A PANEL DATA ANALYSIS ON THE DETERMINANTS OF FINANCIAL EQUILIBRIUM IN ROMANIAN COUNTIES

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Abstract

The article draws on how public debt influences financial equilibrium of six Romanian counties during a time span of one decade (2007–2016). By means of panel data analyses conducted via panel estimated generalized least squares with cross-section weights, empirial results obtained on financial data measuring public det, current liquidity and solvency revealed a strong relationship between these indicators. Both short-term and long-term financial equilibria were significantly determined by public debt indicators. Insights provided by this study could assist public authorities at county level in implementing efficient strategies that aim to maintain the financial equilibrium of public institutions and best serve citizens' interests.

Keywords: *public debt, financial equilibrium, liquidity, solvency*

JEL Classification: G10, G18, G35, G38

1. Introduction and general context

Jean Piaget, the well-known Swiss psychologist, used to assert that "equilibrium is the profoundest tendency of all human activity". Tackling the concept of equilibrium from an economic perspective, David Harvey, a highly respected economic geographer at worldwide level, stated that "the equilibrium between supply and demand is achieved only through a reaction against the upsetting of the equilibrium".

Whether it is about their professional or personal lives, humans have always gravitated towards the state of equilibrium and have searched for adequate solutions to preserve this state over longer periods of time.

For that matter, when taking about the manner in which public authorities make decisions [11], it can be deemed that preserving the financial equilibrium of administrative divisions within a country is important for both public authorities and citizens. On the one hand, public authorities that carefully monitor the state of financial equilibrium may decide the appropriateness of increasing or decreasing public debt levels [8]-[9] while providing public goods via budgetary resources [12]. Moreover, in times of economic crises, when budgetary resources mitigate and authorities must reprioritize public outlays, such analyses targeting equilibrium prove to be extremely timely. On the other hand, citizens manage to enjoy public good services such as education, healthcare, social security and pensions, national defense etc. on the account that public authorities have sufficient resources in the short run and in the long run.

According to financial theory, short-term financial equilibrium is indicated by the liquidity concept [5], while long-term financial equilibrium is indicated by the solvency concept [1]-[3]. Moreover, both types of equilibria can be measured with the help of financial ratios [2]-[10]. For the purpose of this study, the former type of equilibrium will be measured via current liquidity ratio, while the latter type of equilibrium will be measured via solvency ratio.

Within the extant financial literature, the topic of the present empirical research is propitious given the aforementioned importance of monitoring both public debt levels and financial equilibrium states. Proactive monitoring strategies may help public authorities in preventing prolonged illiquidity situations or even social unrest caused by the (temporary) ceasing of certain public goods.

The article is structured in the following manner. Section 2 details on the six variables of interest proxing long-term and short-term financial equilibrium and public debt, descriptive analyses and correlation analyses. Section 3 comprises the research hypotheses, econometric models and estimated results. Section 4 presents the concluding remarks and discussions regarding empirical results, study limitations, policy implications and avenues for future research.

2. Method and variables of interest

The present article scrutinized the relationship between public debt and financial equilibrium on data from six Romanian counties across the period 2007–2016. This specific decade was selected particularly because it comprises the time frame right before the onset of the 2008 global financial crisis and a considerable period after the end of this crisis. As mentioned before, considering that a major liquidity shortage was at the core of the global financial meltdown, the topic of this present research is well timed. Regarding the general economic context in Romania, one can identify two almost diametrically different periods. In the period 2007–2008, after its 2007 accession to the European Union, the country registered a sustained level of economic growth and even managed to mitigate a little the development gap compared to older EU members [13]. Since 2009, Romania has started to "experience" the negative effects of the global crisis through staggering public deficit levels, massive salary cuts in the public sector (i.e., 25%), increased VAT rates from 19% to 24% (2010–2015), increasing unemployment, decreasing consumption and recession. Moreover, both public and private entities have incurred considerable financial losses. Only from 2016 has the economic context of the country improved and have the crisis shadows started to dissipate [14].

Data used to compute financial ratios were taken from two financial statements (i.e., balance sheet, patrimonial result account) corresponding to the following counties in Romania: Bihor, Bistriţa-Năsăud, Cluj, Maramureş, Sălaj, Satu Mare.

The statistical software EViews version 9.0 was the workhorse chosen for running the empirical analyses.

For the purpose of this research, six variables were taken into consideration. Namely, the outcome variables measuring financial equilibrium were the following:

- *Current liquidity ratio (CLR)*, determined as a ratio of current assets to current liabilities. The variable is the expression of the short-term financial equilibrium;
- *Solvency ratio (SR)*, determined as a ratio of total assets to total liabilities. The variable is the expression of the long-term financial equilibrium.

The explanatory variables related to public debt were the following:

- *Short-term public debt to operating revenues ratio (SPDOR)*, determined as a ratio of current public debt and operating revenues;
- *Short-term public debt to operating expenses ratio (SPDOE)*, determined as a ratio of current public debt to operating expenses;
- *Long-term public debt to operating expenses ratio (LPDOE)*, determined as a ratio of non-current public debt to operating expenses;
- *Public debt to GDP ratio (PDGDP)*, determined as a ratio of public debt to gross domestic product.

Table no. 1. Descriptive statistics

Indicators	CLR	SR	SPDOR	SPDOE	LPDOE	PDGDP
Mean	0.4077	1.2034	0.9127	0.9973	–0.2001	–0.4678
Median	0.3546	1.1938	0.9668	0.9959	0.2723	–0.4028
Max.	1.0411	1.9683	1.7876	1.9893	1.6569	1.6325

Min.	0.0493	0.6359	0.0380	0.0580	–3.3504	–3.5229
Std. Dev.	0.2667	0.3451	0.3862	0.4465	1.4410	1.5773
Skewness	0.7015	0.1283	–0.2232	0.0348	–0.8298	–0.3097
Kurtosis	2.4660	1.9773	2.3952	2.3673	2.5565	1.9038
Jarque-Bera	5.6338**	2.7796*	1.4129*	1.0129*	7.3772**	3.9631*
Sum Sq. Dev.	4.1961	7.0271	8.8021	11.7603	122.5142	146.7835
Observations	60	60	60	60	60	60

Source: Author's computations.
Note: *** denotes statistical significance at the 5% and 10% levels.

As can be seen from table no. 1, which illustrates the descriptive statistics, the biggest volatility was registered by the variable public debt to GDP ratio, followed by long-term public debt to operating expenses ratio. On the other side of the spectrum, current liquidity ratio had the smallest volatility.

In terms of skewness, three variables were skewed to the right and the other three were skewed to the left. Moreover, since the kurtosis values corresponding to all variables were less than 3, variables had platykurtic distributions. The statistically-significant values of the Jarque-Bera test indicated that variables were non-normally distributed at the 5% and 10% levels.

Next, multicollinearity issues were investigated by means of correlation analysis, as presented in table no. 2.

Table no. 2. Correlation matrix

Indicators	CLR	SR	SPDOR	SPDOE	LPDOE	PDGDP
CLR	1					
SR	0.489	1				
SPDOR	–0.695	–0.341	1			
SPDOE	–0.640	–0.383	0.724	1		
LPDOE	–0.329	–0.416	0.066	0.082	1	
PDGDP	–0.179	–0.586	–0.034	0.019	0.866	1

Source: Author's computations.

Based on the values of Pearson's correlation coefficients, it can be stated that multicollinearity did not pose any problems for the subsequent empirical results. Namely, the biggest correlation was established between the variables LPDOE and PDGDP (r = 0.866), with the smallest correlation between the variables SPDOR and PDGDP (r = –0.034).

3. Econometric models

In order to test the relationship between public debt and financial equilibrium (measured by current liquidity ratio and solvency ratio), two research hypotheses were formulated, namely:

H_1: Public debt ratios significantly impact current liquidity ratio.

H_2: Public debt ratios significantly impact solvency ratio.

Two econometric models had the following general format:

$$W_{it} = v_0 + v_1 V_{1\,it} + v_2 V_{2it} + v_3 V_{3it} + v_4 V_{4it} + \delta_i + \theta_t + \varepsilon_{it}$$

having the following components:

- v_0 indicates the intercept;
- v_i indicates the coefficient of the explanatory variables, taking values from 1 to 4;
- V indicates the explanatory variable;

- i indicates the activity of the county, taking values from 1 to 6;
- t indicates the period of time analyzed (2007–2016), taking values from 1 to 10;
- δ_i indicates fixed effects, which control the time-invariant county-specific factors of influence;
- θ_t indicates fixed effects controlling for common shocks;
- ε_{it} indicates the error term.

Table no. 3 presents the estimated coefficients of the explanatory variables measuring public debt levels. Hypotheses were tested via the panel estimated generalized least squares (EGLS) method with cross-section weights, an approach well-established in the literature for analyzing panel data. Moreover, the White cross-section test ensures correct estimations of the standard errors of the model parameters in case there are heteroscedasticity problems, which could bias results. The panel data analysis method was selected because the financial equilibrium of the six Romanian countries was analyzed across a time span of ten years.

Table no. 3. Econometric models corresponding to the financial equilibrium outcome variables

	Model 1: $CLR = v_0 + v_1 SPDOR + v_2 SPDOE + v_3 LPDOE + v_4 PDGDP$	**Model 2:** $SR = v_0 + v_1 SPDOR + v_2 SPDOE + v_3 LPDOE + v_4 PDGDP$
Constant	0.7647*** (12.0157)	1.4620*** (23.3670)
$SPDOR$	–0.3130** (–3.0991)	–0.2403** (–2.0375)
$SPDOE$	–0.0805* (–1.7044)	–0.1103 (–0.9302)
$LPDOE$	–0.0827*** (–4.0568)	0.1428*** (4.1201)
$PDGDP$	0.0311 (1.2482)	–0.2236*** (–6.5089)
Prob.>*F*	0.0000	0.0000
R^2	0.5928	0.5564
Adjusted R-squared	0.5631	0.5241
F-statistic	20.0138	17.2452
Observations	60	60

Source: Author's computations.

Note: The values included in parentheses show the robust *t*-statistics; *, **, *** indicate statistical significance at the 10%, 5% and 1% levels. In the case of both models, the variance inflation test revealed no multicollinearity biases. The White test rejected the hypothesis of heteroscedasticity.

According to the first econometric model, 56.31% of the variance in the short-term financial equilibrium was due to the chosen explanatory variables measuring public debt ($F = 20.01$, $p < 0.001$), while the rest was generated by variables outside the model. Analyses revealed that variables SPDOR, SPDOE and LPDOE registered a negative relationship with current liquidity ratio, while PDGDP registered a positive relationship. Namely, a one-unit increase in SPDOR would yield a 0.313-unit decrease in current liquidity ratio. Similarly, if SPDOE and LPDOE augmented by one unit, current liquidity ratio would mitigate by 0.081 and 0.083 units. Last but not least, a one-unit raise in PDGDP would be mirrored by a 0.031 raise in current liquidity ratio.

The second econometric model explained 52.41% of the variance in the long-term financial equilibrium of the Romanian counties ($F = 17.25$, $p < 0.001$) following the impact of public debt

proxies. For this case, the variables SPDOR and PDGDP had a negative influence on solvency ratio, while LPDOE had a positive influence. Namely, should SPDOR increase by one unit, solvency ratio would decrease by 0.24 units. At the same time, when PDGDP increased by one unit, solvency ratio would decrease by 0.224 units. Moreover, when LPDOE rose by one unit, solvency would increase by 0.143 units.

4. Conclusions

By means of a panel data analysis conducted on financial information from six Romanian counties during the decade 2007–2016, the present article tested the impact of public debt measured via different financial ratios (i.e., short-term public debt to operating revenues; short-term public debt to operating expenses; long-term public debt to operating expenses; public debt to GDP) on financial equilibrium. Namely, the short-term equilibrium was quantified by current liquidity ratio, while the long-term equilibrium was quantified by solvency ratio.

As expected, both hypotheses were confirmed and public debt indicators did significantly influence financial equilibrium indicators. According to the estimated results provided by the two econometric models, the strongest impact on short-term equilibrium was exerted by the variable short-term public debt to operating revenues. In other words, on the grounds that public authorities increased the level of indebtedness, currently liquidity decreased the most.

With respect to the long-term financial equilibrium, the variable that had the biggest influence was again short-term public debt to operating revenues. This second result is important because it emphasizes the strong connection between short- and long-term financial equilibrium. In other words, if certain indicators produce changes in the short run, it may be the case that the same indicators have a similar impact in the long run.

As any empirical investigation, the present study entails some limitations. First, the county sample includes only six of the 41 administrative divisions that constitute the territory of Romania. Future studies could focus on more comprehensive approaches by considering all counties across Romania, which could facilitate comparisons between different regions and discuss public authorities' capacity of ensuring financial equilibrium at country level. Second, future investigations might also test the empirical hypotheses over longer time frames (e.g., two decades) and tackle the evolution of public authorities' capacity in managing debt levels and equilibrium states. Last but not least, the econometric models proposed in this study could be tested against financial data retrieved from other countries in the European Union, having a similar political and economic background with Romania.

Insights provided by this empirical investigation could inform public authorities about efficient strategies to be used in order to maintain financial equilibrium of public institutions both in the short run and in the long run [4]. Therefore, equipped with adequate information on how to properly manage public funds, authorities can efficiently monitor the balance between public revenues and public outlays, prevent future shortages of liquidity, ensure citizens with a high quality system of public goods and assist citizens in times of economic crises [6]-[7].

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