

# Households' overdue loans: signs from the money and labor markets

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# The main research themes (1)

- The paper aims to identify **the monetary conditions and labor market variables** that are relevant for modeling **the dynamics of households' overdue loans** in Romania.
  - The comparative treatment of the determinants for the number of overdue loans and volumes of the overdue loans represents a new approach within the literature. (**Boss**, 2002, **Jakubik & Schmieder** 2008, **Fiori** et al, 2009, **Aikman** et al, 2009).
  - The innovating feature of the paper is consolidated by the investigation of the importance of the developments in prices for food products, non-food products and energy on the reimbursing pattern of the debts.

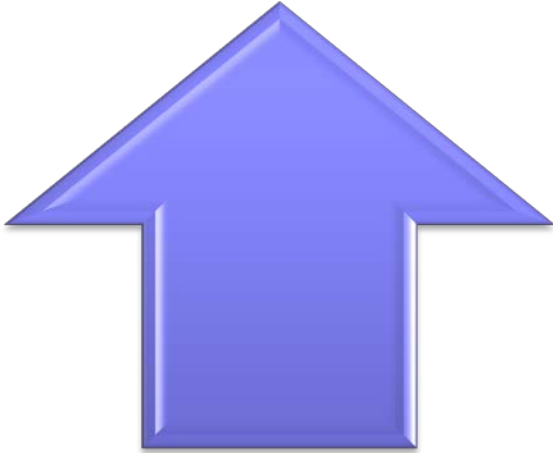
## The main research themes (2)

- The operational aim of this paper is to build a series of econometric models which responds to the following questions:
  - Which are the components of the macroeconomic variables series able to predict the dynamics of the overdue household loans?
    - Which are the differentiation elements among the determinants of the overdue loans rate determined as a numerical weight and that determined as a value weight from the standpoint of the developments of the monetary and labor market conditions?

# The main research themes (3)

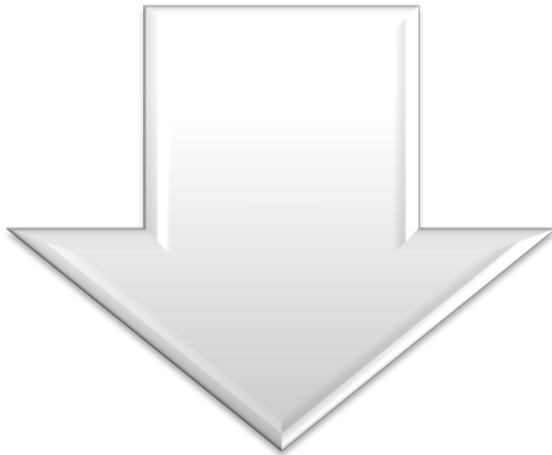
- Which are the lags and the individual intensities of the macroeconomic relevant indicators when affecting the household overdue loans rate?
- What is the hierarchy of the factors with impact on the dynamics of households overdue loans?
- What are the characteristics of the loans reimbursement behavior in case of shocks on the labor, monetary, goods and services markets?
  - How can be characterized the households' credit discipline?

# The mechanism for the households' reimbursement capacity



## Variables reflecting **the households' income** (status of the labor market)

- Average income (for public and private sector)
- Unemployment rate / Number of employees (for public and private sector)



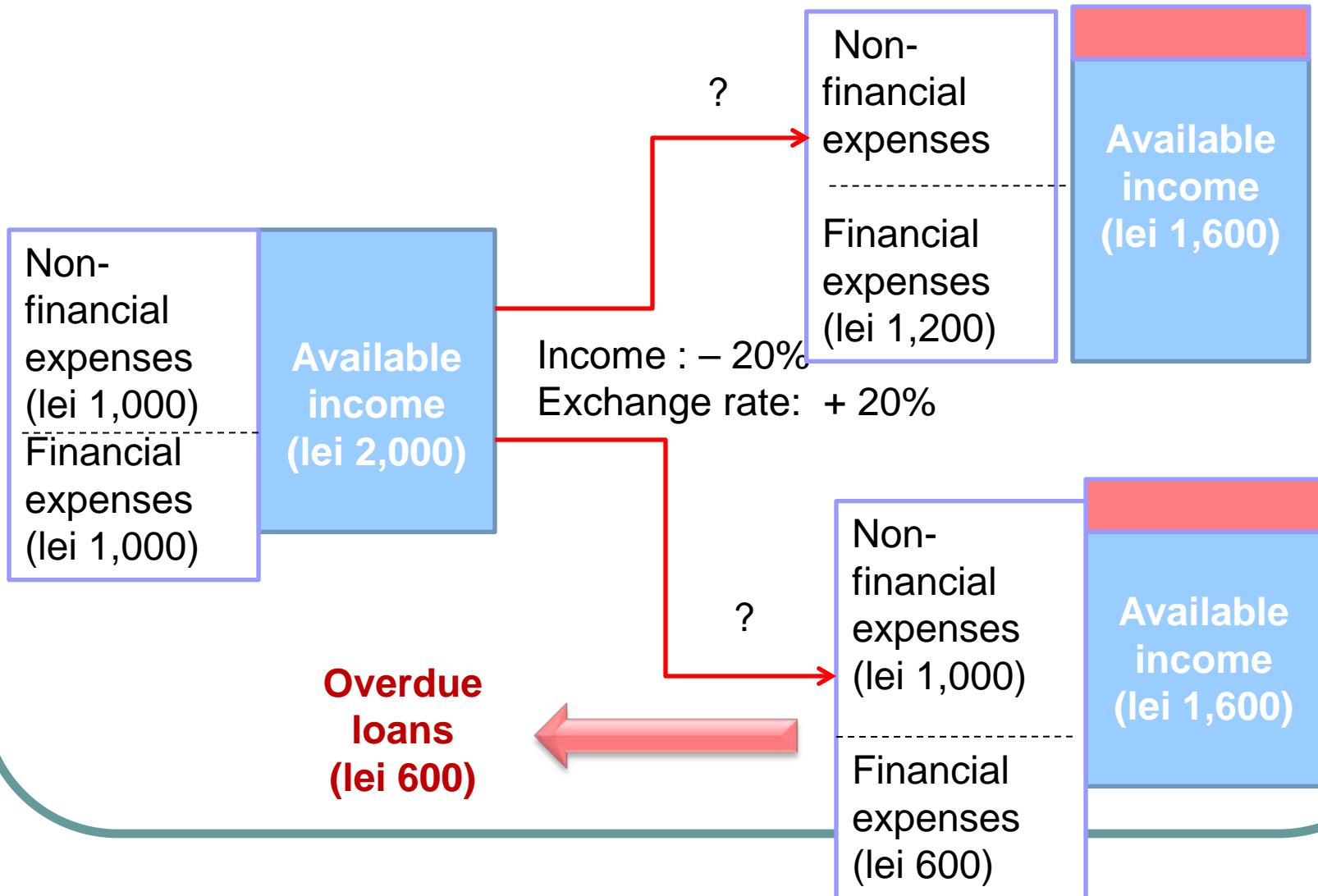
## Variables reflecting **the households' expenditure**

- *financial* (monetary conditions)
  - The exchange rate
  - The loans interest rate (for lei and euro)
- *non-financial* (status of the goods and services market)
  - Inflation for food goods
  - Inflation for non-food goods
  - Inflation for energy component

# Households' reimbursement behavior (1)

- Usually, the shocks on the labor market are accompanied by the deterioration of the loans terms, while the goods and services for current needs become more expensive
- The key problem of the forecasting the dynamics for the overdue loans rate is the adjustment technique of the households' expenditure structure to the new conditions
  - do the households prefer the individual consumption adjustment in favor of banking installments payment?
  - are there partial payments being made (income reduction) or defaults (job loss)?
- The experience gathered along the crisis shows that, usually, the defaults are generated by the individuals' difficult situations: income decrease per family, unemployment.

# Households' reimbursement behavior (2)



# Challenges for the analytical framework

- Identification of the determinant factors for the households' overdue loans rate is difficult, especially that the late payments are not due to the deterioration of the reimbursement capacity, but to the following:
  - Negotiations for loan restructuring;
  - Non due to creditor decision to increase the risk premium/loan commissions for the loan although the debtor's income was not significantly altered
- Modeling the rate of the volume of overdue loans is difficult also due to the partial payments made by debtors



# Theoretical framework

- Simultaneous equations systems which emphasize the different profiles of the explaining factors between the rate of number of overdue loans and rate of volume of overdue loans

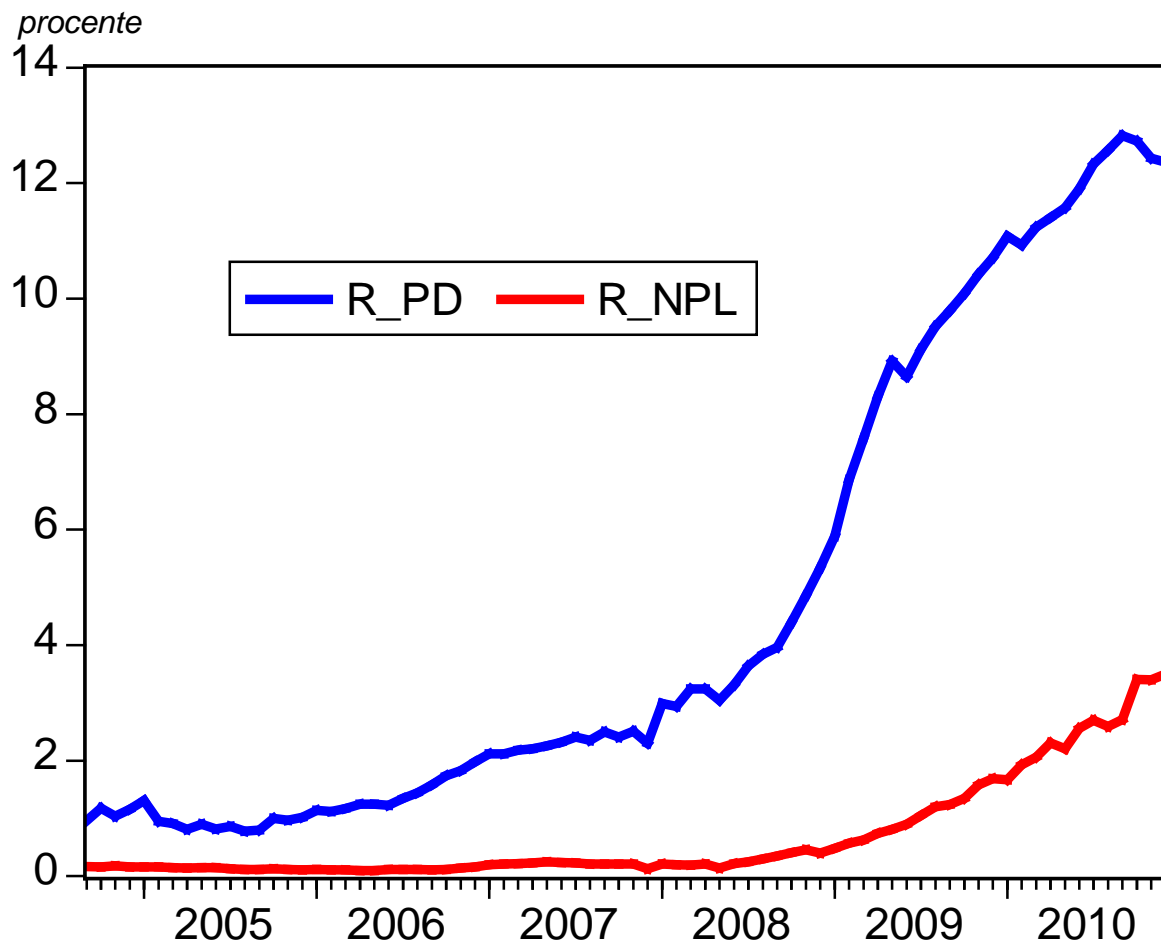
$$\left\{ \begin{array}{l} d(dr_t) = \alpha + \sum_{l=1}^k c_l \times d(v_l) + \sum_{m=1}^n c_m \times d(v_m) + \sum_{gs=1}^r c_{gs} \times d(v_{gs}) + \varepsilon_{dr} \\ d(odr_t) = \alpha + \sum_{l=1}^k a_l \times d(v_l) + \sum_{m=1}^n a_m \times d(v_m) + \sum_{gs=1}^r a_{gs} \times d(v_{gs}) + \varepsilon_{odr} \end{array} \right.$$

- The framework for identifying the determinant factors is improved by using autoregressive vectors that can better identify the persistence and impact in time of the macroeconomic and financial factors on dependent variables

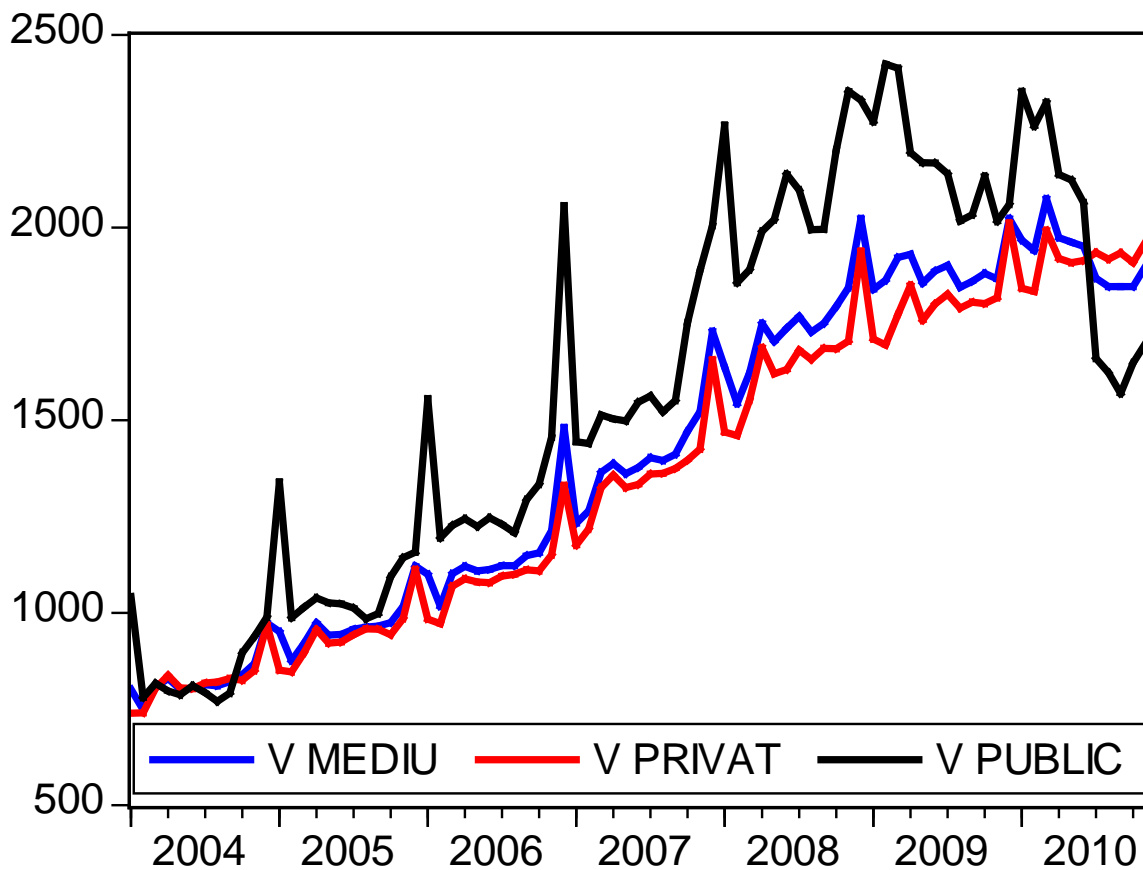
# Data

- Dynamics of the overdue household loans was illustrated both as an overdue loans number weight and as an overdue loans value weight. A loan is considered overdue if the debt service is higher than 30 days.
- Data used for the empirical analysis cover monthly information during December 2004 – June 2010, while the data for ex-post out-of-sample testing cover July 2010 – December 2010
- Data range was limited by the availability of information regarding the dependent variables

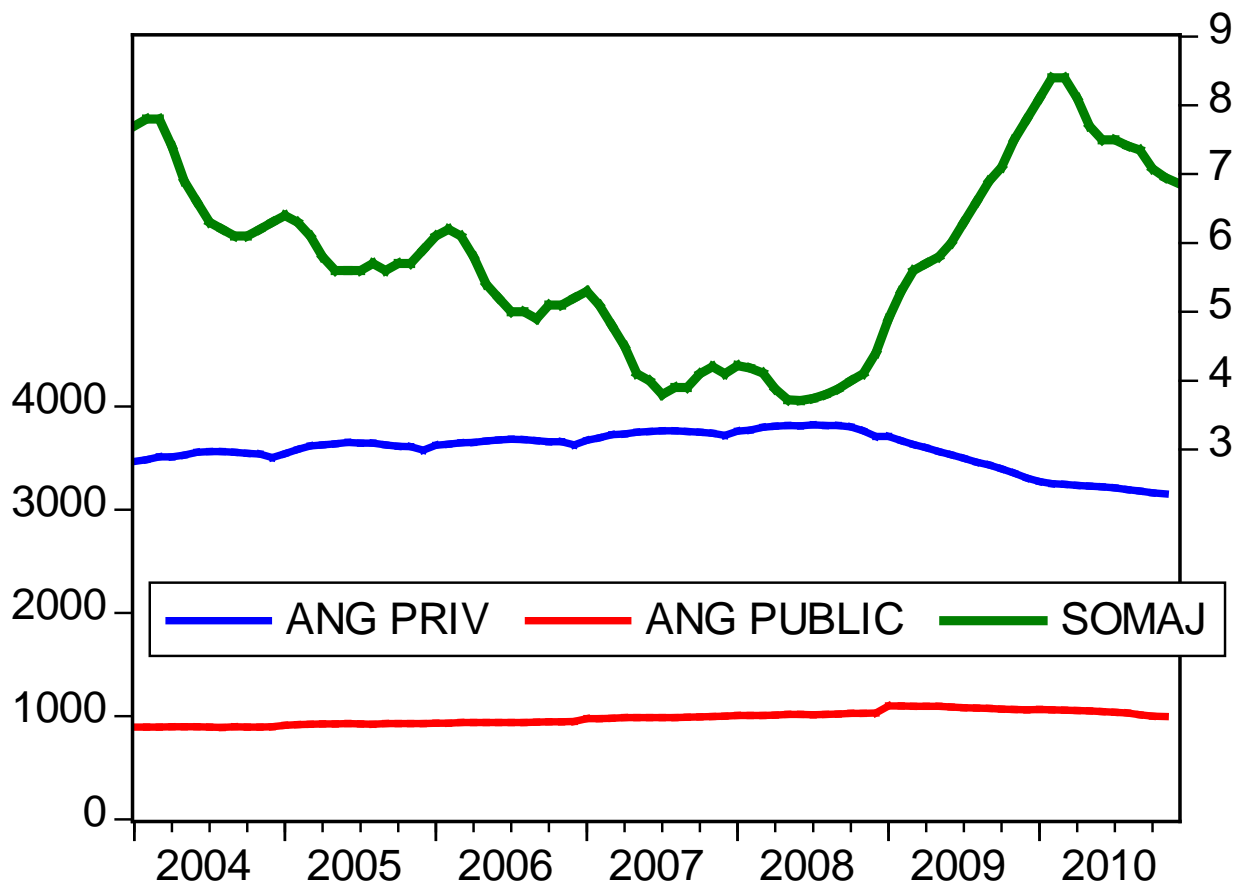
# Dependent variables



# Income



# Labor market



# Empirical analysis

- Employing a reasonable number of models (both VAR and simultaneous equation systems) that used a large diversity of exogenous variables (both single market and combined).
- Models' specifications, including number of lags, was chosen so that to insure functional stability of the mechanism both from the economical and econometrical point of view
- Empirical results lead to the selection of two (relatively) distinct specifications which were estimated both with SUR systems of equations and VAR models.

# Specifications

Estimation Method: Seemingly Unrelated Regression  
Sample: 2004M12 2010M06

## MODEL 1

	Coefficient	Std. Error	t-Statistic	Prob.
C(11)	0.002390	0.000335	7.129186	0.0000
C(12)	-0.047921	0.017007	-2.817717	0.0056
C(13)	0.050826	0.010966	4.634691	0.0000
C(14)	0.024846	0.008388	2.962165	0.0037
C(15)	0.118778	0.045445	2.613637	0.0100
C(21)	0.000236	4.65E-05	5.074897	0.0000
C(22)	-0.100997	0.009272	-10.89257	0.0000
C(23)	0.018455	0.008389	2.200028	0.0296

Determinant residual covariance 4.03E-13

$$\text{Equation: } D(R\_PD/100) = C(11) + C(12)*DLOG(L\_VENIT\_MEDIU\_SA(-1)) + C(13)*DLOG(B\_CURS(-2)) + C(14)*DLOG(L\_SOMAJ\_SA(-3)) + C(15)*D(B\_RATADOB\_LEI(-1)/100)$$

Observations: 67

Adjusted R-squared	0.449310	S.D. dependent var	0.002493
Durbin-Watson stat	2.313096		

$$\text{Equation: } D(R\_NPL\_SA/100) = C(21) + C(22)*DLOG(L\_ANG\_PRIV\_SA(-3)) + C(23)*L\_SOMAJ\_GAP(-5)/100$$

Observations: 67

Adjusted R-squared	0.642194	S.D. dependent var	0.000627
Durbin-Watson stat	2.264129		

Estimation Method: Seemingly Unrelated Regression  
Sample: 2004M12 2010M06

## MODEL 5

	Coefficient	Std. Error	t-Statistic	Prob.
C(11)	0.001757	0.000250	7.016414	0.0000
C(12)	-0.005937	0.002676	-2.218755	0.0283
C(13)	0.041538	0.010306	4.030368	0.0001
C(14)	0.096838	0.042354	2.286393	0.0239
C(15)	-0.085029	0.027913	-3.046171	0.0028
C(16)	-0.233076	0.044297	-5.261681	0.0000
C(21)	0.000277	7.17E-05	3.861189	0.0002
C(22)	-0.090312	0.009804	-9.211888	0.0000
C(23)	-0.007041	0.002899	-2.428637	0.0166
C(24)	0.014150	0.006578	2.151079	0.0334
C(25)	0.015116	0.009506	1.590201	0.1144

Determinant residual covariance 3.01E-13

$$\text{Equation: } D(R\_PD/100) = C(11) + C(12)*DLOG(L\_VENIT\_PUBLIC\_SA(-1)) + C(13)*DLOG(B\_CURS(-2)) + C(14)*D(B\_RATADOB\_LEI(-1)) + C(15)*DLOG(L\_ANG\_PUBLIC\_SA(-5)) + C(16)*DLOG(L\_ANG\_PRIV\_SA)$$

Observations: 67

Adjusted R-squared	0.555889	S.D. dependent var	0.002493
Durbin-Watson stat	2.060769		

$$\text{Equation: } D(R\_NPL\_SA/100) = C(21) + C(22)*DLOG(L\_ANG\_PRIV\_SA(-3)) + C(23)*DLOG(L\_VENIT\_PRIVAT\_SA) + C(24)*DLOG(M\_INDICE\_P\_NEALIM(-1)) + C(25)*D(B\_RATADOB\_LEI(-3))$$

Observations: 67

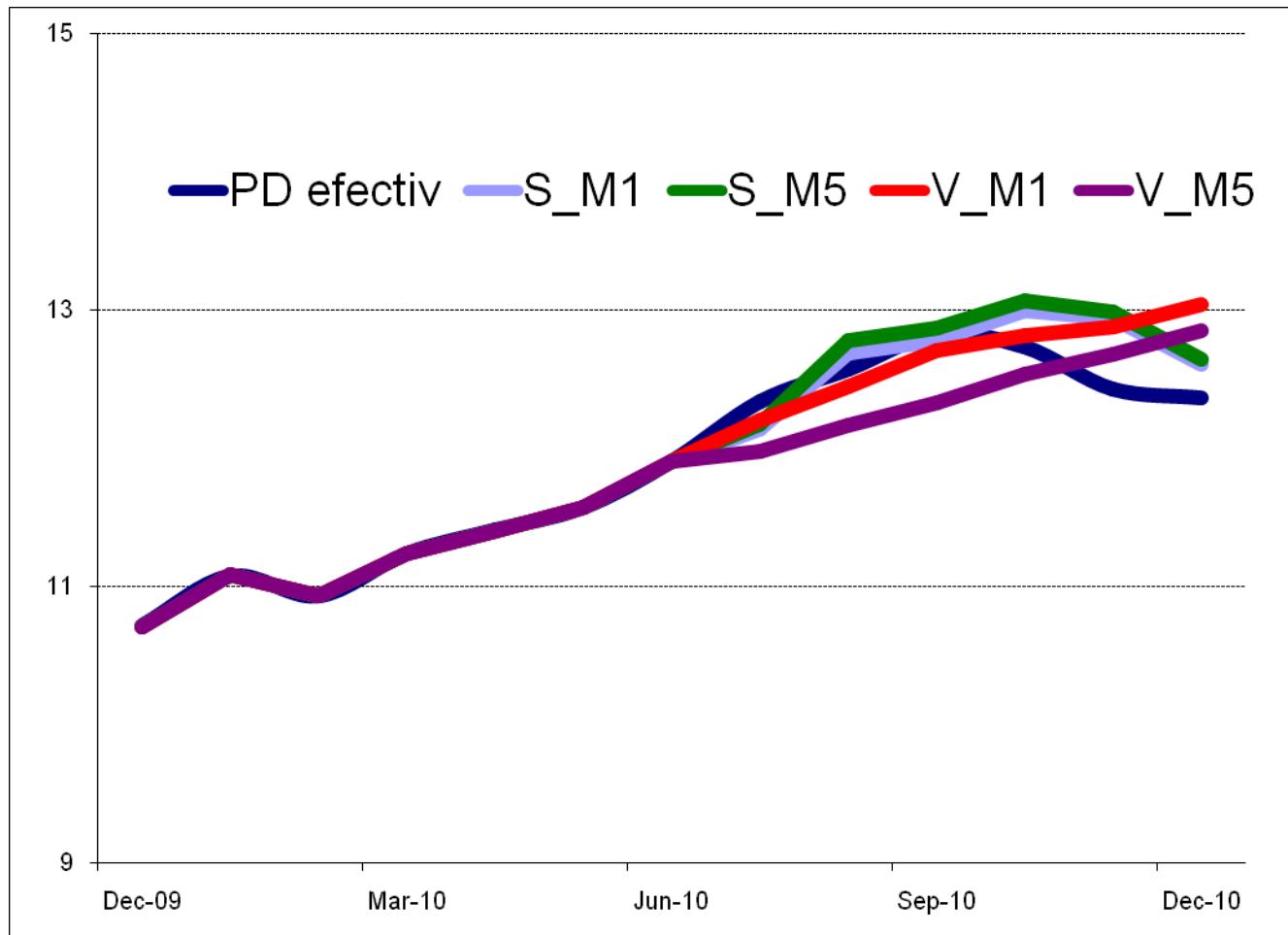
Adjusted R-squared	0.671302	S.D. dependent var	0.000627
Durbin-Watson stat	1.945029		

# Variance decomposition

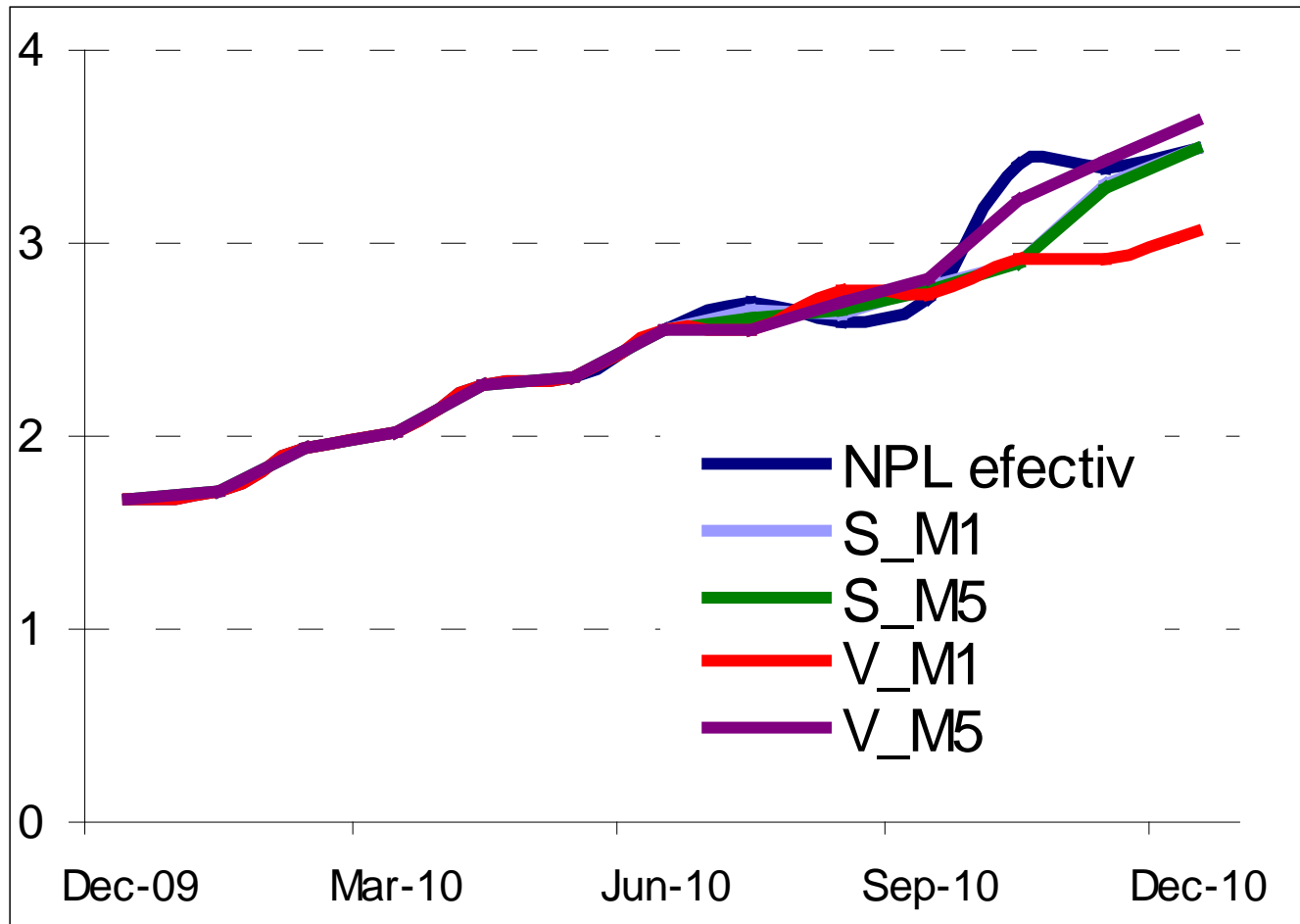
Explanatory variables	Rate of overdue loans number (%)				Rate of overdue loans volume (%)			
	Sist. 1	Sist. 2	VAR 1	VAR 2	Sist. 1	Sist. 2	VAR 1	VAR 2
Labour market	10.45	25.27	24.59	27.12	61.75	42.75	30.44	32.12
Average revenue	4.32		9.85					
Public sector revenue		2.52		2.11				
Privat sector revenue						2.36		2.00
Unemployment rate	6.13		14.74		1.33		21.43	
Public setor employees number		5.43		8.93				
Privat setor employees number		17.31		16.08	60.42	40.39	9.00	30.12
Monetary market	30.09	12.58	21.93	15.19		0.71	0.00	5.61
Exchange Rate	15.04	9.84	21.93	10.01				
Interest rate on domestic loans	15.04	2.74		5.18		0.71		5.61
Goods and services market						1.70	0.00	3.49
Non-food goods inflation						1.70		3.49
Overdue rate	55.07	44.42	53.48	57.69	35.78	32.87	69.56	58.77
Adjusted R2	44.93	55.58	42.77	43.28	64.22	67.13	57.20	80.48



# Ex-post out-of-sample testing number of defaults



# Ex-post out of sample testing value of defaults



# Findings (1)

- Econometric results shows that labor market dynamics represented the main factor of the evolution of the household overdue loans both as number and volumes
- Monetary conditions have an important role only for the number of overdue loans
- Goods and services prices increases does not significantly affect the dynamics of the overdue household loans
  - result suggests a sound reimbursement discipline of the households which prefer the individual consumption adjustment in favor of banking installments payment

## Findings (2)

- Responses to shocks occurs in time ranges up to six months:
  - Monetary conditions generate effects on the dynamics of the overdue loans number rate in a maximum period of two months
  - Evolution of the employment rate influences the overdue loans dynamics in a period of three months, the slower impact being generated by the public sector
  - Although the contribution of the household income variables to the overdue loans rate's dynamics is low, the impact is happening in a maximum period of one month

# Concluzii (3)

- Factorial decomposition shows the following hierarchy of exogenous variables:
  - Number of defaults
    - 1) Exchange rate;
    - 2) Employment indicators (mainly in the private sector);
    - 3) Interest rates for RON loans;
    - 4) Income indicators.
  - Value of defaults
    - 1) Employment indicators (employment in the private sector, unemployment rate gap);
    - 2) Income for employees in the private sector;
    - 3) Interest rates for RON loans;
    - 4) Non-food prices increases.



Thank you!