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STUDY REGARDING THE ASSESSMENT OF THE FINANCIAL STABILITY OF THE ECONOMIC ENTITIES

The research presents both theoretical and practicalthe evolution of the financial stability assessed through the solvency indicators, the real economic growth rate and the GDP deflator in the manufacturing companies from Romania, through the Vector Autoregression Model (VAR). The sample consists in 36 companies belonging to the manufacturing industry in Romania, listed on the Bucharest Stock Exchange, on the first and second category. The study is conducted during the period 2007-2014 and demonstrated the fact that a change in the real economic growth causes a positive change in the GDP deflator. Not lastly, the change of the real economic growth also determines a positive change of the patrimonial solvency, and a change in the GDP deflator produces a reduction of the patrimonial solvency.

Keywords: patrimonial solvency,real economic growth,GDPdeflator, Vector Autoregression Model.

Introduction. The Vector Autoregression Model was introduced by Sims [14] with the aim to characterize the dynamic behavior of a common set of variables, becoming a common method of modeling the time series [14]. The model explains the current values of a set of variables through their past values [11]. VAR model is widely used in time series analysis especially due to its flexibility and to its ease of use. The VAR model captures the dynamic structure of several variables simultaneously, and the impulse-response functions used in the model studies the propagation of the shock of a dependent variable [13].

The VAR model has been studied in numerous specialized publications, such as books written by Hatanaka [4], Lutkepohl and Kratzig [9] and Lutkepohl [10]. In order to estimate a VAR model, it is necessary to follow a series of steps, the most important being the selection of the dependent variables that will be modeled and the selection of the number of lags. Because this research aims to identify the link between patrimonial solvency, real economic growth and GDP deflator, it is important to define the mentioned variables.

The solvency represents the company's ability to meet its financial duties both in the medium and long term.The best known and widely used rate that quantifies the solvency is the general solvency ratio. In 2009, the book *"Economic and financial analysis of the company: problems, approaches, methods, applications,"* written by Monica Petcu defines the general solvency as the "relative expression of the net asset of the company, which is the guarantee of the owners and creditors confidence in the company's management and financial health".

Another rate particularly relevant in determining the solvency of the company, which will be used in this research is patrimonial solvency ratio. In most of the publications, the patrimonial solvency is considered appropriate when its values are in the range 0.3 to 0.5. Patrimonial solvency was determined as ratio between the equity and the permanent capital [2].

$$Sp = \frac{Eguity}{Permanent\ capital}$$

Permanent capital = Equity + Long-term debts

The GDP deflator measures the inflation rate, and expresses the average index of the prices from the economy, for the period that is refered to. The GDP deflator is calculated as the ratio between the nominal GDP and real GDP [15].

The real economic growth *"allows comparisons of the dynamics of economic development, both in time and between economies of different sizes"* [16] and is determined according to the model:

$$\text{The rate of real economic growth} = \frac{Real\ GDP_1 - Real\ GDP_0}{Real\ GDP_0}$$

$$\text{Real GDP} = \frac{Nominal\ GDP}{GDP\ deflator}$$

The unit of measure of the GDP deflator is the percentage change compared with the same period of the last year of the price index (national currency).

Methodology. The sample used in this research consists of 36 companies from the manufacturing industry in Romania, listed on the Bucharest Stock Exchange at the first and second category. The study is conducted during the period 2007-2014, the values of the variables being quarterly. The values of the macroeconomic variables: the real economic growth rate and the GDP deflator were extracted from the Eurostat database (accessed on 04.01.2016). The last update of the data published on the site was made in 01.01.2016. In order to identify the relationship between patrimonial solvency, real economic growth and GDP deflator through the VAR model, the following steps were completed: in order to make the variables stationary, the first difference operator was applied (per t – per t -1); the lags were selected;the VAR model was developed; the Portmanteau test on the residues was conducted.

Results.Empirical study regarding the relationship between patrimonial solvency, real economic growth and GDP deflator through the VAR model

We intend to identify the existence of a relationship between the level of the patrimonial solvency recorded by the the analyzed companies, the real economic growth and the GDP deflator during the period 2007-2014.

The evolution of patrimonial solvency, real economic growth and GDP deflator, determined quarterly, on the period 2007-2014 is presented in the figures no. 1 and no. 2.

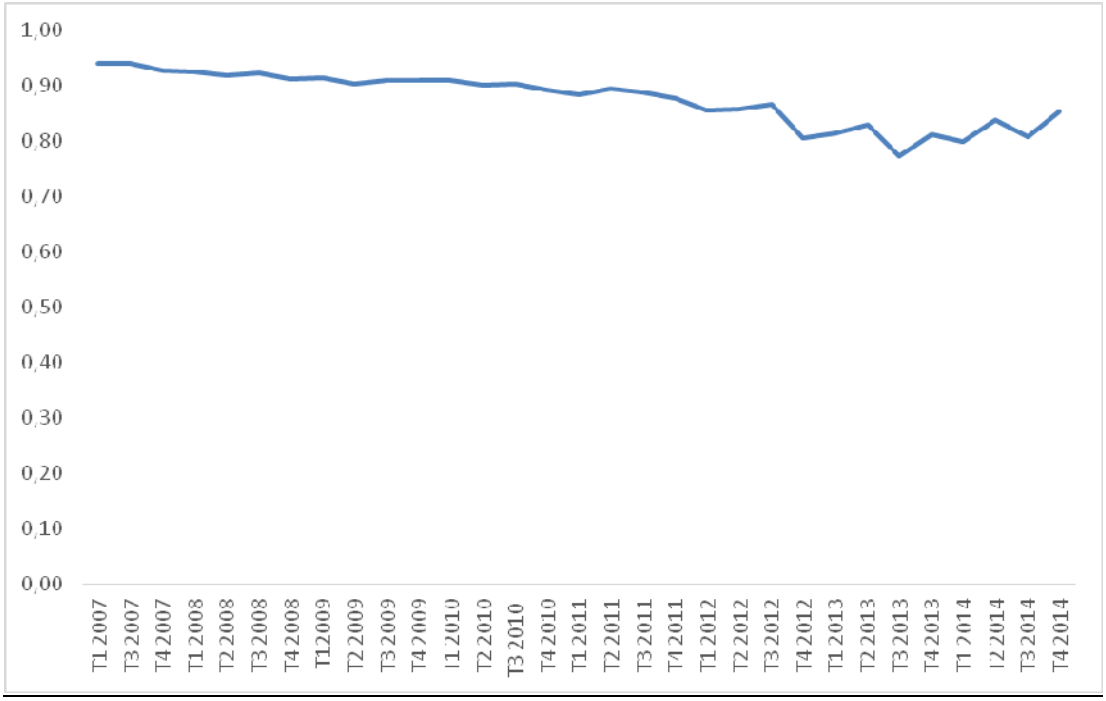

Fig. 1. The evolution of the patrimonial solvency

Source: Authors own processing

It can be noticed the fact that, even if the indicator values are decreasing, during the period 2007-2014, its values are above average: between 0.94 (2007) and 0.81 (2014) .

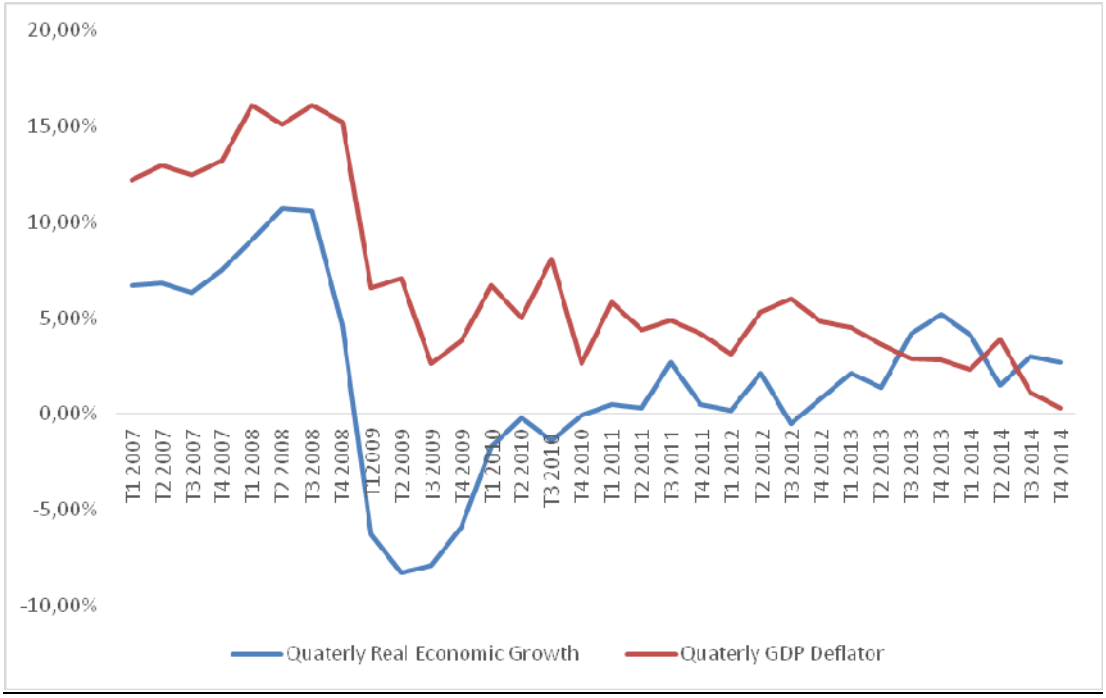

Fig. 2. The evolution of the Real Economic Growth and GDP Deflator

*Source:*Authors own processing

Real economic growth and the GDP deflator are recording oscillating evolutions during the period 2007-2014.

The VAR model regarding the correlation between the analyzed indicators, is presented in Table no. 1 .

Table 1. **VAR model**

Vector Autoregression Estimates
Date: 01/10/16 Time: 11:02
Sample (adjusted): 2007Q3 2014Q4
Included observations: 30 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	DGDP_DEF...	DQUARTER...	DSP
DGDP_DEFLATOR(-1)	-0.664789	-0.180406	-0.088535
	(0.16703)	(0.23384)	(0.15833)
	[-3.98003]	[-0.77149]	[-0.55917]
DQUARTERLY_GDP(-1)	0.622526	0.475807	0.167214
	(0.15119)	(0.21166)	(0.14331)
	[4.11757]	[2.24797]	[1.16676]
DSP(-1)	0.159552	0.199892	-0.579559
	(0.18946)	(0.26524)	(0.17959)
	[0.84216]	[0.75364]	[-3.22712]
C	-0.005217	-0.000560	-0.005611
	(0.00370)	(0.00519)	(0.00351)
	[-1.40860]	[-0.10808]	[-1.59811]
R-squared	0.463104	0.167630	0.378569
Adj. R-squared	0.401155	0.071588	0.306866
Sum sq. resids	0.010054	0.019705	0.009034
S.E. equation	0.019664	0.027529	0.018640
F-statistic	7.475505	1.745373	5.279647
Log likelihood	77.44721	67.35331	79.05161
Akaike AIC	-4.896481	-4.223554	-5.003440
Schwarz SC	-4.709654	-4.036727	-4.816614
Mean dependent	-0.004233	-0.001367	-0.002918
S.D. dependent	0.025411	0.028571	0.022389

Determinant resid covariance (dof adj.)	7.65E-11
Determinant resid covariance	4.98E-11
Log likelihood	228.1459
Akaike information criterion	-14.40973
Schwarz criterion	-13.84925

Source: Author's own processing through the econometric program E –Views

It can be noticed the fact that a change with one unit of the real economic growth, produces in average a positive change, respectively an increase with 0.6225 units in the value of the GDP deflator. Also, the change with one unit of the real economic growth causes, in average, a positive change with 0,167 units in the value of the patrimonial solvency. The change with one unit of the GDP deflator causes, in average, a reduction with 0,088 units of the patrimonial solvency.

In the equations below, we highlighted the dependence between the GDP deflator and it's past values, and the past values of the real economic growth and patrimonial solvency.

$$DGDP\_DEFLATOR = C(1,1)*DGDP\_DEFLATOR(-1) + C(1,2)*DQUATERLY\_GDP(-1) + C(1,3)*DSP(-1) + C(1,4)$$
$$DGDP\_DEFLATOR = -0{,}664789*DGDP\_DEFLATOR(-1) + 0{,}622526*DQUATERLY\_GDP(-1) + 0{,}159552*DSP(-1) - 0{,}005217 \quad (1)$$

The dependence between these variables is strong because the R-squared indicator is 0.46, respectively 46% of the GDP deflator dispersion is determined by the variables presented in the equation below (the past values of the GDP deflator, of the real economic growth and of the patrimonial solvency).

The dependence of the real economic growth by its past values and by the past values of the GDP deflator and of the patrimonial solvency was analyzed in the equation no. 2. It can be noticed a low dependence between the mentioned variables, as R-squared indicator is 0,1676, respectively 17% of the real economic growth dispersion is determined by the variables presented in the equation below.

$$DQUATERLY\_GDP = C(2,1)*DGDP\_DEFLATOR(-1) + C(2,2)*DQUATERLY\_GDP(-1) + C(2,3)*DSP(-1) + C(2,4)$$
$$DQUATERLY\_GDP = -0{,}180406*DGDP\_DEFLATOR(-1) + 0{,}475806*DQUATERLY\_GDP(-1) + 0{,}199891*DSP(-1) - 0{,}000560 \quad (2)$$

The equation no. 3 shows the dependence of the patrimonial solvency by its past values and by the past values of the GDP deflator and of the real economic growth. The dependence between the mentioned indicators is medium as R-squared is 0,3785, respectively 38% from the patrimonial solvency dispersion is determined determined by the variables presented in the equation below.

$$DSP = C(3,1)*DGDP\_DEFLATOR(-1) + C(3,2)*DQUATERLY\_GDP(-1) + C(3,3)*DSP(-1) + C(3,4)$$
$$DSP = -0{,}088535*DGDP\_DEFLATOR(-1) + 0{,}167214*DQUATERLY\_GDP(-1) - 0{,}579558*DSP(-1) - 0{,}005611 \quad (3)$$

In order to validate the relationship between the analyzed variables and the fairness of the VAR model, we rewritten the model through the least squares method (Table 2.)

Table 2. **The VAR model rewritten through the least squares method**

System: SYSTEM01
Estimation Method: Least Squares
Date: 01/10/16 Time: 11:20
Sample: 2007Q3 2014Q4
Included observations: 30
Total system (balanced) observations 90

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.664789	0.167031	-3.980029	0.0002
C(2)	0.622526	0.151188	4.117572	0.0001
C(3)	0.159552	0.189456	0.842158	0.4023
C(4)	-0.005217	0.003704	-1.408596	0.1629
C(5)	-0.180406	0.233842	-0.771490	0.4427
C(6)	0.475807	0.211661	2.247967	0.0274
C(7)	0.199892	0.265236	0.753637	0.4533
C(8)	-0.000560	0.005185	-0.108076	0.9142
C(9)	-0.088535	0.158333	-0.559170	0.5776
C(10)	0.167214	0.143315	1.166763	0.2469
C(11)	-0.579559	0.179590	-3.227115	0.0018
C(12)	-0.005611	0.003511	-1.598109	0.1141
Determinant residual covariance		4.98E-11		

Equation: DGDP_DEFLATOR = C(1)*DGDP_DEFLATOR(-1) + C(2) *DQUARTERLY_GDP(-1) + C(3)*DSP(-1) + C(4)
Observations: 30

R-squared	0.463104	Mean dependent var	-0.004233
Adjusted R-squared	0.401155	S.D. dependent var	0.025411
S.E. of regression	0.019664	Sum squared resid	0.010054
Durbin-Watson stat	2.269859		

Equation: DQUARTERLY_GDP = C(5)*DGDP_DEFLATOR(-1) + C(6) *DQUARTERLY_GDP(-1) + C(7)*DSP(-1) + C(8)
Observations: 30

R-squared	0.167630	Mean dependent var	-0.001367
Adjusted R-squared	0.071588	S.D. dependent var	0.028571
S.E. of regression	0.027529	Sum squared resid	0.019705
Durbin-Watson stat	1.832892		

Equation: DSP = C(9)*DGDP_DEFLATOR(-1) + C(10)*DQUARTERLY_GDP (-1) + C(11)*DSP(-1) + C(12)
Observations: 30

R-squared	0.378569	Mean dependent var	-0.002918
Adjusted R-squared	0.306866	S.D. dependent var	0.022389
S.E. of regression	0.018640	Sum squared resid	0.009034
Durbin-Watson stat	1.969424		

Source: Author's own processing through the econometric program E -Views

Also, after rewriting the VAR model through the least squares method, we fiind out that a change with one unit of the real economic growth determines an increase of the GDP deflator, with the same amount calculated after determining the VAR model itself. After rewriting the VAR model through the least squares method, we reached to the same conclusions as applying the VAR model itself. We refer more exactly to the positive impact of the change of the real economic growth on the patrimonial solvency, but also on the negative influence of the change of the GDP deflator on the patrimonial solvency.

The Portmanteau test conducted in order to verify the residues autocorrelation in the VAR model, assumes that there is no autocorrelation between residuals (the nule hypothesis) (Table no. 3).

The probabilities associated to the Portmanteau test are higher than the significance level of 5%. Thus, the test null hypothesis that assumes that there is no autocorrelation between residuals is accepted.

Table 3. **The Portmanteau test**

VAR Residual Portmanteau Tests for Autocorrelations
Null Hypothesis: no residual autocorrelations up to lag h
Date: 01/10/16 Time: 11:13
Sample: 2007Q1 2014Q4
Included observations: 30

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	2.673467	NA*	2.765655	NA*	NA*
2	9.800691	0.3669	10.40197	0.3189	9
3	14.97043	0.6640	16.14612	0.5824	18
4	27.73192	0.4249	30.87092	0.2765	27
5	33.52487	0.5869	37.82246	0.3861	36
6	41.98296	0.6005	48.39507	0.3375	45
7	45.42638	0.7905	52.88649	0.5174	54
8	54.07255	0.7812	64.67672	0.4179	63
9	58.54426	0.8736	71.06488	0.5090	72
10	61.56953	0.9469	75.60279	0.6485	81
11	66.80233	0.9681	83.86510	0.6621	90
12	70.75423	0.9857	90.45160	0.7184	99

*The test is valid only for lags larger than the VAR lag order.
df is degrees of freedom for (approximate) chi-square distribution

Source: Author's own processing through the econometric program E -Views

Conclusion & Discussion. The study highlighted the correlation between the macroeconomic variables: patrimonial solvency, GDP deflator and real economic growth in the manufacturing industry from Romania, represented by 36 companies listed on the Bucharest Stock Exchange at the first and second category, over the period 2007-2014. Through the VAR model, we demonstrated that the change with one unit of the real economic growth causes a positive change,ie an increase of the patrimonial solvency and of the GDP deflator and that the change with one unit of the GDP deflator produces a reduction of the patrimonial solvency.

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ДОСЛІДЖЕННЯ ОЦІНКИ ФІНАНСОВОЇ СТІЙКОСТІ ГОСПОДАРЮЮЧИХ СУБ'ЄКТІВ

Дослідження представляє теоретичну і практичну еволюцію фінансової стійкості, оцінену за показниками платоспроможності, реальними темпами економічного зростання і дефлятором ВВП в виробничих компаніях Румунії, через векторні авторегресійні моделі. Вибірка складається в 36 компаній обробної промисловості Румунії, зареєстровані на Бухарестській фондовій біржі, першої і другої категорії. Дослідження проводилося за період 2007-2014 рр і продемонструвало той факт, що зміна реального економічного зростання викликає позитивні зміни в дефляторі ВВП. Не в останню чергу, зміна реального економічного зростання також визначає позитивну зміну платоспроможності, а також зміна дефлятора ВВП призводить до зниження платоспроможності.

Ключові слова: родова платоспроможність, реальне економічне зростання, GDP дефлятор, векторна авторегресійна модель.

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ИССЛЕДОВАНИЕ ОЦЕНКИ ФИНАНСОВОЙ УСТОЙЧИВОСТИ ХОЗЯЙСТВУЮЩИХ СУБЪЕКТОВ

Исследование представляет теоретическую и практическую эволюцию финансовой устойчивости, по показателям платежеспособности, реальным темпам экономического роста и дефлятору ВВП в производственных компаниях Румынии, через векторные авторегресионные модели. Выборка состоит в 36 компаний обрабатывающей промышленности Румынии, зарегистрированные на Бухарестской фондовой бирже, первой и второй категории. Исследование проводилось за период 2007-2014 гг и продемонстрировало тот факт, что изменение реального экономического роста вызывает позитивные изменения в дефляторе ВВП. Не в последнюю очередь, изменение реального экономического роста также определяет положительное изменение платежеспособности, а также изменение дефлятора ВВП приводит к снижению платежеспособности.

Ключевые слова: родовая платежеспособность, реальный экономический рост, GDP дефлятор, векторная авторегрессионная модель.