Modelling Municipal Financial Conditions in KwaZulu-Natal – South Africa

Abstract

The commencement of the third millennium brought greater fiscal decentralisation in South Africa in that National Government has devolved much power and responsibilities to Municipalities. Municipalities have now many responsibilities for expenditures and revenues. Fiscal decentralisation has however created much variation in municipal financial conditions; some experience financial problems, whilst others do not. This paper presents a framework to assess the financial conditions of municipalities that adapts and reflects considerations on appropriate financial condition measures of municipalities.

In addition, municipalities need to know what factors determine the variation in their financial conditions. Therefore, the objectives of this study are, firstly, to develop two independent instruments to measure the financial condition of municipalities in the province of KwaZulu-Natal (KZN) South Africa and, secondly, to identify and examine a number of socio economic factors possible affecting the financial condition of these municipalities.

The data that was used for the study is from all 51 municipalities in KZN province from 2009 to 2015. The study used a panel data approach with two financial conditions indices as a dependent variable and a number of explanatory variables. The findings of the study suggest that in the absence of individual effects most of the selected socio-economic variables are relevant in terms of explaining some of the variation in municipal financial conditions. Cross-section fixed-effects does, however, significantly improve the overall performance of the model suggesting that it's rather the unobservable municipal unique factors affecting municipal financial conditions.

Keywords: Municipalities, Financial Conditions, Panel Data Econometrics, Fixed-Effects

JEL Classification codes: C23, G28, H72

1. Introduction

Municipalities or Local Government in South Africa (SA), 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 SA Constitution therefore dedicate municipalities with developmental objectives, organized from priorities to the basic needs of the local community in order to support them and support social change. 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 regards 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 and in particular the management of these financial conditions.

In SA, unfortunately, there has been widespread reporting on the worsening state of municipal finances, for example the Auditor-General state that “The most worrying factor, though was that a total of 26% of South African municipalities were in a particular poor financial position by the end of 2014-’15 and that there is material uncertainty with regard to their ability to continue operating in the foreseeable future.”

Wang, et al. (2007) states that financial condition of local government can be defined or conceptualized as its ability to sufficiently provide services to its current and future communities. This implies that municipalities has the ability and capacity to meets in future financial obligations. Zafra-Gómez (2009) went further to argue that the concept of financial condition is not a magnitude that can be observed directly, i.e., there is no single method by which it can be measured.

The Financial and Fiscal Commission (FFC, 2014) put forward the case that because municipalities in SA 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 conceptualized as situations and conditions affecting the financial conditions external and exogenous to the entity. Dennis (2004) further state that these variables in most cases relate to demographic and socioeconomic information.

I light of the above this study attempts to achieve to goals: First, we develop two indices for assessing the financial condition of municipalities, providing a useful framework of all the elements that make up the financial condition of a municipality, Second the study develops a system that takes into account a number of socioeconomic factors that possible affects the financial conditions of municipalities

The article is organized as follows: First, using a literature review approach, the various financial conditions measurement frameworks are discussed. Then, we investigate the possible socioeconomic factors affecting the financial conditions of municipalities using a literature review approach. Next, two indices of municipal financial conditions are constructed, analysed and compared. In the following section, we identify, analyse and model a number of socioeconomic factors possible affecting the financial condition of municipalities to 51 KwaZulu-Natal province municipalities with respect to the period 2009 to 2015. A panel data approach will be used. The final section of the article contains a discussion of the results achieved and some conclusions.

2. Financial Conditions Measurement Framework

A government's financial position (assets and liabilities) as well as its ability to sufficiently provide services and to meet obligations not only today but in the future is inherent in their financial condition (GASB, 1987). Dennis (2004) states that how well a municipality is able to provide for the needs and preferences of its communities generally depends on the financial resources available; and how such resources are allocated, distributed, and managed. Dennis (2004) further states that financial condition is evaluated primarily using some combination of financial and demographic indicators and ratios at a particular point in time or over a number of years and while some uniformity exist within either the broad areas of concern or the individual indicators, there is no general uniformity among the systems currently in use to assess financial condition.

Brown (1993) states that the analysis of financial conditions may not be a regular part of financial management for a municipality since it involves number of factors and related indicators. He describes a short test of financial conditions called the 10-point test that calculates 10 key financial ratios for a small city with a population under 100 000 people. The 10 key ratios are comprised of four basic factors of local government finance, which are: revenues; expenditures; operating position; and debt structure. The Brown financial performance measurement framework is displayed in the table below.

Table 1: Brown Financial Conditions Measurement Framework

Financial factors	Formula
Revenues	Total revenues / population
	Total general fund revenues from own sources / total general fund revenues
	General fund sources from other funds / total general fund sources
Expenditures	Operating expenditures / total expenditures
Operating position	Total revenues / total expenditures
	Unreserved general fund balance / total general fund revenues
	Total general fund cash and investments / total general fund liabilities
Debt structure	Total general fund liabilities / total general fund revenues
	Direct long-term debt / population
	Debt service / total revenues

Source: Brown (1993)

Ryan, Robinson and Grigg (2000) in their article suggested a number of key financial performance indicators that would be most suited to the needs of external stakeholders who cannot command special purpose reports, yet who may wish to assess the financial performance of individual local government councils. The authors state that they support the view in the literature that performance indicators need to be developed for all key activities of a local government, and that there needs to be a mix of both financial and non-financial measures. The study focusses predominantly on the concept of "fiscal soundness" which the authors argue is often called 'fiscal sustainability' or fiscal solvency. Fiscal soundness concerns the capacity of the organisation to meet present and future levels of debt and other financial obligations within the organisation's revenue constraints and embrace own source revenue reliance, revenue flexibility/intensity, indebtedness and liquidity. Ryan, Robinson and Grigg (2000) also argues that the issue of intergenerational equity is an important consideration for all levels of government, including local governments, i.e., net expenditure on the current generation should not be at the expense of future generations. The Ryan, Robinson and Grigg financial performance measurement framework is displayed in the table below.

Table 2: Ryan, Robinson and Grigg Financial Conditions Measurement Framework

Financial Indicator	Formula
Own Source Revenue	Own Source Revenue/Total Revenue
Revenue Flexibility/Intensity	Own Source Revenue/ Unimproved Capital Value or Capital Improved Value
Indebtedness	Debt/ Own Source Revenue
Liquidity	(Current Assets – Capital contributions not yet expended)/Current Liabilities
Intergenerational Equity	Adjusted Operating Balance/Total Operating Costs

Source: Ryan, Robinson and Grigg (2000)

Dennis (2004) conceptualized financial condition as a governments ability to 1) generate sufficient cash flow over a thirty to sixty days to pay its bills, 2) generate enough revenues over the normal budget period to meet expenditures without incurring deficits, 3) in the long run, pay all costs of doing business including annual expenditures and those appearing only in years in which they must be paid; and 4) provide services at levels and quality required for health, safety, and welfare of the community and that citizens desire

Financial condition was determined through ratio analysis using data from the 2001 Comprehensive Annual Financial for 1 600 Unites States of America cities. Dennis (2004) used a simple average of the four dimension indices as the score for total financial condition. The indicators and ratio's used by Dennis is displayed in the below table.

Table 3: Dennis Financial Conditions Measurement Framework

Indicators	Ratio
Cash solvency	Cash ratio
	Cash ratio
Budgetary solvency	Operating ratio
	Property tax revenue ratio
	Intergovernmental revenue ratio
Long-run solvency	Long-run solvency
	Outstanding general long-term debt ratio
	Governmental debt service ratio
	Unfunded pension liability ratio

Service-level solvency	Outstanding general long-term debt per capita
	General Fund operating revenues per capita
	General Fund expenditures per capita
	Debt Service Fund expenditures per capita
	Capital Project Fund expenditures per capita

Source: Dennis (2004)

Dennis (2004) sent the framework to several municipal chief financial officers in order to provide additional support that the identified dimensions and indicators provided reliability and adequately measured the concept of financial condition. All chief financial officers agreed the identified dimensions and indicators measured financial condition given the limitations of the data source. Cronbach alpha statistics were run on all indices representing the dimensions of financial condition to further test for internal reliability.

Chaney, Mead and Schermann (2002) states that municipal financial analysts use a variety of financial ratios based on fund accounting, demographics, and economic information. The analyses typically include the collection and processing of multiple pieces of fund-based accounting information and the calculation of a number of ratios to develop an overall financial opinion. Chaney, Mead and Schermann (2002) list six government-wide ratios. One ratio provides an overall measure of financial position. Two ratios provide measures of financial performance. A fourth ratio provides a measure of liquidity. Two final ratios provide measures of solvency. The Chaney, Mead and Schermann financial performance measurement framework is displayed in the table below.

Table 4: Chaney, Mead and Schermann Financial Conditions Measurement Framework

Financial Indicator	Formula
Financial position	Unrestricted net assets / Expenses
Financial performance	Change in net assets / Total net assets
	(General revenues + transfers) / Expenses
Liquidity	Current assets / Current liabilities)
Solvency	Long-term debt / Assets
	(Change in net assets + interest expense) / Interest expense

Source: Chaney, Mead and Schermann (2005)

Gomes, Alfinito and Albuquerque (2013) in their article "Analyzing Local Government Financial Performance: Evidence from Brazilian Municipalities 2005-2008" states that some combination of resources and skills should lead to superior financial performance. Sources of financial performance in municipalities include Mayor Qualifications that use educational background and job-related experience. They argue that educational background and job related experience should be positively correlated with financial performance. Municipal performance should also be correlated with organization size, because of control over resources and economies of scale. Larger municipalities, as measured by population size, are more likely to raise revenue due to economies of scale. The study also states that "central administrative costs are lower in larger local municipalities". Municipal financial performance therefore should be positively correlated with the size of the population. The Gomes, Alfinito and Albuquerque financial performance measurement framework is displayed in the table below.

Table 5: Gomes, Alfinito and Albuquerque Financial Conditions Measurement Framework

Financial Indicator	Formula
Mayoral Quality (MQ)	MQ = A x EB x PAE
Mayor's Age (A)	
Educational Background (EB)	
Public Administrative Experience (PAE)	
Population Size	

Source: Gomes, Alfinito and Albuquerque (2013)

Ritonga (2014) in his Doctor of Philosophy dissertation "Modelling Local Government Financial Conditions in Indonesia" uses six dimensions to measure financial conditions, i.e., short-term solvency; budgetary solvency, long-term solvency, financial independence, financial flexibility, service-level solvency. Each of these six dimensions in turn has its own indicators. The study defines the financial condition of a local government as the financial capability of a local government to fulfil its obligations, to anticipate unexpected events and to execute its financial rights efficiently and effectively.

Table 6: Ritonga Financial Conditions Measurement Framework

Indicator	Dimension
A. (Cash and cash equivalent +short –term investment)/Current liabilities	Short-term Solvency

B. (Cash and cash equivalent +short-term investment +account receivables)/Current liabilities	
C. Current assets/Current liabilities	
A. Total assets/Current labilities	
B. Investment equities/Long-term liabilities	Long-term Solvency
C. Investment equities/Total assets	
A. (Total revenue –special allocation fund revenue)/Total expenditure- capital expenditure)	
B. (Total revenues special allocation fund revenue)/Operational expenditure)	Budgetary Solvency
C. (Total revenue-special allocation fund revenue)/Employee expenditure	
D. Total revenue/Total expenditure	
A. Total own revenue/Total revenue	
B. Total own revenue/Total expenditure	Financial Independence
A. (Total revenue -special allocation fund revenue-employee expenditure)/(Repayments of loan principal + interest expenditure)	
B. (Total revenue –special allocation fund revenue-employee expenditure)/Total liabilities	Financial Flexibility
C. (Total revenues- special allocation fund revenue-Employee expenditure)/Long-term liabilities	
D. (Total revenue-special allocation fund revenue)/Total liabilities	
A. Total equities/Population size	
B. Total assets/Population size	Service-level Solvency
C. Total expenditure/Population size	

Source: Ritonga (2014)

Maphalla (2015) in his MPhil in Development Finance dissertation "Financial Performance of Local Government: Evidence from South Africa" states that financial performance is generally measured using financial ratios which measure revenue, operating income, profit, the strength of the balance sheet, cash flow, levels of debt, the ability to meet financial commitments, and 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 the financial measures and ratios in determining the financial health and financial performance of local government. The Maphalla financial performance measurement framework is displayed in the table below.

Table 7: Maphalla Financial Conditions Measurement Framework

Financial Indicator	Formula

Cash as a percentage of operating expenditure	Cash/Operating Expenditure
Persistence of negative cash balances	
Over / (Under) spending of original operating budgets	Budgeted Spending - Actual Spending
Under spending of original capital budgets	Budgeted Spending - Actual Spending
Debtors as a percentage of own revenue	Debtors/Own Revenue
Year of year growth in debtors	$(Debtors_t – Debtors_{t-1})/Debtors_{t-1}$
Creditors as a percentage of cash and investments	Creditors/(Cash + Investments)
Reliance on national and provincial transfers	Own Revenue/Total revenue

Source: Maphalla (2015)

Turley et al. (2015) develop a financial performance measurement framework for Ireland using a five measure framework, including liquidity, autonomy, operating performance, collection efficiency and solvency given the importance of these aspects of financial health of both private- and public sector entities. Liquidity is measured by the current ratio and the average collection period and measures the ability of a municipality to meet is short term obligations without having to liquidate assets or close down. Autonomy is measured by the self-income ratio which is the ratio of own-source income divided by total income and gives an indication how dependent a municipality is on national government for income, as opposed to own-source revenue. Operating performance is measured by the operating surplus/deficit ratio i.e., operating surplus/deficit divided by total income. The collection efficiency ratio is the amount collected divided by the total amount for collection. Solvency focusses on the long-term financial health and survival of the municipality and is measured by net financial liabilities, net financial liabilities ratio, debt-to-income ratio and the debt-to-assets ratio. The Turley et al. financial performance measurement framework is displayed in the table below.

Table 8: Turley et al. Financial Conditions Measurement Framework

Measure	Financial indicators	Formula
Liquidity	Current ratio	Current assets/Current liabilities
	Average collection period	(Rates arrears X 365)/Rates income
Autonomy	Self-income ratio	Own-source income/Total income

Operating performance	Operating surplus/ (deficit) per resident	Operating income operating expenditure/Number of residents
	Operating surplus /(deficit)per resident	(Operating income - operating expenditure)/Total income
Collection efficiency	Commercial rates	Commercial rates collected/Total commercial rates for collection
	Housing rents collection efficiency ration	Housing rents collected/Total housing rents for collection
	Commercial water charges collection efficiency ratio	Commercial rates collected/Total commercial rates for collection
	Housing rents collection efficiency ratio	Housing loans collected/Total commercial water charges for collection
	Commercial water charges collection efficiency ratio	Commercial water charges collected/Total commercial water charges for collection
	Housing loans collection efficiency ratio	Housing loans collected/Total housing loans for collection
Solvency 1	Net financial liabilities Net financial liabilities ratio	(Total liabilities - financial assets)/Total income
	(Gross)Debt-to-income ratio	Total liabilities/Total income
	Debt-to-assets ratio	Total liabilities/Total assets

Source: Turley et al. (2015)

3. Factors Affecting the Financial Condition of Municipalities: A Literature Review

Berne and Schramm (1986) in their book “Financial Analysis of Governments” list financial community tastes and needs (poverty, education, unemployment, etc.), local conditions affecting production and distribution of public goods and services (population density, size, climate, etc.), the costs of labour, capital and other productive resources (wage rates, interest rates, etc.), the wealth of the community (income, property values, retail sales, etc.), the political and governmental structure in the locality and surrounding area (dominance of

local government, city manager form, etc.), federal and state policies affecting local resources, constraints and responsibilities and government financial policies and practices (tax rates, debt, etc.) as major factors of governments' financial conditions.

Nollenberger, et al (2004) in their book "Evaluating Financial Condition: A Handbook for Local Government" identify three factors impacting on the financial conditions of local government; 1) financial factors comprising of revenues, expenditures, operating position, debt structure, unfunded liabilities and the condition of capital plant; 2) organisational factors that consist of the responses of management and legislative policy and 3) environmental factors that comprise of community needs and resources, intergovernmental constraints, disaster risk, political culture and external economic conditions.

Dennis (2004) in her PhD dissertation states that demographics, size of local government, supply and age of infrastructure, financial position of the government, and the local economy are only a few of the factors affecting what public goods and services citizens prefer. Dennis (2004) proposes the inclusion of a number of control variables including the form (type) of government, population, per capita income, percentage of population with high school education, median age and percentage of population over 16 employed.

Honadle et al. (2004) in their article "Analysing Rural Local Governments' Financial Condition" states that there are a larger number of components effecting local government financial conditions including the frequency and severity of occurrence of natural disasters in a local government area; the state of the national economy; the structure of the local economic base; the tax bases of a local government; the relevant tax rates in a local government; the population changes; the labour costs; and the pressure from the voting public for public services.

Wang et al. (2007) in their article "'Measuring financial condition: A Study of US states" uses a number of socio economic variables including, population and its growth rate, personal income per capita and its growth rate, gross state product and its growth rate, change in employment, economic momentum index and its rank change. The authors state that although these factors may affect financial conditions they are not financial conditions per se and that is unknown how exactly these factors affect financial conditions. The authors conclude by stating that these socio-economic variables are significantly correlated with financial conditions of local governments an can be used to predict financial conditions with a certain degree of accuracy.

Jones and Walker (2007) in their article "Explanators of Local Government Distress" investigated the sources of local government financial distress through a statistical model.

They employed a multiple regression model using data from a sample of 161 councils for 2001 and 2002. The results indicate that the size of the population and the degree of distress in local councils is positively associated as well as the composition of their revenues. The council's revenue generating ability had the strongest statistical impact on local government distress.

Carmeli (2002b) in his article "Relationship between organizational and structural characteristics and local authority's fiscal health" examined the relationship between the local government financial health and three explanatory variables namely the demographic characteristics; community's socioeconomic status; and the perceived organisational reputation of local government. The results of the multiple regression analysis found that local government financial health is positively related to the community's socioeconomic status and demographic characteristics. The three factors collectively explained around 51 percent of the variance of the financial health of the local governments.

Zafra-Gomez et al. (2007) in their article "Developing a Model to Measure Financial Condition in Local Government" states that the socioeconomic variables they included 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 used by national and regional governments to determine the required spending needed by local governments and their associated national financial transfers and support. The included socioeconomic variables are, domestic income per capita, registered unemployment, industrial activity, commercial activity, tourism activity, population aged less than 14 years, population age more than 65 years, net migration rate and dwellings per capita. Using regression analysis by ordinary least squares they found that financial conditions largely depend on the characteristics of the social and economic environment and so the ability to generate own revenue, i.e., economic level of the local population and taxes levied on housing.

4. Developing an Index of Municipal Financial Condition

This study will focus on two methodologies in developing a composite municipal financial conditions index for the province of KwaZulu-Natal, i.e., Ritonga (2014) and Gomes et al. (2013).

4.1 The Ritonga methodology

The Ritonga methodology is very much a holistic methodology based on the standard financial ratio approach. The approach incorporates the standard Financial Conditions/Performance Measurement Framework as set out in the previous heading. The Ritonga (2014) methodology in developing the composite financial conditions index for municipalities are displayed in the below table.

Table 9: Ritonga Financial Conditions Measurement Framework

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

Source: Ritonga (2014)

The length of observation period was seven years, from the financial year 2009 to 2015 incorporating all 51 municipalities in the province. There were 357 financial statements

available as published by National Treasury (NT). The municipal financial data was obtained from the NT Municipal Finance Data website, i.e., https://municipaldata.treasury.gov.za/. Based on data availability, ratios for each of the 16 indicators (categorised in six dimensions) were calculated. The descriptive statistics for each of the indicators are displayed in the table below. The result of the descriptive statistic can be used as a benchmark or "industry ratio" by municipalities.

The statistics suggest that none of these ratios are normally distributed ($p<0.05$). Non-normality may increase the chance of a false positive result when using a test that assumes normality. However the model makes no assumptions about normality and therefore these is no need for the independent variables to be normally distributed. None the less it's relevant to understand the distribution of predictor variables to find influential outliers or concentrated values.

Table 10: Descriptive Statistics of the Ratios

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

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

Source: Authors' own analysis using data from National Treasury

Ritonga (2014) used the Pearson, Spearman rho and Kendall tau correlation tests to assess the reliability of the indicators forming each dimension. The reason for using the three tests together is to anticipate for non-normal data distribution and non-linear relationships between variables. Since the Pearson correlation test requires that the data tested have the

characteristics of normal distribution and linear relationships between variables it was not used in this case. The Spearman rho and Kendall tau tests on the other hand do not make such assumptions and therefore were used.

The results of the Spearman rho and Kendall tau tests of the six sets of ratios are presented in Table and Table. The results shows that the six sets of ratios were individually significantly correlated (p-values < 0.05) with high intensity correlation, because all tests showed coefficients of correlation nearly equal to 1 for all pairs. It can therefore be concluded that the six set of ratios measure the same construct or dimension.

Table 11: Covariance Analysis: Spearman rank-order

Correlation Probability			
	LIQUIDITYA	LIQUIDITYB	LIQUIDITYC
LIQUIDITYA	1		

LIQUIDITYB	0.97517*	1	
	0	-----	
LIQUIDITYC	0.758949*	0.790632*	1
	0	0	-----
	SOLVENCYA	SOLVENCYB	SOLVENCYC
SOLVENCYA	1		

SOLVENCYB	0.299129*	1	
	0	-----	
SOLVENCYC	-0.168177*	0.859307*	1
	0.0014	0	-----
	BUDGETA	BUDGETB	BUDGETC
BUDGETA	1		

BUDGETB	0.948148*	1	
	0	-----	
BUDGETC	0.79624*	0.752709*	1
	0	0	-----
	INDEPENDENCEA	INDEPENDENCEB	
INDEPENDENCEA	1		

INDEPENDENCEB	0.966237*	1	
	0	-----	
	FLEXIBILITYA	FLEXIBILITYB	
FLEXIBILITYA	1		

FLEXIBILITYB	0.747294*	1	
	0	-----	
	SERVICEA	SERVICEB	SERVICEC
SERVICEA	1		

SERVICEB	0.976639*	1	
	0	-----	
SERVICEC	0.847937*	0.896628*	1
	0	0	-----

Note: * = Statistically significant (p < 0.05)

Source: Authors' own analysis using data from National Treasury

Table 12: Covariance Analysis: Kendall tau

Correlation Probability			
	LIQUIDITYA	LIQUIDITYB	LIQUIDITYC
LIQUIDITYA	0.999715 -----		
LIQUIDITYB	0.944485* 0	0.999731 -----	
LIQUIDITYC	0.608482* 0	0.642396* 0	0.999731 -----
	SOLVENCYA	SOLVENCYB	SOLVENCYC
SOLVENCYA	0.999747 -----		
SOLVENCYB	0.20394* 0	0.999731 -----	
SOLVENCYC	-0.117044* 0.001	0.678762* 0	0.999747 -----
	BUDGETA	BUDGETB	BUDGETC
BUDGETA	0.999668 -----		
BUDGETB	0.804352* 0	0.999668 -----	
BUDGETC	0.602548* 0	0.553774* 0	0.999668 -----
	INDEPENDENCEA	INDEPENDENCEB	
INDEPENDENCEA	0.999668 -----		
INDEPENDENCEB	0.853347* 0	0.999668 -----	
	FLEXIBILITYA	FLEXIBILITYB	
FLEXIBILITYA	0.999304 -----		
FLEXIBILITYB	0.560722* 0	0.999747 -----	
	SERVICEA	SERVICEB	SERVICEC
SERVICEA	1 -----		
SERVICEB	0.907201* 0	1 -----	
SERVICEC	0.6746* 0	0.728786* 0	1 -----

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

Source: Authors' own analysis using data from National Treasury

The Cronbach alpha test was then used to analyse the reliability (i.e. internal consistency) of the 16 ratios, to determine whether they reliably measure the same underlying construct (i.e. financial condition of a municipality). The Cronbach coefficient alpha is 0.769 as displayed the table below. Based on the coefficient, it can be concluded that the 16 indicators demonstrate good internal consistency (reliability) to measure the same construct (financial condition of local government) because it is more than 0.70.

Table 13: Results of the Cronbach alpha test

Source of Variation	SS	df	MS	F	P-value	F crit
Rows	6859.941	356	19.2695	4.326011	4.7E-123	1.131291
Columns	5904.864	15	393.6576	88.37631	2.1E-243	1.668258
Error	23786.14	5340	4.454334			
Total	36550.95	5711				
Cronbach coefficient alpha			0.76884			

Source: Authors' own analysis using data from National Treasury

This study does not assume equal importance of the six dimensions and therefore proposes the development of a weighted composite financial conditions index. The Analytic Hierarchy Process (AHP) was proposed by Ritonga (2014) to analyse the weight of each the six dimensions comprising the composite financial conditions index. To determine the weight, this study used response of three respondents.

Table 14: Pairwise Comparison Matrix

			x			
y	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

A number in row x-th and column y-th is the relative importance of dimension x compared to dimension y. The scale ranges from 1 to 6, which can be interpreted as follows:

Mxy = 1 if the two dimensions are equally important
Mxy = 2 if dimension x is slightly more important than dimension y
Mxy = 3 if dimension x is more important than dimension y
Mxy = 4 if dimension x is much more important than dimension y
Mxy = 5 if dimension x is absolutely more important than dimension y

The next step is to calculate the values of eigenvectors of the pair-wise comparison matrix. The larger the eigenvector value of a dimension, the more important is the dimension. The general principle matrix multiplication is done by multiplying the values of the first row of the

matrix with the values of the first column of the matrix. The result of squaring the matrix is displayed the table below.

Table 15: Calculation of priority (i.e., normalized eigenvector)

	Liquidity	Solvency	Budget	Independence	Flexibility	Service	Sum	Eigenvector
Liquidity	6.00	4.83	7.25	17.50	17.50	30.00	83.08	0.225295
Solvency	9.00	6.00	9.75	27.50	27.50	44.00	123.75	0.33557
Budget	6.67	5.00	6.00	18.50	17.83	32.67	86.67	0.235012
Independence	2.15	1.73	2.48	6.00	6.00	10.58	28.95	0.078503
Flexibility	2.23	1.82	2.40	6.25	6.00	11.00	29.70	0.080537
Service	1.22	0.96	1.45	3.50	3.50	6.00	16.63	0.045082

Source: Authors' own analysis using data from National Treasury

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 is squared again and the above step to calculate the eigenvector is redone to obtain a new eigenvector (E2). A comparison between the first and second eigenvectors is done. If both values show no change or only slight change, it means that the value of the first eigenvector is correct. However, if otherwise, then the first eigenvector is wrong; repeat again the process until the eigenvector is unchanged or only slightly changed. In this case the process was done 5 times until the values were consistent. The weights are displayed in the table below.

Table 16: Weights matrix

Dimension	Weights
Liquidity	0.23
Solvency	0.33
Budget	0.23
Independence	0.08
Flexibility	0.08
Service	0.05

Source: Authors' own analysis using data from National Treasury

A consistency index (CI) is calculated in order to assess the consistency of the respondents' answers. The Weighted Sum Vector is calculated by multiplying the rows of the Pairwise Comparison Matrix (table) by the last column of the Weights Matrix (table). Then the result is added horizontally for each row as follows displayed below.

Table 17: Weighted Sum Vector

Row	Weighted Rating
Row1	1.425375
Row2	2.054751
Row3	1.448889
Row4	0.498268
Row5	0.50893
Row6	0.285246

Source: Authors' own analysis using data from National Treasury

Lambda (λ) is the average of the weighted sum vector row weighted rating (table) multiplied by its weight (table). In this case, lambda is 6.221. The formula to calculate the consistency index is

$$CI = (\lambda - n)/(n-1)$$

where n is the sum of the dimensions being compared. In this case, n is six. The result of the consistency index is 0.04429. The consistency ratio (CR) is the result of the Consistency Index (CI) divided by the Random Index (RI), i.e.,

$$CR = CI/RI$$

The random index is a function of the number of alternatives or dimensions being compared. The random indexes are shown in the following table:

Table 18: Random indexes for various numbers of alternatives

Number of alternatives (n)	RI
2	0.0
3	0.58
4	0.90
5	1.12
6	1.24
7	1.32
8	1.41

Source: Authors' own analysis using data from National Treasury

The number of alternatives compared is six, so the random index is 1.24. Therefore, the consistency ratio is 0.0357 or 3.6%. The consistency ratio is less than 10%, so it can be concluded that the respondents' answers is consistent.

Table 20 shows that the dimension with the largest weight is the dimension of long-term solvency, followed by the dimensions of budgetary solvency, short-term solvency, financial flexibility, financial independence and service-level solvency. This means that the dimensions of long-term solvency and budgetary solvency are considered the two most important dimensions among the dimensions comprising the financial condition of

municipalities. On the other hand, the dimension of service-level solvency is considered the least important of the elements of financial condition

Table 20: Weights of the Composite Financial Conditions Index

Dimension	Weights (%)
Liquidity	22.91062
Solvency	33.02683
Budget	23.28857
Independence	8.008863
Flexibility	8.180237
Service	4.584878

Source: Authors' own analysis using data from National Treasury

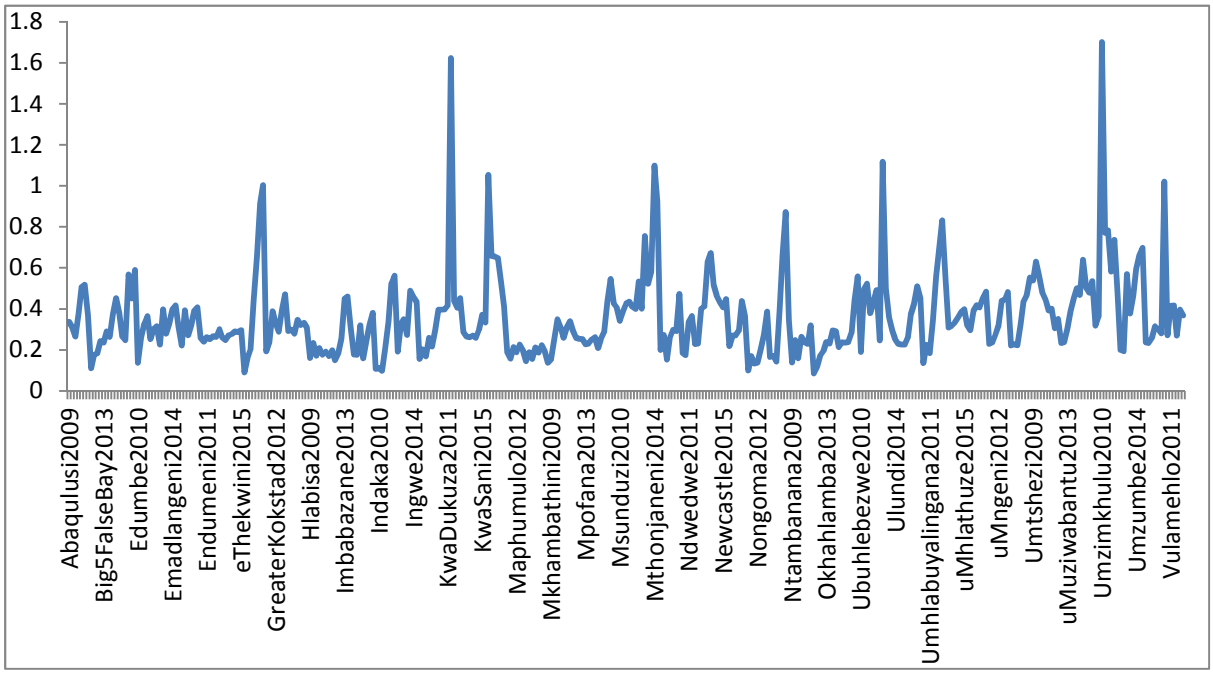
Now that the weight of each dimension is determined, the final step is to develop the composite financial condition index. The formula to create the index is as follows:

$$CFCI = w_1 * DI_1 + w_2 * DI_2 + \ldots\ldots + w_n * DI_n \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

where: CFCI = composite financial condition index; w = weight of dimension index; DI = dimension indicator; n = number of dimension indicators.

The composite financial condition index for the 51 municipalities from 2009 to 2015 is displayed in the graph below.

Graph 1: Composite Financial Condition Index based on Ritonga



4.2 The Gomes et al. methodology

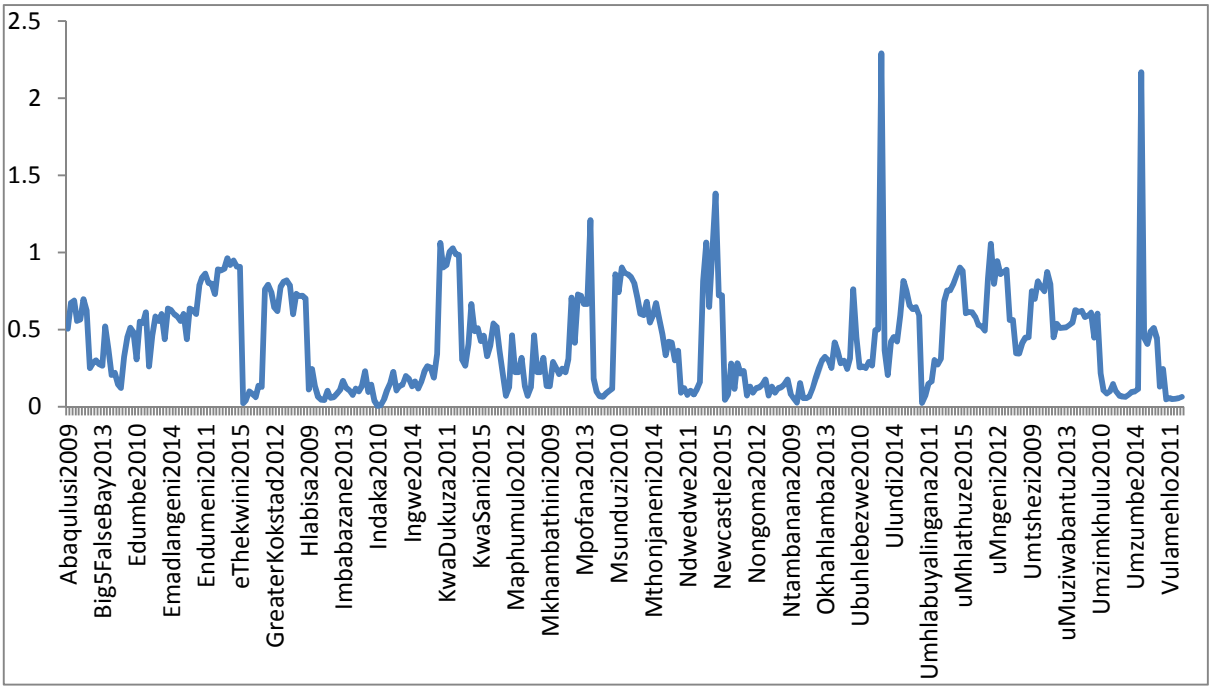
The Gomes et al. methodology is based on the level of self-sufficiency of municipalities in terms of wisely managing financial resources (total revenues ratio total expenditures), and, therefore, the level of dependence upon external sources of revenues. Three indexes, namely property tax revenue, services tax revenue, and total expenditure, are combined in order to derive an overall measure of dependence upon external sources of revenue, which we labelled as Financial Conditions Management Index (FCMI), and calculated, by the following formula:

FCMI = (PTPI + STPI) / TEPI

where PTPI = Property Tax Performance Index, STPI = Service Tax Performance Index, and TEPI = Total Expenditure Performance Index. The length of observation period was seven years, from the financial year 2009 to 2015 incorporating all 51 municipalities in the province. There were 357 financial statements available as published by National Treasury (NT). The municipal financial data was obtained from the NT Municipal Finance Data website, i.e., https://municipaldata.treasury.gov.za/

The financial conditions index as proposed by Gomes et al (2013) is displayed in the graph below. The FCMI is a number between 0 and 1. As FPMI approaches zero, the reliance upon transfers increases and, therefore, the financial situation of the municipality becomes weaker. The interpretation of the index is that the higher the FPMI, the better the municipal financial conditions, as the municipality becomes less dependent upon transfers.

Graph 2: Financial Condition Management Index based on Gomes et al



5. Comparing the Two Municipal Financial Condition Indices

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

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

Graph 3: Average Annual CFCI and FCMI

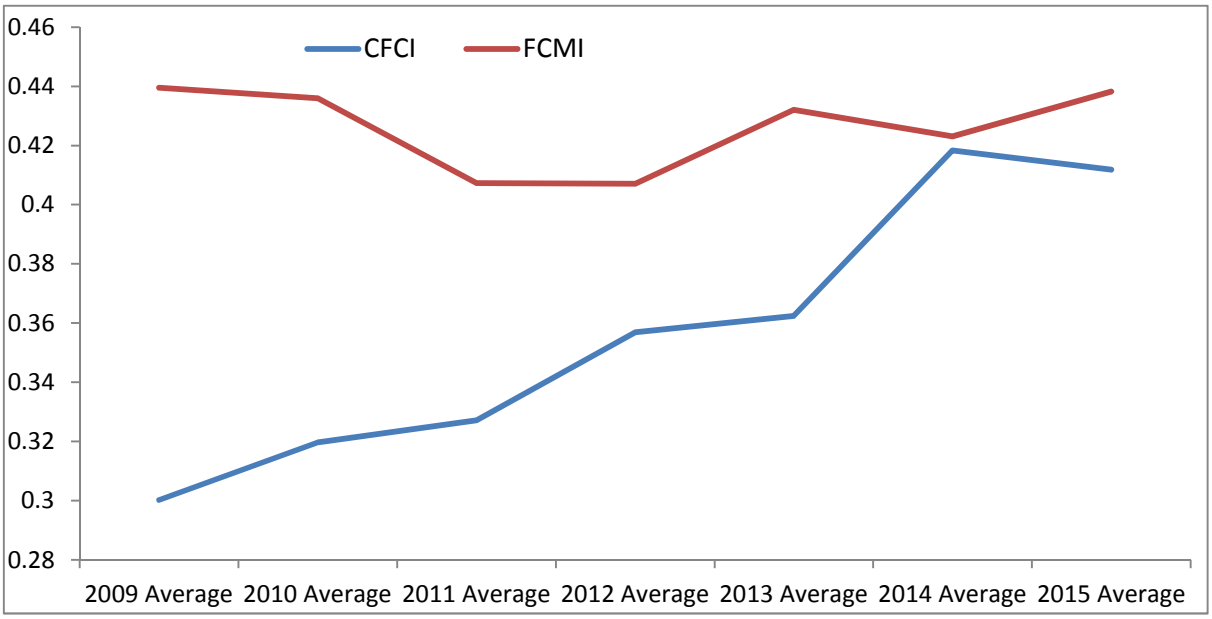


Table 21 displays the descriptive statistics of the two indices. Both the indices are not normally distributed ($p<0.05$). The descriptive statistics indicates that the FCMI is indeed much more volatile (standard deviation FCMI = 0.32 compared to standard deviation of CFCI = 0.19). However the FCMI has a much lower skewness and kurtosis value indicating that the FCMI displays greater symmetry around the sample mean and contains fewer outliners.

Graph 4: Average Period CFCI and FCMI per Municipality

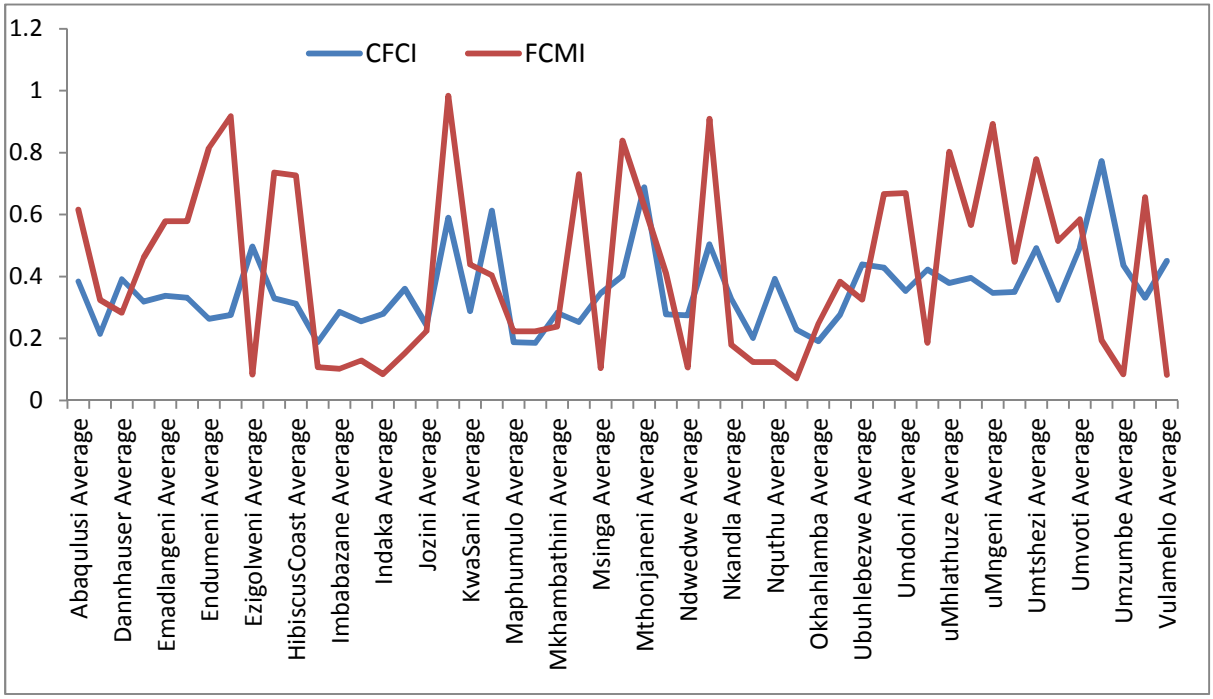


Table 21: Descriptive Statistics of the Two Indices

	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

Note: * = Statistically significant (p > 0.05)

Both the Kendall's tau and the Spearman rank-order correlation coefficient suggest that there is very little correlation between the two indices. Both the two indices will therefore be used in analysing the factors affecting the financial condition of the municipalities.

Table 22: Covariance Analysis: Kendall's tau

Correlation Probability		
	CFCI	FCMI

CFCI	1.000000 -----	
FCMI	0.223098 0.0000*	0.999670 -----

Note: * = Statistically significant (p < 0.05)

Table 23: Covariance Analysis: Spearman rank-order

Correlation Probability		
	CFCI	FCMI
CFCI	1.000000 -----	
FCMI	0.326325* 0.0000	1.000000 -----

Note: * = Statistically significant (p < 0.05)

The test statistics for the equality of the means of the two indices provide strong evidence of the presence of municipal heteroskedasticity, decisively rejecting the null hypothesis of equal means supporting the Kendall's tau and the Spearman rank-order correlation results.

Table 24: Test for Equality of Means between CFCI and FCMI

Method	df	Value	Probability
t-test	712	-3.495456*	0.0005
Satterthwaite-Welch t-test*	590.4297	-3.495456*	0.0005
Anova F-test	(1, 712)	12.21821*	0.0005
Welch F-test*	(1, 590.43)	12.21821*	0.0005

*Test allows for unequal cell variances

Note: * = Statistically significant (p < 0.05)

6. Analysing Factors Affecting the Financial Condition of Municipalities

The literature alludes to a number of possible factors affecting municipal conditions. These are displayed in the table below.

Table 25: Possible Factors

Factor	Abbreviation	Description
Population Size	Popsizea	Number of people residing in the municipality
Age Profile	Ager	Composition of the population of working age and non-working age, i.e., ratio of the sum of people under 18 years old and over 60 years old divided by

		population size.
Population Density	Den	Number of people living in a square kilometre
Wealth of the Population	Povr	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	Literacy	Level of the education attainment of people living in the municipality measured by the number of people functionally literate (completed grade 7 and higher) as defined by Global Insight
Revenue Base	Gdp	Resource available for municipalities measured by using the gross domestic product at constant prices
Employment Levels	Employment	Number of people formally employed in the municipality

The descriptive statistics of the above variables are displayed in the table below. The data are sourced from the Global Insight Regional Explorer and covers the period 2009 to 2015 for all 51 municipalities. The statistics suggest that none of these variables are normally distributed ($p<0.05$).

Table 26: Descriptive Statistics of the Variables

	Popsizea	Ager	Povr	Den	Gdp	Employment	Literacy
Mean	205437.7	0.521737	0.534335	127.7203	8984333.	39947.34	111329.5
Median	107510.6	0.537870	0.570519	62.98026	2031677.	10927.80	50382.81
Maximum	3730434.	0.627774	0.686842	1473.086	2.82E+08	1148841.	2480758.
Minimum	11810.17	0.382121	0.274667	9.709478	513343.5	2990.784	5816.471
Std. Dev.	486435.3	0.057905	0.098617	221.4110	36595762	149842.2	323479.4
Skewness	6.502342	-0.542222	-0.822792	4.506211	6.744646	6.678058	6.566582
Kurtosis	45.09223	2.381486	2.631349	24.48183	47.50919	46.72002	45.71063
Jarque-Bera	28870.56	23.18388	42.30227	8072.558	32175.05	31086.16	29700.59
Probability	0.000000	0.000009	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	73341249	186.2601	190.7575	45596.13	3.21E+09	14261200	39744645
Sum Sq. Dev.	8.42E+13	1.193676	3.462193	17452135	4.77E+17	7.99E+12	3.73E+13
Observations	357	357	357	357	357	357	357

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

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

The below covariance matrix suggest that the set of variables for the most (except for gdp and employment, popsizea and literacy, dgp and literacy and employment and literacy) are

not individually correlated, since the tests showed coefficients of correlation significant less than 1 for all pairs. It can therefore be concluded that the set of variables measure different constructs. The results of the Spearman rank-order test are confirmed by the results of the Kendall's tau test.

Table 27: Covariance Analysis: Spearman rank-order

Correlation Probability	Popsizea	Ager	Povr	Den	Gdp	Employment	Literacy
Popsizea	1.000000						

Ager	0.072770	1.000000					
	0.1701	-----					
Povr	-0.012043	0.865763	1.000000				
	0.8206	0.0000*	-----				
Den	0.417062	-0.249975	-0.240346	1.000000			
	0.0000*	0.0000*	0.0000*	-----			
Gdp	0.679289	-0.428491	-0.405538	0.267043	1.000000		
	0.0000*	0.0000*	0.0000*	0.0000*	-----		
Employment	0.675393	-0.470360	-0.456557	0.279474	0.936525	1.000000	
	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	-----	
Literacy	0.966661	-0.079338	-0.155178	0.418228	0.777906	0.757915	1.000000
	0.0000*	0.1346	0.0033*	0.0000*	0.0000*	0.0000*	-----

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

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

The below covariance matrix suggest that the set of variables (popsizea, ager, povr, den, gdp employment and literacy) are individually correlated with the two municipal financial conditions indices, since the tests showed coefficients of correlation significant at the 5 percent level.

Table 28: Covariance Analysis: Spearman rank-order

Correlation Probability	CFCI	FCMI
Popsizea	0.171905	0.177609
	0.0011*	0.0007*

Ager	-0.153726 0.0036*	-0.556089 0.0000*
Povr	-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

The results of the panel unit root test for the variables are displayed in the table below except for employment and literacy because of size constraints. The results, including for literacy and employment, 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 29: Unit Root Statistics for the Panel

	CFCI	FCMI	Popsizea	Ager	Povr	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)

p-values reported in parenthesis

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

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

The first regression equation (pooled model) developed in this study is as follows:

$FCMI_{idt} = \alpha + \beta_1 Pop_{idt} + \beta_2 AGER_{idt} + \beta_3 POVR_{idt} + \beta_4 DEN_{idt} + \beta_5 GDP_{idt} + \beta_6 LITERACY_{id} + \varepsilon_{idt}$

where:

$FCMI_{idt}$ = financial condition index; α = overall intercept term; β_1 to β_6 = regression coefficients; Pop = population size; AGER = age profile of municipality; POVR = wealth of community; DEN = population density; GDP = revenue base; LITERACY = the education attainment, ε = error term. The regional identifiers are noted as id whilst the time identifiers are noted t (id = 1,...,N and t = 1,...,N). The results of the regression equation is displayed in the table below.

Table 30: 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 variables, except poverty and density, are statistically significant in explaining the financial conditions of municipalities. The signs of the various coefficients for the most part seems correct except for literacy. Greater levels of literacy should be advantages towards municipalities since greater literacy levels suggest greater household income levels and therefor a higher tax base. However this could also suggest less dependence on municipal services, i.e., wealthier households consumes less municipal services and therefore municipalities have fewer revenue sources and income.

The F-test (11.88) suggest that the regression model as a whole is significant at the 5 percent level. The very low Durbin-Watson test (0.20) suggest that successive error terms

are, on average, close in value to one another, or positively correlated. The very low adjusted R-square (0.16) suggests that the financial condition of municipalities are a complex phenomenon in that more almost 85 percent of the variation in the financial condition is explained by unknown variables.

The low predictive power of the equation argument is further supported through the inclusion of "fixed effects". The fixed effects model is a statistical model that represents the observed quantities in terms of explanatory variables that are treated as if the quantities were non-random. The within estimator (fixed effect model) is used to refer to an estimator for the coefficients in the regression model. If we assume fixed effects (individual-specific effects), we impose cross-section and period independent effects for each entity that are possibly correlated with the regressors.

By including fixed effects (group dummies for cross-sections and periods), one is controlling for the average differences across regions and periods in any observable or unobservable predictors. The fixed effect coefficients soak up all the across-group action. What is left over is the within-group action. The one-way error component model allows cross-section heterogeneity in the error term, i.e.,

$$FCMI_{idt} = \alpha + \beta X_{idt} + F_{id} + \varepsilon_{idt}$$

where

$FCMI_{idt}$ = financial condition index

X_{idt} = vector of explanatory variables (β_1 to β_6)

F_{id} = cross-section or period effects

id = 1,...,N

t = 1,...,N

ε_{idt} = error term

$$\varepsilon_{idt} = \mu_i + v_{it}$$

where

μ_i = unobservable individual effects

v_{it} = well behaved disturbance

The inclusion of the cross-section fixed effects, i.e., the municipal individual-specific effects, greatly improve 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. However the inclusion of period fixed effects had no significant overall effect on the overall performance of the regression equation for example adjusted R-square decreased from 0.16 to 0.15. The null hypothesis of no individual (cross-section or period) effects is tested with the applied Chow or F-test, combining the residual sum of errors for the regression both with constraints and without.

F = 41.93 (cross-section fixed effects) which is greater than the critical value of 1.39 (F(n-1),(nt-n-k) at the 5% percent probability value thus suggesting that the individual cross-section effects are valid. F = 0.23 (period fixed effects) which is smaller than the critical value of 2.13 (F(n-1),(nt-n-k) at the 5% percent probability value thus suggesting that the individual period effects are not valid.

The second regression equation (pooled model) developed in this study is as follows:

$$CFCI_{idt} = \alpha + \beta_1 Pop_{idt} + \beta_2 AGER_{idt} + \beta_3 POVR_{idt} + \beta_4 DEN_{idt} + \beta_5 GDP_{idt} + \beta_6 LITERACY_{id} + \varepsilon_{idt}$$

where:

$CFCI_{idt}$ = financial condition index; α = overall intercept term; $\beta 1$ to $\beta 6$ = regression coefficients; Pop = population size; AGER = age profile of municipality; POVR = wealth of community; DEN = population density; GDP = revenue base; LITERACY = the education attainment, ε = error term. The regional identifiers are noted as id whilst the time identifiers are noted t (id = 1,...,N and t = 1,...,N). The results of the regression equation is displayed in the table below.

Table 31: 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 ($p < 0.05$)

The results suggest that all of the variables, except poverty and density, are not statistically significant in explaining the financial conditions of municipalities. The signs of the two statistically significant coefficients seems correct except for literacy. The F-test (5.41) suggest that the regression model as a whole is significant at the 5 percent level. The Durbin-Watson test (0.68) suggest that successive error terms are, on average, close in value to one another, or positively correlated. The very low adjusted R-square (0.07) suggests that more almost 90 percent of the variation in the financial condition is explained by unknown variables.

The inclusion of the cross-section fixed effects i.e., the municipal individual-specific effects, as done in the previous regression equation, greater improve the overall performance of the regression equation in that the adjusted R-square 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 period fixed effects also had a significant overall effect on the overall performance of the regression equation for example adjusted R-square increased from 0.07 to 0.14. The null hypothesis of no individual (cross-section or period) effects is tested with the applied Chow or F-test, combining the residual sum of errors for the regression both with constraints and without.

F = 6.57 (cross-section fixed effects) which is greater than the critical value of 1.39 (F(n-1),(nt-n-k) at the 5% percent probability value thus suggesting that the individual cross-section effects are valid. F = 5.57 (period fixed effects) which is bigger than the critical value of 2.12 (F(n-1),(nt-n-k) at the 5% percent probability value thus suggesting that the individual period effects are also valid.

The random effects model was also tested. However in both cases the Hausman test suggest that the fixed-effect model is the more appropriate model compared to the random effects model. The Hausman test test the null hypothesis that the preferred model is the random effects vs. the alternative the fixed effects (see Green, 2008, chapter 9). It basically tests whether the unique errors (u_{id}) are correlated with the regressors, the null hypothesis is they are not. The results of the Hausman test are displayed in the table below.

Table 32: Hausman Test Results

Test Summary	Chi-Sq. Statistic	Prob.
FCMI Model		
Cross-section random	13.198405	0.04*
Period random	1.357444	0.97
CFCI Model		
Cross-section random	71.424483	0.00*
Period random	32.92224	0.00*

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

Both fixed-effects models however suffer from heteroskedasticity. The models therefore needs to be corrected for heteroskedasticity and contemporaneous correlation. This can be done by including cross-section weights and for computing coefficient covariances using the White cross-section method. The results of the modified fixed-effects models are displayed in the table below.

Table 33: 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 ($p < 0.05$)

7. Conclusions

This study develops two indices of measuring and evaluating the financial conditions of municipalities in the province of KwaZulu-Natal South Africa over the period 2009 to 2015 using a financial conditions measurement framework. The composite financial conditions index (CFCI) is weighted index consisting of a number of financial ratios, whereas the financial conditions management index (FCMI) is constructed using one financial ratio. The financial data is obtained from the annual financial statements of each of the 51 municipalities.

The various individual and comparative tests employed suggest the two indices is relatively reliable and valid in measuring municipal financial conditions and therefore they represents a useful reporting framework to evaluate and monitor the financial condition of a municipality.

The literature review indicate that there are a number of socioeconomic factors that actually and/or potentially have an impact on the financial conditions of municipalities, amongst other population size, age profile of the population, density and poverty levels, economic environment to name a few. The study focus on six socioeconomic variables and developed two regression models, one for each of the indexes using the same set of socioeconomic variables.

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

The results suggest that the unobservable municipal unique factors (cross-section effects) significantly affects municipal financial conditions and that these unobservable municipal unique factors are correlated with the socioeconomic variables. The study therefore provides a benchmark of financial conditions for municipalities to (1) evaluate, monitor and compare their financial condition over time and with that of others, (2) investigate the impact of the socioeconomic environment and changes thereof and 3) seek ways to improve their financial condition.

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