Accounting & Taxation
Vol. 12, No. 1, 2020, pp. 81-96
ISSN: 1944-592X (print)
ISSN: 2157-0175 (online)

IBFR
www.theIBFR.com

ALTERNATIVE TREATMENT OF CONTRIBUTION IN AID OF CONSTRUCTION: THE IMPACT ON INVESTOR-OWNED UTILITY PLANT ASSET REPLACEMENT

Daniel Acheampong, Florida Gulf Coast University, USA
Tanya Benford, Florida Gulf Coast University, USA

ABSTRACT

This paper proposes an alternative treatment of Contribution in Aid of Construction within the Investor-Owned water and wastewater utility industry. This study analyzes the impact of CIAC on funding utility aged assets by comparing the current amortization (credit) treatment to an alternative depreciation (debit) treatment of CIAC. This paper examines how the establishment of a reserve account for the recovery of plant asset usage through depreciation can fund Investor-Owned utility plant asset replacement. Recommended viability financial ratios and related CIAC ratios are used to consider the efficacy of funding a reserve account to replace retired assets. The results suggest an inverse correlation between the current credit treatment and aged plant assets and a positive correlation between the proposed debit treatment and financing of donated plant assets.

JEL: M4

KEYWORDS: Contribution in Aid of Construction, Investor-Owned Utilities, Credit Treatment, Debit Treatment, Aged Plant Assets, Donated Capital

INTRODUCTION

The United States Environmental Protection Agency (1995) explains that a utility should be able to consistently deliver quality services at a reasonable cost and exhibit financial, technical, and managerial capabilities that will enable it to comply with current as well as proposed regulations. The services of Investor-owned utilities (IOU) are essential for reaching parts of cities and rural areas where municipal utilities are not available. However, most utility infrastructures were placed in service and paid for during World war I or during the U.S. economic boom of the1890's (Kline 2017). Currently, most small water and wastewater utilities are challenged to replace and repair their aged plant assets due to lack of funding (Stanford, 2008). The Congressional Budget Office (2015) reports that the cost of water industry infrastructure replacement rose rapidly in 2003, and this increased cost is exacerbating the difficulties related to replacing and repairing aged IOU water and wastewater infrastructures. Since the 107th congressional session, there have been a series of bills to extend and increase appropriations to the State Water Pollution Control Revolving Fund. These bills were designed to comply with the Clean Water and Safe Drinking Water Acts (CWA) and improve existing aged assets within the water and wastewater industry (Copeland & Tiemann 2010). For utilities to comply with the CWA, they need to upgrade, replace, and install new transmission and distribution infrastructures; these improvements are projected to require a $271 Billion investment (Environmental Protection Agency, 2017).

This study examines the amortization (credit) treatment of Contribution in Aid of Construction (CIAC) and the impact of this approach on IOU utility infrastructure repair and replacement. The study proposes an alternative depreciation (debit) treatment of CIAC. The remainder of the paper is presented in four sections. The next section presents a review of prior literature and articulates the importance of this issue. The third section presents the OLS research model and data used in this study, and the fourth section provides a discussion of the empirical results. The final section provides concluding thoughts on the implications of the research, associated limitations, and avenues for future research.

LITERATURE REVIEW

For a water or wastewater system to be sustainable and viable, the utility should be able to generate enough revenue to regularly improve, construct, operate, maintain, and manage the utility to comply with local, state, and federal regulations (Washington State Department of Health, 2010). Utilities require practical steps to assess both the viability of and the need for upgrading existing aged assets and infrastructure (Acheampong, Benford, & Volkan, 2018). Mann (1993) explains that capital expenditures (asset replacement) are primarily funded by debt capital or capital contributions (CIAC) and not through the ratemaking process. An insufficient rate base and dilapidated plant assets resulting in diminished collateral equity challenge IOUs ability to raise adequate, less expensive, debt capital, or capital contributions (CIAC) to fund utility asset replacements (Beecher & Mann, 1990). This suggests it is imperative for the water industry to establish practices that will enable utilities to sustain their assets and meet the needs of the populations they serve. The key to assuring the viability of water systems is the judicious use of state regulatory authorities so that only sustainable systems emerge in the first place (Beecher, Higbee, Anthony, and Richard, 1996). A viable utility is one that has the managerial and technical expertise as well as the financial capabilities to consistently meet long-term performance requirements.

The economic viability of an IOU is an essential factor in measuring the rate of return on IOU operating plant assets. Comparing the cost of borrowing to the rate earned by IOUs through ratemaking provides a better assessment of a utility performance (Warford & Julius,1979). The study suggests a debit treatment of CIAC with a reserve account established to reinvest the accumulated, may partially fund donated assets when the need arises. The situation may not be as devastating as it appears now (Acheampong et al. 2018). IOU infrastructure replacement depends heavily on performance dimensions, such as the ability to raise capital to finance these utilities. Unlike municipal utilities, IOUs rely on bank loans and owners' investments (loans to the utilities); the credit treatment of CIAC does not afford owners the recovery of plant usage through depreciation for asset replacement. It is assumed that ratepayers have paid for the initial infrastructure and that they need not pay again for its replacement. CIAC is classified as donated capital by many states; the AICPA (2017) classified CIAC as a representation of capital or property raised by a regulated utility for required services to ensure economical and fair rates to utility users. "CIAC is contributed by a customer that requests an uneconomic connection based on projected consumption and regulator-established utility rates" (AICPA, 2017). The AICPA definition suggests that CIAC is paid by customers and considered donated capital.

The AICPA (2017) recognized that the methodology for calculating CIAC is specific to the regulating bodies of the various states, e.g., Florida Public Service Commission (FPSC); however, they acknowledged that most regulators' methods do not include recovery and replacement of donated infrastructures. Guidance on the accounting treatment of CIAC is minimal, and due to the various regulatory methodologies, the accounting for CIAC is subject to interpretation and requires judgment because CAIC is considered a cost-reimbursement. Lastly, CAIC is not covered by FASB 606 (AICPA, 2017). Utility rate studies serve as a roadmap for planners making decisions about capital expansion, asset replacement, and other improvements (Forrer, Ehart, & Forrer, 2011). During rate case proceedings, regulators consider the plant assets of the utility and award the utility owners adequate returns on their investment. The total assets involved in the provision of utility services are used to establish the rate base for IOUs. The rate of return on utility investments is determined by dividing the net operating income from the test year by the net rate base. An adequate rate of return is the percentage factor that generates enough earnings when multiplied by the rate base to cover interest and equity requirements of the capital invested in supporting the rate base (Deloitte Center for Energy Solutions 2004). Treating CIAC, as a credit balance offsets the net asset of the utility; however, this does not allow for the recovery of donated capital nor equity earnings of the assets.

F.A.C. 25-30.443 requires all water and wastewater utilities to include in their request for rate filings the beginning balances of all plant assets as well as the ending balances of the test year to determine the rate base. The Florida Administrative Rule 2530.515/ [14] clarifies that CIAC constitutes utility system capacity costs, citing examples as main pipe extension charges and ratepayers' connection assessments (Crahan, 1994). AAWA (2012) explains that a commission that uses the utility approach measures the cost of capital by recovering depreciation expense and return on rate base. They explained that the rate base is primarily made up of plant-in-service plus CIAC less accumulated depreciation. Most states use different methodologies that factor in Accumulated Depreciation and CIAC as a credit. These methodologies affirm the AICPA position on the recovery and replacement of donated capital. Depreciation assesses the decline of the operating plant assets' value as a result of usage. The assessment is used as a justification to replace the plant assets when replacement of the asset is necessary (Brazell & Mackie, 2000). The rate base calculation presents institutional challenges to IOUs; the credit treatment of the CIAC in the rate base formula reduces the rate base for these utilities. Hence, the utilities are not able to recover and replace these assets through the accumulation of funds through rate settings (Acheampong, 2019).

The creation of a reserve account to fund asset replacement and assist the IOUs in sustaining their operations was among the twelve concerns and recommendations to address problems besieging the water and wastewater utility industry (The Study Committee, 2013). They) acknowledged the aging or deteriorating state of IOU utility plant assets and the challenges associated with accessing capital funding at an affordable rate and proposed the creation of a state revolving fund for utility asset replacement. However, they did not directly address CIAC issues related to the replacement of donated assets (Acheampong, 2019). Nevertheless, CIAC may be considered a potential source for the revolving fund. Amortization of CIAC is a contra-expense account, and consequently, utilities do not recoup the amount associated with donated plant assets. Hence, planned replacement of the donated assets is not funded by the current rate case proceedings. This study examines the impact of an alternative treatment of CIAC on asset infrastructure funding. The Study specifically posits reserve account replacement funding can occur if CIAC is treated as a debit balance in the rate base. The study tends to address the question; can a debit treatment of CIAC improve the current infrastructure deficit in the water and wastewater industry? The next section presents the OLS research model and data used in this study.

DATA AND METHODOLOGY

This study compares a debit balance treatment of CIAC on investor-owned assets to tests the impact of the current credit balance treatment. Consistent with Acheampong et al. (2018), the explanatory variables used are financial ratios modified from the NRRI viability model and CIAC related financial ratios (i.e., ratios affected by the total assets of the utilities). A reserve account was created using the depreciation of CIAC assets with interest revenue at a 12-month Treasury bill rate, and the financial ratios were calculated for both the debit and credit balance CIAC treatment. The NARUC implemented accounting standard changes in 2008. The 2008 changes rendered financial filings prior to 2008 inconsistent with later financial statement filings. Besides, utility regulations are state-specific; thus, the data employed in this study were from the state of Florida investor-owned annual filings from 2008 to 2017 (http://www.psc.state.fl.us/). The data is used as a proxy for all other states amortizing CIAC. A random sample of 60% of the Florida IOU annual filings yielded eighty-eight utilities and 74 utilities (655 observations) qualified for the study. Table 1 presents the model predictors.

Table 1: CIAC Credit (CR_) and Debit (DR_) Treatment Independent Variables

The Current Credit Treatment of CIAC (Amortization)		The Alternative Treatment of CIAC (Depreciation)		CIAC Ratios
CR1	CR1_Total Debt to Total Capital	DR1	DR1_ Total Debt to Total Capital _	Total Debt to Total Capital
CR2	CR2_Net Plant Assets to net worth	DR2	DR2_Net Plant Assets to net worth	Net Plant Assets to net worth
CR3	CR3_ Total Debt to Total Assets	DR3	DR3_ Total Debt to Total Assets	Total Debt to Total Assets
CR4	CR4_ Asset Turnover	DR4	DR4_ Asset Turnover	Asset Turnover
CR5	CR5_ Return on Assets	DR5	DR5_ Return on Assets	Return on Assets
CR6	CR6_ Return on Equity	DR6	DR6_ Return on Equity	Return on Equity
CR7	CR7_ Return on Invested Capital	DR7	DR7_ Return on Invested Capital	Return on Invested Capital
CR8	CR8_ Total Assets Turnover Ratio	DR8	DR8_ Total Assets Turnover Ratio	Total Assets Turnover Ratio
CR9	CR9_ CIAC-total Asset Ratio	DR9	DR9_ CIAC-total Asset Ratio	CIAC-total Asset Ratio
CR10	CR10_ Net Margin	DR10	DR10_ Net Margin	Net Margin
CR11	CR11_ Total Net Assets	DR11	DR11_ Total Net Assets	Total Net Assets
IR 12			Interest Revenue generated from the Reserve account	

Table one presents the predictors for the model; the current treatment of CIAC column presents the corresponding CIAC ratios under the current treatment of CIAC as a credit balance offsetting ratebase in rate establishment. The Alternative treatment of the CIAC column presents the corresponding ratio by treating CIAC as a debit balance, an alternative to the current credit treatment, thereby increasing the total operating assets of a utility with an offset by an accumulated depreciation in the ratebase. The IR12 is the interest revenue generated by the reserve account at the US treasury bill rate.

Descriptive Statistics

Table two presents the demographics of the 74 water and wastewater utilities qualified for the study. Total net assets range from $1,874 to $39,400,000. Some utilities reported the value of the entire real estate development as utility assets.

Table 2: Demographics of the 74 Water & Wastewater Utilities

Data Item (in 1,000 Dollars)	Mean	Std. Dev.	Min	Max
RAcct	2.019	5.842	(0.9059)	57.252
Int_Rev	0.2062	0.6043	(0.0237)	6.183
DR_TotalNe~s	229.58	582.44	0.1874	3,940.0
DR_TotalDe~l	2.244	18.629	(76.123)	212.46
DR_NetPlan~h	0.0000	0.0006	(0.0104)	0.0026
DR_TotalDe~s	0.0002	0.0005	(0.0001)	0.0047
DR_AssetTu~r	0.0001	0.0002	0.0000	0.0017
DR_NetMargin	(0.0002)	0.0013	(0.0253)	0.0001
DR_Returno~s	(0.0000)	0.0002	(0.0023)	0.0001
DR_Returno~y	(0.0857)	0.7888	(12.581)	0.0026
DR_Returno~l	(0.1022)	0.9624	(13.854)	2.982
DR_TotalAs~o	0.0001	0.0004	0.0000	0.0062
DR_CIACtot~l	0.0000	0.0000	0.0000	0.0002
CR_TotalDe~l	(0.9373)	8.107	(79.547)	44.229
CR_NetPlan~h	0.0000	0.0026	(0.0342)	0.0408
CR_TotalDe~s	0.0001	0.0001	(0.0001)	0.0005
CR_AssetTu~r	0.0001	0.0002	0.0000	0.0017
CR_NetMargin	(0.0002)	0.0013	(0.0253)	0.0001
CR_Returno~s	(0.0000)	0.0002	(0.0021)	0.0001
CR_Returno~y	(0.0000)	0.0002	(0.0030)	0.0019
CR_Returno~l	(0.0937)	0.8627	(12.581)	3.084
CR_TotalAs~o	0.0001	0.0004	0.0000	0.0063
CR_CIACtot~l	0.0000	0.0001	0.0000	0.0029
CR_TotalNe~s	218.54	573.77	0.1874	3,940.0

Table two shows the descriptive statistics of the selected sample size; the data item column is the variables for the study, and the Mean column indicates the averages for each variable. The Std. Dev is the standard deviation of the corresponding variable, and the "Min-Max" is the range of the data from the least to the highest for the corresponding variables. The RAcct (reserve account) is the dependable variable for the OLS model. The rest of the variables are the independent variables identified in Table 1.

MODEL RESULTS

Based on a Variance inflation factor (VIF) of 3, seven variables qualified for the initial model. Table 3 shows both the debit and credit treatments of CIAC retained variables.

Table 3: CIAC Retained Variables (VIF of 3 or Less)

Variable	VIF	1/VIF
DR_TotalDe~s	3..02	0.257706
DR_CIACtot~l	1.59	0.629014
CR_TotalDe~s	1.41	0.707369
CR_CIACtot~l	1.17	0.852595
CR_Returno~y	1.02	0.977341
DR_NetPlan~h	1.02	0.978146
CR_NetPlan~h	1.01	0.989169
Mean VIF	2316.36	

Table 3 shows the retained variables for the initial OLS model. The VIF column shows the proportion of the variance measuring the severity of the multicollinearity issues in the OLS analysis, and the 1/VIF column estimates the standard deviation of the VIF. The VIF of 3 was based on standard rounding to accommodate numbers between 3 and 4.

The reserve account was regressed on the seven retained explanatory variables, for both debit and credit treatments of CIAC. The initial OLS model regression estimate of the equation is presented below:

$$R_{Acct}=B0+B1DR3+B2DR9+B3CR3+B4CR9+B5CR6+B6CR2+B7DR7+E_i \quad (1)$$

The DR3 is the alternative treatment total debt to total assets ratio. The Dr9 is the alternative treatment of CIAC total assets ratio; the CR3 is the credit treatment total debt to total assets ratio, and the CR9 is the credit treatment of CIAC total assets ratio. The CR6 is the credit treatment of CIAC return on equity ratio, the CR2 is the credit treatment of CIAC net plant assets to net worth ratio, and the DR2 is the debit treatment of CIAC net plant assets to net worth ratio. Table 4 presents the initial results of the OLS model retained variables.

Table 4: Initial OLS Regression Results

Source	SS	df	MS	Number of Obs	=	653
				F (10, 644)	=	19.57
				Prob > F	=	0.000
Model	389,880,000	7	55,697,000	R-squared	=	0.1752
Residual	1,835,500,000	645	2,845,800	Adj R-squared	=	0.1662
Total	2,225,400,000	652	3,413,200	Root MSE	=	53,346
ReserveAccount	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DR_TotalDebttoTotalAssets	319.42	441.09	0.7200	0.4690	(546.7279)	1,185.5660
DR_CIACtotalAssetRatio	92,112	8,164.6	11.280	0.0000**	76,079.5300	108,144.2000
CR_TotalDebttoTotalAssets	(1,641.8)	3,299.1	(0.5000)	0.6190	(8,120.1570)	4,836.5190
CR_CIACtotalAssetRatioTotal	(2,907.7)	1,918.4	(1.520)	0.1300	(6,674.7500)	859.2970
CR_ReturnonEquity	149.998	1,115.4	0.1300	0.8930	(2,040.1960)	2,340.1910
CR_NetPlantAssetstonetworth	16.779	80.250	0.2100	0.8340	(140.8038)	174.3613
DR_NetPlantAssetstonetworth	90.224	355.77	0.2500	0.8000	(608.3766)	788.8237
_cons	5,627.4	3,138.3	1.790	0.0730	(535.1966)	11,790.0000

Table 4 presents the results of the initial OLS model;(RAcct=B0+B1DR3+B2DR9+B3CR3+B4CR9+B5CR6+B6CR2+B7DR7+Ei) the SS indicates the sum of squares of the model, the residual, and the total variance of the model. The df is the degree of freedom of the source (model, residual or error, & total). The MS represents the mean squares (the sum of squares divided by their respective degrees of freedom). Number of obs is the total sample observations used by the model in the analysis. F (10, 644) is the F-value (Mean Square Model divided by the Mean Square Residual). The Prob > F is the p-value of the model measuring the reliability of the independent variable predicting the dependent variable. R-squared and the Adj R-squared measures the proportion of variance in the dependent variance by the predictors. Root MS is the standard deviation of the error term. The Coef. column represents the coefficient of the predictors, the Std. Err column is the standard errors of the coefficients. "t" and P>|t| shows the t values of the predictors. The [95% Conf. Interval] columns indicate the confidence level signifying the range of the population. The overall model was statistically significant but not specified (possibility of omitted independent variables).

As shown in Table 4, the overall model is statistically significant (Prob > F =0.000), however only the total asset ratio for the debit treatment of CIAC was statistically significant (P>0.000). A linktest was employed to ensure a specified model (rule out omitted variables). The Linktest output indicates the overall model is not specified; a significant hatsq p-value = 0.000 suggests the possibility of missing variables that may be significant in establishing the relationship with the funding of the reserve account. Table 5 presents the results of the linktest.

Table 5: Linktest for the Initial OLS

Source	**SS**	**df**	**MS**	**Number of Obs**	**=**	**653**
				F (2, 653)	=	101.41
Model	529,270,000,000	2	264,640,000,000	Prob > F	=	0.0000
Residual	1,696,100,000,000	650	2,609,400,000	R-squared	=	0.2378
				Adj R-squared	=	0.2355
Total	2,225,400,000,000		3,413,200,000	Root MSE	=	51,083
ReserveAcc~t	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
_hat	2.333	0.2000	11.67	0.0000**	1.941	2.726
_hatsq	0.000	0.0000	(7.31)	0.0000**	0.000	0.0000
_cons	(13,214.1)	3161.5	(4.18)	0.0000**	(19,422)	-7006.2

Table 5 is the Linktest of the initial OLS model; The Coef. column represents the coefficient of the predictors, the Std. Err column is the standard errors of the coefficients. "t" and P>|t| shows the t values of the predictors. The [95% Conf. Interval] columns indicate the confidence level signifying the range of the population. The results are statistically significant (P=0.000), an indication of missing variables.

Mehmetoglu and Jakobsen (2016), recommend further testing to confirm the inclusion of all significant explanatory variables. Shukur and Mantalos (1997) suggest the Ramsey RESET test to identify omitted variables and improper functional models. The Ramsey RESET test indicates omitted explanatory variables in the OLS model, a significant p-value =0.000, indicates the test rejects the assumption that the OLS model is appropriately specified; hence, there is a specification error. Table 6 presents the Ramsey RESET test outcome.

Table 6: Ramsey RESET Test

Ramsey RESET Test Using Powers of the Fitted Values of Reserve Account		
F (3, 642)	=	29.100
Prob > F	=	0.0000**

Table 6 shows the results of the Ramsey RESET test; it is a general specification OLS error test, customarily used to confirm the omission of independent variables, if Prob > F (P-value) is significant, the model is not specified. The results are statistically significant (P=0.000), a confirmation of an unspecified model.

The OLS model was run on the two separate treatments of CIAC; first, it was run on the debit treatment of CIAC, and then it was run on the Credit treatment to assist in adding variables to arrive at a specified model. The credit treatment model was not specified. The Debit treatment model shows that four explanatory variables were statistically significant, the interest generated on the reserve account, the total net assets, the total debt to total assets, and the Debit treatment of CIAC total Assets ratio. Table 7 demonstrates the regression estimates of the alternative treatment (Debit) of CIAC equation 2:

$$R_{Acct}=B0+B1Dr1+B2Dr2+B3Dr3+B4Dr4+B5Dr5+B6Dr6+B7Dr7+B8Dr8+B9Dr9+B10Dr10+B11Dr11+B12IR12+\varepsilon_i \quad (2)$$

The Dr1 through Dr11 are the alternative treatment of CIAC independent variables. The DR1 is the total debt to total capital, DR2 is the net plant assets to net worth, the DR3is the total debt to total assets, the

DR4 represents the asset turnover ratio, the DR5 is the return on assets ratio, DR6 is the Return on Equity ratio, DR7 is the return on invested capital ratio, the DR8 is the total assets turnover ratio, the DR9 represents the CIAC-total asset ratio, the DR10 is the net margin ratio, DR11 is the total net assets, and the IR12 represents the interest revenue from the reserve account. The results are presented in Table 7.

Table 7: Debit Treatment of CIAC OLS Results

Source	**SS**	**Df**	**MS**	**Number of Obs**	**=**	**625**
				F (12, 612)	=	80.020
				Prob > F	=	0.00**
Model	1,351,900,000,000	12	112,660,000,000	R-squared	=	0.6108
Residual	861,590,000,000	612	1,407,800,000	Adj R-squared	=	0.6031
Total	2,213,500,000,000	624	3,547,200,000	Root MSE	=	37,521
ReserveAccount	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
InterestRevenue	5.924	0.3009	19.690	0.0000**	5.333	6.515
DR_TotalNetAssets	0.0029	0.0005	5.880	0.0000**	0.0019	0.0038
DR_TotalDebttoTotalCapital	(0.0005)	0.0171	(0.0300)	0.9760	(0.0340)	0.0330
DR_NetPlantAssetstonetworth	16.561	254.08	0.0700	0.9480	(482.42)	515.54
DR_TotalDebttoTotalAssets	(2,491.2)	523.18	(4.760)	0.0000**	(3,518.6)	(1,463.7)
DR_AssetTurnover	685.30	2,335.5	0.2900	0.7690	(3,901.2)	5,271.8
DR_NetMargin	104.25	183.85	0.5700	0.5710	(256.80)	465.30
DR_ReturnonAssets	348.84	2,108.9	0.1700	0.8690	(3,792.6)	4,490.3
DR_ReturnonEquity	(0.0602)	0.3274	(0.1800)	0.8540	(0.7030)	0.5827
DR_ReturnonTotalCapital	0.0598	0.3774	0.1600	0.8740	(0.6814)	0.8009
DR_TotalAssetsTurnoverRatio	(78.426)	1,056.4	(0.0700)	0.9410	(2,153.1)	1,996.2
DR_CIACtotalAssetRatioTotal	33,483	5,941.2	5.640	0.00**	21,816	45,151
_cons	600.66	2,496.8	0.2400	0.8100	(4,303)	5,504.0

Table 7 (RAcct=B0+B1Dr1+B2Dr2+B3Dr3+B4Dr4+B5Dr5+B6Dr6+B7Dr7+B8Dr8+B9Dr9+B10Dr10+B11Dr11+ B12IR12+εi)presents the results of the debit treatment of the CIAC and the interest revenue; the SS indicates the sum of squares of the model, the residual, and the total variance of the model. The df is the degree of freedom of the source (model, residual or error, & total). The MS represents the mean squares (the sum of squares divided by their respective degrees of freedom). Number of obs is the total observations used by the model in the analysis. F (12, 612) is the F-value (Mean Square Model divided by the Mean Square Residual). The Prob > F is the p-value of the model measuring the reliability of the independent variable predicting the dependent variable. R-squared and the Adj R-squared measures the proportion of variance in the dependent variance by the independent variables. Root MS is the standard deviation of the error term. The Coef. column represents the coefficient of the predictors, the Std. Err column is the standard errors of the coefficients. "t" and P>|t| shows the t values of the predictors. The [95% Conf. Interval] columns indicate the confidence level signifying the range of the population. The overall model results are statistically significant (P=0.000).

A linktest was run to assess the debit treatment. The linktest reveals _hatsq is not significant with p-value = 0.091, confirming a specified model and a higher possibility that all required variables relevant to explain the relationship between debit treatment of CIAC and the funding of the reserve account are included in the model. The test results are presented in Table 8.

Table 8: Debit Treatment of CIAC-Linktest

Source	SS	Df	MS	Number of Obs	=	625	
				F (2, 653)	=	491.66	
Model	1,355,800,000,000	2	677,920,000,000	Prob > F	=	0.0000**	
Residual	857,640,000,000	622	1,378,800,000	R-squared	=	0.6125	
				Adj R-squared=		0.6113	
Total	2,213,500,000,000	624	3,547,200,000	Root MSE	=	37,133	
ReserveAcc~t	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**		
_hat	1.095	0.0647	16.930	0.00**	0.9682	1.222	
_hatsq	0.0000	0.0000	-1.690	0.0910	0.0000	0.0000	
_cons	(1,017.8)	1,738.3	-0.5900	0.5580	(4,431.5)	2,395.8	

Table 8 is the Linktest of the initial OLS model; The Coef. column represents the coefficient of the predictors, the Std. Err column is the standard errors of the coefficients. "t" and P>|t| shows the t values of the predictors. The [95% Conf. Interval] columns indicate the confidence level signifying the range of the population. The results are statistically not significant (P>0.0910), an indication of a specified model.

The Ramsey RESET test was used to confirm whether the debit treatment alone is sufficient to analyze the reserve account relationship with CIAC treatment. The Ramsey RESET test is statistically significant, indicating a possibility of omitted variables, Clarke (2009) explained that the RESET is used to check for general misspecification. When the model is misclassified, it is appropriate to increase the variables to determine a specified model. Table 9 presents the outcome of the Ramsey RESET test.

Table 9: Ramsey RESET Test-Debit CIAC OLS

Ramsey RESET Test Using Powers of the Fitted Values of Reserve Account		
F (3, 642)	=	18.37
Prob > F	=	0.0000**

Table 9 shows the results of the Ramsey Reset test; it is a general specification OLS error test, customarily used to confirm the omission of independent variables, if Prob > F (P-value) is significant, the model is not specified. Table 9 Ramsey RESET test is not specified. It is statistically significant with p-value =0000.

Consistent with Godfrey and Orme (1994), the original VIF results (in ascending order) were used to add variables until a specified model was achieved. The debit treatment of CIAC, the Total Debt to total asset ratio, the interest revenue, the debit total net assets, the debit net margin were all statistically significant with a positive coefficient in funding the reserve account. Table 10 shows the regression estimates equation using both debit and credit treatment variables (equation 3):

$$R_{Acct}=B0+B1DR6+B2CR3+B3DR9+B4DR3+B5IR12+B6CR9+B7CR6+B8CR2+B9DR2+B10DR11+B11CR10+B12DR10+\varepsilon_i \quad (3)$$

The DR 6 represents the alternative treatment return on equity ratio. The Cr3 is the credit treatment total debt to total asset ratio; the DR9 represents the debit CIAC-total asset ratio; the DR3 is the alternative treatment total debt to total assets ratio; the IR12 represents the interest revenue from the reserve account. The CR9 is the credit treatment CIAC-total asset ratio; the CR6 is the credit treatment return on equity ratio. The CR2 represents the credit treatment, net plant assets to net worth ratio, and DR2 represents the debit treatment net plant assets to net worth ratio. The DR 11 represents the alternative treatment, total net assets, the CR10 is the credit treatment, net margin ratio, and the DR 10 is the debit treatment, net margin ratio. Table 10 presents the OLS model results.

Table 10: OLS Model Output for Both Credit and Debit Treatment

Source	**SS**	**df**	**MS**	**Number of Obs**	**=**	**625**
				F (12, 612)	=	81.420
				Prob > F	=	0.0000**
Model	1,361,000,000,000	12	113,410,000,000	R-squared	=	0.6149
Residual	852,520,000,000	612	1,393,000,000	Adj R-squared	=	0.6073
Total	2,213,500,000,000	624	3,547,200,000	Root MSE	=	37,323
ReserveAccount	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DR_ReturnonEquity	0.0300	0.1916	0.1600	0.8760	(0.3463)	0.4062
CR_TotalDebttoTotalAssets	3,668.8	2,555.1	1.440	0.1520	(1,348.9)	8,686.6
DR_CIACtotalAssetRatioTotal	36,249	6,641.9	5.460	0.0000**	23,205	49,292
DR_TotalDebttoTotalAssets	(2,830.0)	557.45	(5.080)	0.0000**	(3,924.7)	(1,735.2)
InterestRevenue	5.834	0.3016	19.340	0.0000**	5.242	6.427
CR_CIACtotalAssetRatioTotal	473.96	1,366.5	0.3500	0.7290	(2,209.5)	3,157.5
CR_ReturnonEquity	276.19	872.61	0.3200	0.7520	(1,437.5)	1,989.9
CR_NetPlantAssetstonetworth	(42.332)	56.479	(0.7500)	0.4540	(153.25)	68.583
DR_NetPlantAssetstonetworth	26.470	252.22	0.1000	0.9160	(468.85)	521.79
DR_TotalNetAssets	0.0031	0.0005	6.400	0.0000**	0.0021	0.0040
CR_NetMargin	(4,091.5)	1,971.2	(2.080)	0.0380	(7,962.7)	(220.32)
DR_NetMargin	4,155.8	1,959.9	2.120	0.0340	306.88	8,004.7
_cons	(1,050.1)	2,332.6	(0.4500)	0.6530	(5,631.1)	3,530.8

Table 10 (RAcct=B0+B1DR6+B2CR3+B3DR9+B4DR3+B5IR12+B6CR9+B7CR6+B8CR2+B9DR2+B10DR11+B11CR10+B12DR10+εi) presents the results of both the credit and debit treatment of the CIAC first specified model. The SS indicates the sum of squares of the model, the residual, and the total variance of the model. The df is the degree of freedom of the source (model, residual or error, & total). The MS represents the mean squares (the sum of squares divided by their respective degrees of freedom). Number of obs is the total observations used by the model in the analysis. F (12, 612) is the F-value (Mean Square Model divided by the Mean Square Residual). The Prob > F is the p-value of the model measuring the reliability of the independent variable predicting the dependent variable. R-squared and the Adj R-squared measures the proportion of variance in the dependent variance by the predictors. Root MS is the standard deviation of the error term. The Coef. column represents the coefficient of the predictors, the Std. Err column is the standard errors of the coefficients. "t" and P>|t| shows the t values of the predictors. The [95% Conf. Interval] columns indicate the confidence level signifying the range of the population. The overall model is statistically significant p-value = 0.000

A linktest was run to determine the specification of the combined model. The linktest results show a _hatsq p-value = 0.136, which is better than when only the debit treatment variables were used. Table 11 presents the results of the linktest.

Table 11: Linktest for the Specified OLS Model Output for Both Credit and Debit Treatment

Source	**SS**	**df**	**MS**	**Number of Obs**	**=**	**625**
				F (2, 622)	=	499.38
Model	1,364,000,000,000	2	682,000,000,000	Prob > F	=	0.00**
Residual	849,470,000,000	622	1,365,700,000	R-squared	=	0.6162
				Adj R-squared	=	0.6150
Total	2,213,500,000,000	624	3,547,200,000	Root MSE	=	36,956
ReserveAcc~t	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
_hat	1.082	0.0636	17.010	0.0000**	0.9574	1.207
_hatsq	0.0000	0.0000	-1.490	0.1360	0.0000	0.0000
_cons	(871.14)	1,724.1	-0.5100	0.6140	(4,256.9)	2,514.6

Table 11 is the Linktest of the initial OLS model; The Coef. column represents the coefficient of the predictors. The Std. Err column is the standard errors of the coefficients," and P>|t| shows the t values of the independent variables. The [95% Conf. Interval] columns indicate the confidence level signifying the range of the population. A _hatsq p-value =0.1360 at 95% confidence level, indicates a specified model.

The Ramsey RESET test was used to confirm the results from the Linktest. The Ramsey RESET test is statistically significant, indicating the possibility of omitted variables. Table 12 presents the results of the Ramsey RESET test.

Table 12: Ramsey RESET Test for the Specified OLS Model

Ramsey RESET Test Using Powers of the Fitted Values of Reserve Account		
F (3, 642)	=	19.26
Prob > F	=	0.0000**

Table 12 shows the results of the Ramsey Reset test; it is a general specification OLS error test, customarily used to confirm the omission of independent variables, if Prob > F (P-value) is significant, the model is not specified. Table 12 Ramsey RESET test is not specified; the result is statistically significant, p-value =0.000.

Godfrey and Orme (1994) caution there may be increased in collinearity when variables are added; hence, a Correlation matrix of coefficients of the OLS model was run to determine if a further increase or decrease in variables presents a fit model. Table 13 shows the results of the Correlation matrix of coefficients. A lower Correlation matrix of coefficients among the significant variables is preferred in OLS models (Swamy, 1970; Wheeler &Tiefelsdorf, 2005). The Debit and credit net margins were significant in the model and highly correlated and were removed one at a time to achieve a specified model with no highly correlated explanatory variables. The OLS model revealed that the debit treatment of CIAC to total asset ratio is statistically significant, with a 3.18 positive coefficient. Suggesting a dollar increase in the donated asset with a possibility of depreciating to recover the asset and invest at the current Treasury bill rate may fund the related asset 3.18 times, subject to an inflation factor. Consistent with the general conception of utility owners providing 40% to 100% equity financing (FPSC 2018), the total debt to total assets ratio had an inverse relationship with the reserve account, and utilities are required to have a minimum of 40% owners' equity. Interest revenue is statistically significant, with a positive 5.90 coefficient. The productive employment of the total utility assets indicates less than one percent impact on financing the reserve account. The equation below represents the final OLS model for the study, where R_{Acct} is the reserve account to fund donated plant asset, B0-11 are the coefficients specified by the model. The regression equation presented below is the final model for the study. Table 14 presents the study's final specified OLS model results without any high correlated variables.

Table 13: Correlation Matrix of Coefficients of the Specified OLS Model (Credit and Debit)

e(V)	**DR_Ret**	**CR_Tot**	**DR_CIA**	**DR_Tot**	**Int_R**	**CR_CIA**	**CR_Ret**	**CR_Net**	**DR_Net**	**D~NetA**	**CR_Net**	**DR_Net**
DR_Return	1.000											
CR_TotalD	0.0673	1.000										
DR_CIACtot	-0.0674	-0.0606	1.000									
DR_TotalD	-0.0427	-0.3687	0.2112	1.000								
InterestR	-0.0185	-0.0811	-0.2456	0.3760	1.000							
CR_CIACto	0.0121	0.0994	-0.3385	-0.2020	-0.0255	1.000						
CR_Returno	0.0214	0.0242	-0.0661	-0.0455	-0.0175	0.0153	1.000					
CR_NetPlan	-0.0043	0.0166	0.0026	0.0134	-0.0237	0.0027	0.0711	1.000				
DR_NetPlan	0.0970	0.0201	-0.0473	0.0081	-0.0025	0.0047	0.0218	-0.0045	1.000			
DR_TotalNe	0.0167	0.2052	-0.1272	-0.8242	-0.4728	0.1629	0.0342	-0.0180	-0.0122	1.000		
CR_NetMag	0.0029	-0.0938	-0.3240	0.0651	0.1088	0.0357	0.0106	-0.0051	-0.0051	-0.0955	1.000	
DR_NetMag	-0.0020	0.0899	0.3236	-0.0724	-0.1169	-0.0307	-0.0100	0.0048	0.0060	0.1037	-0.9957	1.000
_cons	0.0700	-0.5495	-0.3544	0.0114	-0.0435	-0.0073	0.0439	-0.0156	-0.0005	-0.0712	0.1203	-0.1066

Table 13 shows the correlation matrix of the specified model from table 9; it depicts the correlation coefficients of the predictors, and lower correlations between predictors are preferred to higher to avoid multicollinearity issues within the model. The table reveals lower correlations of less than 40% except for the net margin ratio under both the debit and credit treatment, indicating a 99.5% correlation.

$$R_{Acct}=B0+B1Dr6+B2Cr3+B3Dr9+B4Dr3+B5IR12+B6Cr9+B7Cr6+B8Cr2+B9Dr2+B10Dr11+B11Dr10+\varepsilon_i \quad (4)$$

Table 14: The Study Final OLS Model

Source	SS	df	MS	Number of Obs	=	625
				F (11, 613)	=	87.950
				Prob > F	=	0..00**
Model	1,355,000,000,000	11	123,180,000,000	R-squared	=	0.6121
Residual	858,520,000,000	613	1,400,500,000	Adj R-squared	=	0.6052
Total	2,213,500,000,000	624	3,547,200,000	Root MSE	=	37,423
ReserveAccount	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
DR_ReturnonEquity	0.0000	0.0000	0.1600	0.8710	(0.0000)	0.0000
CR_TotalDebttoTotalAssets	0.3171	0.2551	1.240	0.2140	(0.1838)	0.8180
DR_CIACtotalAssetRatioTotal	3.178	0.6301	5.040	0.00**	1.941	4.416
DR_TotalDebttoTotalAssets	(2,754.6)	557.76	(4.940)	0.00**	(3,850.0)	(1,659.3)
InterestRevenue	5.903	0.3007	19.630	0.00**	5.312	6.493
CR_CIACtotalAssetRatioTotal	0.0575	0.1369	0.4200	0.6750	(0.2114)	0.3264
CR_ReturnonEquity	0.0295	0.0875	0.3400	0.7360	(0.1423)	0.2014
CR_NetPlantAssetstonetworth	(0.0043)	0.0057	(0.7600)	0.4490	(0.0154)	0.0068
DR_NetPlantAssetstonetworth	23.785	252.90	0.0900	0.9250	(472.87)	520.43
DR_TotalNetAssets	0.0030	0.0005	6.210	0.00**	0.0020	0.0039
DR_NetMargin	0.0105	0.0183	0.580	0.5640	(0.0253)	0.0464
_cons	**(467.5)**	**2,321.9**	**(0.2000)**	**0.8400**	**(5,027.4)**	**4,092.4**

The independent variables for the model are represented by Dr's and the Cr's. Dr6 represent DR_ReturnonEquity. It is the return on equity ratio under the alternative treatment (debit) of CIAC. The Cr3 represents CR_TotalDebttoTotalAssets, which is the total debt to total assets ratio under the current credit treatment (credit) of CIAC. The Dr9 represents DR_CIACtotalAssetRatioTotal; it is the total CIAC (donated assets) divided by the total assets of the utility. The Dr3 represents DR_TotalDebttoTotalAssets; it is the total debt to total assets ratio under the alternative treatment (debit) of CIAC. The IR12 represent InterestRevenue; it is the interest revenues, generated by the reserve account at the treasury bill rate. Cr9 represent CR_CIACtotalAssetRatio: is the total asset ratio generated by the current credit treatment of CIAC. Cr6 represent CR_ReturnonEquity: is the return on assets ratio under the existing credit treatment of CIAC. Cr2 represent CR_NetPlantAssetstonetworth: is the net plant assets to the net worth ratio under the current treatment of CIAC. Dr2 represent DR_NetPlantAssetstonetworth: is the net plant assets to the net worth ratio by the alternative treatment (debit) of CIAC. Dr11 represent DR_TotalNetAssets: is the total net assets of the utility by depreciating the donated assets (all assets). Dr10 represent DR_NetMargin: is the net margin ratio treating CIAC as a debit balance. The overall model was statistically significant p-value =0.000 at a 95% confidence level.

A linktest was used to determine the specification of the final model. The linked test reveals a _hatsq p-value = 0.093, confirming a specified model, with a probability of inclusion of all relevant variables necessary to determine the funding of the reserve account. Table 15 presents the results of the linktest.

Table 15: The Study Final OLS Model Linktest

Source	SS	Df	MS	Number of Obs	=	625
				F (2, 622)	=	494.48
Model	1,358,800,000,000	2	679,420,000,000	Prob > F	=	0.0000**
Residual	854,640,000,000	622	1,374,000,000	R-squared	=	0.6139
				Adj R-squared	=	0.6127
Total	2,213,500,000,000	624	3,547,200,000	Root MSE	=	37,068
ReserveAcc~t	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
_hat	1.094	0.0644	16.990	0.0000**	0.9676	1.220
_hatsq	0.0000	0.0000	-1.680	0.0930	0.0000	0.0000
_cons	(1,005.23)	1,734.3	-0.5800	0.5620	(4,411.0)	2,400.6

Table 15 is the Linktest of the initial OLS model; The Coef. column represents the coefficient of the predictors, the Std. Err column is the standard errors of the coefficients. "t" and P>|t| shows the t values of the predictors. The [95% Conf. Interval] columns indicate the confidence level signifying the range of the population. The result indicates a specified model with the _hatsq p-value >0.0930.

A correlation matrix was run on the final model to ascertain the correlation between the included variables. The correlation matrix of the study's final model reveals the highest correlation of 38% between the credit treatment Total Debt to Total Assets ratio and the debit treatment Net Margin ratio. Below 50% correlation is acceptable for the study (Godfrey & Orme.1994). Table 16 presents the results of the correlation matrix.

Table 16: OLS Model Correlation Matrix

E(V)	Dr_Ret	Cr_Tot	Dr_Cia	Dr_Tot	Intere~E	Cr_Cia	Cr_Ret	Cr_Net	Dr_Net	D~Neta	Dr_Net
DR_Returno	1.000										
CR_TotalDe	0.0679	1.000									
DR_CIACtot	-0.0702	-0.0965	1.000								
DR_TotalDe	-0.0429	-0.3650	0.2461	1.000							
InterestRe	-0.0189	-0.0717	-0.2237	0.3719	1.000						
CR_CIACtot	0.0120	0.1033	-0.3458	-0.2049	-0.0296	1.000					
CR_Returno	0.0214	0.0253	-0.0663	-0.0462	-0.0187	0.0149	1.000				
CR_NetPlan	-0.0043	0.0162	0.0010	0.0138	-0.0232	0.0029	0.0712	1.000			
DR_NetPlan	0.0971	0.0197	-0.0518	0.0084	-0.0019	0.0049	0.0218	-0.0045	1.000		
DR_TotalNe	0.0170	0.1980	-0.1679	-0.0823	-0.4673	0.1672	0.0354	-0.0186	-0.0128	1.000	
DR_NetM	0.0096	-0.0381	0.0123	-0.0810	-0.0928	0.0526	0.0056	-0.0033	0.0092	0.0924	1.0000
_cons	0.0702	-0.5446	-0.3358	0.0036	-0.0573	-0.0117	0.0430	-0.0151	0.0001	-0.0605	0.1434

Table 16 shows the correlation matrix of the specified model from table 14; it depicts the correlation coefficients of the predictors, and lower correlations between predictors are preferred to higher correlations to avoid multicollinearity issues within the model. The overall results show lower correlations among the predictors.

Discussion of Results

The study used the OLS to analyze the data and examine the correlation between the explanatory variables and a reserve account to fund the replacement of donated assets when they are retired. None of the results of the empirical tests for the credit treatment of CIAC were significant. This suggests that the current credit treatment of CIAC is not a viable method for replacing IOU donated aged assets. The results of the empirical tests of the debit treatment of CIAC were mixed. Four of the variables (CIAC Total Asset Ratio, Total Debt to Total Asset Ratio, Interest Revenue, and Total Net Asset Ratio) were statistically significant. However, the Total Debt to Total Asset Ratio had an inverse relationship suggesting increases in Debt are associated with lower funding of the reserve account. The results also reveal that the net margin of a utility has a positive impact on funding utility assets; under the debit treatment of a CIAC, the net margin coefficient is positive and statistically significant. The calculation of the net margin under the debit treatment included depreciation of the CIAC. Acheampong (2019) found an average net margin loss of $34,672 for utility abandonments and transfers, suggesting asset replacement funding by net margins may be a challenge. However, the positive statistically significant net margin impact on funding the reserve account suggests a viable investor-owned utility industry will be able to partially fund asset replacement.The interest revenue generated at the treasury bill rate (2019 2nd Quarter rate) had a positive relationship with the reserve account, suggesting another revenue source for funding asset replacement. The accumulated depreciation amount may be invested to accumulate extra revenue in the reserve account until there is the need to replace the donated asset. The debt to total assets ratio reflects the total assets financed by creditors divided by total utility plant assets. A debt to total assets ratio higher than the industry standards is unfavorable to any organization (Remmers, Stonehill, Wright, & Beekhuisen, 1974). Consistent with existing theory and the FPSC minimum 40% equity requirement, financing assets with debt reduces the funding of the reserve account. The debt to total assets ratio had a very high inverse relationship with funding the reserve account for asset replacement. Taken together, these results support treating CIAC as a debit balance to enable utilities to accumulate depreciation value in a reserve account for the funding of replacement assets.

CONCLUSION

The Tax Reform Act of 1986 treats the CIAC of a regulated public utility as part of the regulated utility income. Representative Robert T. Matsui sponsored a bill to exclude CIAC from income recognition and the rate base of a regulated utility (H.R. 3250, 1987). Due to the severe impact of taxes on utilities, NARUC (1995) passed a resolution for the IRS to exclude CIAC from income recognition, asserting that the disallowance of depreciation by the utilities leads to an increase taxes on utilities. CIAC has been receiving attention since the 1986 Tax Reform. NARUC (1995) explained that utilities are not allowed to depreciate assets that are not recoverable through rate base. However, to continue serving customers (utility ratepayers), plant assets are expected to be replaced when they are retired. CIAC is currently treated as a credit balance to compensate for the donation by reducing the plant asset in the rate base. The rate base is fundamentally composed of the plant-in-service offset by CIAC and the accumulated depreciation (Acheampong, 2019). Thus, the future funding of donated assets cannot depend on other donations; however, utilities must replace these assets when they are retired if they are to continue to serve their ratepayers. The study extends prior research by examining the impact of an alternative treatment of CIAC on asset infrastructure funding for investor-owned utilities. These results have practical implications for owner-investors and regulators as they highlight the necessity of considering funding sources for donated asset replacement. The data used in this study are specific to Florida and thus may not be generalizable to other states which do not amortize CIAC. Future research employing data from these other states may provide additional insights for regulators and owner-investors.

REFERENCES

Acheampong, D., Benford, T., & Volkan, A. (2018). Modelling utility financial viability using logistic regression: Evidence from Florida. *Accounting & Taxation*, *10*(1), 87-96.

Acheampong, D. (2019). The financial and nonfinancial performance measures that drive utility abandonments and transfers in the state of Florida. Available from ProQuest Dissertations & Theses Global. (2310632306). Retrieved from https://search.proquest.com/docview/2310632306?accountid=14745.

American Institute of Certified Public Accountants. (2017). Revenue Recognition: Audit and Accounting Guide. New York, NY: American Institute of Certified Public Accountants. Retrieved from https://www.aicpa.org/interestareas/frc/accountingfinancialreporting/revenuerecognition/rrtf-utilities.html

American Water Works Association (AWWA). (2012). *Principles of water rates, fees, and charges* (6th).

American Water Works Association. Retrieved from http://search.ebscohost.com.ezproxy.lib.usf.edu/login.aspx?direct=true&db=edsgao&AN=edsgcl.298704895&site=eds-live.

Beecher, J. A., Higbee, J., Manzel, A., & Dooley, R. (1996). The regionalization of water utilities: perspectives, literature review, and annotated bibliography. Retrieved from: https://www.researchgate.net/profile/janice_beecher/publication/260400114_96-21_the_regionalization_of_water_utilities_perspectives_literature_review_and_annotated_bibliography/links/569d351908ae16fdf07962c4/96-21-the-regionalization-of-water-utilities-perspectives-literature-review-and-annotated-bibliography.pdf

Beecher, J. A., Dreese, G. R., & Landers, J. R. (1992). *Viability Policies and Assessment Methods for Small Water Utilities* (Vol. 91, No. 17). National Regulatory Research Institute, Ohio State University.

Beecher, J. A., & Mann, P. C. (1990). *Deregulation and Regulatory Alternatives for Water Utilities. National Regulatory Research Institute. Retrieved from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.230.3858&rep=rep1&type=pdf*

Belsley, D. (1984). Demeaning conditioning diagnostics through centering. The American Statistician, 38(2), 73-77.

Brazell, D. W., & Mackie III, J. B. (2000). Depreciation lives and methods: current issues in the US capital cost recovery system. National Tax Journal, 531-561

Clarke, K. A. (2009). Return of the phantom menace: Omitted variable bias in political research. Conflict Management and Peace Science, 26(1), 46-66.

Congress of the United States Congressional Budget Office. (2015). Public Spending on Transportation and Water Infrastructure, 1956-2014. (Report No. 49910), pp. 1, 5.

Copeland, C. and Tiemann, M. (2010). Water Infrastructure Needs and Investment: Review and Analysis of Key Issues. Congressional Research Service. [Report No. 7-5700], pp. 3-4, 6, 15-16.

Contributions in aid of construction Tax reform Act 1986 amendment, H.R. 3250, 100th Cong. (1987).
Crahan, J. (1994). The value of contributed property in utility valuation. The Appraisal Journal, 62(2), 264-264.

Deloitte Center for Energy Solutions. (2004). *Regulated utilities manual: A service for regulated utilities.* Retrieved from http://www.ipu.msu.edu/library/pdfs/Deloitte%20Regulated%20Utilities%20Manual%20rebranded%20042012%20(1).pdf

Florida Public Service Commission. (1993). *F.A.C. 25-30.433 rate case proceedings*. Retrieved from https://www.flrules.org/gateway/ruleNo.asp?id=25-30.433

Florida Public Service Commission. (2018). *Leverage formula for water and wastewater utilities:* Docket No. 20180006-WS, Order No. PSC-2018-0327-PAA-WS *rate case proceedings.*

Forrer, D. A., Ehart, C., & Forrer, A. S. (2011). Water and wastewater utility affordability: The Cape Coral Florida experience. Journal of Business Case Studies, 7(3), 37-48.

Godfrey, L. G., & Orme, C. D. (1994). The sensitivity of some general checks to omitted variables in the linear model. International Economic Review, 489-506.

Kline, K.J (2017). Small water systems: Surveying state utility commission best practices. *National Regulatory Research Institute.* Columbus, OH: Retrieved from https://www.wyoleg.gov/InterimCommittee/2018/07-20180521NRRI17-05SmallWaterSystems_updated.pdf

Mann, P. C. (1993). Water utility regulation: rates and cost recovery (pp. 6-8). Reason Foundation. Retrieved from https://salisbury.md/wp-content/uploads/2013/08/Water-Utility-Regulations.pdf

Mason, C. H., & Perreault Jr, W. D. (1991). Collinearity, power, and interpretation of multiple regression analysis. Journal of Marketing Research, 28(3), 268-280.

National Association of Regulatory Utility Commissioners (1995), Resolution Regarding Contributions in Aid of Construction for Water and Sewer Utilities. Retrieved from https://pubs.naruc.org/pub.cfm?id=539F4492-2354-D714-5119-07644429C95F

National Association of Regulatory Utility Commissioners. (1996). Uniform systems of accounts for class C water utilities. Washington, DC: Author. Retrieved from https://pubs.naruc.org/pub.cfm?id=5381A5A2-2354-D714-5192-728574E7A8E8

Remmers, L., Stonehill, A., Wright, R., & Beekhuisen, T. (1974). Industry and size as debt ratio determinants in manufacturing internationally. Financial Management, 24-32.

Shukur, G., & Mantalos, P. (1997). Size and power of the RESET test as applied to systems of equations: a bootstrap approach. Department of Statistics, working paper, 3. Retrieved from http://interstat.statjournals.net/YEAR/2001/articles/0102003.pdf

Stanford, M. J. (2008). *Small water systems: Challenges and recommendations.* Retrieved from http://nrri.org/pubs/water/nrri_small_water_systems_08-02.pdf

Swamy, P. A. (1970). Efficient inference in a random coefficient regression model. Econometrica: Journal of the Econometric Society, 311-323.

The Environmental Protection Agency (EPA). (2017). 2016 Annual Report Clean Water State Revolving Fund Programs. Retrieved from https://www.epa.gov/cwsrf/clean-water-state-revolving-fund-cwsrf-reports

The Study Committee (2013). Report of the study committee on investor-owned water & wastewater utility systems. Retrieved from http://www.psc.state.fl.us/Files/PDF/Utilities/WaterAndWastewater/Water-Wastewater%20Sub%20Committee%20Report.pdf

The United States Environmental Protection Agency. (1995, August). Methods for assessing the viability of small water systems: A review of current techniques and approaches. Retrieved from https://nepis.epa.gov/exe/tiff2png.cgi/20001rrb.png?-r+75+-g+7+d%3a%5czyfiles%5cindex%20data%5c95thru99%5ctiff%5c00000110%5c20001rrb.tif

Warford, J. J., & Julius, D. S. (1979). Water rate policy: Lessons from less developed countries. Journal-American Water Works Association, 71(4), 199-203.

Washington State Department of Health. (2010, January). Financial viability for small water systems. Retrieved from http://www.doh.wa.gov/portals/1/Documents /pubs/331-405.pdf

Wheeler, D., & Tiefelsdorf, M. (2005). Multicollinearity and correlation among local regression coefficients in geographically weighted regression. Journal of Geographical Systems, 7(2), 161-187.

AUTHORS BIOGRAPHY

Dr. Daniel Acheampong is the Managerial Accounting Course Coordinator and Accounting instructor at Florida Gulf Coast University. He can be Contact at Lutgert Hall LH 3302 10501 FGCU Blvd. S. Fort Myers, FL 33965.

Dr. Tanya Benford is the Accounting Department Chair and Associate Professor at Florida Gulf Coast University. She can be Contact at Lutgert Hall LH 3339. 10501 FGCU Blvd. S. Fort Myers, FL 33965.