The lending channel and budget balance: empirical evidences from Central and Eastern European economies

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Abstract. *The study aims to deepen the analysis on the indirect dependence of government budget balance on private sector credit flow in the countries of Central and Eastern Europe. The added value of this approach consists of two elements. First, the analysis suggests developing the traditional analytical framework of assessing risks to public finance stability by including second round effects of negative fiscal impulses on credit to private sector during recession periods. Second, the study provides empirical evidence on the importance of economic growth transmission channel for the impact of credit accelerator effects on primary deficit. At the same time, nonperforming loans channel proved to be insignificant, especially in relation to the persistency of last year's budget deficit and the effects of budget allocations pro-cyclicality. However, loan portfolio quality seems to be more relevant in the case of public debt service, through its influence on the evolution of the yield on long-term government securities that is closely related to sovereign risk premium. Nevertheless, strengthening the financial safety net by the introduction of resolution funds will most probably break the link investors saw between credit portfolio quality and the impending increase in budget spending. This expected development across not only CEE countries, but at the EU level also, will facilitate the isolation of sovereign risk premium from non-performing loans' dynamics.*

Keywords: credit flow; primary balance; debt service; GDP growth; nonperforming loans; CEE economies; panel regressions.

1. Introduction

Banking system stability and public finances sustainability are mutually reinforcing each other in the long-term. Promoting a conservative macro-prudential policy, which favors a relatively constant credit supply dynamic and close to growth potential, contributes to maintaining the cyclical component of budget revenues at around zero. At the same time, implementing a disciplined budget policy creates the prerequisites of a favorable development in the trading book value of credit institutions, where government bonds play a leading role.

The traditional approach in addressing the interaction between the budget deficit and credit to private sector has at its centre-point the crowding-out effect during recessions. The more government borrows from the local market, the lower credit supply to nonfinancial corporations and households is. Fewer private sector financing puts additional pressure on GDP contraction, which degenerates later on in lower reimbursing capacity of debtors. Hence, second round effects of crowding-out the private sector lead to both lower fiscal revenues and higher nonperforming loans in the banking sector.

Moreover, a procyclical fiscal policy during a period of economic boom can contribute to the accumulation of systemic vulnerabilities in the banking sector, by excessively feeding the demand for loans with modest multiplier effects in the economy. The rapid growth of bank intermediation in emerging Europe countries, in the context of accelerated households' income, generally regarded as a sign of economic catching up with Old Europe, captured particular and equal attention from both investors and policymakers (Duenwald et al., 2005, Sirtaine, Skamnelor, 2007), just a few years before the transatlantic financial crisis. Excessive credit growth, followed by strong contractions of private sector financing, amplifies both the economic volatility and the asset prices fluctuations. The financial accelerator mechanism reflects the role of financial markets in reinforcing and spreading macroeconomic shocks, against the background of fiscal vulnerabilities. In this respect, Bernanke (2007) shows that the financial system is not an independent source of vulnerability, but it acts as an amplifier of exogenous shocks.

The degrees of freedom fiscal policy has at its disposal to stabilise the economy by stimulating aggregate demand at the first signs of recession are strictly bounded by the level of budget deficit and that of public debt stock at the onset of the crisis. Expansionary fiscal policy on the background of vulnerable public finance is counterproductive as the increase of budget deficit is accompanied by rocketing developments in the cost of borrowing for the government, which is transmitted later on to the private sector via risk premium. Hence, although private sector's turnover benefits from stronger

public demand, the net result falls into negative territory as the financial expenses increase more than revenues.

Topical issues on fiscal vulnerabilities have marked an outstanding return on the public agenda since the beginning of the sovereign debt crisis in some of the euro zone countries (Hayes, 2011, Baldacci, MaHugh, Petrova, 2011). Large budget deficits and strong reliance on external funds were highlighted as the main early warning indicators of sovereign debt crisis. Moreover, booming public debt along with population ageing induces additional financing and solvency vulnerabilities to fiscal policy (Stoian, 2011). Furthermore, recent researches pointed the role of sovereign risk premium in linking budget balance, financial conditions, monetary policy and external position of the economy (Fouejieu, Roger, 2013).

The authorities' reaction to address challenges posed by budget vulnerabilities was represented by a mix of fiscal increases with expenditures adjustments. These solutions led, however, to depressed reimbursing capacity for households and nonfinancial companies, while banks strengthened credit standards amid deteriorating banking books. Furthermore, lower credit growth and, especially, deleveraging affects the liquidity in the economy, risking economic depression and, consequently, lower budget revenues.

Against this background, this study aims at investigating the second round effects of fiscal adjustment measures on the budget balance components, transmitted through the credit flow to private sector in Central and Eastern European countries. The operational objective consists in developing a simplified financial satellite with two equations in order to model the indirect dependence of primary budget balance and that of debt service on the credit supply, against the background of GDP growth and long term interest rate, which is strongly connected to the impact of banking book quality on the sovereign risk premium.

The remaining of the paper is organized as follows. Section two describes the methodology underlying the system of forecasting the primary balance and the debt service based on economic growth and nonperforming loans channels. Section three presents the data used in the paper and describes in detail both the economic rationale and the statistical evidence that led to the selection of the explanatory variables. Section four gives an overview of the key empirical issues on devising and testing the set of simplified macroeconomic models of budget balance. The last section presents the main conclusions.

2. The methodological framework

The recent experience of the transatlantic financial crisis suggests that the banking system stability and budgetary developments are strongly interconnected. The analytical framework, used to investigate the impact of

credit exogenous shocks on the evolution of public finance in CEE countries, employs a transmission mechanism with two components, namely economic growth and the quality of banking book (Figure 1).
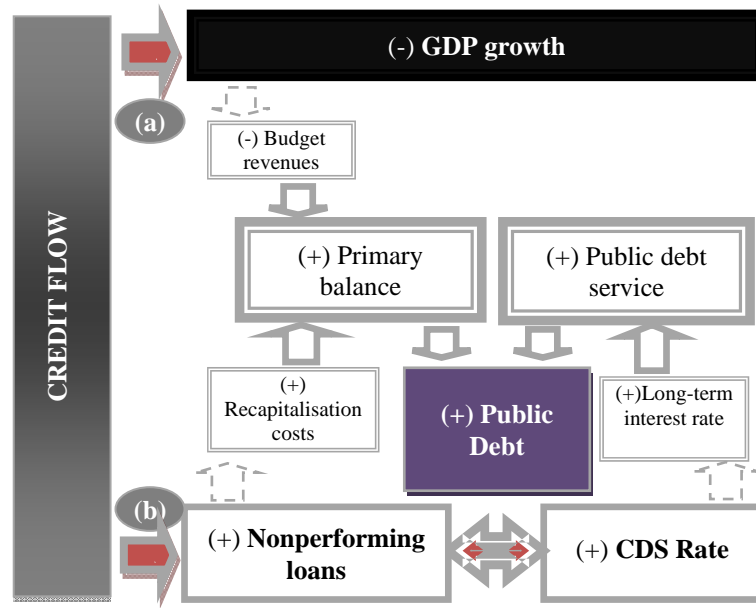
Figure 1. *The conceptual model of public finance dependence on credit flow*

The public finance stance is expressed exclusively by budget deficit, whose structure is detailed by: (1) primary budget deficit, and (2) public debt service. Public debt is not analyzed separately, given that it forms from the accumulation of deficits, and the 60 percent limit, stipulated by the Maastricht criteria, remains much over the NMS indebtedness level, despite the crisis effects, with one exception only.

(1) Impact on primary balance

Credit flow effects on budget stance spread using two main channels, namely: (a) economic growth, which affects directly proportional tax revenues ($\alpha_1 > 0$), and (b) non-performing loans, which can positively influence budgetary expenditures associated with bailing-out failing credit institutions amid deteriorating banking books (equation 1).

$$Primary\ balance_t^i = \alpha_1 \times GDP_t^i + \beta_1 \times NPL_t^i + \gamma_1 \times$$
$$\times Primary\ balance_{t-1}^i + \delta_3 \times M_t^i + C_{1i} \qquad (1)$$

The state budget primary deficit equation includes the persistency component, namely the budgetary balance recorded in the previous year, other relevant macroeconomic factors (M_t^i) as well as structural differences between budgetary policies of the countries in the CEE region, captured by the fixed effects of panel estimation (C_{1i}). Indices "i" and "t" expresses the Member State, respectively the relevant period.

(a) Economic growth transmission channel

The GDP growth transmission channel relies on the credit accelerator theory proposed by Bernanke et al. (1999), showing that increasing credit flow (*Credit accelerator*) feeds consumption and investment, creating space for multiplying the value added in the economy (see relation 2).

$$GDP_t^i = \alpha_2 \times Credit\ Accelerator_t^i + \beta_2 \times GDP_t^{EZ} + \gamma_2 \times LTY_t^i + C_{2i} \qquad (2)$$

The functional form of the economic growth explanatory equation also includes the dependency on economic growth in the Euro area (GDP_t^{EZ}), the reversed relation with the level of long-term interest rate (*LTY*), as well as the structural differences between the economies of the CEE countries, captured through the fixed effects of panel estimation (C_{2i}). Credit accelerator represents the first order difference of the annual credit flow, expressed as a percentage of GDP.

(b) Non-performing loans transmission channel

Non-performing loans (*NPL*) transmission channel is based on the model proposed by Moinescu and Codirlasu (2012), showing that the deterioration of bank portfolio quality is determined by square deviation of credit rate from the potential level of economic growth, recorded two years earlier (see relation 3).

$$dl\left(NPL_t^i\right) = \alpha_3 \times \left(Credit\ flow_{t-2}^i - Potential\ growth_{t-2}^i\right)^2 +$$
$$+ \beta_3 \times Macro_t^i \qquad (3)$$

The harmful effect of deleveraging on the reimbursement of existing loans is similar to inefficient allocation of bank resources (Jakubik, Moinescu, 2012), given that the intensification of the struggle for market share and excessive lending increase the risk of financing more unfeasible projects, in the context of loose credit conditions.

The conceptual model for the dynamics of non-performing loans ratio implies the existence of an exponential relationship, in which the set of determinant factors also includes macroeconomic variables such as output gap, changes in average income and exchange rate.

(2) Consequences on public debt service

The credit flow effect on public debt service spreads through the impact on long-term interest rates, as a result of sovereign risk premium evolution closely connected with the dynamics of nonperforming loans (Moinescu, 2012). Increasing non-performance of the loan portfolio generates recapitalization needs in banks, sometimes covered only by public resources, and deteriorates investor perceptions of sovereign risk, followed by significant upward movements of CDS rate. Dynamics of sovereign risk premiums is later reflected in the yield required for the issuance of bonds (LTY^i), which, in return, increase the financial burden of the public budget over "l" years (relation 4).

$$Debt\ service^i_t = \alpha_4 \times LTY^i_{t-l} + \beta_4 \times Public\ debt^i_{t-k} + C_{4i} \qquad (4)$$

Along with long-term interest rates, public debt service explanatory model also includes the dependence on public debt to GDP by "k" years before (*Public debt*), capturing the positive relationship between government indebtedness and the cost of financing accumulated public deficits. Structural differences between the economies of CEE countries are also captured through fixed effects of the panel estimation (C_{4i}).

The individual impact of macroeconomic factors on dependent variables was estimated applying the least squares method, using inclusively the assumption of fixed effects, in order to capture structural differences between CEE countries.

3. Data

The statistics underlying the assessment of the impact which credit has on budget balance in the ten new UE Member States (namely Bulgaria, Czech Republic, Estonia, Lithuania, Latvia, Poland, Romania, Slovenia, Slovakia and Hungary) consists in annual frequency data, covering the period 2000 to 2011.

The main source of used information is represented by Eurostat, from which were extracted data on credit flow to the private sector, economic growth, the number of employees in the economy, average income, foreign direct investment, long-term interest rate, exchange rate, average inflation rate, primary budget deficit as well as public debt service. The data on nonperforming loans rate were extracted from the International Monetary Fund reports on indicators of financial stability, while the sovereign risk premium was calculated based on daily information extracted from Bloomberg platform. At the same time, the data on potential economic growth were extracted from the AMECO database.
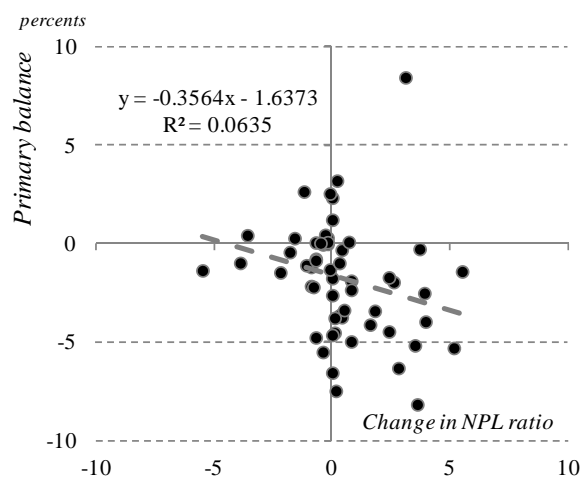
(1) Primary deficit

Preliminary empirical analysis confirms the positive reaction of primary budget deficit balance to economic growth, given that about 30 percent of GDP growth is reflected in the improving budget situation (Figure 2).

percents

$y = 0.2961x - 2.5729$
$R^2 = 0.2627$
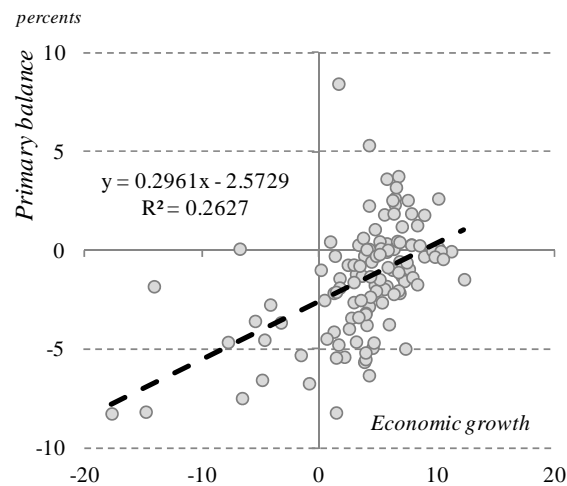
Source: Eurostat, author's calculations.

Figure 2. *Correlation between primary budget balance and economic growth*

percents

$y = -0.3564x - 1.6373$
$R^2 = 0.0635$

Source: Eurostat, IMF, author's calculations.

Figure 3. *Correlation between primary budget balance and NPL ratio dynamics*

At the same time, increasing non-performing loans leads to a deepening of the primary deficit, but the functional relationship presents a rather low explanatory power (Adjusted R-squared of just slightly over 6 percent). The result is not surprising, given that support from public funds in order to recapitalize credit institutions in the CEE region was only marginally.

The preliminary set of determinant factors of the primary budget deficit was complemented by macroeconomic variables identified in specialized literature as statistically relevant, such as foreign direct investment, labour occupancy rate, the average income in the economy, inflation rate and output gap. Stationarity of the considered indicators was tested. All indicators were I(0) after the appropriate transformation and the first difference. Furthermore, the univariate OLS regression was used to make the first selection of variables based on statistical relevance. The applied procedure tested variables on one-by-one basis up to two lags, including the contemporary impact, for each explanatory variable. A short list of variables was created based on results of univariate analysis (Table 1).

Table 1

Univariate analysis results on primary balance

| Variable	Coefficient	Std. Error	t-Statistic	Prob.	Adj. R-squared
GDP growth	0.265969	0.041183	6.458166	0.00	0.415519
Primary balance (-1)	0.566772	0.089722	6.316984	0.00	0.40433
Change in NPL ratio	-0.482034	0.097577	-4.940011	0.00	0.33993
Cange in Output GAP	0.306636	0.059763	5.130856	0.00	0.312468
EMPLOYMENT (dlog)	29.96912	6.691503	4.478682	0.00	0.305039
GDP growth (-1)	0.173722	0.04599	3.777416	0.00	0.269516
Inflation	0.13531	0.046415	2.915238	0.00	0.250324
FDIs (dlog)	4.771986	1.716262	2.780453	0.01	0.22477
EARNINGS (dlog)	9.447356	3.216408	2.937238	0.00	0.203824

(2) Public debt service

Additional preliminary statistical results show that public debt service reacts directly proportional to the cost of financing, given that about a quarter of the long-term interest rates are reflected in the financial expenditures of the budget (Figure 4).

percents

$$y = 0.225x + 0.4932$$
$$R^2 = 0.1505$$

Debt Service to GDP

Long term yields
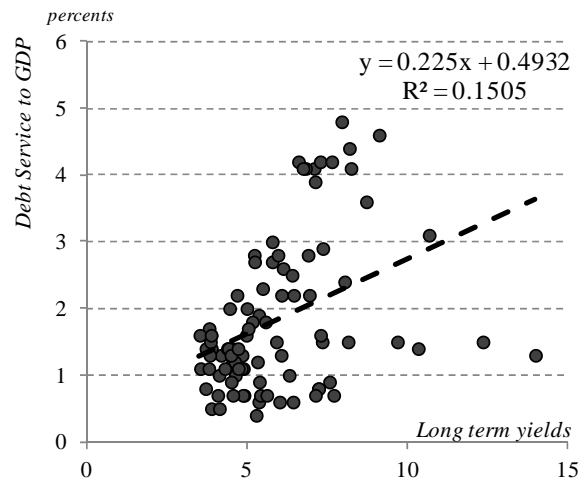
Source: Eurostat, author's calculations.

Figure 4. *Correlation between debt service and long-term interest rate*

percents

$$y = 0.0574x - 0.0078$$
$$R^2 = 0.6907$$

Debt Service to GDP

Public Debt to GDP
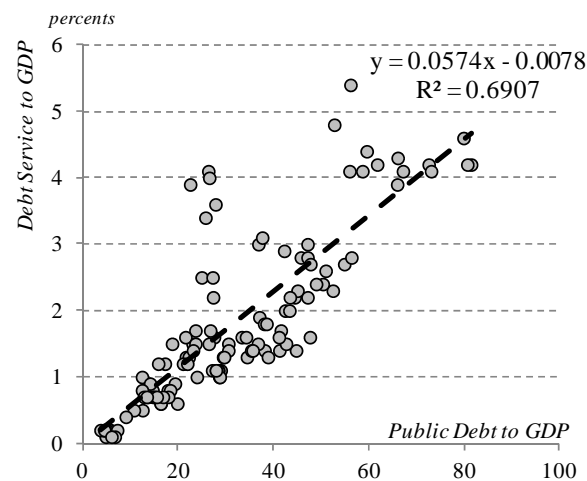
Source: Eurostat, author's calculations.

Figure 5. *Correlation between debt service and government debt to GDP*

At the same time, preliminary assessment confirms the strong dependence of debt service to government indebtedness (Figure 5). This intuitive representation was completed by a univariate analysis, both at the same level as well as using first difference, in order to capture any sensitivity to the dynamic of determinant factors. Testing delayed effects used an impact period of up to

two years. In the next step, multivariate analysis was performed. For each explanatory variable contained in the short list the best of its lags of those found statistically relevant were considered, with only one exception (credit accelerator for which both the instantaneous effect and that of one year lag were selected).

4. Multivariate empirical findings

The operational objective of the multivariate empirical assessment was to substantiate the mechanism by which credit growth influences budget deficit components at the level of Central and Eastern Europe countries, by taking into account macroeconomic factors short-listed in the previous section. The analytical component consists of a set of simplified econometric models, built by OLS panel estimation.

The polynomial regression for primary budget balance (equation 1) confirms the importance of economic growth transmission channel (see Appendix 1 for details on its estimated functional form), with a strictly positive coefficient, at more than 99 percent confidence level (Table 2).

Table 2

Estimation output on the primary balance model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.233081	0.371501	-6.010968	0.0000
GDP Growth	0.211184	0.036417	5.799064	0.0000
Primary balance (-1)	0.418426	0.080825	5.176956	0.0000
Inflation	0.118262	0.049031	2.412001	0.0177
Fixed Effects (Cross)				
_BG--C	1.336338		_HUN--C	-0.120416
_CZ--C	-0.359051		_POL--C	-0.391813
_EE--C	1.315453		_RO--C	-1.435136
_LET--C	-0.568641		_SK--C	-0.542652
_LIT--C	0.512416		_SLO--C	0.253502
Adjusted R-squared	0.573776			

Nevertheless, the multifactorial assessment rejects the non-performing loans transmission channel hypothesis (see Appendix 2 for details on its estimated functional form). The banking book quality variable was excluded from the final regression, after running backward estimation procedure. Meanwhile, econometric results show high persistency of the previous year's deficit, given that 40 percent of its value is reflected in current year's deficit.

Budgetary consolidation efforts are affected inclusively by autonomous factors, which significantly differ from one economy to another in the sample, given that the fixed effects range from -1.43 (Romania) to 1.33 percent (for Bulgaria), around -2.23 percent level, which is the constant term of the equation. A slight release of pressure on the primary budget balance comes from the evolution of prices in the economy, given that about 10 percent of the inflation is reflected in deficit adjustment. These determinant factors together explain about 60 percent of the variance of NMS economies primary deficits.

Estimating the multifactorial model of public debt service confirms the relevance of long-term interest rates transmission channel, closely connected with investor perceptions on the correlation between sovereign risk premium and the quality of bank portfolios. The optimal lag is two years, and the coefficient is strictly positive for a 99 percent confidence level (Table 3).

Table 3

Estimation output on the debt service model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.746909	0.176635	4.228539	0.0001
Long term yield (-2)	0.073949	0.020578	3.593633	0.0006
Public Debt to GDP (-2)	0.017973	0.005655	3.178524	0.0023
Fixed Effects (Cross)				
_BG--C	-0.589677	_HUN--C		1.748749
_CZ--C	-0.430727	_POL--C		0.605611
_EE--C	-0.337853	_RO--C		-0.288360
_LET--C	-0.622437	_SK--C		-0.154412
_LIT--C	-0.473041	_SLO--C		-0.097812
Adjusted R-squared	0.936874			

Meanwhile, approximately 1.8 percent of public debt to GDP is reflected in the level of public debt service. Fixed effects, although statistically relevant, are not major in the analyzed sample, except for one economy. These autonomous factors highlight the long-term risks of exceeding the 60 percent ceiling on public debt, pointing the need of strong adjustments of primary balance in order to offset the burden of debt service.

Conclusions

The innovative feature of this study is to highlight the indirect dependence of government budget balance on private sector credit flow in the countries of Central and Eastern Europe.

The added value of this approach consists of two elements. First, the analysis suggests that the usual analytical framework of risks and vulnerabilities to achieve balanced state budget might be enhanced by structuring the sensitivity of primary budget balance and public debt service to the pace of private sector credit. Second, the study provides empirical evidence on the importance of economic growth transmission channel for passing the credit accelerator effects to primary deficit. At the same time, non-performing loans transmission channel proved to be insignificant, especially compared to the persistency of previous year's deficit and effects of budget allocations pro-cyclicality. However, loan portfolio quality seems to be more relevant in the case of public debt service, through its influence on the evolution of the yield on long-term government securities that is closely related to sovereign risk premium. The result reflects, however, the unfavorable investors' perception on the emerging imminent distress in NMS banking systems due to deteriorated quality of banking books and its propagation to the government financing needs, amid alleged actions of nationalising the risky banks.

Nevertheless, strengthening the banking system protection mechanisms, including through the introduction of stabilization measures and creation of resolution funds, will create the conditions for restructuring of failing credit institutions, based on the financial support provided by ex-ante accumulation of private funds. This will break the indirect contagion channel from the credit portfolio quality to the impending increase in budget spending, which during the global financial crisis seems to have contributed, together with domestic macroeconomic context and regional spillover effects, to adverse developments in sovereign risk premium of NMS.

Aknowledgements

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APPENDIX 1

Estimation output for the GDP growth model based on credit accelerator

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.163919	0.210841	10.26326	0.0000
Credit accelerator	0.140840	0.028069	5.017607	0.0000
Credit accelerator (-1)	0.193103	0.022524	8.573318	0.0000
GDP growth euro zone	1.446552	0.124521	11.61695	0.0000
Fixed Effects (Cross)				
_BG--C	0.281383			
_CZ--C	-0.809549			
_EE--C	0.779897			
_LET--C	0.800063			
_LIT--C	0.938297			
_HUN--C	-1.668096			
_POL--C	0.319000			
_RO--C	0.121189			
_SLO--C	-1.746480			
_SK--C	0.754898			
Adjusted R-squared	0.781583	S.D. dependent var		4.573569

APPENDIX 2

Estimation output for the NPL model based on credit flow

Variable	Coefficient	Std. Error	t-Statistic	Prob.
(Credit flow (-2)-Potential growth(-2))^2	0.078581	0.013450	5.842562	0.0000
GDP growth	-0.039225	0.007103	-5.522203	0.0000
C	0.085807	0.044402	1.932494	0.0559
Fixed Effects (Cross)				
_BG--C	-0.078339			
_CZ--C	0.009405			
_EE--C	0.004229			
_LET--C	0.007337			
_LIT--C	0.151015			
_HUN--C	-0.065176			
_POL--C	-0.070052			
_RO--C	-0.029122			
_SLO--C	-0.028524			
_SK--C	0.099228			
Adjusted R-squared	0.541999	S.D. dependent var		0.447275