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Examining the relationship between banking loans to private individuals growth rate and personal consumption growth rate in Croatia – the cointegration approach

Ispitivanje veze između stope rasta bankovnih kredita građanima i stope rasta osobne potrošnje u Hrvatskoj – kointegracijski pristup

Abstract

The main hypothesis of the paper states that banking loans to private individuals growth rate correlates with the personal consumption growth rate in Croatia. Following the Engle-Granger cointegration and Johansen cointegration approaches on yearly data samples from 1996 to 2012, we found banking loan to private individuals annual growth rate and personal consumption annual growth rate in Croatia were cointegrated. According to estimates, there is empirical evidence for statistically significant, long-run and short-run levels of banking loans to private individuals growth rate having an effect on the personal consumption growth rate in Croatia. Given the low competitiveness of the domestic economy, the research results raise questions regarding the sustainability of a banking business in Croatia which is mainly oriented toward lending to private individuals, and the potential need to update banking regulations in Croatia. We found evidence of debt-financed consumption. In addition, the research results further illustrate the sensitivity of cointegration methods to deviations from the pure unit-root assumption, since unit-root tests cannot easily distinguish between a unit root and close alternatives.

Keywords: personal consumption, life-cycle hypothesis, banking loans, cointegration, Croatia

JEL classification: C22, D12, E21, E51

Sažetak

Glavna hipoteza rada glasi da je stopa rasta bankovnih kredita građanima korelirana s osobnom potrošnjom u Hrvatskoj. Slijedeći Engle-Grangerov pristup, kao i Johansenov kointegracijski pristup na godišnjim podatcima od 1996. godine do 2012. godine, utvrđeno je kako su godišnje stope rasta bankovnih kredita građanima i godišnje stope rasta osobne potrošnje u Hrvatskoj kointegrirane. Empirijski je dokazan statistički značajan efekt stope bankovnih kredita građanima u dugom i kratkom roku na stopu rasta osobne potrošnje u Hrvatskoj. U slučaju relativno niske konkurentnosti domaćega gospodarstva rezultati istraživanja upućuju na pitanje o održivosti poslovanja banaka u Hrvatskoj kao većinski orijentiranog na kreditiranje građana kao i potrebu za potencijalnim izmjenama u regulaciji banaka u Hrvatskoj. Rad ukazuje na potrošnju financiranu zaduživanjem. Također, rezultati istraživanja ilustriraju osjetljivost kointegracijskih metoda na odstupanja od čistih pretpostavki jediničnih korijena jer testovi jediničnih korijena ne moraju pokazati razliku između jediničnih korijena i bliskih alternativa.

Ključne riječi: osobna potrošnja, hipoteza životnog ciklusa, krediti banaka, kointegracija, Hrvatska.

JEL klasifikacija: C22, D12, E21, E51

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1. Introduction

Financial liberalization in Croatia has resulted in the increase of financial inflow from abroad. According to the Croatian National Bank (CNB) data on Foreign Direct Investment (FDI) since 1993, the greatest proportion of FDI in Croatia has been directed towards the financial intermediation sector (mainly foreign-owned credit institutions). Furthermore, according to the Croatian National Bank data on loans structure by institutional sectors since 1993, the highest proportion of loans in Croatian banking system is to private individuals. Banking orientation toward private individuals is due to higher loans diversification and positive effects on domestic demand and the economy as a whole. An increase in loans to private individuals may increase domestic demand for goods and that may be desirable in a large, competitive economy. At the same time, if the competitiveness of the domestic economy is low, domestic demand may be oriented toward foreign goods from more competitive economies. If this phenomenon lasts long enough, it can weaken the economy as a whole, so the issue can be raised of the sustainability of a banking business in Croatia which is mainly oriented towards private individuals.

According to the Croatian Bureau of Statistic data for the same period, an extensive increase in personal consumption has been recorded. The effects of the increase in financial inflows from abroad on economic performance are different when bank loans are made to households and used for government consumption, compared to lending to companies for entrepreneurial activities and added value creation.

Bank loans should support future value-added, but also future income, from which the debtor's liability and the expenses of interest repayment should be settled.

According to Hall (1978), the academic community has been oriented toward testing the hypothesis that aggregate consumption evolves over time, in accordance with the life cycle-permanent income hypothesis, but has often failed to support the theory with empirical evidence. According to Bacchetta and Gerlach (1997), attention is focused on how alternative monetary policy measures influence credit conditions, and how the induced changes in credit conditions are likely to influence aggregate consumption.

Recent literature on this topic is scarce, even though it is important in any economy, and especially in a small, open economy like Croatia. The main objective of this paper is to contribute empirical evidence to understanding the relationship between banking loans to private individuals and personal consumption in Croatia.

In what follows, we explore the relationship between banking loans to private individuals and personal consumption in Croatia, so the main research hypothesis states: the level of banking loans to private individuals growth rate correlates with the consumption growth rate in Croatia. The paper consists of five parts. After the introduction, the second part provides a brief literature overview. The third part presents the methodology applied and the fourth results of the study. The fifth part is the conclusion.

2. Literature overview

The personal consumption function model in macroeconomics is often based on the permanent income hypothesis (Friedman, 1957) and life-cycle hypothesis (Ando and Modigliani, 1963). According to these hypotheses, personal consumption is determined by income and asset wealth.

Furthermore, monetary policy can only influence consumption through its influence on permanent income. Nonetheless, several research papers have examined the interconnections between personal consumption and credit constraints. There has been inconsistency in findings regarding the impact of debt on consumption.

Bacchetta and Gerlach (1997) confirmed empirically the link between credit availability and personal consumption in the USA, Canada, the UK, Japan and France. Furthermore, the authors found credit availability to be a more influential determinant of personal consumption than personal income. Jappelli and Pagano (1989), and Vaidyanathan (1993) found empirical evidence indicated that excess consumption sensitivity to current disposable income could be explained by credit constraints to some extent. Lovrinčević and Mikulić (2003), using data samples from 1972 to 2002,

found the credit constraint variable to be a significant personal consumption determinant in Croatia. Čeh Časni (2014) tested the housing wealth effect on personal consumption on a sample of six European post-transition economies, including Croatia, and found it to be significant. But the influence of banking loans to private individuals has not been tested on personal consumption or housing wealth. It might be that banking loans to private individuals influence both variables, and in that case, the estimation would be biased.

From the 1990s on, household access to credit eased considerably, due to a variety of factors, including financial deregulation, automated credit scoring, and mortgage securitization (Gramlich, 2007). So, loans could be made to less creditworthy borrowers and take riskier forms. On the other hand, according to Murphy (1998), debt to income ratio reduces disposable income and therefore correlates negatively with future consumer spending growth.

According to Olney (1999), the relationship between consumption and debt during the 1930s in the USA was negative. According to Beaton (2009), loans growth was shown as an important consumer spending determinant. Consumer loans and consumer spending were highly correlated while mortgage loans facilitated consumption through equity loans.

Conclusively, the literature review points to an ambiguous relationship between banking loans to private individuals and personal consumption. This relationship may be different in different economies at various stages of development.

3. Methodology and empirical data

As mentioned in the introduction, the main research hypothesis states that the level of banking loans to private individuals growth rate correlates with the personal consumption growth rate in Croatia.

The hypothesis focuses on exploring the correlation between time series. Economic time series are usually non-stationary, because they often include different trends (Stock and Watson, 1988). When examining time series, as in this paper, the stationarity property and cointegration between the time series observed must be tested. Based on the test results, the methodology to apply can be selected.

Spurious regression represents a problem when variables are near-integrated as well as integrated and it is relevant to consider the cointegration of near-integrated variables (Phillips, 1988). If two time series contain the same trend, i.e. if they are cointegrated, the error correction model and the Engle-Granger cointegration approach (Engle and Granger, 1987) can be applied.

According to Johansen (1995), there is no need to pre-test the variables in the system to establish their order of integration. If a single variable is *I(0)* instead of *I(1)*, this will be shown through a cointegrating vector whose space is spanned by the only stationary variable in the model.

Nonetheless, to provide better insight into the research problem at the outset, using appropriate statistical tests, namely the Augmented Dickey - Fuller test, the property of stationarity for the observed variables was tested. Upon completion of the stationarity test using the least squares method as an estimator, the parameters of the model could be estimated. Verification of the model assumptions was conducted by applying the appropriate statistical methods.

The autocorrelation of residuals (errors) of the model was tested using Durbin-Watson's test, Breusch-Godfrey's test and the correlogram.

Heteroscedasticity variance is tested using White's heteroscedasticity test, while the Jarque-Bera test was used to test the normality of residuals distribution.

We observed the banking loan to private individuals annual growth rate and personal consumption annual growth rate in Croatia from 1996 to 2012, since this was the period following financial liberalization in Croatia and the most representative in terms of the goal of this research.

Furthermore, at the time of writing this paper, official data on personal consumption were not available from the Croatian Bureau of Statistics for the period after 2012. When deciding on frequency, we considered annual and quarterly data series, since both were available and we found no differences in the results. Even though the higher frequency (quarterly) provided a greater number of observations, we belong to the group of econometricians

Table 1 Augmented Dickey-Fuller Test results for the variables observed

Variable		P-value
PCGR	around the constant	0.0729
	in first differences	0.0000
BLGR	around the constant	0.2724
	in first differences	0.0000

Source: the authors.

who consider time span to be relevant, not only the number of observations.

The impact of banking loan to private individuals annual growth rate on the personal consumption annual growth rate in Croatia was explored by defining the econometric model. It was to be expected that banking loans to private individuals annual growth rate and the personal consumption annual growth rate in Croatia would be non-stationary time series in levels of the same order of integration, and ultimately cointegrated time series, thus, the error correction model would be defined. The econometric model defined was as follows:

$$PCGR = \alpha + \beta \bullet BLGR + \varepsilon$$

where:

PCGR - personal consumption (at constant prices) annual growth rate in Croatia from 1996 to 2012, according to the Croatian Bureau of Statistics;

BLGR - banking loan to private individuals annual growth rate in Croatia from 1996 to 2012, according to the Croatian National Bank.

4. RESULTS AND DISCUSSIONS

We first tested the stationarity properties for the observed variables using the Augmented Dickey-Fuller Test. The Augmented Dickey–Fuller test (ADF) is a test for a unit root in a time series sample. The unit root test is then carried out under the null hypothesis of unit root existence against the alternative hypothesis that assumes no unit root is present. The test results are shown in Table 1.

As can be seen in Table 1, at the usually accepted significance levels of 5% and 1%, the observed variables are not stationary. But banking loans to private individuals annual growth rate (*BLGR*) is stationary at the 10% significance level. The same results were obtained using the Phillips–Perron unit root test.

In the next steps we investigated the properties of Johansen (1988) and Johansen (1991) maximum eigenvalue and trace tests for cointegration. Table 2 shows the trace test results.

As can be seen in Table 2, the trace test results indicated the existence of one cointegration equation at 1% significance level and two cointegration equations at 5% significance level. Table 3 shows the eigenvalue test results.

As can be seen in Table 3, the same results were obtained from the eigenvalue test. The eigenvalue test results indicated the existence of one cointegration equation at 1% significance level and two cointegration equations at 5% significance level.

The results of both tests, Johansen's (1988) and Johansen's (1991) maximum eigenvalue and trace tests for cointegration, indicated the existence of cointegration between the observed variables.

To provide better insight into the relationship between the banking loans to private individuals annual growth rate and the personal consumption annual growth rate in Croatia, and to provide more evidence for cointegration among the observed variables, we used Engle-Granger cointegration approach (Engle and Granger, 1987) and thus estimated the error correction model.

Table 4 shows the estimated long-run equilibrium from Engle-Granger cointegration approach

Table 2 Unrestricted Cointegration Rank Test (Trace)

Hypothesized no. of *CE*(s)	Eigenvalue	Max-Eigen Statistic	Critical Value (0.05)	P-value
None	0.778395	27.59785	15.49471	0.0005
At most 1	0.283227	4.994944	3.841466	0.0254

Source: the authors.

Table 3 Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized no. of *CE*(s)	Eigenvalue	Max-Eigen Statistic	Critical Value (0.05)	P-value
None	0.778395	22.60291	14.26460	0.0019
At most 1	0.283227	4.994944	3.841466	0.0254

Source: the authors.

between the banking loans to private individuals annual growth rate and the personal consumption annual growth rate in Croatia.

As shown in Table 4, we found the estimated model significant at 1% significance level and the determination coefficient at the level of 60%. Therefore, 60% of changes in the personal consumption annual growth rate can be explained by the banking loans annual growth rate, and one can say that the estimated model is well explained.

If cointegration exists between the banking loans to private individuals annual growth rate and the personal consumption annual growth rate in Croatia, then the residuals from the estimated model in Table 4 will display the property of stationarity.

The Augmented Dickey-Fuller Test results for the residuals from the estimated long-run equilibrium model (*ECT*) are shown in Table 5.

As can be seen in Table 5, the residuals from the estimated long-run equilibrium model or error correction term (*ECT*), show no unit root is present, meaning stationarity property at levels, therefore more evidence for cointegration between the observed variables is provided.

After evaluating the long-run equilibrium model, Table 6 presents a model that describes the interdependence of changes in the short term.

According to the assessment results in Table 6, all the variables observed achieved statistical significance and impact as expected. If the banking loans to private individuals annual growth rate and the personal consumption annual growth rate in Croatia move from their equilibrium state in one year, in the next year they return to their equilibrium state at the rate of 67.24%. Furthermore, an increase of 1% in banking loans annual growth rate raises the personal consumption annual growth rate by 0.15%.

Testing the assumptions in the model of the banking loans to private individuals annual growth rate and the personal consumption annual growth rate in Croatia using the White test and Jarque-Bera test showed that the variance was homoscedastic and residuals normally distributed.

Also, Durbin-Watson's test, Breusch-Godfrey's test and the correlogram showed that an autocorrelation problem among the residuals did not exist.

In accordance with the empirical evidence provided, the hypothesis which states the level of banking loans to private individuals growth rate correlates with the personal consumption growth rate in Croatia can be accepted. The research results are consistent with Bacchetta and Gerlach (1997), Lovrinčević and Mikulić (2003) and Beaton (2009). The results emphasise banking regulations, since regulatory authorities may control banking portfolio growth and its structure. The research findings may be important for small open economies, since a rapid increase in debt-financed consumption in a small open economy may increase demand for external goods and therefore created a current ac-

Table 4 Estimated model of long-run equilibrium between the variables observed

Variable	Model Description	Constant value (α)/ coefficient of constant (β)	Critical Value (0.05)
PCGR	dependent variable		
α	constant	-0.014601	0.1862
BLGR	independent variable	0.155849	0.0003
Significance of defined model (F-test)			0.0002
Determination coefficient (R^2)	0.601570		

Source: the authors.

Table 5 Augmented Dickey-Fuller Test results for the residuals from the estimated long-run equilibrium model *(ECT)*

Variable		P-value
ECT	around zero	0.0018

Source: the authors.

count imbalance. According to Demirgüc-Kunt and Detragiache (2005) positive credit growth, and increasing exposure of banks to the private sector, among other variables, increase the probability of a banking crisis, so credit institutions will also experience the adverse effects of lending policies.

5. Conclusions

Several conclusions can be drawn from the research presented in this paper. Firstly, the main hypothesis of the paper, which states that the level of banking loans to private individuals growth rate correlates with the personal consumption growth rate in Croatia, can be accepted. Secondly, according to the estimates, there is empirical evidence for the effect of a statistically significant, long-run and short-run level of banking loans to private individuals growth rate effect on the personal consumption growth rate in Croatia. Thus, we found evidence for debt-financed consumption in Croatia lasting fifteen years. Thirdly, the research results further illustrate the sensitivity of cointegration methods to deviations from the pure unit-root assumption, since unit-root tests cannot easily distinguish between a unit root and close alternatives, as originally noted by Elliott (1998). Finally, the research results raise the question of the sustainability of a banking business in Croatia which is mainly oriented towards lending to private individuals. Policymakers, monetary authorities and banking regulators should take these factors into account, to prevent potentially adverse effects on the economy as a whole that may arise as a consequence of extensive lending by credit institutions to private individuals. In line with the main goal of this article, the relationship between banking loans to private individuals and personal consumption in Croatia was examined. Čeh Časni (2014) confirmed the housing wealth effect on personal consumption in a sample of six European post-transition economies, including Croatia. But the influence of banking loans to private individuals has not been tested on housing wealth. It may be that banking loans to private individuals influence both variables, and in that case, the estimation would be biased. Personal income and wealth may influence personal consumption, and this research does not take into account the potential effects of the aforementioned variables, which may indicate its limitations and directions for further research.

Table 6 Engle-Granger cointegration approach in the model banking loans to private individuals annual growth rate and personal consumption annual growth rate in Croatia

Variable	Model Description	Constant value (α)/ coefficient of constant (β)	P-value
ΔPCGR	dependent variable		
ΔBLGR	independent variable	0.155849	0.0000
ECT (-1)	independent variable	-0.672437	0.0183
Determination coefficient (R^2)	0.783971		

Source: the authors.

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