# MACROECONOMIC FACTORS INFLUENCING THE LEVEL OF HOUSEHOLD INDEBTEDNESS: EVIDENCE FROM EURO AREA

**Nikola Šubová – Ján Buleca**

**Abstract**

The household indebtedness has been increasing in the last decades and it is widely considered to be risky for the stability of economy. Article is focused on the macroeconomic factors influencing the level of household indebtedness in Euro area member states. The data set consisted of the territorial and time dimension and therefore it was structured as panel data. It included 19 Euro area member states and 5 selected macroeconomic indicators (gross domestic product, inflation, unemployment, income, and savings) in the period 2007–2018 obtained from the Eurostat database. The quantitative approach was applied using correlation and regression analysis in which all three types of panel regression models (pooling, fixed effect, and random effect model) were created. Highly correlated macroeconomic indicator representing unemployment was removed and not used in the regression analysis. According to our analysis, disposable income and the level of savings are the only statistically significant variables. It underlines the fact, that higher income of households leads to greater indebtedness. One-euro increase in household income causes a 1,6802 € increase in household debt. On the other hand, the effect of savings on indebtedness is negative. The savings increase by one € leads to the lower household debt by 1,3546 €. Statistical significance of gross domestic product and inflation is not confirmed.

**Key words:** Household, Indebtedness, Income, Panel Data.

**JEL Code:** C230, D120, G510.

## Introduction

In the last decades, household debt has reached unprecedented levels while it has exceeded income. Since the financial crisis, the debt of Euro area households fell to the lowest level in 2018. This year, the most indebted households lived in Germany. The lowest debt from Euro area households was reached by Latvia. The level of debt of Slovak households more than doubled in the last two decades. Moreover, each indicator that is usually used to assess

household indebtedness can bring a different view of the country's household debt. While considering the share of debt on income as an indicator of household indebtedness, Germany was approximately in the middle of other Euro area countries and Latvia recorded the highest value until 2015.

The risks arising from household debt may not be the same across various countries while it depends on the different economic, social, and demographic conditions. The global financial crisis in 2008, which was to a large extent a debt crisis, showed the importance of regulation of household indebtedness because it poses a risk for household financial stability and the whole economy as well. Because of increasing household indebtedness and its association with the economy, it is important to understand the macroeconomic factors of household debt especially for policymakers, that helps national and international authorities to take precautionary measures to curb household debt taking into account different conditions and the level of household indebtedness.

Submitted paper focuses on the analysis of the macroeconomic factors influencing the level of household debt in member states of the Euro area (except of Malta) in the period 2007–2018. The research question is formulated as follows: „Which of the macroeconomic factors significantly affect the household indebtedness?"

The main aim of this study is to analyse the effect of macroeconomic factors on the level of household indebtedness in the Euro area.

# 1 Literature review

In the last decade, household debt has become often discussed question because the level of debt has exceeded income. Unprecedentedly high debt levels also called over-indebtedness of households can be defined as the level of debt that is three or more time higher than the value of its assets (Loukoianova, 2019).

The current literature is dominated by studies which analyse household indebtedness and its determinants in developed (Kim *et al*., 2014) and in developing countries (Raboloko and Zimunya, 2015) using various econometric methods, time periods and different debt determinants as well. The factors influencing household debt should be divided into demographic, socio-economic and economic factors (Modigliani and Brumberg, 1954; Davies *et al*., 2010; Nomatye and Phiri, 2017).

The age structure of the country's population should drive household indebtedness and it is a basis of generic life cycle model (Modigliani and Brumberg, 1954). Young people do not

earn the income for required consumption and if they fulfill conditions for receiving loans, they will borrow for consumption smoothing (Moore and Stockhammer, 2018). The effect of life expectancy on the level of debt is *a priori* doubtful because longer life expectancy could lead to the greater debt through bank willingness to lend, but on the other hand, a longer life expectancy is associated with the older population and higher debt, because the older population is less able to repay its debts (Davies *et al*., 2010).

After the global financial crisis in 2007, the macroeconomic indicators of household debt has become crucial mainly for policymakers. The most common discussed macroeconomic factors are GDP, interest rates, inflation, investment, and unemployment that are the main reason why households record-high debt (Cardaci, 2012; Coletta *et al.*, 2014; Catherine *et al*., 2016; Masturah *et al*., 2016; Nomatye and Phiri, 2017). In most countries, higher GDP *per capita* and a higher level of household debt lead to higher household indebtedness. Higher *per capita* GDP and wealth enable more responsible debt repayment and better financial education especially in developed countries and it might imply higher household debt (Coletta *et al.*, 2014).

The unemployment rate and consumption are also positive and significantly related to household debt. While unemployment rate refers to the number of unemployed people as a percentage of the labour force, to decrease the value of debt, it is important to lower the unemployment. The temporary unemployment situation force households to increase debt to finance consumption (Catherine *et al*., 2016). In contrary to this, another study describes a negative and statistically significant relationship between unemployment and debt (Mastuah *et al.*, 2016). A negative relationship is confirmed between inflation and household debt as well (Loukoianova *et al*., 2019). Debelle (2004) explains that the increase in indebtedness is the interaction of inflation with the tax system that causes a significant reduction in the real after-tax cost of borrowing.

Income inequality is closely related to income and directly increase household debt. A higher level of household debt is also associated with „peer effect“ in consumption that is based on income inequality. People usually compare their living standards and consumption with that of richer people around and try to imitate their consumption. It encourages households to spend more and use loans to finance consumption expenditure (Cardaci, 2012).

An increase in borrowing is caused by low-interest rates as well. Low short term interest rates lead to cheap borrowing for banks and then for households and therefore low-interest rates support people’s borrowing that is usually associated with housing boom (Moore and Stockhammer, 2018).

The rise of household debt is also determined by a house price index, has a positive relationship with debt. Higher house prices result in a higher wealth of households that should be used to secure a loan and therefore house prices are major factors influencing the level of household debt in the long-term (Masturah *et al*., 2016).

# 1 Data and methodology

To met the goal, the country-level data was obtained from the Eurostat database which is the official European Commission database, providing high quality, publicly available statistics for Europe covering all areas of European society. It contained the tables Real GDP growth rate coded tec00115, Financial balance sheets marked nasa_10_f_bs, Non-financial transactions marked nasa_10_nf_tr, HICP annual data coded prc_hicp_aind, and Unemployment by sex and age marked une_rt_a.

The data was structured as panel data and it means that there are two dimensions: territorial and time dimension. The data set contained 19 member states of the Euro area (without Malta because of data unavailability) and explored the time period covered the period 2007–2018. The following countries were involved: Belgium, Bulgaria, Germany, Estonia, Ireland, Greece, Spain, France, Italy, Cyprus, Latvia, Lithuania, Luxembourg, the Netherlands, Austria, Portugal, Slovenia, Slovakia, and Finland.

In submitted study, descriptive, quantitative and econometric methods were used. The analysis was based mainly on linear regression of panel data. The explained variable represented the level of household debt in € million, while based on the existing literature the explanatory variables described macroeconomic factors such as GDP growth rate, inflation rate, disposable income, unemployment rate, and savings. The data used within this study are presented in Table 1.

**Tab. 1 Variables description**

| Variable | Unit | Description |
|---|---|---|
| *Dependent variables* | | |
| Debt | % of GDP | The level of household liabilities |
| *Independent variables* | | |
| GDP | % | Real GDP growth rate-percentage change on previous period |
| Income | % of GDP | Gross disposable income of households |
| Savings | % of GDP | The volume of gross savings |
| Inflation | % | All items Harmonised Index of Consumer Prices |
| Unemployment | % | Unemployment rate as a % of active population |

Source: own processing

There are three approaches of the panel linear regression: the pooling approach, the random effect approach and the fixed effect approach. The general model for panel data is given by the equation:

$$y_{it} = \alpha + \beta_{it}^{T} x_{it} + u_{it} \qquad (1)$$

where:

-$y_{it}$: dependent variable, in case of this study i tis the level of household debt;

-$x_{it}$: vector of explanatory variables, GDP, disposable income, savings, inflation, unemployment rate;

-I=1,2,...,n: territorial dimension, index of various countries used in this study;

-t=1,2,...,T: time dimension;

-$u_{it}$: error term.

Before the regression analysis, it is necessary to test the correlation between explanatory variables that can distort the results of statistically significant factors. To check the correlation, we used the Pearson correlation coefficient. All correlated variables were removed and not be a part of later panel regression analysis.

After the correlation test, panel regression analysis began. The pooling regression model represents a standard form of the panel regression model. If the individual component is missing or statistically insignificant, the pooling regression model is the most appropriate estimator for β. If the individual component is unobserved and correlated with the explanatory variable, then the estimates of the fixed-effect model should be used because the OLS estimator is biased and inconsistent. On the other hand, if the individual heterogeneity is uncorrelated with any of the explanatory variables but statistically significant, the random effect model should be used (Greene, 2012).

F test and Lagrange multiplier test enable to test the statistical significance of individual and time effect in models. The models underlay the diagnostic tests such as checking serial correlation using Breusch-Godfrey/Wooldridge test for serial correlation in panel models and Wooldridge's test for unobserved individual effects, testing cross-sectional dependence by Pesaran CD test for cross-sectional dependence in panels, diagnostic of stationarity using Maddala-Wu Unit-Root Test, and heteroscedasticity testing by Breusch-Pagan test.

While panel regression models did not fulfill all assumptions for panel data models, it was necessary to estimate the statistical significance of coefficient using a robust covariance matrix based on arellano method that is consistent for models with heteroscedasticity and cross-sectional correlation (Wooldridge, 2010).

The whole analysis is executed in R programming with its packages *plm*, *lmtest*, and *tseries* (R Core Team, 2018).

## 2 Results and discussion

Household credit demand and supply of credit from lenders have increased in the last decade and it caused raising indebtedness of households all over the world. Nowadays, many households, especially those with lower income, use loans to finance their required consumption. While greater household debt is widely considered to be risky for the financial stability of households and financial stability of the whole economy as well, there is a great importance of understanding the macroeconomic factors of household indebtedness mainly for the policymakers.

The panel regression analysis revealed the interesting relations between explained and explanatory variables that are described in more detail in the next part of this paper. Before the regression analysis, it was a necessity to check correlation between explanatory variables, that can distort the relations between them. Results of correlation test are reported in Table 2.

**Tab. 2: Correlation matrix**

| | Inflation | GDP | Income | Savings | Unemployment |
|---|---|---|---|---|---|
| Inflation | 1,0000 | 0,0559 | 0,0074 | -0,0872 | -0,2699 |
| GDP | 0,0559 | 1,0000 | -0,0384 | -0,1643 | -0,2442 |
| Income | 0,0074 | -0,0384 | 1,0000 | 0,0645 | **0,3356** |
| Savings | -0,0873 | -0,1643 | -0,0645 | 1,0000 | **-0,4033** |
| Unemployment | **-0,2698** | **-0,2442** | **0,3356** | **-0,4033** | 1,0000 |

Source: own processing

The correlation evaluated by Pearson's correlation coefficient demonstrated a strong positive correlation between unemployment and other explanatory variables and therefore the indicator representing unemployment has been excluded from the models. As a result, a statistically significant effect of unemployment on the level of household debt was not confirmed (Catherine *et al.*, 2016; Masturah *et al.*, 2016; Nomatye and Phiri, 2017).

After the correlation test, three types of panel regression models were processed. The results obtained by applying regression analysis are presented in Table 3.

Results suggested that a disposable income was the only statistically significant factor after removing high correlated variables representing savings and unemployment. The effect of income on debt was positive, so the higher value of income led to greater indebtedness.

**Tab. 3: Results of panel regression analysis**

| | Pooling model | Fixed effect model | Random effect model |
|---|---|---|---|
| Intercept | 76,7745 *** | - | -20,7546 |
| GDP | -1,2260 * | -0,4174 ** | -0,4732 ** |
| Income | -0,1787 | 1,6802 *** | 1,4822 *** |
| Inflation | -2,1770 * | 0,1465 | 0,1422 |
| Savings | 0,1812 | -1,3546 *** | -1,1943 *** |
| R-squared | 0,0596 | 0,3707 | 0,3246 |

Source: own processing

Note: ***, **, *, . statistical significance on the probability level 1%, 5%, 10%, 50%

Every model was checked for competing key assumptions. Lagrange multiplier and F test tests confirmed, the statistical significance of individual effect in all three models (p-value $<2{,}2\text{x}10^{-16}$) while the statistical significance of time effect was not assumed (p-value 0,3764 and 0,8774). The result of Maddala-Wu Unit Root test clearly showed stationarity of the data used in this study. Hausman test showed, that the fixed effect model is more appropriate to estimate the results (p-value 0,0036 than the fixed effect model and therefore we describe the coefficients of this model. Diagnostic tests indicated, that there was a problem with serial correlation, cross-sectional dependence, and heteroscedasticity in all three models (p-value less than significance level) and therefore it was not appropriate to estimate the statistical significance of coefficient from the first original panel models and the estimate of robust covariance matrix was used. Table 4 provides an overview of the statistical significance of macroeconomic factors after a robust covariance matrix using.

**Tab. 4: Results of variance-covariance matrix**

| | Pooling model | Fixed effect model | Random effect model |
|---|---|---|---|
| Intercept | 76,7800 * | - | - |
| GDP | -1,2260 *** | -0,4174 | -0,4732 . |
| Income | -0,1787 | 1,6802 * | 1,4822 * |
| Inflation | -2,1766 *** | 0,1465 | 0,1424 |
| Savings | 0,1812 | -1,3546 * | -1,1943 * |

Source: own processing

Note: ***, **, *, . statistical significance on the probability level 1%, 5%, 10%, 50%

Results of the variance-covariance matrix indicated a positive and statistically significant effect of income on the level of household indebtedness at 10% significance level. It means, that if household income as a percentage of GDP increase by one 1%, household

indebtedness as a percentage of GDP will increase by 1,6802%. This result is in line with other studies that found a positive and significant relationship between disposable income and the level of indebtedness (Coletta *et al.*, 2014; Masturah *et al.*, 2016). Our results also suggest a statistically significant but negative effect of savings on the household's debt that reject the findings of Catherine et al. (2016) about the positive relationship. The greater level of savings by 1% leads to lower debt by 1,3546%.

On the other hand, on contrary to these studies and the study of Nomatye and Phiri (2017), our results indicated a statistically insignificant and negative relationship between GDP and the level of debt. Results describing an insignificant effect of inflation on indebtedness are in line with Nomatye and Phiri (2017) but in contrary with Loukoianova *et al*. (2019) who states that inflation has a negative and statistically significant effect on household debt.

## Conclusion

Household debt increased sharply in the last decades and it poses a higher risk for the financial stability of households but also for the financial stability of the whole economy. Therefore it is important to understand the macroeconomic indicators of household indebtedness mainly for national and international authorities such as government, national banks, or international banks that take precautionary measures to manage the level of household debt.

In the current study, we contribute to the literature by examining the macroeconomic factors ifnluencing the level of household indebtedness in Euro area member states in the period 2007–2018. The analysis was based on country-level data from Eurostat database and two quantitative approaches: correlation and regression analysis.

Pearson's correlation matrix showed a significant correlation between unemployment and other independent variables, therefore the indicator representing unemployment was excluded from further analysis.

Results of regression analysis of panel data indicated the positive and statistically significant effect of income on the level of household indebtedness. Our results also suggest a statistically significant and negative relationship between the household's savings and debt. The effect of inflation and the gross domestic product on the level of indebtedness was not confirmed.

While the factors influencing the level of household debt depend not only on the average debt but also on its distribution across households, for future research we recommend to use

household-level data and take into account unequal distribution of income and other characteristics that can affect the level of debt as well.

## References

Cardaci, A. (2018). Inequality, household debt and financial instability: An agent based-perspective. *Journal of Economic Behavior and Organization*, 49, 434–458. DOI: 10.1016/j.jebo.2018.01.010.

Catherine S. F. H., Jamaliah M.Y., Aminah M., Arshad A. (2016). Household Debt, Macroeconomic Fundamentals and Household Characteristics in Asian Developed and Developing Countries. *The Social Sciences*, 11(18), 4358–4362. DOI: 10.36478/sscience.2016.4358.4362.

Coletta, M., De Bonis, R., Piermattei, S. (2014). The Determinants of Household Debt: A Cross-Country Analysis. *SSRN Electronic Journal*, 1–36. DOI: 10.2139/ssrn.2571267.

Davies, J., Sandstrom, J. B. S., Shorrocks, A., Wolff, E. (2010). The Level and Distribution of Global Household Wealth. *The Economic Journal*, 121(551), 223–254. DOI: 10.1111/j.1468-0297.2010.02391.x.

Debelle, G. (2004). Macroeconomic Implications of Rising Household Debt [online]. Bank for International Settlements: BIS Working Papers No. 153 [cit.15.06.2020], 46 p. ISSN: 1682–7678. Available at: < https://www.bis.org/publ/work153.pdf>.

Greene, W. H. (2012). Econometric Analysis. The Seventh Edition. Edinburgh: Pearson Education Limited, 1241 p. ISBN: 978–0–273–75356–8.

Kim, H. J., Lee, D., Son, J. C., Son, M. K. (2014). Household Indebtedness in Korea: Its Causes and Sustainability. *Japan and the World Economy*, 29, 59–76. DOI: 10.1016/j.japwor.2013.12.001.

Loukoianova, E., Wong, Y. Ch., Hussiada, I. (2019). Household Debt, Consumption, and Monetary Policy in Australia. International Monetary Fund Working Paper, WP/19/76.

Masturah, M., Amira, I., Badariah, S. N. (2016). Household Debt and Macroeconmic Variables in Malaysia. BE-ci 2016 International Conference on Business and Economics: The European Proceedings of Social & Behavioural Sciences EpSBS, 121–130. DOI: 10.15405/epsbs.2016.11.02.12.

Modigliani, F., Brumbergh, R. (1954). Utility Analysis and the Consumption Function: An Interpretation of Cross-section Data, 388–436. In: Kurihara, K. (editor). Post Keynesian Economics. New Brunswick: Rutgers University Press, 442 p. ISBN: 978–0415607896.

Moore, G. L., Stockhammer, E. (2018). The Drivers of Household Indebtedness Reconsidered: An Empirical Evaluation of Competing Arguments on the Macroeconomic Determinants of

Household Indebtedness in OECD Countries. *Journal of Post Keynesian Economics*, 41(4), 547–577. DOI:10.1080/01603477.2018.1486207.

Nomatye, A., Phiri, A. (2018). Investigating the Macroeconomic Determinants of Household Debt in South Africa. *International Journal of Economics and Financial Issues*, 8(2), 62–69. ISSN: 214–4138.

R Core Team. (2018). R: Language and Environment for Statistical Computing [online]. Vienna, Austria: R Foundation for Statistical Computing [cit. 15.062020]. Available at: <https://www.R-project.org>.

Raboloko, F., Zimunya, M. (2015). Determinants of Household Debt in Botswana: 1994-2012. *Journal of Economics and Public Finance*, 1(1), 14–36. DOI: 10.22158/jepf.v1n1p14.

Wooldridge, J. M. (2010). Econometric Analysis of Cross Section and Panel Data [online]. Cambridge (MA): MIT Press [cit.15.06.2020], 644 p. ISBN: 9780262232586. Available at: <http://new.mmf.lnu.edu.ua/wpcontent/uploads/2018/03/wooldridge_cross_section_and_panel_data.pdf>.

**Contact**

Nikola Šubová
Technical University of Kosice, Faculty of Economics
Department of Finance
Boženy Němcovej 32, 040 02 Košice
nikola.subova@tuke.sk

Ján Buleca
Technical University of Kosice, Faculty of Economics
Department of Finance
Boženy Němcovej 32, 040 02 Košice
jan.buleca@tuke.sk