Article

Assessment of Financial Conditions of South African Municipalities: A Unique Model for KwaZulu-Natal

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Abstract

Most South African municipalities experience significant financial problems. This study investigates the financial conditions of municipalities in the province of KwaZulu-Natal (KZN). It was found that the most important factors which influence their financial position are unobservable municipally unique factors. The ratio of people of non-working age to the total population is also significant in influencing the financial position of municipalities. This article designed a unique financial conditions measurement framework to evaluate the financial status of local governments. Two independent instruments were developed, first to measure the financial quality of a municipality, and secondly, to identify and examine a number of socio-economic factors possibly affecting the financial condition of these municipalities. The study developed a composite financial condition index (CFCI) and a financial conditions management index (FCMI), and then tested the framework on 51 municipalities in the KZN province from 2009 to 2015. The study used a panel data approach with two financial condition indices as indicators. The findings suggest that, in the absence of individual effects, most of the selected socio-economic variables are relevant in terms of explaining some of the variations in municipal financial conditions. Cross-section fixed-effects do, however, significantly improve the overall performance of the model, suggesting that it is rather the unobservable municipally unique factors affecting municipal financial conditions.

Keywords: municipalities; financial conditions; panel data econometrics; fixed-effects; local government; public finance; South Africa; JEL Classification Codes C23, G28, H72

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Introduction

Most municipalities in South Africa have financial problems, and few ever receive a clean audit from the Auditor-General (SA Auditor-General 2016). In South Africa, there has been widespread reporting on the worsening state of municipal finances. The Auditor-General (SA Auditor-General 2016) states, for example, that 26 per cent of South Africa's municipalities were in a particularly poor financial position by the end of 2015, and there is material uncertainty with regard to their ability to continue operating in future.

Municipalities or local government in South Africa are not only recognised as a separate and independent level of government, but are also allocated specific powers and functions that are exclusive and relevant to this level of government. The South African Constitution, therefore, also dedicates municipalities with developmental objectives, besides the usual provision of basic services, such as water and sanitation. The broadening of the scope of power allocated to municipalities requires the advancement of economic, political and social development of local communities. As a result, decentralised municipalities have a number of powers with regard to their ability to raise revenue and incur expenses in order to provide services to communities in a sustainable manner. The financial health of municipalities is, therefore, of great relevance, since service delivery is dependent on such status, and in particular the management of these financial conditions.

The financial conditions of local government can be defined or conceptualised as a town or municipality's level of competence to deliver adequate services to its citizens, currently and in the long-term (Wang, Dennis and Tu 2007). This implies that municipalities have the ability and capacity to meet their future financial obligations. Zafra-Gómez, López-Hernández, and Hernández-Bastida (2009) went further to argue that it involves a whole range of factors that cannot be measured by a single criterion.

The Financial and Fiscal Commission (FFC 2014) put forward the case that because municipalities in South Africa are diverse, and because they operate in unique social, demographic and economic spaces, there are a number of characteristics or variables that potentially significantly impact on the municipal financial conditions. Dennis (2004) agrees with this view, stating that explanatory or control variables can be conceptualised as situations and conditions affecting the financial conditions external and exogenous to the entity. Dennis (2004) further states that, in most cases, these variables relate to demographic and socio-economic information.

This study has the following objectives: It intends to design a unique financial conditions measurement framework for the evaluation of the financial condition of municipalities. This article develops two indices: firstly, an index providing a useful financial ratio framework, which employs various factors that impact on their financial position (composite financial condition index [CFCI]); and secondly, an index that

considers a number of socio-economic factors, which may possibly affect the financial conditions of municipalities (financial conditions management index [FCMI]).

The article is structured as follows: firstly, possible socio-economic factors determining the financial conditions of municipalities are investigated by means of a literature review. Various frameworks measuring financial conditions are discussed. Next, two indices of municipal financial conditions are constructed, analysed and compared. A number of socio-economic factors (possibly affecting the financial condition of 51 municipalities in KwaZulu-Natal between 2009 and 2015) are identified, analysed and modelled through a panel data approach. The final section discusses the results and presents some conclusions based on the research findings.

Factors Determining the Financial Condition of Municipalities: Literature Review

The financial position of local governments and municipalities and the factors influencing them have been investigated by several researchers. Most of these studies regarded long lists of factors affecting the financial position of local authorities. Major factors that determine governments' financial conditions were established by Berne and Schramm (1986) as the needs and preferences of the local community. They considered levels of education, poverty and employment, as well as the various factors that affect the supply of public services. These also include population densities, labour cost, municipal debt and the available productive resources. They also considered factors affecting the region's income, such as the wealth of its citizens, their income and property values, as well as interest rates, tax rates and market sales. Finally, the political dominance and management, together with their policies and conduct were considered.

The financial conditions of local authorities were studied by Nollenberger, Groves, and Valente (2003), who identified financial, organisational and environmental factors as the most important factors influencing their position. Their income revenue and expenditure are regarded as the most important financial factors, which are also affected by their debt and liabilities, operational expenditure and depreciation of their plants and facilities. Organisational factors include the way the municipal region is managed and their policies, while the environmental factors include the needs of the citizens and their level of wealth and support, the national economic position, and the ability to address disasters and political risk.

In the short term, Dennis (2004) states that the most important factors that affect the preferences of the community in terms of public goods and services, depend on the state of local infrastructure, their specific demographic features, the wealth and strength of the local authority, as well as that of central government. She also proposes the inclusion of a number of control variables, which include the type of government, population, income per capita, percentage of population with high school education, the share of the workforce, and the median.

Analysing rural local governments' financial condition, Honadle, Costa and Cigler (2004) found that states which often experience natural disasters are worse off. The economic base of the local authorities and their structure, labour costs, charges and the tax base, as well as the state of the national economy are most important. Demands for services by the electorate constituency for services, and changes in the numbers and poverty levels of the local population, all influence the financial health of the municipal region.

Studying American states (USA), Wang et al. (2007) include socio-economic variables such as the size of the population, personal income, gross state production, variation in employment, and the economic momentum index (both levels and growth rates). These are not financial factors *per se*, and how these factors exactly affect financial conditions is unknown. Their research concludes that these socio-economic variables are significantly correlated with local governments' financial conditions and may be applied to estimate financial conditions to some degree of accuracy.

The financial distress of local authorities was investigated by Jones and Walker (2007), who used a statistically-based multiple regression model. The results indicate that the most important factors determining their financial conditions are the municipal level of distress, the composition of their revenue and their population size. The local authority's level of distress is statistically most dependent on their ability to generate revenue.

Carmeli (2002) investigated organisational and structural characteristics and their relationship with the fiscal health of local authorities, using multiple regression analysis. They examined the relationship between local governments' financial health and the explanatory variables, which included the reputation of the local authority, and the community's demographic characteristics and socio-economic levels. Their results revealed that the financial health of municipalities is positively linked to the community's socio-economic status and demographic characteristics. These three factors collectively explained approximately 51 per cent of the variance of the local authorities' financial conditions.

Zafra-Gómez et al. (2009) incorporated socio-economic variables in a model analysing local governments' finances. Their variables were based on a number of criteria, i.e. analysing the bivariate correlations of each of the identified variables with financial conditions indicators, variables listed and used in previous studies, variables considered by the local and national authorities to estimate the spending needs of local governments, as well as their associated national financial transfers and support. The socio-economic variables they employed are: domestic per capita income; unemployment, industrial; commercial and tourism activities; the population younger than 14 and those older than 65 years; total migration rates; and homes owned by residents. Their regression analysis (OLS) found that financial conditions are largely dependent on aspects related to the social and economic environment, which determines

local authority's ability to generate revenue, including the economic welfare of its citizens and their tax levies on housing.

A Framework Measuring Financial Conditions

A government's financial position (assets and liabilities) and its ability to meet its obligations and to supply services, today and in future, are inherent in their financial condition (GASB 1987). Dennis (2004) states that a municipality's ability to answer to the preferences and needs of its community is dependent on their available financial resources, and on the way the local authorities manage, allocate and distribute those resources. Similar to other researchers, she also considered combinations of demographic and economic factors at applied ratios over a number of years. She found some uniformity; however, in general, there is no consensus as to which method is best in assessing the financial positions of local authorities.

Brown (1993) states that local authorities do not, as a rule, assess their financial conditions in their normal managerial capacity. He considered the so-called short test or 10-point test of financial conditions. The test calculates ten ratios of a small local authority or municipality with a population of less than 100 000. These ratios are based on the authority's operating and other expenses, their revenue and their debt position.

Ryan, Robinson and Grigg (2000) suggested some indicators for people from elsewhere, who may need information about a local authority's financial situation, but lack the ability to acquire financial statements. They highlight the need for a framework that could represent all spheres of local government activities, which include both financial and other factors. Their study focuses predominantly on the concept of "fiscal soundness," which is also known as "fiscal sustainability" or "fiscal solvency." Fiscal soundness represents the local authority's ability to adhere to its financial liabilities and responsibilities, within its own financial means. This embraces the expenditure and debt pressures, and answering its financial obligations within its revenue constraints, both over the short- and long term. The objective is to remain solvent and flexible, and only dependent on its own resources. Ryan et al. (2000) also insist that future generations should not be left with the debt of current expenditure. They stress the importance of intergenerational equity.

Dennis (2004) conceptualised the healthy financial condition of local authorities as their ability to pay for their own expenses, using the revenue generated through their own means. Authorities should be able to have adequate liquidity to settle all the obligations of their normal budget within 60 days. They should be able to generate enough revenue to cover their expenses without any debt, and supply the required municipal services, including health, safety, and welfare if necessary.

Chaney, Mead and Schermann (2002) state that financial analysts of municipalities apply a range of financial ratios based on demographics, economics and accounting.

Their analyses, therefore, also include a collection of fund-based accounting and economic figures to determine ratios, which can provide an overall financial opinion. Chaney et al. (2002) estimate government-wide ratios that include ratios indicating the financial position overall, liquidity, solvency and financial performance.

Gomes, Alfinito and Albuquerque (2013) found that the control over resources may lead to the superior financial performance of local governments. Big municipalities have more taxpayers, leading to higher municipal income. Larger local authorities may command more resources, even enjoying economies of scale and lower administrative costs. Municipal financial performance is, therefore, positively correlated to the size of the population. The skills of the management team also play a role. Where the mayor and top management have higher levels of education and job-related experience, local authorities do better and their financial performance is stable and growing.

Ritonga (2014) modelled local governments' financial conditions in Indonesia considering six dimensions to measure financial conditions. These included financial independence, flexibility, budgetary and service-level short and long-term solvency. These six dimensions, in turn, are determined using their own indicators. Ritonga states that financial health depends on an authority's ability to answer to its financial obligations, finance expenditure, including unexpected expenses, and manage its finances effectively and efficiently.

Maphalla (2015), studying the financial performance of local government in South Africa, found that financial performance is generally measured using financial ratios, which measure revenue, operating income, profit, the strength of the balance sheet, cashflow, levels of debt, and the ability to meet financial commitments. In the case of local government levels, it also measures dependence on government transfers, the ability to raise own revenues (management of debtors) and trends in expenditure. The study suggests financial measures and ratios to determine the level, quality and success of municipal finances.

A financial performance instrument for Ireland was developed by Turley, Robbins and McNena (2015), which focuses on five factors, namely the proper functioning, self-sufficiency, efficient collection of income, as well as solvency and liquidity, of both private- and public sectors. Liquidity depends on the current ratio, as well as the timing of collection. It measures the ability of municipalities to cover their short-term responsibilities. The self-income ratio indicates the autonomy of a local authority. It is the ratio between their incomes from own sources and total income, and gives an indication of how dependent a municipality is on national government for funding. The operating surplus/deficit operational performance ratio is the ratio between the operating surplus/deficit and total income. The ratio between the funds collected and the total collectable potential yields is the collection efficiency ratio. A composite view of grouping the debt-to-income and debt-to-assets ratios, the net liabilities ratio, and the

net financial liabilities, provides a clear view of the municipality's level of solvency in the long term, as well as its ability to survive in the long term.

Developing an Index of Municipal Financial Conditions for South Africa

To develop a composite municipal financial conditions index (CFCI) for the province of KwaZulu-Natal, the current study focused mainly on methodologies of Ritonga (2014) and Gomes et al. (2013), described below.

The Composite Financial Condition Index (CFCI) methodology

Ritonga (2014) applied a holistic methodology based on the standard financial ratio approach. The approach incorporates the financial conditions/performance measurement framework as set out above. The framework followed in developing the CFCI for municipalities is displayed in Table 1.

The current study considered seven years (2009–2015), incorporating all 51 municipalities in the KZN province. There were 357 financial statements available, published by the National Treasury (NT 2018). The municipal financial data were obtained from the NT Municipal Finance Data website, i.e. https://municipaldata.treasury.gov.za/. Based on the data availability, ratios for each of the 16 indicators (categorised in six dimensions) were calculated. Table 2 presents the descriptive statistics for each indicator, which municipalities may now regard as "industry ratios" to compare themselves against as a benchmark.

None of the ratios is, however, normally distributed ($p<0.05$), which may cause some results to show false positives. Normality may therefore not be assumed, but this does not pose any problem as the model does not assume normality of the independent variables. It is, however, important to take note of the desperation of the independent variables, as it can indicate values that are densely packed as well as other outliners.

Table 1: Ritonga financial conditions measurement framework

Name	*Dimensions*	*Indicators*	*Index*
Liquidity A	Short-term Solvency	A. (Cash & cash equivalent + short term investment)/Current liabilities	*Financial Conditions*
Liquidity B		B. (Cash & cash equivalent + short term investment + account receivables)/Current liabilities	
Liquidity C		C. Current assets/Current liabilities	
Solvency A	Long-term Solvency	A. Total assets/Current liabilities	
Solvency B		B. Investment equities/Long-term liabilities	
Solvency C		C. Investment equities/Total assets	
Budget A	Budgetary Solvency	A. (Total revenue – special allocation fund revenue)/Total expenditure – capital expenditure)	
Budget B		B. (Total revenues – special allocation fund revenue)/Operational expenditure	
Budget C		C. (Total revenue – special allocation fund revenue)/Employee expenditure	
Budget D		D. Total revenue/Total expenditure	
Independence A	Financial Independence	A. Total own revenue/Total revenue	
Independence B		B. Total own revenue/Total expenditure	
Flexibility A	Financial Flexibility	A. (Total revenue – special allocation fund revenue-employee expenditure)/Total liabilities	
Flexibility B		B. (Total revenues – special allocation fund revenue – Employee expenditure)/Long-term liabilities	
Service A	Service-level Solvency	A. Total equities/Population size	
Service B		B. Total assets/Population size	
Service C		C. Total expenditure/Population size	

Source: Ritonga, 2014

Table 2: Descriptive statistics of the ratios

	Mean	*Median*	*Max*	*Min*	*Std. Dev.*	*Skewness*	*Kurtosis*	*Jarque-Bera*	*Probability*
Liquidity a	2.02	1.54	11.53	0.14	1.67	2.69	12.16	1678.33	0.00
Liquidity b	2.04	1.49	21.51	0.14	1.96	4.34	33.31	14781.21	0.00
Liquidity c	1.34	0.93	21.51	0.00	1.75	5.53	54.07	40619.12	0.00
Solvency a	6.99	5.63	57.39	1.34	5.24	4.06	32.32	13770.15	0.00
Solvency b	1.02	0.74	12.11	0.00	1.21	3.49	24.54	7628.56	0.00
Solvency c	0.16	0.13	0.96	0.00	0.14	1.42	6.18	269.54	0.00
Budget a	0.42	0.37	2.29	0.01	0.32	1.28	7.30	373.14	0.00
Budget b	1.78	1.42	10.91	0.04	1.67	1.95	7.88	579.77	0.00
Budget c	0.99	0.91	14.88	0.01	1.10	7.00	79.80	90640.92	0.00
Independence A	0.37	0.32	0.99	0.01	0.28	0.43	1.77	33.15	0.00
Independence B	0.42	0.37	2.29	0.01	0.32	1.28	7.30	373.14	0.00
Flexibility a	4.39	2.73	136.60	0.00	8.59	11.10	161.77	382308.90	0.00
Flexibility b	1.17	0.91	29.22	0.02	1.78	11.55	177.08	458710.20	0.00
Service a	2.64	1.65	13.27	0.13	2.75	1.78	5.55	284.77	0.00
Service b	3.34	1.96	16.10	0.24	3.57	1.88	5.92	338.46	0.00
Service c	1.35	0.77	7.16	0.09	1.36	1.92	6.61	413.98	0.00

Source: Authors' own analysis using National Treasury data, 2018

The Pearson, Spearman rho and Kendall tau correlation tests were applied to ascertain the reliability of the various dimensions (Ritonga 2014). These tests were also used to determine the relationship and distribution of the data. The analysis revealed that this set of six ratios estimated the same constructs. The three tests conducted found the ratios are significantly correlated individually with p-values smaller than 0.05 and correlations close to one for all. The Cronbach alpha test also showed that this measure is internally consistent and repayable, with an alpha coefficient of 0.769, which exceeds 0.7. The 16 ratios of indicators do estimate the financial position of the municipalities truthfully.

This study does not assume the six dimensions to be equally important and therefore proposes the development of a weighted composite financial conditions index. Ritonga (2014) proposed the analytic hierarchy process (AHP) to allocate specific the weights to the six dimensions that composite the financial conditions index. To determine the weight, this study used the responses of three respondents.

Table 3: Pairwise comparison matrix

Dimension Y	*Dimension X*					
	Liquidity	*Solvency*	*Budget*	*Independence*	*Flexibility*	*Service*
Liquidity	1.00	1.00	1.00	3.00	2.00	6.00
Solvency	1.00	1.00	3.00	3.00	4.00	5.00
Budget	1.00	0.33	1.00	4.00	4.00	6.00
Independence	0.33	0.33	0.25	1.00	1.00	2.00
Flexibility	0.50	0.25	0.25	1.00	1.00	2.00
Service	0.17	0.20	0.17	0.50	0.50	1.00
Sum	4.00	3.12	5.67	12.50	12.50	22.00

Source: Authors' own analysis using data from National Treasury, 2018

The importance of dimension x relative to y is shown in the particular row and column in Table 3. The scale lies between 1 and 6, which indicates:

Mxy = 1 when the two dimensions are of equal importance.

Mxy = 2 when dimension x exceeds dimension y slightly in importance.

Mxy = 3 when the importance of dimension x exceeds dimension y.

Mxy = 4 when the importance of dimension x exceeds dimension y very much.

Mxy = 5 when dimension x is absolutely more important than dimension y.

The values of the eigenvectors of this matrix in Table 3 should then be calculated as the product of the first row and the corresponding values in the column. The most important dimensions have the highest eigenvector values. When the sum of each column is then multiplied by the totals of the matrix, it yields the eigenvector (E).

The eigenvector (E) is calculated by dividing the total values of each row (sum column) with the total values of the matrix. To evaluate the value of the eigenvector (E), the results of the squaring matrix above are squared again and the above step to calculate the eigenvector is redone to obtain a new eigenvector (E2). If the values of E and E2 remain the same or are still close, it may be assumed that the values of the original eigenvector are true. If it differs much, the first eigenvector is not correct, and the process should be done again until the eigenvector values are approximately equal. For the current analysis, the process is repeated five times until the values are consistent.

To evaluate the consistency of the answers of respondents, a consistency index (CI) is calculated. The product of the pairwise comparison matrix and the last column of the weights matrix yields a weighted sum vector. The consistency index is estimated as:

$$CI = (\lambda - n)/(n-1) \qquad \text{eq. 1}$$

… where lambda (λ) represents the average of the weighted sum vector row weighted rating multiplied by its weight. Lambda equals 6.221 in this case. The sum of the relevant dimensions is “n”; which equalled six. In this case, the consistency index equalled 0.04429. The consistency ratio (CR) is the result of the consistency index (CI) divided by the random index (RI), i.e.

$$CR = CI/RI \qquad \text{eq. 2}$$

The random index is a function of the number of alternatives or dimensions being compared. The number of alternatives compared is six, so the random index is 1.24. Therefore, the consistency ratio is 0.0357 or 3.6 per cent. The consistency ratio is less than 10 per cent, so it can be concluded that the respondents’ answers are consistent.

The results showed that long-term solvency has the biggest weight, with budgetary solvency in second place, as indicated in Table 4. This is followed by solvency in the short term, financial flexibility, financial independence and service level. Accordingly, the most important factors determining the financial conditions of municipalities are long-term and budgetary solvencies, while service-level solvency has the least influence.

Table 4: Weights of the Composite Financial Conditions Index (CFCI)

Dimension	*Relative weight*	*Weights (%)*
Liquidity	0.23	22.91062
Solvency	0.33	33.02683
Budget	0.23	23.28857
Independence	0.08	8.008863
Flexibility	0.08	8.180237
Service	0.05	4.584878

Source: Authors' own analysis using data from National Treasury, 2018

Finally, the Composite Financial Conditions Index (CFCI) can be estimated using equation 3:

CFCI = w1*DI1 + w2*DI2+……+ wn*DIn ..... eq. 3

… where the weight of the dimension index is "w", the dimension indicator "DI" and the number of indicators "n". The composite financial condition index for the 51 municipalities between 2009 and 2015 is displayed in Figure 1.

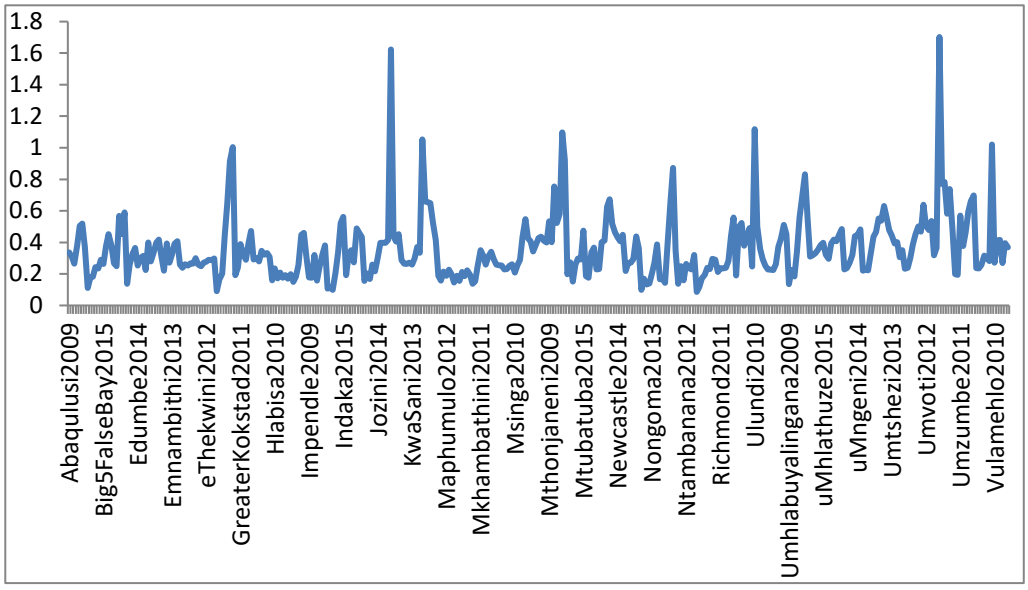

Figure 1: Composite Financial Condition Index (CFCI) for KZN

Source*:* Authors' construction based on Ritonga, 2014

Financial Conditions Management Index (FCMI)

The Gomes et al. (2013) methodology considered the total municipal revenue relative to expenditure as a ratio indicator of self-sufficiency, and consequently how dependent these are on external sources of revenue. They estimated an index, which indicates how well the local authority manages its finances. The index is a composite of the municipality's revenue from services and property taxes, and its expenditure. This gave an aggregate indication of the local authority's dependence on external sources of income. This then constitutes a Financial Conditions Management Index (FCMI) and is estimated as:

FCMI = (PTPI + STPI) / TEPI eq. 4

… which is a composite of the indices representing the performance of property taxes (PTPI), service taxes (STPI), and aggregate expenditure (TEPI).

For the current study, the length of the observation period was also seven years (2009–2015) and incorporated all 51 municipalities in the province. There were 357 financial statements available, as published by National Treasury (NT). The municipal financial data were also obtained from the National Treasury's Municipal Finance Data website.

The estimation of the financial conditions index based on the Gomes et al. (2013) methodology is displayed in Figure 2. The FCMI index ranges between 0 and 1. Index values closer to one indicate that the local authority is less dependent on revenue sources from outside the region, while values closer to zero suggest poor financial conditions.

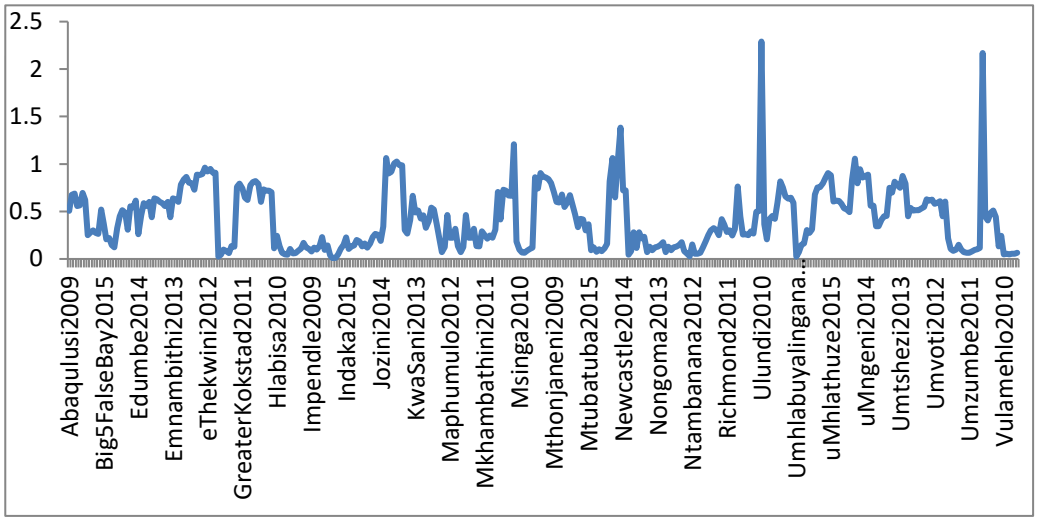

Figure 2: Financial Condition Management Index (FCMI) of KZN

Source*:* Authors' construction based on Gomes et al., 2013

Comparing the municipal financial condition indices

Figure 3 displays the annual averages of the two indices for municipalities in the KZN province. It can be seen that the average annual FCMI stayed fairly constant between 0.4 and 0.44 over the period as the average annual CFCI increased from 2009 to 2014, decreasing during 2015. The average annual FCMI was also consistently greater than the average annual CFCI, although this difference decreased from 0.14 in 2009 to 0.005 in 2014, increasing to 0.03 in 2015.

Figure 4 displays the period averages of the two indices per KZN municipality. The average per municipality for the FCMI seems much more volatile than the CFCI, suggesting fairly large differences in financial conditions as measured by the FCMI between the municipalities. Both the average per municipality of the FCMI and the CFCI seem fairly random, suggesting that the financial conditions of the municipalities are very much independent from each other.

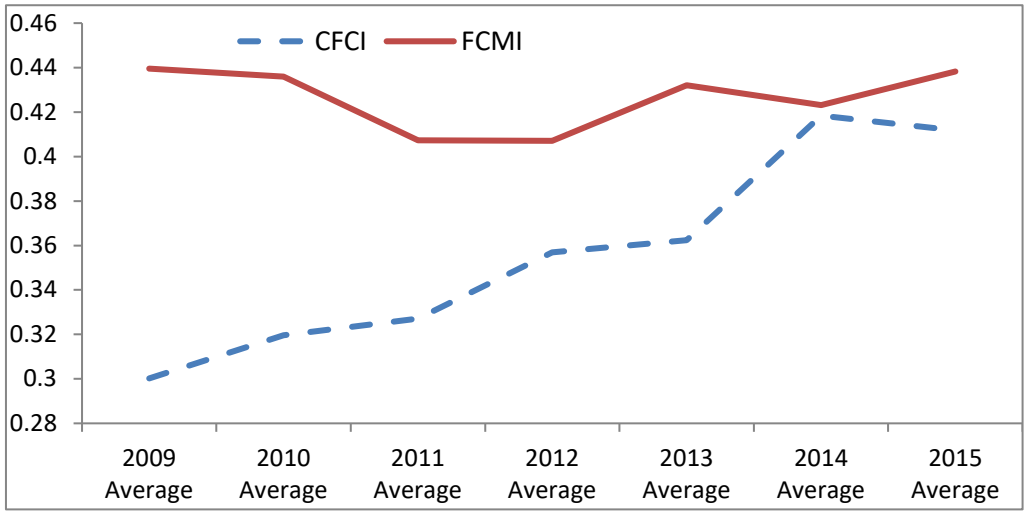

Figure 3: Average annual CFCI and FCMI

Source*:* Authors' estimations

Table 5 displays the descriptive statistics of the two indices. Both the indices are not normally distributed ($p<0.05$). The descriptive statistics indicate that the FCMI is indeed much more volatile (standard deviation FCMI = 0.32 compared to standard deviation of CFCI = 0.19). However, the FCMI has a much lower skewness and kurtosis value, indicating that the FCMI displays greater symmetry around the sample mean and contains fewer outliers.

Table 5: Descriptive statistics of the two indices

	CFCI	*FCMI*
Mean	0.356644	0.426182
Median	0.309759	0.365235
Maximum	1.702042	2.289968
Minimum	0.085887	0.007198
Std. dev.	0.196439	0.320468
Skewness	2.611987	1.278798
Kurtosis	14.72044	7.150161
Jarque-Bera	2449.295	353.5063
Probability	0.000000	0.000000
Sum	127.3218	152.1469
Sum sq. dev.	13.73746	36.56112
Observations	357	357

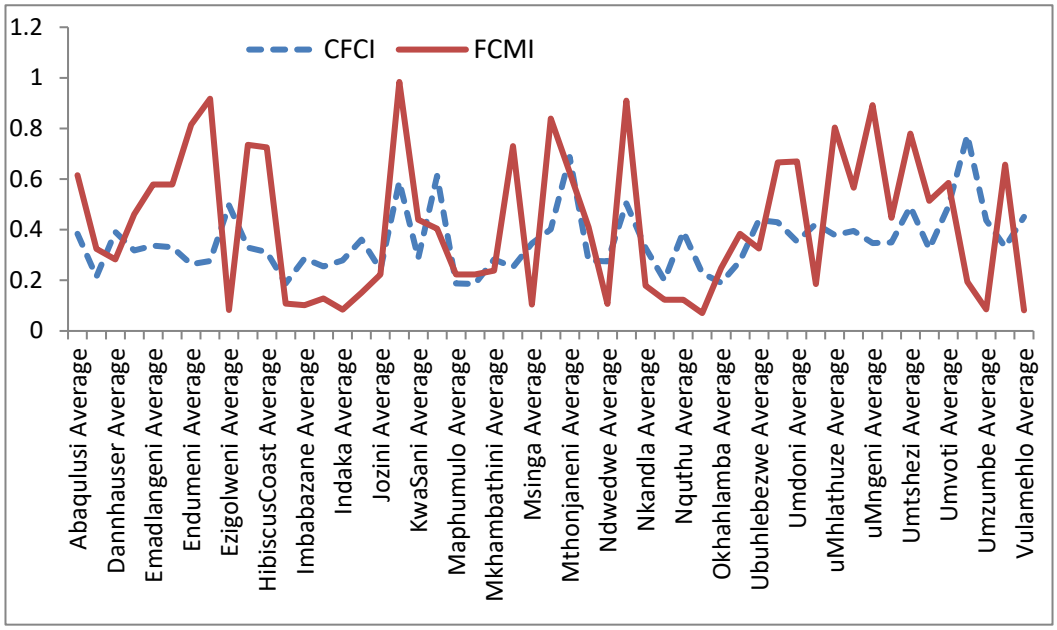

Figure 4: Average period CFCI and FCMI per municipality

Source*:* Authors' estimations

Both the Kendall's tau and the Spearman rank-order correlation coefficient suggest that there is very little correlation between the two indices. The two indices will, therefore, both be used in the evaluation of the municipalities' finances. The test statistics for the equality of the means of the two indices provide strong evidence of the presence of

municipal heteroscedasticity, decisively rejecting the null hypothesis of equal means, supporting the conclusions of the Kendall's tau and the Spearman rank-order correlations.

Factors Influencing the Financial Condition of Municipalities

A number of possible factors affecting municipal conditions are provided in the existing literature, as explained in Table 6.

Table 6: Possible factors

Factor	*Abbreviation*	*Description*
Population size	Popsize	Number of people residing in the municipality
Age profile	Age	Ratio of people of non-working age, i.e. number of people younger than 18 years plus those older than 60, divided by the total population.
Population density	Den	Population per a square kilometre (km^2)
Wealth of the population	Pov	Level of the prosperity of people living in the municipality measured by the ratio of people living below the lower poverty line as defined by Statistics South Africa divided by population size
Literacy levels	Lit	Level of the education attainment of people living in a municipality measured by the number of people functionally literate (completed grade 7 and higher) as defined by Global Insight (2018).
Revenue base	Gdp	Resources available for municipalities as indicated by the gross domestic product (constant prices).
Employment levels	Employ	Number of people formally employed in the municipal area.

The descriptive statistics of the relevant variables were inspected. This data was sourced from the Global Insight (2018) Regional Explorer and covers the period 2009 to 2015 for all 51 municipalities. Inspection reveals that none of these figures has normal distribution ($p<0.05$).

The covariance matrix, following Spearman rank-order and Kendall's tau tests, suggests that the set of variables for the most (except for Gdp and employment, popsize and literacy) is not individually correlated, since the tests showed that all coefficients of correlation are significantly less than unitary. The assumption is, therefore, that the set of variables gives a true report of the different constructs.

The covariance matrix (Table 7) suggests that the set of variables (popsize, age, pov, den, Gdp, employment and literacy) is individually correlated with the two municipal financial conditions indices (CFCI & FCMI) since the tests showed coefficients of correlation significant at a 5 per cent level.

Table 7: Covariance analysis: Spearman rank-order

Correlation *Probability*	*CFCI*	*FCMI*
Popsize	0.171905 0.0011*	0.177609 0.0007*
Ager	-0.153726 0.0036*	-0.556089 0.0000*
Pov	-0.229183 0.0000*	-0.576812 0.0000*
Den	0.131195 0.0131*	0.018220 0.7315
Gdp	0.149104 0.0048*	0.463691 0.0000*
Employment	0.177804 0.0007*	0.410706 0.0000*
Literacy	0.215012 0.0000*	0.309323 0.0000*

Note: * = Statistically significant ($p < 0.05$)

Source: Authors' own analysis using data from Global Insight Regional Explorer, 2018

The panel unit root test results are displayed in Table 8, except for employment and literacy because of size constraints. The results, including for literacy, suggest that the variables (except for employment) are indeed stationary, i.e., I(0). Employment will therefore not be included in the regression analysis.

Table 8: Unit root statistics for the panel

	CFCI	*FCMI*	*Popsize*	*Age*	*Pov*	*Den*	*Gdp*
Null: Unit root (assumes common unit root process)							
Levin, Lin & Chu t*	-10.841* (0.0000)	-38.532* (0.0000)	-6.555* (0.0000)	-31.588* (0.0000)	-12.183* (0.0000)	-5.419* (0.0000)	-13.499* (0.0000)
Null: Unit root (assumes individual unit root process)							
Im, Pesaran and Shin W-stat	-0.8217 (0.2056)	-7.450* (0.0000)	2.1102 (0.9826)	-18.512* (0.0000)	-3.124* (0.0009)	2.485 (0.9935)	-0.482 (0.3150)
ADF - Fisher Chi-square	136.29* (0.0132)	201.74* (0.0000)	165.92* (0.0001)	496.98* (0.0000)	180.11* (0.0000)	146.43* (0.0026)	122.80 (0.0787)
PP - Fisher Chi-square	175.27* (0.0000)	240.16* (0.0000)	210.40* (0.0000)	851.62* (0.0000)	252.33* (0.0000)	172.57* (0.0000)	257.69* (0.0000)

Note: * = Statistically significant ($p < 0.05$), p-values reported in parenthesis

Source: Authors' own estimates applying data from Global Insight Regional Explorer

The first pooled model regression equation of the financial condition index (FCMI) of the research is:

$$FCMIidt = \alpha + \beta 1Popidt + \beta 2AGEidt + \beta 3POVidt + \beta 4DENidt + \beta 5Gdpidt + \beta 6LITERACYid + \varepsilon idt \quad \text{eq. 5}$$

… where: α denotes the overall intercept term; β_1 to β_6 the regression coefficients and ε the error term. The regional identifiers are noted as id, while the time identifiers are noted as t (id = 1,...,N and t = 1,...,N). The output of the estimated regression is displayed in Table 9.

Table 9: Pooled regression equation – FCMI

Variable	$FCMI_{idt}$	*p-values*
α	1.625082000	0.0000*
β_1	0.000008000	0.0000*
β_2	-2.577866000	0.0003*
β_3	-0.136719000	0.69660
β_4	0.000058300	0.73550
β_5	0.000000024	0.0044*
β_6	-0.000015000	0.0000*
Adjusted R^2	0.16	
Durbin Watson	0.20	
F-statistic	11.88	0.000*
Schwarz criterion	0.23	
Sum of squared residuals	23.42	

Note: * = Statistically significant ($p < 0.05$)

The results suggest that all of the independent variables, except poverty and density, have statistically significant influences on the financial conditions of municipalities. Most of the various coefficients seem correct, except for the sign of literacy. Greater levels of literacy should be advantageous for municipalities, since greater literacy levels suggest greater household income levels and therefore a broader tax base. However, this could also suggest less dependence on municipal services, i.e. wealthier households consume less municipal services, and therefore municipalities have fewer revenue sources and income.

As a whole, the regression model seems to be significant at the five per cent level, having an F-statistic of 11.88. It is, however, suspected that the values of consecutive error terms are very near to each other, or at least positively correlated, as the Durbin-Watson test shows (0.20). The very low adjusted coefficient of determination (R^2 = 0.16) suggests that several factors were not taken into consideration, as municipal finances are such a complex phenomenon. Approximately 85 per cent of the variation could not be explained by this model.

The low predictive power of the equation argument is further supported through the inclusion of "fixed effects." The fixed effects assume most explanatory variables in the regression to be non-random. The model assumes that the specific estimators are located

within the system. With the assumption of individual-specific fixed effects, cross-section and period independent effects, all entities that determine correlations can be determined.

Group dummies for cross-sections and periods, which represent fixed effects, were then included. This eliminated any differences between regions or periods, both those visible but also other predictors. All activity across groups was absorbed by these fixed effect coefficients. What was left represents the within-group dynamics. Cross-section heterogeneity in the error terms is, therefore, built into the one-way error component model. This constitutes the financial conditions management index (FCMI), which is estimated as:

$$FCMI_{idt} = \alpha + \beta X_{idt} + F_{id} + \varepsilon_{idt} \qquad \text{eq. 6}$$

… where X_{idt} is the vector of explanatory variables (β_1 to β_6); F_{id} the cross-section or period effects; id = 1,...,N; and t = 1,...,N. The error term ε_{idt} consists of:

$$\varepsilon_{idt} = \mu_i + \nu_{it} \qquad \text{eq. 7}$$

… where μ_i is the unobservable individual effects and ν_{it} the well-behaved disturbance.

The inclusion of the cross-section fixed effects, i.e. the municipal individual-specific effects, greatly improves the overall performance of the regression equation in that the adjusted R-square increases from 0.16 to 0.89. The Durbin-Watson test improves from 0.20 to 1.76, suggesting that the errors are not correlated. The sum of squared residuals decreases from 23.42 to 2.59. The inclusion of period-fixed effects had, however, no significant overall effect on the overall performance of the regression equation, for example, adjusted R^2 decreased from 0.16 to 0.15. Chow or F-test was then applied to test the null hypothesis, which stated that there are no individual cross-section effects or effects between periods. This also combines the regression's residual sum of errors and tests for instances with constraints, but also those without.

The statistical cross-section fixed effects "F" now equal 41.93, which is greater than the critical value of 1.39 (F(n-1),(nt-n-k) at the five per cent probability value, thereby suggesting that the individual cross-section effects are valid. The period-fixed effects now get F equal to 0.23, which is smaller than the critical value of 2.13 (F(n-1),(nt-n-k) at five per cent probability, suggesting that the individual period effects are not valid.

The second CFCI pooled model regression equation is:

$$CFCI_{idt} = \alpha + \beta_1 Pop_{idt} + \beta_2 AGE_{idt} + \beta_3 POV_{idt} + \beta_4 DEN_{idt} + \beta_5 Gdp_{idt} + \beta_6 LITERACY_{id} + \varepsilon_{idt} \qquad \text{eq. 8}$$

The output table of this regression is displayed in Table 10.

Table 10: Pooled regression equation – CFCI

Variable	$CFCI_{idt}$	*p-values*
α	0.297300000	0.02120
β_1	0.000000540	0.41610
β_2	0.527436000	0.19190
β_3	-0.489178000	0.01620*
β_4	0.000276000	0.00590*
β_5	0.000000003	0.56250
β_6	-0.000001220	0.39520
Adjusted R^2	0.07	
Durban Watson	0.68	
F-statistic	5.41	0.003*
Schwarz criterion	-0.88	
Sum of squared residuals	7.82	

Note: * = Statistically significant ($p < 0.05$)

Variation in the financial conditions of municipalities is, therefore, explained by the variations of the independent variables. Except for poverty and density, the variables were statistically insignificant. Except for literacy, the signs of the statistically significant coefficients seem correct. As a whole, the regression model is significant at a five per cent level with the F-statistic equal to 5.41; however, consecutive error terms are still close to each other and/or positively correlated, with the Durbin-Watson test equal to 0.68. Approximately 90 per cent of the factors influencing municipal finances, in this regression, are, however, still unknown with the adjusted R^2 as low as seven per cent.

The inclusion of the cross-section fixed effects, i.e. the municipal individual-specific effects, as done in the previous regression equation, greatly improves the overall performance of the regression equation in that the adjusted R^2 increases from 0.07 to 0.48. The Durbin-Watson test improves from 0.68 to 1.35, suggesting that the errors are not correlated. The sum of squared residuals decreases from 7.82 to 3.77. In this case, the inclusion of the period-fixed effects also had a significant overall effect on the overall performance of the regression equation; for example, the adjusted R-square increased from 0.07 to 0.14.

The Chow or F-test was again applied to test the null hypothesis, which stated that there are no individual cross-section effects or effects between periods. The tests combine the

regression's residual sum of errors and test for instances with constraints, but also those without. Evaluating the cross-section fixed effects gives an F value of 6.57, which is greater than the critical value of 1.39 (F(n-1),(nt-n-k) at five per cent probability, suggesting that the individual cross-sectional effects are valid. The F equal to 5.57 for period-fixed effects is bigger than the critical value of 2.12 (F(n-1),(nt-n-k) at the five per cent probability, suggesting that the individual period effects are also valid.

The random effects model was also tested and the Hausman test applied. The results, however, revealed that the fixed-effect model is superior to the random-effects model. The null hypothesis, that suggests that the random-effects model is better than the fixed-effect model, was evaluated using the Hausman test (see Green, 2008). In essence, the Hausman test determines the null hypothesis, which states that the unique errors (u_{id}) are not related to the regressors.

However, both fixed-effects models suffer from heteroscedasticity. The models, therefore, need to be corrected for heteroscedasticity and contemporaneous correlation. This can be done by including cross-section weights and by computing coefficient covariance using the White cross-section method. The results of the modified fixed-effects models are displayed in Table 11.

Table 11: Modified fixed-effects models

Variable	$FCMI_{idt}$	*p-values*	$CFCI_{idt}$	*p-values*
α	1.803201	0.000*	1.304734	0.000*
β_1	0.0000035	0.000*	0.0000027	0.182
β_2	-2.3196030	0.015*	-2.8877210	0.000*
β_3	-0.4349210	0.015*	-0.1068700	0.385
β_4	-0.0016160	0.031*	0.0007340	0.598
β_5	0.0000000	0.026*	0.0000000	0.670
β_6	-0.0000059	0.006*	-0.0000008	0.833
Adjusted R^2	0.96852		0.727215	
Durbin Watson	1.902944		1.527158	
F-statistic	196.584	0.000*	17.947	0.000*
Sum of squared residuals	2.55161		3.665017	

Note: * = Statistically significant ($p < 0.05$). More detail on the empirical analysis is available on request.

Conclusions

This study investigated the financial position of municipalities in the province of KwaZulu-Natal, South Africa, over the period 2009 to 2015. It was found that the most significant factors affecting the financial condition are found to be the ratio of people of non-working age to the total population. The results also suggest that the unobservable municipally unique factors (cross-section effects) significantly affect municipal financial conditions and that these unobservable municipal-specific factors are correlated to the socio-economic variables.

In order to assess the financial position of municipal areas, a unique financial conditions measurement framework was designed, which includes two special indices. This study developed two indices to measure and evaluate the financial conditions of municipalities. A composite financial conditions index (CFCI) was weighted using a number of financial ratios; and a financial conditions management index (FCMI) was constructed using a financial ratio. The various individual and comparative tests employed in the study suggest that the two indices developed in this study are statistically significant in the explanation and evaluation of the financial conditions of local governments or municipalities and may be taken as a relatively reliable framework instrument.

The literature review indicated that there are a number of socio-economic factors that influence the financial conditions of municipalities; among others, population size, age profile of the population, density, poverty levels, and economic environment, to name a few. The current study focused on six socio-economic variables and developed two regression models, one for each of the indices, using the same set of socio-economic variables. The financial data of the 51 municipalities were taken from their annual financial statements.

The two models perform reasonably as pooled objects, while the inclusion of cross-section fixed effects greatly improved the models. The various tests also support the validity of the cross-section fixed effects. However, results following the inclusion of the period-fixed effects were mixed and were, therefore, excluded from the models. The cross-section fixed-effects models did, however, suffer from heteroscedasticity and serial correlation that were controlled for by including cross-section weights and for computing coefficient covariances using the White cross-section method.

The study establishes a benchmark against which the financial conditions of municipalities may: 1) be evaluated, monitored and compared over time and to others and each other; 2) investigate the impact of the socio-economic environment and changes thereof; and 3) find manners to enhance their financial performance.

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