of supporting documents). In addition, the working capital (the sum of the cumulative results of the operating and investment sections) will also be wrong; that is to say that the working capital is calculated from the mandates and securities issued by the community in question during a financial year, whereas the treasury results from the difference between the receipts and the disbursements of the 'year. Thus, if the local authority has issued receipts whose amounts have not yet been collected by the accountant (remainder to be collected), or money orders not yet disbursed (remainders to be paid), these sums are already included in the fund. working capital, while they have not been yet taken into account in the treasury.

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125 *[...] The stability of the municipal teams, the political changes or even mayor's simple changes (and of the controlling team who surrounds the mayor) are important variables for the analysis of the local policies. The municipal teams have an ascendancy limited in the short term on the big budgetary masses and the fundamental choices indeed (a mandate of six years at least) only cannot be translated effectively by changes in the local policies that medium-term. In spite of this bureaucratic and budgetary "inertia", all mayors know and many use some strategies short-term that permit to maximize their luck of reelection: stabilization of the local taxes one year before the elections, strong expenses of investment in the second part of the mandate to make more visible and spectacular the municipal realizations or to answer demands that become more pressing, elevated increase of the taxes the year according to the elections, then progressive reduction of the rate of increase etc... (GUENGANT TO and UHALDEBORDE, 1989; DERY CKE PH and GILBERT G 1988).*
Quoted by Jean-Yves NEVERS, "Changes political and new fashions of municipal management in the French cities (1971 -1989) ", version reviewed of a communication presented to the conference of the project Fiscal Austerity Urban and, HAL, France, 2008, p. 7, 36 pages.

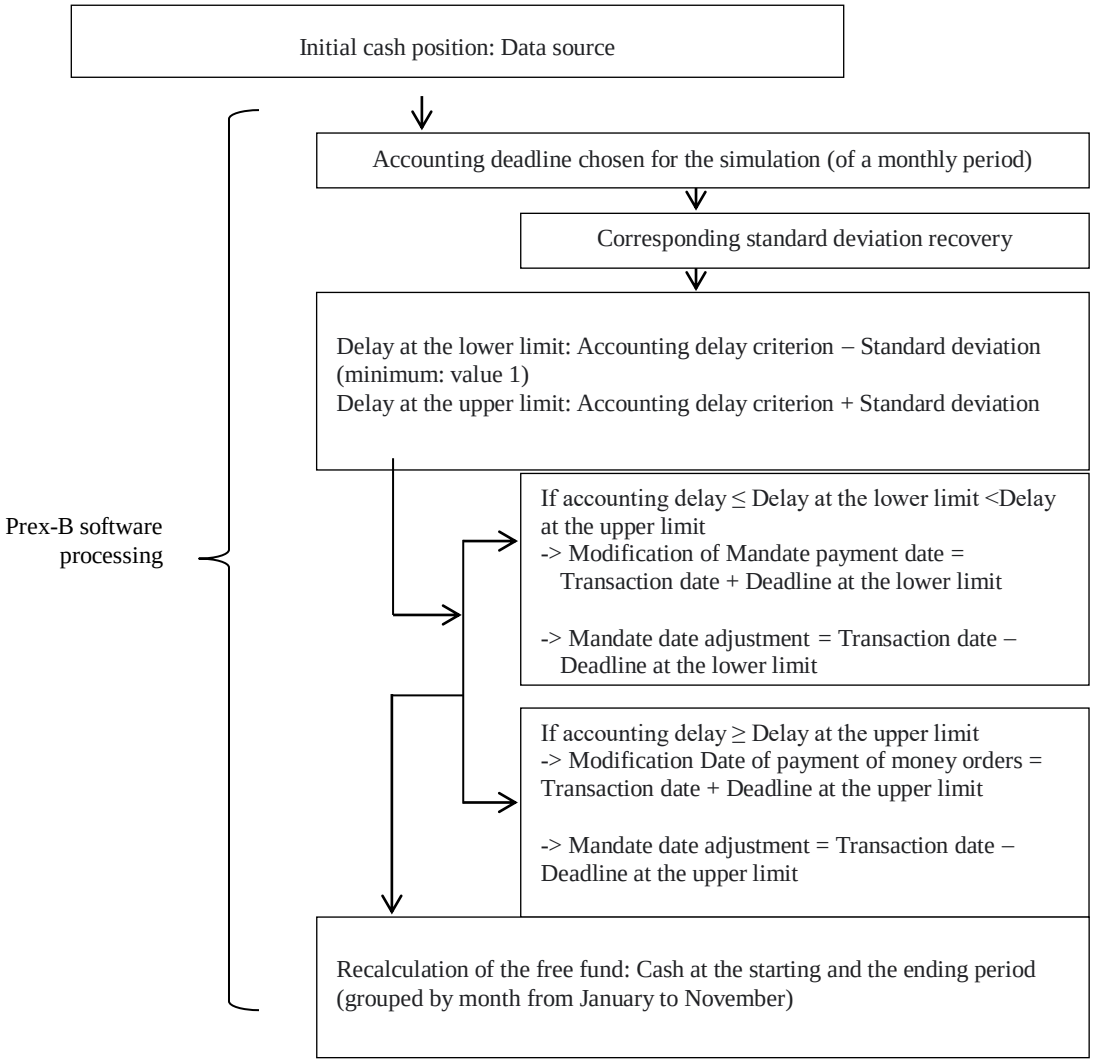
126 The organizers arrange in the beginning of every year of one-month delay to conduct the broadcast of the titles of perception and the mandates of the corresponding working section to the vested rights and to the services made during the year or the previous years: the complementary period or the complementary day. it doesn't exist the complementary period for the expenses of investment. The complementary day permits the compatibilization in the management that ends, of the last exercise operations.

127 *[…] The deletion of the complementary day appears like a measure presenting several advantages. It cleared, indeed, on a better budgetary execution rate and a surrender of the faster accounts. Indeed, the establishment of the administrative accounts and the accounts of management has can be achieved earlier in the time and permitted a resumption of the faster results otherwise, what improved the management of the territorial collectivities.*
Jean-Bernard MATTRET, "The advantages of the deletion of the complementary day ", Letter n° 348 of November 19, 2015,139309.html?edition=9233, consulted the 15/10/2016.

By replacing the accounting deadline in the monthly cash flow[128] variation data, the Prex-B software changes all the payment dates of each mandate, according to the configured deadline, without exceeding the availability of free funds at each end of the period.

The periods approaching the average time minus their standard deviation are considered to be minimum accounting times. The maximum accounting times, the times approaching the average time increased by their standard deviation.

Figure 2: Simulation algorithm of the effect of accounting delay on net cash



Source: Author, 2017

The option is three (03), either by:

– the minimum delay: it is assumed that the payment mandates are processed by the Public Accountant within the minimum delay;

[128] The plotting of the balance of year N-1 treasury is considered like treasury of departure of the year N+1. For the rejected mandates, one considered their delay accountant as is hopeless.

– the maximum delay, payment mandates are processed by the Public Accountant within a maximum period;
– the average time, payment mandates are processed by the Public Accountant within an average time.

A simulation of the lowest average delay of 4 days (standard deviation 2.1602, lower limit 1.8398 (2 days) and upper limit 6.1602 (6 days)), the minimum delay of one day (standard deviation 4.6398, lower limit of one day and upper limit 5.6398 (6 days)), and the lowest maximum time limit of 7 days (standard deviation 2.1602, limit at l 'lower 4.8398 (5 days) and upper limit 9.1602 (10 days)), the analysis revealed:

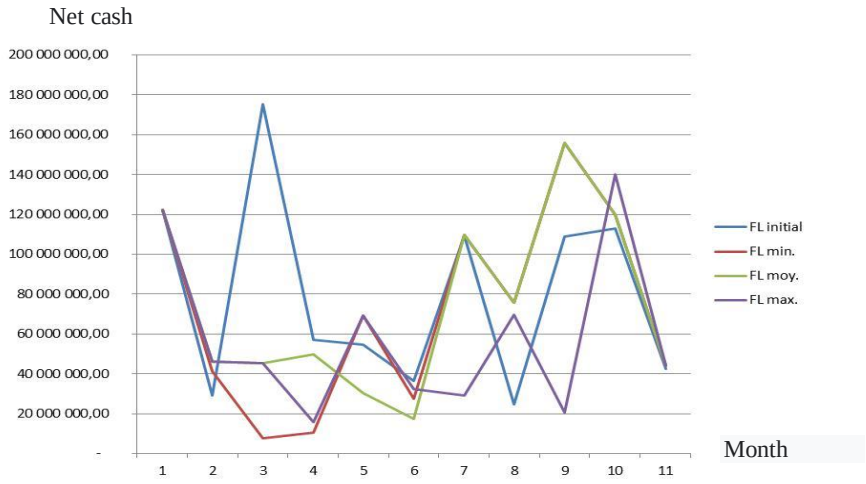
- the processing time changes the number of Op_i operations processed. For the longest timeframe, the number of pending transactions accumulates from period to period. In the other case, it is the other way around;
- a decrease in the free fund for the shortest period and an increase for the longest period;
- an acceleration of the processing of payment orders for the shortest time;
- the number of Op_i operations for the month of January is always zero. This situation is caused by the waiting time for validation of the municipal budget at the level of the CIR[129];
- that the final free fund always remains the same.

In other words, it is only the treasury that changes for each monthly period of the fiscal year. The risk of the shortest lead time is that:

– cash or free funds always remain very low at the ending period;
– and the elected representative or decision-makers of the CTD always try to liquidate a maximum of expenses, up to the level of the availability of net cash.

The delay effect for each parameter is shown in Graph 1 below.

Graph 1: Effect of the variation in the accounting delay on the monthly treasury: Simulation from January to November 2018



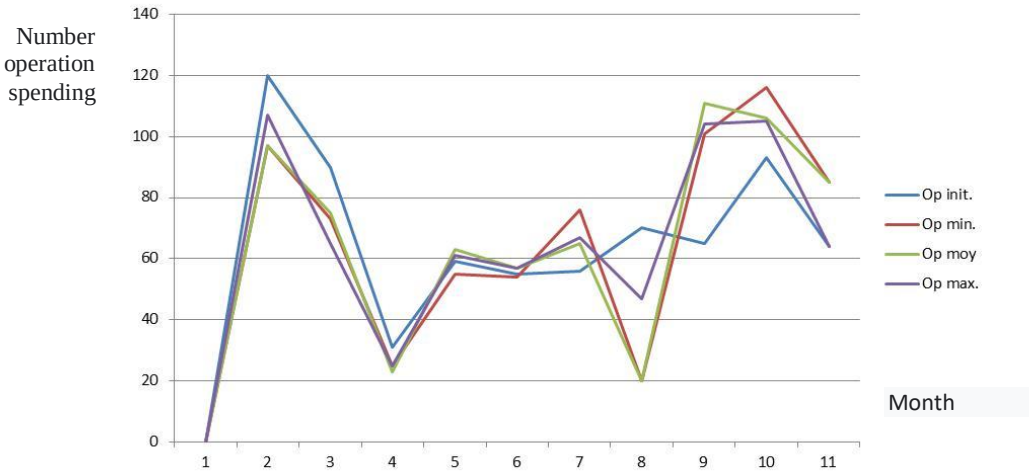
Source: Simulation of net cash for the year 2018 in Prex-B

[129] Regional Computer center of the Ministry of the economy and finances.

month

In March (month 3), the volume of the free fund is very low using the minimum accounting delay. Thus, the number of transactions must be very high (see the number of transactions in February and March in Graph 2 below).

Graph 2: Effect of the variation in the accounting delay on the number of expenditure operations on the monthly treasury: Simulation from January to November 2018



Source: Simulation of net cash for the year 2018 in Prex-B

Changes in the cash balance, although widely noted, have not been widely analyzed. Different reasons justify this exclusion:

– work carried out within the framework of companies is difficult to apply to CTD, taking into account both the strict rules to which they are subject and the specific operating characteristics of administrations (predominance of politics);

– the problem of cash management does not appear to be important, from the point of view of municipal decision-makers. They are satisfied with the availability of variation in cash to liquidate expenses;

– the cash balance, or its variation from one year to the next, is an intermediate variable of expenditure instances, unpaid, either by omissions in the supporting documents, or a voluntary choice of a need for rollover at the starting of the fiscal year.

As a result, accounting approaches are often considered sufficient. Then we have the free fund equation to estimate:

• *under h1:*

$$FL = \left(\sum_{i=0}^{n} R_i - ECELU\right) - \sum_{i=0}^{n} D_i \quad (27)$$

and under h2:

$$FL = \left(\sum_{i=0}^{n} R_i - \sum_{i=0}^{n} D_i - Seuil\right)$$

$$= \left(\sum_{i=0}^{n} R_i - \left(\sum_{i=0}^{n} R_i \times Seuil\right)\right) - \sum_{i=0}^{n} D_i$$

$$= \sum_{i=0}^{n} R_i\,(1 - Seuil) - \sum_{i=0}^{n} D_i \qquad (28)$$

with *Threshold* : net cash rate to be maintained at the ending period *t*
An average timeframe of two (2) days was chosen for the estimate.

4.10. Estimation of the treasury model

Both assumptions modify the final cash balance per period, where there are Op_i transactions. During the estimation of the model, if the final net cash at the end of the period becomes negative, the cash[130] threshold parameter must be modified. In the calibration procedure, the variable days cannot be removed from the model, since it reflects the time t_n of the treasury. The month observation is maintained because the treasury schedule established by decision-makers and accountants is monthly.

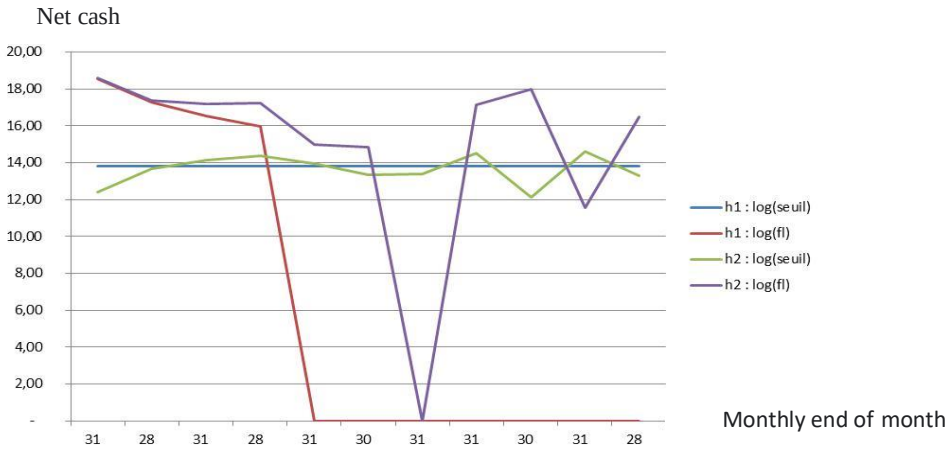
• ***Under h1***, the variable ecelu is constant. It is not considered among the explanatory variables. In a treasury simulation, using data for 2018, assume an *ecelu* treasury threshold equals to 1,000,000 ariary[131]. We have a treasury model as follows: R^2 (0.8177), log (*fl*) = - 0.31813log (*depenses*) + 0.7625log (*fldebutperiode*)+0.0973 (*jours*) +0.8879. The model is significant but it presents some atypical points. After removing the atypical points, we have the optimal model: R^2 (0.9052), log (*fl*) = - 0.1697log (*depenses*) + 0.8581log (*fldebutperiode*) + 0.0858*jours*-0.2468.

• ***Under h2***, assume a risk threshold of threshold treasury equals to 5%. The model estimate gave the following result: (R^2: 0.7049), log (*fl*) = - 0.4656log (*depenses*) + 0.0129log (*seuil*)+ 0.8121log (*fldebutperiode*) -0.0215*jours*+ 3.0823. The calibration procedure, removing the explanatory variables cannot be carried out. The model is significant after removing atypical points (R^2: 0.8080), log (*fl*) = - 0.9081log(*depenses*)-0.6396log (*seuil*)+0.8937log (*fldebutperiode*) - 0.0547*jours*+ 10.8961.

Cash always depends on revenue at the starting period, operations of expenditure for the period and the balance or cash at the end of the period, including the treasury threshold. Thus, no variables from the two models under *h1* and *h2* were removed in the calibration process. Indeed, it is important to analyze the difference in the variation in treasury between the two assumptions.

[130] Red line colored in the software Prex-B or use the order to propose a minimum doorstep of treasury to calibrate the parameter doorstep in relation to the minimal expense paid for the hypothesis *h1* (effect of chisel between spends them and the returns), and in relation to the minimal recipe for the hypothesis *h2* (doorstep of treasury risk to maintain) during the period.
[131] In Prex-B, this value is transformed in logarithmic value.

Graph 3: Change in net treasury between assumption h1 and h2



Source: Data from the estimate of net cash for the year 2018 in Prex-B

The data shown in Graph 3, above, is the data for each cash transaction at the end of the month.

Note that the most advantageous is the *h2* hypothesis. At the seventh end perioding (month of July), the net cash is equal to zero, an effective liquidation of expenses. Spending then spreads out over the month, up to breakeven, where the breakeven point equalizes revenue and expenditure, in case of an urgent need. For the *h1* hypothesis, the treasury is zero at each ending period, from the fifth end of the month (month of May), until November, while under *h2*, the net treasury increases. This is the cause of the instability[132] of the treasury at the level of the CTD. The magnitude of the threshold variation, guarantees the difference between the receipts and the expenses to be paid, without reaching the minimum limit of the cash.

5. Conclusion

In the modeling phase, a model for capital expenditure was not found. Most of the investment income is financed by grants, the transfers of which are not made in most fiscal years. This model can only be analyzed as part of an analysis of the return on investment, associated with other variables of the investment section.

For CUT, investment income and expenditure is very low. The tax revenue model is not very significant. This justifies that the rate proposed by the CUT is not an optimal rate[133]. Even when including the variable *LOLF fiscal rate*, the model is not significant. The high level of land revenue (direct taxation) compared to other tax revenue makes it insignificant, with a low level of collection. The rate voted by the CSM must therefore be modified or

[132] In Prex-B, this value is transformed in logarithmic value.

[133] The electoral considerations seem often priority that the economic aspects in the hold of the important decisions to the level of the CTD. The distribution of expertise between the state and the collectivities decentralized modified the balance of the powers between the central and local (partisan and non-partisan) administrations.

optimized[134]. We can also introduce better control and monitoring of collections, by the most effective means to increase *ctd fiscal rate*. Likewise, for performance, overestimating the size of the budget does not make the model very meaningful. The arrears are badly recorded or badly recorded in the various administrative accounts. Subsequently, this changes the structure of the budget (I/F). The other models are significant.

During the simulation of the net treasury, the number of transactions increases between two periods t_0 and t_1, for a minimum delay. The instances payable for the following period also decrease. The effect of the practice of cash management at the CTD level, depletion of free funds up to the threshold of the amount of mandates for the period, reduces the time to stock net cash. This therefore requires a treasury model to forecast free fund flows, using an average accounting delay, and a net cash risk threshold parameter. The two treasury perspectives depend on the choice of the decision-makers of the CTD, either by precautionary cash, or by desired transaction cash. The most common choice in what-if analysis is the desired transaction cash.

This is how we have the two treasury assumptions *h1*: desired transaction cash, and *h2*: precautionary cash. The *h2* hypothesis is effective for treasury risk, because at the end of each period, net cash is positive, except for an exceptional or urgent expenditure to be satisfied. The threshold variable must be appreciated by the decision-makers of the CTD, to maintain a net treasury with security, without the risk of a free funds lack. Hence, optimal cash[135] management. The case of the CUT's treasury is considered to be a management of balance between cash and expenditure, that is to say a principle of liquidation of expenditure, up to the ceiling of receipts paid to the General Treasury. The equilibrium condition here is an accounting equality.

The use of the model by section, by volume and by nature of the budget resulted in an N + 1 primitive budget prediction model. The GAR method is based on maintaining the ratio of previous budget executions, compared to the result indicator desired by CTD leaders. The progress of the indicator makes it possible to choose a ratio between the budget execution ratio and the number of years of the program budget. While the evaluation by the PEFA method made it possible to define, in advance, the forecasts to be achieved by budget heading, for a performance or a better rating from the exercise predicted to the execution phase. In fact, we have a dashboard of forecasting and process control of budget executions, over the course of a year, and throughout the program budget timeframe. These two methods guarantee the performance of CTD management. So, in the event of a change of executive, for a transitional period, neither the elected representative nor the administration can escape this dashboard. Otherwise, the adjustment consists in re-modeling the budget, through an amending budget, with a new redefinition of the parameters.

The study of the budget forecast modeling was based on the analysis of the administrative accounts over a period from 2002 to 2019. The absence of data for the consolidation of the CTDs in Madagascar did not make it possible to establish the dimension

[134] According to the hypothesis of TIEBOUT (1956), " *[...] the mobility of the taxpayers, reveal its preferences for the offer of local public property of a township. It drives to an optimal allowance of the local public property.*" That is that the elected must respect the preferences of their managed.
Michel MOUGEOT, " Local public Economy and economic theory ", Economic Magazine, volume 41, n°1, 1990, pp. 153-158.

[135] A management that maximizes the liquidity (here, the term profitability is excluded because of the CTD are institutions to characters of satisfaction of the public services but not a commercial vocation: the EPCI or Public Establishment to Industrial Character).

macroeconomic budget of local authorities. Given the quality of the tests carried out, the results are not free of bias. Bias can have several sources. As much, they can be linked to the fact that we measure the budgetary performance of the Communes from the administrative account, of which the political choices of the authorizing officer or the local elected representative are, the size of the commune (in terms of the number of population and sector of existing activity) are different and that the redistribution system (grants and allocations) are unfair. They can also come from the political orientation position of the central state, on public investment, favoring an imbalance in the dynamics of the development of the Communes. So, although improbable, a change in State-local authority relations would not undoubtedly be without an effect on the behavior of budget forecasting because:

- the Municipality (large like the CUT), for which the management process has already been completed, or is close to perfection (zero treasury), will quickly adapt to the new system (whatever the nature of the reforms and the methodology to be adopted for the preparation and execution of the budget), in order to derive maximum benefit from it, in terms of savings in fiscal pressure, improvement of own resources and settlement of expenditure incurred. However, research involves knowledge and mastery of financial analysis tools, information technologies and knowledge in planning and statistical analysis in the execution of budget operations, but also an original approach to William NISKANEN[136] "*Theory of Bureaucracy*";
- the Municipality (small or rural), for which the evolution towards an efficient management of local and fiscal resources was stopped by the scale and the cost of the techniques to be observed, would react according to the nature of the transformation of relations: public finance management reform project in support, intercommunality, other sources of public financing of the Central State ... and would easily rush into a system adapted to their needs[137]: the search for a reliable indicator to measure the regularity of local budgetary operations, or that relating to the ratings (*rating*) of local authorities and deviations (*grap analysis or variance*), always close to a budget of resources as well but not to a GAR.

  The simulation of models, development of electoral influence on budgetary components in particular, and on cash or treasury, would make it possible to combine two areas - economic and political - fundamental in the organization and functioning of local public administrations. .

[136] *[…] The model of NISKANEN describes the situation of an administration producing only one public property in q quantity under a certain number of hypotheses (H1: the B budget that (q) the politician is going to allocate to the bureaucrat is the total utility that the politician withdraws equal q, H2, from a production level: the bureaucrat maximizes the budget and H3: so C is (q) the cost of production. The bureaucrat of NISKANEN is going to respect the B condition = (q) C while (q) trying to maximize his budget), the model shows how the bureaucratic optimum defers the optimum parétien. In particular, the model shows the excesses of production in the bureaucratic administrations, because these essaying especially to maximize their budget. The civil servants having a privileged and anxious information to increase their power, tend to overestimate the amounts of their needs in investments without worry of their efficiency, so that the weight of the budgetary expenses made grow only of period in period, without the public interest doesn't justify it. According to Niskanen, the public organisms grow because of their inefficiency and the desire of power of their leaders (Delas 2001).*

[137] Budget preparation is an exercise to which all public or private entities must comply every year. In the absence of a suitable solution, it is often carried out by manual compilation of figures gathered in spreadsheets (or Excel tables). It is long, tedious and sometimes synonymous with errors introduced during compilation or by different working methods depending on the participants.

The simulation of models, development of electoral influence on budgetary components in particular, and on cash or treasury, would make it possible to combine two areas - economic and political - fundamental in the organization and functioning of local public administrations.

" *[...] The inability of the budget to provide fair and relevant forecasts translating strategy and action plans into quantified targets as well as performance evaluation is one of the main criticisms. By Hopwood (1974): Companies feel the need to budget in a complex and uncertain environment as the relevance of budget forecasts depends on the condition of a stable and predictable environment. But taking into account the existing environment and a simulation by cyclical, economic and political parameters, the reliability of the budget forecast is reliable*[138] ".

Hence, budget preparation by "*Prex-B*" advantageously replaces manual consolidations in spreadsheet software. Above all, it brings reliability to the process, to the prediction and promotes better financial visibility by simulating cash management, by type of cash. This tool integrates functionalities allowing you to design various assumptions and scenarios (treasury perspective, assumptions of the elected official's budgetary behavior, desired ex ante evaluation in GAR and PEFA mode), in order to prepare yourself for future contingencies. It is also of great use in the preparation of accurate statistical forecasts, which allow the Municipality to manage its performance expectations, and to make tactical adjustments to achieve its objectives, making it possible to set up rolling forecasts, compare the projections. The benefits of using Prex-B are numerous: dynamic data[139] analysis, fully centralized process and reliable collection of information, sharing of information within the authorizing officer and accountants via reports.

[138] *[…] According to the school of HARVARD, the budget is a tool to the service of the managers. The managerial theory of the business underlines the importance of the professional managers, that replaces the capitalistic entrepreneur. For Anthony and Simons, the budget is a tool to the service of the managers to orient the behavior of the controlled so that they act in the sense of the strategy. The typologies of the control practices proposed by Anthony and Simons permit a classification of the budgetary practices according to the manner whose leaders use the budget.*
Anthony's model: a tight or flexible control According to Anthony, the criteria on which are judged the actions of the leaders are the efficiency and efficiency (Anthony 1988). To reach this efficiency and efficiency the role of the budget is primordial because it permits:

- *the piloting of the activities: transformation of the programs long-term in projects of actions short-term. Retroactive control (feedback) as well as the necessary corrective actions ;*
- *the coordination: the decision making and to make converge the goals of the individuals and the strategic objectives of the organization ;*
- *the incentive of the actors ;*
- *the modelling: reduction of the uncertainty and analysis of the scripts.*

For Anthony (1965; 1988), the budgetary control is a tool of the system of management control that can be either narrow ("tight"), either flexible ("loose"). Narrow in the" definition retailed of the roles of their subordinates, their frequent involvement to the decision making of the subordinate managers and their follow-up of the results ". Flexible", when they allow their subordinates to decide what should be undertaken, in a large enough setting, and that themselves concentrate on the global results rather than on the detail of the approaches used. "This narrow or flexible degree of the control depends on the manner of which these devices are used (Anthony, 1988, p. 173).
Hamid Bachir BENDAOUD, "Budget and budgetary control: does one have to do without it? ", Versailles academy, CREG, May 2014, p. 5-7, 22 pages. http://www.creg.ac-versailles.to fr/Budget-and-control-budgetary-must-one-s-in-pass, consulted the 11/09/2016.

[139] Requiring an interconnection of the data accountants or an update of a Dated Warehouse.

Particularly, in the case of the CUT, the investment model cannot be achieved by the presence of a low level of investment income, transfer funds (grants and endowments) entered in the budget but not received. The use of administrative account data did not make it possible to establish an optimal model. While the tax revenue model has justified that the tax rate voted by the CSM is not optimal taxation. The Municipality's tax pressure rate does not align with LOLF's tax pressure rate. In this regard, strengthening local taxation must be a major concern of elected officials and local decision-makers. The budget performance model has shown that CUT's performance in budget management is not very reliable. The model is not significant, because of the various inconsistencies in accounting information on payment arrears, and outstanding amounts. Little room for maneuver on operating expenditure is due to the existence of very high compulsory expenditure (expenditure on payroll and fuel). The other models found are significant and can effectively predict a primitive budget. Obviously, taking into account the economic, structural and political parameters of local elected officials.

If the cash management models of companies resulting from optimal control make it possible to determine, in a theoretical way, the volume, the number and the amount of each investment collection necessary to the minimization of the costs and the risks related to the cash management , they cannot easily be transposed to local authorities, given the ban on the investment of their idle funds[140].

The interest of these models, however, lies in the approach they inspire: knowledge of the elected representative's cash management approach and the most acceptable preference for CTDs, adapted to the specificities of the APULs treasury. The net cash position of CUT is based on the desired transaction cash, which induces time, and frequently instability, of the free fund.

An adjustment constant appears in all the models found, that is, there is *an omnipresence of the constraints*. However, the strong inertia in the budget toward the macroeconomic environment taken as a whole (growth, consumer price index (or IPC), inflation, crisis,…) and the local political will to elected[141] officials, on the part of the State, to maintain a certain control of public expenditure, contribute to slowing down the general progress of budget[142] execution.

The simulation of a primitive budget gives a dashboard according to the chosen evaluation method (PEFA or GAR), for a periodic progression of the indicators. The advantage of the dashboard is to visualize the progress of the budget execution, if it fits with the policy of the CDMT and the PTA of the Municipality. It is also a beacon for the management policies of the municipal budget, for elected municipal officials, vis-à-vis its deliberative and control bodies (legality, administrative and financial, accountancy, etc.). It is a political commitment, as a target-indicator and an accounting commitment, as an associated performance-indicator throughout the term of elected officials office.

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[140] No objective of profitability but of the public service offers.

[141] The electoral role: " *[...] On the other hand, the result of the electoral component introduced by TO. GILLOUARD (1982) confirms the influence of the cycle on the variation of the cash balance. The efforts of self-financing are reduced at the end of electoral cycle: indeed, the local people responsible grant, understandably, a particular attention to the fiscal pressure, this one being one of the only elements to which the voters is sensitive, and hesitates to increase it during the pre-electoral years in order to avoid a loss of popularity can cost them their place* ".
Alain GILLOUARD, " Econometric analysis of a Local investment function "; Communication to the round table on the local public finances of the CEREVE, 25/11/82, University Paris-Nanterre, 1982, 20 pages.

[142] Inciting an overestimate of the estimable budget driving to a reduction of the budgetary execution rate, because a lot of gap exists between the forecast and the realization.

Knowing that these variations (the electoral cycle and partisan politics) are repetitive, the forecasting system can trigger an alert, and thus warn, in advance, the authorizing officers in the process of forecasting and budget execution. A field which, in this thesis, is largely invested in the search for explanatory factors. Let us recall that it was essential to arrive at a mathematical forecasting model common to all the Decentralized Communities.

It should also be remembered that the Communes have an activity that differs, depending on their size and their current activity sector, and that is why it seemed difficult to find common explanatory factors.

Although the study did not take into account other Communes in Madagascar for the comparative analysis, the conclusions are difficult to transpose[143] to other countries and to other foreign economic political contexts, because of the need to introduction of the two variables: borrowing[144] and budget deficit, noted in their administrative accounts, but not in the case of the Communes in Madagascar.

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[143] Even though *[...] the LOLF inspires numerous local collectivities wishing to modernize their management. It is in progress evident from the experimentations that these collectivities adopt, from common principles of oriented management toward the results, of the very different organizations the some of the other because of their specificities. It is preferable to accompany these experimentations rather than to tempt to format them in a common mold that would discourage their promoters (Lambert and Migaud 2006).*
Quoted by Christophe MAUREL, David CARASSUS, Damien GARDEY, "The local steps of public performance facing the LOLF: mimetism or innovation? ", Policies and public management [on line], Volume 28/4 | 2011, put on line April 11, 2014, consulted June 26, 2014, p. 418, pp. 418-440. http://pmp.reviewed.org/4423; DOI: 10.4000 /pmp.4423.

[144] *[…] The evolution of the loan is interesting to double title: this last constitutes, on the one hand, one of the main means of financing of the local investments and makes the object of a politics voluntary of the APUL undoubtedly; it represents, in second place, the main instrument of circumstantial politics of the State until the end of the years 1970. These two reasons drove the authors of models to be interested especially in this fashion of financing. However, as makes it notice J.J. AERTS [1982] doesn't have a direct link between the variations of the raw loan and those of the investment of the local collectivities. This observation is verified as well to the microeconomic level that to the macro-economic level (...). On the other hand, if one excludes the balance of treasury, the part of the loans used effectively each year to a profile of evolution close to the one of the investments* ".
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ANNEXE

LIST OF EXPLANATORY VARIABLES OF THE MODELS

ACCRHAB	:	Growth rate of habitat change
ADDIT	:	Amount of additional budget (sum of QI and QF)
AI	:	Other investment income
AR	:	Other recipes
ARF	:	Other tax revenue
ARR	:	Arrears of expenditure
AUGSAL	:	Average annual rate of salary increase
B	:	Budget
CARBUR	:	Fuels and lubricants
CA	:	Administrative account
CLTAUXFISCAL	:	Rate of fiscal pressure chosen by the elected representative of the CTD
CROISS	:	Forecast of economic growth rate (LOLF N + 1)
DA	:	Other expenses
DF	:	Functionnary costs
DI	:	Investment expenditure
DO	:	Mandatory expenses
DOTA	:	Endowment
DT	:	Total expenses
ECELU	:	Additional cash or difference on free funds desired by the elected official and defined in advance
EFFORT	:	Adjustment index to keep the mandate or win the next election
ELU	:	Variable in the electoral cycle (pre-electoral, infra-annual, supra-annual and cessation of activity)
F	:	Functioning
FL	:	Free Fund
H	:	Number of population
I	:	Investissement
IFPB	:	Property tax on built properties, including TAFB arrears before fiscal 2008
IFT	:	Property tax on the land
INFLA	:	Inflation rate forecast (LOLF N + 1)
IP	:	Poverty index
IPC	:	Consumer price index
IS	:	Synthetic index
N	:	Total number of Communes
OBJECT	:	GAR target by budget allocation
PCARBUR	:	Average annual rate of increase in the price of fuels and lubricants
QF	:	Part of the budget balance for year N-1 transferred to operations for

		year N + 1
QI	:	Part of the budget balance for year N-1 transferred to investment for year N + 1
RECDECENT	:	Sum of tax revenues, subsidies and endowments
RECRUELU	:	Volume of the budget allocated to the social recruitment of elected officials
RF	:	Operating recipes
RI	:	Investment income
RLB	:	Revenue on sale and rental of municipal buildings
RLT	:	Revenue on sale and rental of communal land
RT	:	Total revenue
RTEE	:	Revenue based on water and electricity works
SAL	:	Spending on pay or salary
SUB	:	Subvention
TAUXFISCAL	:	Forecast of the tax pressure rate (LOLF N + 1)
TIRELIQUAT	:	Transfer rate of the balance to the investment section