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## PURCHASING POWER PARITY IN TRANSITION ECONOMIES: DOMESTIC CURRENCY AGAINST THE EURO

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**Abstract.** The objective of this study is to analyze the validity of the PPP theory, in its strong or weakest forms, for a sample of countries that have recently integrated or are about to integrate in the European Union vis-à-vis the Eurozone countries. We apply three different classical methodologies: graphical analysis, stationarity tests of the real exchange rates and cointegration analysis. The exchange rates display most of the times negative deviations from the PPP exchange rates. For most of the countries (8 out of 10), the unit root tests indicate that the real exchange rate is not level or trend stationary. The cointegration analysis provides support for the existence of a long run relationship between the exchange rate and the price ratio for 5 of 7 transition economies. The results of such an investigation are important for policy makers, as well as for traders.

**JEL Classification:** E31, F31, P24

**Keywords:** purchasing power parity, real exchange rate, cointegration, transition

### 1. Introduction

The theory of purchasing power parity (PPP) is one of the oldest theoretical models in International Finance. The PPP is, in fact, an extension of the aggregate form of the law of one price applied on two different countries. Within Cassel's (1918) approach, the absolute version of PPP states that the price of a common basket of goods and services traded in two different countries is the same if it is expressed in the same currency. The PPP exchange rate (units of domestic currency per one unit of foreign currency) is defined as the ratio between the aggregate price levels (*PL*) of a tradable basket of goods and services. Relative PPP states that exchange rate changes are the result of the existing difference between the domestic and foreign inflation rates. The PPP exchange rate can be

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viewed as an equilibrium exchange rate, as well as a target toward which the actual exchange rate reverts after a longer or shorter period. Empirical studies usually use price indices ( $P$ ) from the two countries, which measure the average change in prices for goods and services (bought by an average household, in the case of CPI) compared to a base period. The PPP exchange rate at time  $t$ ,  $E_t^{PPP}$ , can be determined based on the PPP rate in the base period ( $0$ ),  $E_0^{PPP}$ , as follows:

$$E_t^{PPP} = \frac{PL_t}{PL_t^*} = \frac{PL_0}{PL_0^*} \frac{PL_t / PL_0}{PL_t^* / PL_0^*} = E_0^{PPP} \frac{P_t}{P_t^*} \quad (1)$$

where  $PL$  is the domestic price level,  $PL^*$  is the foreign price level,  $P$  the domestic price index,  $P^*$  the foreign price index. The base period ( $0$ ) must be the same for both domestic and foreign price indices.

This PPP exchange rate is an equilibrium rate, which is determined by the behavior of importers and exporters, who respond to the movements in the price of the market basket. When the exchange rate does not equal its equilibrium value (the PPP exchange rate), importers and exporters react, seeking for gains out of international goods arbitrage. This leads to a variation in the demand for foreign currency and finally to a new state of equilibrium of the exchange rate. Yet, this adjustment process of the exchange rate toward a level established by the PPP requires a certain time period. Given all the above arguments, the PPP theory is seen in literature as a theory concerning finding an appropriate level of the exchange rate. The empirical studies in the area sustain the validity of the PPP theory in the long run rather than in the short run (Taylor and Taylor, 2004).

The PPP theory and also the Law of One Price theory are theoretical models, which are valid only within well defined hypotheses: no transportation costs, no trade restrictions, such as tariffs or non tariff barriers between countries, perfect competition markets. In the real world, there are a lot of factors that can cause short run deviations and even systematic divergences from PPP (Balassa, 1964; Samuelson, 1964).

The theoretical approach and the recent empirical studies take into account these factors, as well as the slow speed of adjustment toward the equilibrium exchange rate. In the real world, the traders (importers and exporters) do not respond instantaneously to price differentials between countries. The strong form of the PPP hypothesis assumes the mean reversion or stationarity of real exchange rates, while the weakest PPP form supposes a long run relationship (cointegration relationship) between the exchange rate, the domestic price level and the foreign price level. The stationarity and cointegration hypotheses, that are specific to time series econometrics, are tested by using more and more powerfully univariate and multivariate tests.

The objective of this study is to analyze the validity of the PPP theory, in its different forms, for a sample of countries that have recently integrated or are about to integrate in the European Union vis-à-vis the Eurozone countries. We will test the validity of the PPP theory for each domestic currency from our sample of countries against Euro. The results of such an investigation are important for policy makers and for traders, who are interested if the domestic currency is over or undervalued with respect to the PPP theory.

## **2. The PPP literature regarding developing countries**

Empirical studies in the area provide mixed results concerning both developed and developing countries (Taylor, 2002).

Alba and Papell (2005) examine the long run PPP for a large group of developed and developing countries against the US Dollar. The study reveals that the country characteristics explain the validity or rejection of the PPP theory. They use panel data methods in order to test the stationarity of real exchange rates (RER). They reveal evidence of PPP in countries more open to trade and conclude that tariff and non tariff barriers are an impediment for international arbitrage. Stronger evidence is found in countries that are geographically closer to each other (lower transportation costs), with lower inflation and with similar economic growth rates.

Holmes (2001) finds evidence against PPP for most of the 30 less developed countries comprised in his study, by testing for unit roots in heterogeneous panel data sets. Sideris (2006) tests the validity of long run PPP for 17 economies in transition vis-à-vis the US Dollar. Using Johansen's cointegration methodology and the panel cointegration technique, he finds support in favor of a long run relationship between nominal exchange rates, domestic price levels and foreign price levels. However, the coefficients of the cointegration vectors do not meet the symmetry and proportionality conditions. Other empirical studies concerning high inflation economies, which use different cointegration techniques, sustain the weak form of the PPP theory (Zhou, 1997, Christev and Noorbakhsh, 2000). In high inflation countries, the movements in the price level overshadow the factors that determine deviations from PPP (Zhou, 1997).

Concerning the evolution of real exchange rates in transition economies, the literature notes a strong real appreciation. However, there are economists that sustain the existence of permanent, long-run deviations of the real exchange rate from its mean. The long run PPP may be seen as a persistent reverse of the real exchange rate toward a deterministic trend. Pappel and Prodan (2003) investigate the validity of the two forms of the PPP theory for 16 developed countries, by using a long run real exchange rate. The classical version of the theory, reverse towards a constant mean, is proved to be valid for 10 countries, while the Balassa-Samuelson version is proved for 4 economies. This version of the PPP theory is due to the productivity approach; according to Balassa (1964) and Samuelson (1964), the deviations of the exchange rate from its mean are caused by the gaps in productivity levels between different countries. In countries with high productivity in the traded goods sector, real exchange rates tend to appreciate. Therefore, one can expect for the PPP not to be valid between high-growth and low-growth economies (Alba and Papell, 2006). The prices denominated in the same currency tend to be lower in low-income countries than in high income countries (Penn effect).

Halpern and Wyplosz (2001) analyze the appreciation of real exchange rates in transition economies by considering the Balassa-Samuelson effect. They conclude that the real appreciation will go on for a long period of time. The policies of macroeconomic stabilization meant to stabilize prices or reduce inflation, the foreign investors' behavior, as well as the intervention of the governments on the exchange rate markets are causes of deviations from the long run PPP.

Countries with transition economies adopted different exchange rate regimes. A history concerning the types of exchange rates, according to the IMF classification, adopted by transition economies between 1990 and 2000 is illustrated in Halpern and Wyplosz (2001). Nowadays, the Czech Republic, Poland, the Slovak Republic, Slovenia, Hungary and Romania have more or less managed floats. The Czech Republic and Poland adopted the most flexible managed floating regime, while in Hungary, floating bands are imposed. We must also notice that the Maastricht criteria dispose an annual change of maximum 15% for the exchange rates of currencies of the member states against Euro. Countries like Bulgaria, Estonia, Lithuania and Latvia have a fixed exchange rate regime with Euro as an anchor currency. For each of the above countries, sooner or later terms for the integration in the Eurozone are established.

For monetary authorities, PPP provides an equilibrium exchange rate, which is often the target of various policies of intervention on the exchange market. Moreover, the PPP exchange rate is used as a conversion method meant to make possible different comparisons between countries concerning GDP/inhabitant, wages or income per inhabitant. Such comparisons are important as income convergence is a significant objective for the EU members. The equilibrium exchange rate is also an essential issue for exporters and importers from developing member countries that are not part yet of the Economic Monetary Union (EMU). They can elaborate long run business plans by taking into consideration the equilibrium exchange rate predicted by the PPP theory.

### 3. Methodology issue and data

a) *Graphical analysis.* The use of graphs that illustrate the evolution of both actual exchange rates (nominal) and PPP exchange rates confers us the possibility to discover the periods when the exchange rates were over or undervalued. The PPP exchange rates are determined as follows:

$$E_t^{PPP} = E_0^{PPP} (P_t / P_t^*) \quad (2)$$

where  $P_t$  stands for the domestic Harmonized Index of Consumer Prices (HCPI), while  $P_t^*$  is the HCPI for the Eurozone. The closer the exchange rate  $E_t$  is to  $E_t^{PPP}$ , the closer is the PPP theory from being validated.

b) *Testing the stationarity of the real exchange rate.* The PPP theory can be seen as a relationship between the exchange rate, the domestic price level and the foreign price level. This relationship is suggested by equation (3):

$$e_t = a + b_1 p_t - b_2 p_t^* + \varepsilon_t \quad (3)$$

where  $e_t = \ln(E_t)$  stands for the log of the nominal exchange rate,  $p_t = \ln(P_t)$  and  $p_t^* = \ln(P_t^*)$  are the logs of the prices, and  $\varepsilon_t$  is a white-noise error term.

The strong PPP (univariate form of PPP) imposes symmetry ( $b_1 = b_2$ ) and proportionality restrictions  $b_1 = b_2 = 1$  on the coefficients of equation (3). In order

to test the validity of strong PPP, the real exchange rate must be computed as follows:

$$r_t = e_t - p_t + p_t^* \quad (4)$$

We investigate the mean reversion (toward a constant or a deterministic trend) of the RER, by using three unit root tests, such as Augmented Dickey-Fuller test (ADF), Dickey-Fuller test with GLS Detrending (DF-GLS) and Elliott, Rothenberg and Stock (ERS) Point Optimal test.

c) *The cointegration analysis.* The weak form of PPP imposes on the coefficient of equation (3) a single restriction, that is the symmetry restriction  $b_1 = b_2$ :

$$e_t = a + bpr_t + \varepsilon_t \quad (5)$$

where  $pr_t = \ln(P/P^*)$  is the domestic/foreign price relative and  $b > 0$ . Strong PPP requires that  $b = 1$  in (5). If  $a = \ln E_0$  than the base period property is fulfilled (Officer, 2006).

More recent papers apply the cointegration analysis and estimate error-correction models in order to validate the PPP. In this way, the existence of a stable long run relationship between the nominal exchange rates and the price indices is tested. Two variables that display stochastic trends and are cointegrated have a common evolution in time. This long run equilibrium is disturbed only by random shocks with short run effects. Two variables,  $Y_t$  and  $X_t$ , integrated of first order,  $I(1)$ , are cointegrated if there is a linear combination of them,  $\varepsilon_t$ , which is generated by a stationary process,  $\varepsilon_t = Y_t - a - bX_t$ . The existence of this cointegration relationship between the two variables indicates that in the long run, the series tend to reverse towards the equilibrium relationship:  $Y_t = a + bX_t$ .

When applied for equation (5), this methodology allows us to investigate the existence of a stable long run relationship between nominal exchange rates and relative prices. Equation (5) is a long run equilibrium relationship between exchange rates and relative prices, when series  $e_t$  and  $pr_t$  are cointegrated.

According to the Engle-Granger approach, for the hypothesis that  $e_t$  and  $pr_t$  are cointegrated to be accepted, the residuals  $\hat{\varepsilon}_t = e_t - \hat{a} - \hat{b}pr_t$  must be stationary. Therefore, one must test whether the residuals,  $\hat{\varepsilon}_t = e_t - \hat{a} - \hat{b}pr_t$ , display unit roots. The classical critical values for the ADF tests are inappropriate for these estimated errors. MacKinnon's (1991) asymptotic critical values for cointegration tests are used. In our case, these critical values are taken from Harris and Sollis (2003).

The price indices used in this study are Harmonized Indices of Consumer Prices (HICP) with the base period 1996. We collected monthly data, for a period ranging between January 1996 and July 2006, and for each of the 10 countries

comprised in our study: Bulgaria, the Czech Republic, Estonia, Hungary, Lithuania, Leetonia, Poland, the Slovak Republic, Slovenia, and Turkey. These indices are based on a set of harmonized rules. Moreover, we collected the aggregate Harmonized Index of Consumer Prices for the Eurozone for the same period. The monthly data for the nominal exchange rates, as number of units of domestic currency per 1 Euro, was also considered for each country and for the same period (with the exception of Bulgaria, for which data ranges between January 1997 and July 2006). The source of all our data is the web site of the Statistical Office of the European Communities (Eurostat).

#### 4. Empirical results and analysis

a) *Graphical analysis.* Table 1 displays, for each of the 10 countries comprised in our study, the mean absolute percentage error (MAPE) of the observed exchange rate  $E$  from the PPP exchange rate  $E^{PPP}$  (computed as in equation (1)).

Table 1. MAPE from PPP exchange rate (%)

| Country             | MAPE   | Percentage of positive deviations |
|---------------------|--------|-----------------------------------|
| The Czech Republic  | 24.8   | 3.97                              |
| Poland              | 13.78  | 25.19                             |
| Romania             | 28.33  | 13.38                             |
| The Slovak Republic | 28.89  | 14.96                             |
| Slovenia            | 7.48   | 6.30                              |
| Hungary             | 8.29   | 11.02                             |
| Estonia             | 9.63   | 3.93                              |
| Leetonia            | 20.16  | 3.93                              |
| Lithuania           | 107.92 | 3.15                              |
| Turkey              | 25.81  | 4.72                              |

The table also contains the percentage of positive deviations. The deviations are in most of the cases significant and negative.

Figure 1. Observed and PPP exchange rates

Figure 1a. Slovenia

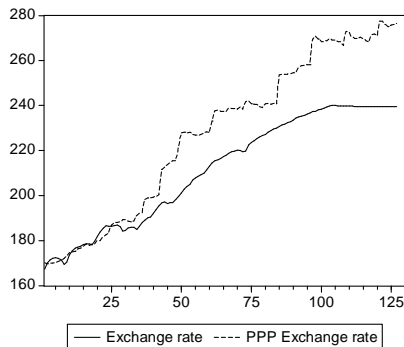
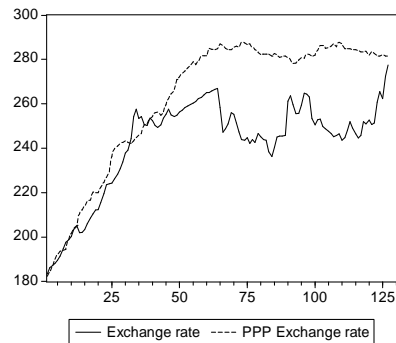


Figure 1b. Hungary





The countries display similar behaviors, as the exchange rates display most of the times negative deviations from the PPP rates. Bulgaria is eliminated from the country sample, as the Bulgarian Lev/Euro exchange rate was maintained constant during most of the period considered by us. We also mention that Poland liberalized the Zloty starting with 2000; Hungary has a currency regime with fluctuation band, while Slovenia has a managed flotation, with several currency restrictions. Deviations are minimal for Slovenia and Hungary; figure 1 displays the graph for the observed exchange rate and PPP exchange rate, for this two countries.

b) *Testing the stationarity of the real exchange.* The analysis of the RER time series suggests a tendency of persistent and significant appreciation of the real exchange rate for all the countries, except Leetonia. For Leetonia, until 2000 the real exchange rate tended to appreciate; after 2000, it started to depreciate and then a relatively constant evolution followed. The real exchange rate had a high volatility in Poland, Hungary and Turkey.

The analysis of the mean reversion of the real exchange rates is performed by using unit root tests: Augmented Dickey-Fuller test (ADF), Dickey-Fuller test with GLS Detrending (DF-GLS) and Elliott, Rothenberg and Stock (ERS) Point Optimal test. The results of these tests, computed in both the following forms: constant (Const) and constant & linear trend (Const&Trend), are presented in Table 2.

For Turkey, all tests support trend stationarity; DF-GLS test indicates trend stationarity for the Slovak Republic, too. Figure 2 displays the graphs of the real exchange rate for the Slovak Republic and Turkey.

Table 2. Unit Root Tests for real exchange rate

| Country         | ADF    |             | DF-GLS |             | ERS Point Optimal |             |
|-----------------|--------|-------------|--------|-------------|-------------------|-------------|
|                 | Const  | Const&Trend | Const  | Const&Trend | Const             | Const&Trend |
| Czech Republic  | -0.81  | -2.33       | 1.91   | -2.11       | 157.92            | 8.88        |
| Poland          | -1.36  | -2.52       | -0.93  | -2.33       | 9.59              | 8.51        |
| Romania         | -2.31  | -2.69       | 0.05   | -1.92       | 44.87             | 13.37       |
| Slovak Republic | -0.52  | -3.01       | 0.92   | -2.69*      | 77.93             | 6.63        |
| Slovenia        | -0.93  | -2.81       | -0.21  | -2.52       | 20.64             | 8.31        |
| Hungary         | -2.09  | -1.79       | -1.39  | -2.08       | 7.59              | 8.91        |
| Estonia         | -0.06  | -0.89       | 3.14   | -2.11       | 233.76            | 11.02       |
| Leetonia        | -1.75  | -2.06       | -0.58  | -0.64       | 42.78             | 110.56      |
| Lithuania       | -2.84  | -1.48       | 1.04   | -0.57       | 373.89            | 61.31       |
| Turkey          | -2.89* | -4.31**     | -1.65  | -4.29**     | -5.23             | 2.63**      |

Notes: 1) \*,\*\* denotes rejection of the null hypothesis, of unit root, at 5% and 1% significance levels, respectively. 2) The length of the lag is selected by using the Schwartz Information Criterion. ERS Point Optimal test uses the autoregressive spectral OLS density estimator at frequency zero. 3) We used MacKinnon's (1996) critical values for the ADF and DF-GLS tests, respectively Elliot, Rothenberg and Stock's (1996) critical values for the ERS Point Optimal test. The EViews 4.1 software was used.

For others countries, these unit root tests indicate that RER is not level stationary (level stationary means reversion toward a constant mean) and consequently, the strict PPP form is not valid. Moreover, the results also show that RER is not trend stationary, meaning that the PPP in Balassa-Samuelson tradition cannot be validated, too. However, in the OLS regression the coefficient of the linear time trend is statistically significant for some countries (the Czech Republic, Leetonia, Poland, Slovenia, the Slovak Republic, Turkey).

The examination of the RER time series suggests the presence of a nonlinear rather than linear deterministic trend or the occurrence of possible shifts in the intercept of the trend function. This can be due to strong nominal or real shocks, which are typical for transition economies.

Figure 2. Real exchange rate time series  
Figure 2a. The Slovak Republic

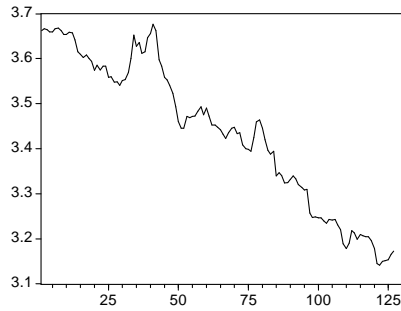
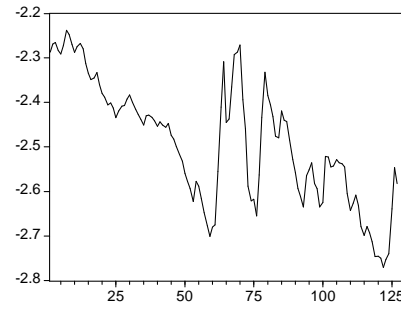


Figure 2b. Turkey



c) *The cointegration analysis.* The study of the validity of the PPP theory for this sample of countries from Central and Eastern Europe will be completed with cointegration tests. We test the cointegration between the log of exchange rates and the log of the price ratio, by using the Engle-Granger (1987) approach. Within this analysis only countries with floating exchange regimes are included: the Czech Republic, Hungary, Poland, Romania, Slovenia, the Slovak Republic and Turkey.

The times series involved in our study, log of exchange rates  $\ln(E_t)$  and the log of the price ratio  $\ln(P_t/P_t^*)$ , are integrated of first order  $I(1)$ . The previously run unit root tests (ADF, DF-GLS, ERS Point Optimal) were applied for levels, as well as for the first difference of the variables. According to the Engle-Granger approach, in order for the null that  $\ln(E_t)$  and  $\ln(P_t/P_t^*)$  are cointegrated to be accepted, the residuals from the equation (5):

$$e_t = a + bpr_t + \varepsilon_t \quad \text{or} \quad \ln(E_t) = a + b\ln(P_t/P_t^*) + \varepsilon_t$$

must be stationary. We will use unit root test with the null that the residuals are  $I(1)$  (thus no cointegration) against the alternative that they are  $I(0)$ . We use MacKinnon's (1991) response surfaces for critical values of cointegration tests.

Table 3 contains the OLS estimations for the coefficients in equation (5) and the results of the ADF test for cointegration.

The results in table 3 suggest a strong support for the bivariate PPP theory in a restrictive form (containing the symmetry condition) for Turkey and Slovenia. For these countries, the null of one unit root in residuals is rejected at a 1% significance level. A weaker support in favor of cointegration is found also in the cases of Poland, Hungary and Romania, for which the null is rejected at a 5% significance level.

Table 3. OLS coefficients and ADF test for cointegration

| Country             | $\alpha$ | $\beta$ | ADF $\varepsilon_t \approx I(1)$ |
|---------------------|----------|---------|----------------------------------|
| The Czech Republic  | 3.618    | -0.629  | -1.52                            |
| Poland              | 1.283    | 0.360   | -2.57*                           |
| Hungary             | 5.287    | 0.635   | -2.28*                           |
| Romania             | -0.97    | 0.82    | -2.49*                           |
| The Slovak Republic | 3.693    | 0.047   | -1.59                            |
| Slovenia            | 5.152    | 0.72    | -2.82**                          |
| Turkey              | -2.29    | 0.91    | -4.08**                          |

Notes. \*,\*\* denote rejection of the null of unit root in residuals at 5%, respectively 1% significance level. The critical values for the ADF test are computed by using response surfaces for critical values of the cointegration tests. These critical values are taken from Harris and Sollis (2003, p. 245) for the case of no constant and no trend: -1.94 and -2.575 for 5% and 1% significance level.

The results in table 3 suggest a strong support for the bivariate PPP theory in a restrictive form (containing the symmetry condition) for Turkey and Slovenia. For these countries, the null of one unit root in residuals is rejected at a 1% significance level. A weaker support in favor of cointegration is found also in the cases of Poland, Hungary and Romania, for which the null is rejected at a 5% significance level.

Figure 3. Long run relationship between the exchange rate and the price ratio  
 Figure 3a. Romania                      Figure 3b. Turkey

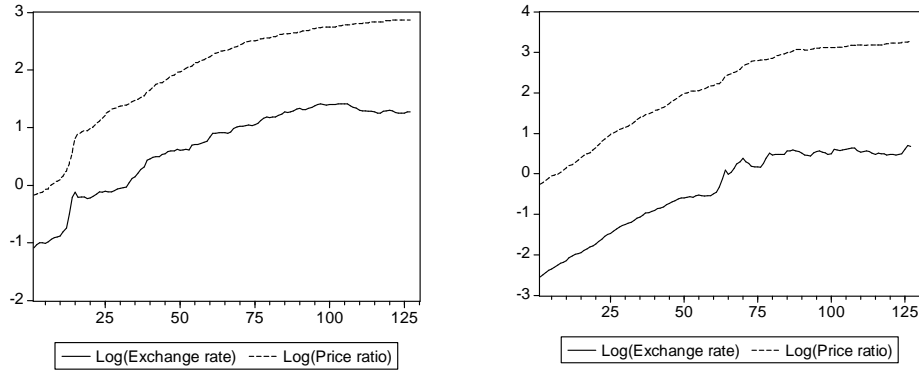


Figure 3 shows the evolution of the log of the exchange rate and the log of the price ratio for two countries: Turkey and Romania. In these two cases, the  $b$  coefficients from the cointegration equations are very close to 1. However, by using the Wald F-test, the null that  $b=1$  is rejected in all the 5 cases where cointegration was found. We also tested the hypothesis that  $a = \ln(E_0)$  by using the same Wald F-test. This hypothesis is not rejected for all the 5 countries mentioned above, for a 5% significance level.

## 5. Conclusions

Within this paper, we attempted to find evidence for both the strong and weak PPP theory in the case of domestic currency/Euro exchange rate. We applied three different classical methodologies: graphical analysis, stationarity tests of the real exchange rate and cointegration analysis of the long run relationship between nominal exchange rates and relative prices.

The countries display similar behaviors, as the exchange rates display most of the times negative deviations from the PPP exchange rates. For most of countries (8 of the 10 countries), the unit root tests indicate that the real exchange rate is not level stationary and consequently, the strict PPP form is not valid. Moreover, the results also show that RER is not trend stationary, meaning that the PPP in Balassa-Samuelson tradition cannot be validated, too. The examination of the RER time series suggests the presence of a nonlinear rather than linear deterministic trend or of possible shifts in the intercept of the trend function. This can be due to strong nominal or real shocks typical for transition economies.

The cointegration analysis provides support for the existence of a long run relationship between the exchange rate and the price ratio for 5 of the 7 transition economies (at a 5% significance level for 3 countries and 1% for 2 countries). Nevertheless, the proportionality restriction suggested by the strong form of PPP is validated for none of the sample countries.

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## SERVICES POLICY REFORM AND EU ACCESSION: ASSESSING THE RESTRICTIVENESS OF TRADE BARRIERS IN ROMANIA

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**Abstract.** Services account for more than two-thirds of overall European GDP, while exports represent only one-fifth of intra-European trade. One of the justifications is that trade costs resulting from the multitude of regulatory barriers in the European states constitute a significant impediment to services trade. In the course of its negotiations with the WTO and the EU, Romania has started to make noticeable progress towards opening up its services market. The paper indicates that, on one hand the EU was used more as a commitment device for service sector policy reform than the WTO agreement and, on the other hand, that even if Romania has attained a high degree of services trade liberalization - illustrated on the case of banking services, as well as a significant degree of integration with the European market, it still has to undertake some efforts towards dismantling impediments to the supply of services and towards good governance of service markets.

**JEL Classification:** F13, F15, L80, G28

**Keywords:** services policy reform, trade barriers, Romania, banking services, restrictiveness index

### 1. Introduction

Developed economies around the world have become increasingly service oriented, the EU being no exception. Services account for more than two-thirds of employment and GDP in the EU (Vogt, 2005). The role of services in production is, however, not reflected in their share of intra-European trade. Services account for no more than one-fifth of cross-border trade, though this does not include the substantial volume of trade undertaken through the other modes of supply – in particular through commercial establishments in the export market. One of the justifications is that trade costs resulting from the multitude of regulatory barriers in the European states constitute a significant impediment to services trade.

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Romania, like other Eastern European countries that were formerly saddled with centrally planned economies, remained largely unaffected by the dynamic growth of the service sector, until it undertook market reforms. Dynamic and deep structural changes towards the modernization of the service sector, the expansion of international trade in services and better regulation of individual service sectors (e.g. banking and insurance, transport, telecommunications) have become major drivers of the service sector growth and important elements of the reform process in the country.

Owing to the traditional neglect of the role services play in growth and development and to the concentration of industrial policies on manufacturing, structural changes brought about by transition were rather dramatic: since 1990, the services sector has grown quite rapidly in Romania and the share of services in total employment and GDP is now much closer to that observed in OECD countries (Stare & Zupancic, 2000).

Privatization, domestic liberalization and external opening, underpinned by the use of multilateral trade agreements (such as the GATS, i.e. General Agreement on Trade in Services) and other regional liberalization mechanisms (such as EU accession) as focal points for policy reform, enabled Romania to partially overcome the backwardness of its service sector.

Changes in the regulatory environment in Romania were related to the speed of integration in the world economy through international relations (World Trade Organization - WTO, GATS) and, in particular, to the EU accession processes. The latter gave considerable impetus to regulatory reforms and institutional change in Romania.

Both multilateral commitments within the GATS and EU-related rules have played a similar role. They contributed to the quality, transparency and coherence of the legal and regulatory system, as well as its efficient enforcement. They have also helped national authorities maintain a trade liberalization policy stance against domestic protectionist pressures. However, regulatory guidelines are generally less developed in the multilateral context than in the regional framework. Also, the accession process did not only put the adoption of the EU regulation (*acquis communautaire*) at the top of the political agenda, but has also brought about a regular monitoring mechanism that controlled the adoption and implementation of regulation.

As a result, regional disciplines embodied in the European Association Agreement (EAA) and those resulting from the adoption of EU regulations have exerted a stronger impact on individual service sectors in Romania.

The question explored in this paper is the extent to which the EU was used more as a commitment device for services sector policy reform in Romania than the WTO agreement (GATS), based on a comparative assessment of the restrictiveness of services trade barriers in relation to EU regulations and, respectively, to GATS disciplines, illustrated on the case of banking services.

A common argument in the literature on regional integration and trade agreements, more generally is that a rationale for participating in such agreements is to improve the terms of trade (Bagwell & Staiger, 2003). This has always been more difficult to argue in the case of transition countries, where an alternative, political economy-based hypothesis is more likely: trade agreements offer a mechanism for governments to signal their commitment to a particular policy path (Tumliir, 1985). Transition economies in particular, with a very limited track record



on maintaining an open policy stance, can be expected to have had strong incentives to use membership of trade agreements for such credibility purposes (Hoekman & Eschenbach, 2006). In addition, in Romania's case, given the very limited experience with market-based services sector policies, trade agreements may also have been valuable by establishing a template of (minimum) standards for trade and investment policy in the services area.

There is so far little research and empirical analysis on the evolution of transition economies' trade in services and on the nature and extent of restrictions on trade in services, especially for Romania and from a twofold perspective (regional and multilateral). This neglect has to do both with the lack of data and with the poor appreciation of the importance of trade in services in transition economies.

The main objective of the paper is to contribute to the narrowing of this gap by exploring the shifts in the evolution of services in Romania, in relation to EU accession, and relate these to the policy reforms that have influenced the supply of services and improved the functioning of services markets, illustrated through the measurement of services trade barriers, with banking services as an example.

Taking into account that the services sector recently assumed dominant position among economic activities in Romania, bearing heavily on economic development (Francois & Reinert, 1996), it becomes important to explore and discern the tendencies in services trade, aspects dealt with in the second part of this paper.

The characteristics of the existing regulatory framework in the services sector, as well as a review of the main barriers at the European level are addressed in the third part of the paper. These are important especially in view of the need to accommodate EU policies to better serve Romania as a member state and, thus, to shape a more "services inclusive" regulatory environment, in order to ensure faster and more efficient integration of the services market into the European economy.

To this end, the fourth part addresses the methodologies used for measuring services barriers.

To maximise the benefits from multilateral and regional negotiations, it is important that governments know what the major barriers to services trade are. Against this background, the fifth part of the paper focuses on the methods used to measure the level of restrictions in banking services in Romania, in relation to both WTO and EU-related policies. The main challenge here is the transformation of available, essentially regulatory measures characterizing services into quantitative information, on the basis of an index methodology which allows for comparisons across time, different service sectors and countries.

Based on the information from the above, we conclude that a flexible approach to shaping the regulatory setting and a continuing decrease in the impediments to services activities on the Internal market, coupled with a thorough enforcement of the transposed legislation constitute major challenges for new and old EU Member States to better cope with the emerging trends in the international economy.

## **2. Shifts in the evolution of services in Romania**

### **a. Key facts**

One of the conventionalized facts of economic development is that the share of services in GDP and employment rises as per capita income increases (Francois & Reinert, 1996). This reflects increasing specialization and exchange of services through the market, with an associated increase in variety and quality that may raise productivity of firms and welfare of final consumers, in turn increasing demand for services.

In recent years, transition economies, including Romania have had to overcome a major handicap, as the share of the services sector in their national economy was generally lower than in other countries at a similar level of development. In addition, their participation in world trade in services was way below their potential.

Available data show that during the last sixteen years the contribution of the services sector to GDP and employment has grown quite rapidly in Romania. Compared with the high-income OECD average in 1990, when the share of services in employment and GDP was around 63%, Romania clearly lagged far behind: services accounted for under 30% of GDP and employment. As of 2003, these services shares had increased substantially, reaching 45% of GDP (with 51% in 2006) and around 40% employment (with 44% in 2006) - as compared to 68% OECD average and around 70% in the EU (National Institute of Statistics, 2006). Services had the highest contribution to the increase in GDP in 2006 (3.6%, out of 7.4%), as well as the highest contribution to gross value added formation (59%).

While in most transition economies the increase in services mainly reflects the growth of traditional services, such as wholesale and retail trade activities, travel and urban transportation, in Romania, as well as in Bulgaria, the importance of other services sectors, such as business services is rising, suggesting that these countries are beginning to develop the modern services link.

As it is the case with the share of GDP attributed to the services sector, trade in services in Romania has become increasingly important, reflecting the level of market liberalization and progress in transitional reforms.

Romania's share of EU-25 trade in services is only 0.7% (4.5 mld. EUR in 2004), as opposed to 1.62% for the share of EU-25 merchandise trade with Romania (32.188 mld. EUR in 2004).

In 2003, Romania registered a trade surplus in services (70 mil. USD). The situation changed in 2004, when Romania completed the list of countries with deficits from trade in services (265 mil. USD).

Services exports as a share of GDP more than doubled for Romania on average since 1996. This development is not exceptional, in that the ratio of service exports to GDP (about 8%) has simply been converging toward that found in other parts of the world (Broadman, 2005). Thus, this can be seen as one dimension of the transition to a more market based economy. A similar pattern can be discerned on the import side - a process of convergence on the part of Romania toward the pattern that already prevailed in the EU-8 and the EU-15 (about 8.7%).

Romania is still not heavily dependent on services as a source of foreign exchange - its share of services in foreign exchange receipts decreased from 16% in 1996 to 13% in 2004, with a relative increase, though, in "transport services"

and, more importantly, in “other services” (from 29.5% in 1996 to 45.4% in 2004, as percentage of all services contribution).

Given that services trade often requires proximity between service providers and consumers, FDI is an important mode for the international supply of services. The stock of FDI in services in Romania is of about 45% (as compared to over 60% in the EU-25). In general, the EU-15 generates about 72% of inward FDI in Romania, out of which about 78% in services (Vienna Institute for International Economic Studies, 2004).

The pattern that emerges is similar to that suggested by the services trade data - there is a distinct difference between the EU-15 states and Romania, in that the former have attracted much larger flows of services FDI. Given that FDI in services can be expected to be associated with new technologies, higher service standards, and more effective delivery, these inflows help to explain both the higher labor productivity performance in services and the aggregate growth performance of these countries.

#### **b. Major findings**

The analysis shows that, while still lagging behind the developed economies, the trend towards a service-oriented society is observable also in Romania. This is reflected by the increasing proportion of GDP attributable to services and the growing share of employment in services sectors, comparable to those of more advanced transition economies in Central and Eastern Europe, EU members.

The analysis of balance of payments data in Romania shows that international trade in services has gained increasing recognition in the last decade as a contributor to economic performance, though admittedly from relatively low bases.

While services trade represents 13.5% of Romania’s international trade, it amounts to 26% of EU-25 international trade and only one-fifth of intra-European trade. The lower level of trade in comparison with the larger output share for the EU states is likely to be correlated with the respective regulatory environment.

Service trade flows Romania - EU-25 and within the internal market are still relatively small in comparison with manufacturing trade. 58% of Romania’s services trade is conducted with EU-25 countries, while in the case of merchandise trade, the proportion is 72%, suggesting a lower degree of integration than that attained for merchandise trade, due to the multitude of regulatory barriers that constitute a significant impediment to services trade.

While services represent only 13% of Romania’s exports, the structure of Romania’s exports towards EU-25 countries is slightly different, suggesting a higher propensity to export services towards this group of countries (Romania’s services exports represents approximately 16.5% of the total exports with the EU-25), reflecting the more advanced liberalization measures that are being implemented as a result of EU accession.

The level of FDI in services sectors suggests that this form of services transactions is becoming increasingly important. Data on the sectoral distribution of FDI reveal that manufacturing is losing its position as the largest host sector to the services sector. By contrast, outflows remain at low levels. The experience of the more advanced transition economies shows that liberalization and privatization programs largely explain the FDI inflows. Attracting FDI and implementing

investment disciplines in services sectors as a means of encouraging greater volumes of services trade are the result of enhanced co-operation among Romania and EU countries, leading to further integration of its market into the EU services market.

### **3. Trade barriers in the intra-EU services market**

The special characteristics of services, such as their intangible nature, the high prevalence of regulatory intervention to avoid market failures and achieve non-economic social benefits, the requirement for proximity between producers and consumers and the factor-mobility associated with their trade determine the nature of restrictions in services trade.

Services are much more vulnerable to cross-border barriers within the enlarged European market than goods, since service delivery often requires the presence of service providers in the country where services are delivered. In the case of service provision, it is often the provider himself, his staff, his equipment and material that cross national borders. As a result, barriers that inhibit international transactions with services affect all stages of the business process: the establishment of firms, the use of inputs, promotional activities, distribution forms of a service, the sales process itself, and the after-sales organization.

The restrictions to international services transactions typically take the form of non-tariff barriers and are designed to limit not only the access of foreign services, but mostly the access of suppliers or consumers to the domestic market. Foreign service providers are often confronted by national regulations such as requirements for additional professional qualifications, local residence of management, additional professional insurance, and constraints on the use of inputs from their country of origin. Sometimes, regulatory procedures and their application are not transparent, thus creating uncertainty for foreign service providers. The heterogeneity of national regulations increases trade and investment costs for service providers doing business in other countries. Thus, policy heterogeneity in itself acts also as a trade barrier (Kox & al, 2004).

From a multilateral perspective, and given that the GATS constitutes the generally recognised framework for analysing trade in services, a general classification of services barriers following the GATS categorisations is in order. Conventional non-tariff instruments of trade policy like quantitative restrictions, price based instruments, licensing or certification requirements, discriminatory access to distribution and communication systems are imposed especially on service providers and classified in the GATS in two main categories relating to: market access - measures which restrict the contestability of markets, and national treatment - policies which discriminate between domestic and foreign suppliers, to the advantage of domestic providers.

From a regional perspective and in order to take stock of cross-country barriers to services expansion, the European Commission has made a comprehensive inventory of the internal market barriers and discovered that many companies find it difficult - or even impossible - to establish in other member states. Member States often have little confidence in the quality of future member states and even in each other's legal regimes and are reluctant to adapt their own regimes where necessary to facilitate cross-border activities. There are examples of companies who had found it easier to open a subsidiary in some of the new member states than in the EU-15. Most companies still "think national" and often

do not consider growth across national borders, even if their services are not specifically designed for the domestic market and could potentially be exported. There is a lack of trust and a natural resistance to deal with habits in other current or future member states and there is still a lack of “thinking European”. The main types of barriers identified by the European Commission are summarized below (EC, 2002; Vogt, 2005; Kox & al, 2004):

- *horizontal barriers*, i.e. barriers that affect a wide range of activities, not only services. Administrative procedures and decision processes may act as entry barriers for foreign service providers: authorization requirements, the length and complexity of the procedures, the opacity of the administrative decision-making and the unclear discretionary powers of local authorities;
- *barriers resulting from additional compliance requirements*: EU member states often apply a single regime both to service providers established on their territory and service firms that provide services from their country of origin. For services exports that are already subject to regulations by national authorities in their origin country, this may result in the duplication of regulatory requirements. If foreign service firms from another EU member state send their personnel to the export market on a temporary basis for supplying a particular service, they are often fully subject to rules of the social security system of the country where the service is provided. The associated administrative and tax procedures implicitly function as a non-tariff barrier for foreign service providers. Some EU countries require that the owners or managers of firms in particular industries must be resident in their country or must have their nationality;
- *operational restrictions*: several countries require that only locally established firms may provide services. EU member states impose restrictions on the legal form of the service provider, on the use of inputs, or limitations on the variety of services that may be provided by one firm. The market promotion of services is sometimes difficult due to restrictive and detailed rules for commercial communications, ranging from outright bans on advertising for certain professions to strict control on content in other cases. Some countries apply fixed or recommended prices for certain services. The large divergence of legislation between member states impedes pan-European promotional activities for many services. With regard to input use by service providers, a variety of restrictions affect, for example, the posting of workers, the use of equipment or material by the service provider or the use of cross-border business services;
- *restrictions on the use of foreign services*: countries sometimes apply regulations that restrict the freedom of consumers to use services from abroad;
- *other barriers*: the sale of services across borders may be hindered by differences in contract law. In the after-sales phase, a service provider can also face particular difficulties resulting from differences between countries concerning professional liability and insurance or financial guarantees, or problems with repair or maintenance services, if they involve the posting of workers across borders. Finally, the intra-EU differences in regulations regarding the payment and reimbursement of value added tax and other indirect taxes (rates, classification systems and procedures) may function as effective barriers for service providers that operate across national borders. In some professional services and construction, member states require service providers to have a nationally recognized liability insurance or professional indemnity insurance.

#### **4. Methods for measuring services trade barriers**

The services sector is becoming the largest and most important sector in all countries of the enlarged Europe. Not only do economies derive the bulk of their employment and income from services, but many services – financial,

telecommunications and transport – are vital intermediate inputs for the production of other goods and services. The efficiency of this sector is crucial for the efficiency of the overall economy.

Restrictions on trade in services impose costs, usually in the form of higher prices for businesses and consumers. Restrictions limit domestic and international competition, decrease efficiency and permit incumbent service suppliers to charge prices above those in a competitive market. Estimating the extent to which restrictions increase prices or impede competition crystallises the benefits of removing restrictions for consumers, policymakers and trade negotiators.

Measures of the costs of services protection are also useful in multilateral and regional trade negotiations. Negotiators can use measures of restrictions to illustrate the costs of maintaining them. Therefore, these measures constitute useful complements to the more extensive qualitative description on the regulatory framework, presented above.

Measurement of services barriers is based upon research on the measurement of non-tariff barriers affecting goods trade. The available methodologies seek to quantify two main aspects, the *level* of restrictions in services and the *effect* of such restrictions.

There have been significant improvements concerning the methodologies for measuring *the level of services restrictions* since the pioneering work undertaken by Hoekman (1995) that was based exclusively on GATS schedules and did not take into account the actual impact of different restrictions.

Several recent studies have tried to overcome these initial limitations. In general, these studies have relied on more comprehensive qualitative databases of measures affecting trade in services and developed sophisticated weighting methods to assess the restrictiveness of different measures (McGuire & Schuele, 2000; McGuire & al, 2001; Nguyen-Hong, 2000). The classification and estimation of weights take into account information on types of barriers and their likely relative economic impact. This information is derived from GATS schedules and from various other qualitative studies. In order to minimise the subjective weighting of restrictions, sensitivity tests have been conducted to examine the extent of variation of the computed index in response to alternative weights (Hardin & Holmes, 1997). Additional efforts to improve the explanatory power of models and the analysis of the accuracy and plausibility of results have also been carried out (Warren, 2001a).

In parallel, the methods to quantify *the effects of services restrictions* have also been improved. For example, within the research project conducted by the Australian Productivity Commission, the impact of services restrictions on price or quantity have been determined for banking services (Kalirajan & al, 2001), maritime services (Kang, 2001), telecommunication services (Warren, 2001b), distribution services (Kalirajan, 2000) and professional services (Nguyen-Hong, 2000). A more detailed analysis of these methods is provided in the OECD publications (OECD, 2003).

Furthermore, research on the effect of regulatory regimes in services sectors has also been developed. The OECD undertook research to analyze the effects of domestic regulatory regimes in OECD member countries on productivity, prices and quality of services in telecommunications, international air passenger transport, electricity supply, road freight and retail distribution (OECD, 2001). The findings generally confirm that regulatory reforms have a positive effect on sectoral

performances. Extending OECD's research on regulatory regimes, the Australian Productivity Commission (Doove et al, 2001) estimated the extent to which regulatory regimes in international air passenger transport, telecommunications and electricity supply have raised prices in a number of OECD and non-OECD economies. The results suggest a positive relationship between the restrictiveness of regulatory regimes and prices in these sectors.

In general, transition countries have not been covered by these different studies. Therefore, this paper employs one of the outlined methodologies to estimate the progress in the liberalization of banking services in Romania. The comparison of services barriers at multilateral and regional level can bring some insights into the assessment of various reform strategies and contribute to further research on relevant analytical instruments.

## **5. Assessing the restrictiveness of trade barriers in Romania: the case of banking services**

### **a. Conceptual issues – the research method**

The nature and extent of restrictions on trade in services and of government regulation for a particular service can be quantified using a *trade restrictiveness index*, one of the most advanced methods existing at this stage, developed by OECD, that concentrates a large amount of qualitative information about restrictions and converts them into comparable quantitative information (among sectors and across time). The more restrictions and the greater their severity, the more restrictive an economy is judged to be under the index. A trade restrictiveness index score can be calculated for each sector of an economy. Restrictions that are common to a number of economies (horizontal sectoral analysis) are grouped into restriction categories. Scores are then assigned to each restriction on the basis of a judgment about how stringent it is. The more stringent the restriction, the higher the score will be. Scores range from 0 to 1.

The specific aim of this section is illustrate this methodology and determine the restrictiveness index for banking services in Romania. The reason for selecting this services sector is that its significance is being increasingly recognized among economists. It is not only an important services industry in its own right, but it is also a critical support element for other services industries. Services such as banking, telecommunications and transport are major inputs into the production of goods and services including agriculture as well as manufacturing. The costs of these inputs can account for a major share of the total cost of production, and are thus important factors affecting the competitiveness of firms. This explains why banking policies have occupied a central position in the economic development of nations. There is broad international agreement that these policies should be based on a fair competitive environment and, thus, many countries have undertaken significant liberalization of their banking sectors.

The restrictiveness index for banking services mirrors the classification of trade barriers used by the General Agreement on Trade in Services (GATS). More specifically, it distinguishes between the barriers that affect services delivered via commercial presence (FDI) and those that affect ongoing operations or, in GATS terms, other modes of delivery (cross-border trade, consumption abroad and the movement of natural persons). Moreover, barriers impeding the market access (MA) of any new entrants, domestic or foreign, are distinguished from those that discriminate against foreigners, corresponding to restrictions on national treatment

(NT). Table 1 describes in more detail the five components of the restrictiveness index for banking services and indicates their values for Romania.

Table 1 : The banking services restrictiveness index, 2007

| Component  | Summary Description  | GATS           | UE              |
|--|--|----------------|-----------------|
| Section 1: Economic Issues   | This section of the restrictiveness index provides an overview of the market in terms of structure, sectoral characteristics, and performance indicators.  |                |                 |
| Section 2: GATS-related issues<br><b>Cross-border transfer</b>       | <b>Average score</b>   | <b>0.16/1</b>  | <b>0/1</b>      |
| Section 2: GATS-related issues<br><b>Consumption abroad</b>          | <b>Average score</b>   | <b>0.5/1</b>   | <b>0/1</b>      |
| Section 2: GATS-related issues<br><b>Commercial presence</b>         | <b>Average score</b>   | <b>0.12/1</b>  | <b>0.068/1</b>  |
| Section 2: GATS-related issues<br><b>Presence of natural persons</b> | <b>Average score</b>   | <b>0.125/1</b> | <b>0.05/1</b>   |
|  | <b>Trade Restrictiveness index</b>   | <b>0.226/1</b> | <b>0.0295/1</b> |
| Section 3:<br><b>Regulatory and institutional aspects</b>            | <b>Regulatory and institutional restrictiveness index:</b> legal and policy environment (transparency and predictability), regulatory and institutional aspects, commitments under " <i>Understanding on commitments in financial services</i> " | <b>0.176/1</b> | <b>0.027/1</b>  |
| <b>Total index</b>   | The scores reflect a subjective assessment of their relative importance in terms of producing competitive outcomes in banking services   | <b>0.201</b>   | <b>0.028</b>    |

Source: own calculations based on OECD methodology

Note: indicators included in section 1 do not have a contribution to the calculation of the index; they provide an indication of the general economic environment in the sector and are more a consequence of trade policy than its determinant

#### **b. Research results - services policy reform and EU accession**

Services sector reform involves a mix of deregulation (opening markets to internal competition), liberalization (the dismantlement of barriers to foreign entry and promotion of external competition) and improved regulation (putting in place an appropriate legal environment, strengthening regulatory agencies, increasing their independence, etc.). The policy challenge is to achieve a balance between effective regulation and increasing the contestability of markets (Eschenbach, 2005).

Both in the context of EU accession and as a GATS member, Romania has strived to reform and adapt policies and regulatory regimes for services



industries. Table 1 provides the results for the individual policy components, as well as the un-weighted scores of these components for Romania, both in relation to the GATS and to the EU as liberalization mechanisms, summarized in an index that measures the *restrictiveness* of the banking sector.

The information was collected from the relevant institutions (banks) and regulatory bodies in the field (National Bank of Romania) as well as from additional sources on information such as the GATS schedules of commitments, reports produced by international organizations, sectoral laws etc.

The results obtained confirm both the assumption that the recent progress in Romania's trade policy reform is due, to a large extent, to its process of EU accession and less to its WTO membership, as well as the statistical evidence that there is a trade diversion effect from the rest of the world to the EU (and, similarly, a trade creation effect towards the EU) with respect to Romania's foreign trade in services.

Romania's participation in the European Association Agreement (EAA) has proved to be a more far-reaching initiative than its GATS membership, providing a framework for the gradual integration into the EU. The EAA provisions cover a large number of areas and disciplines, which go beyond current international disciplines, including in the area of services. They entail gradual liberalization in cross-border supply of services, the right of establishment of EU firms, national treatment in setting up operations of subsidiaries and branches of EU companies, as well as temporary movement of specified categories of natural persons.

The main difference between commitments in the GATS and those in the accession process is the preferential character of the latter. GATS commitments apply to all WTO members in a non-discriminatory way, while concessions within the EAA are granted only to the parties to the agreements and therefore represent derogation from GATS rules enabled by Article V of the GATS on Economic Integration. Exemptions to MFN treatment by Romania and other EU candidate countries reflect their commitments in the accession process and also reciprocal provisions in bilateral agreements, signed essentially with EU countries. As the EU candidate countries progress in their legal and regulatory rapprochement leading to their integration to the EU, their positions in on-going WTO negotiations are to be harmonized with the EU global negotiating position, including in the GATS context.

The estimates of the restrictiveness index for banking services in Romania, computed for the year 2007 and taking into account the regulations in force at that moment indicate a high degree of liberalization of the market for these services, as well as a high degree of integration with the European market (2.8% restrictiveness in relation to EU countries as opposed to 20% in relation to WTO members). Banking services have undergone the most far-reaching restructuring. As a result, these services in Romania now exhibit many similarities with the EU banking system.

The regulatory measures that have generally determined the improvement of the openness degree for the banking services market in Romania, especially as a result of the activity of transposition and implementation of the *acquis communautaire* are:

- *The amendments to Law no. 58/1998 (the Banking Law); these have been introduced in stages, as follows:*

- at the end of 2003, through the enactment of Law no. 485/2003, 10 existing barriers in the banking sector have been eliminated, some of which with immediate effect (including *inter alia*: the prior approval by the central bank of the significant shareholders; the citizenship requirements for the executive management of banks). Other barriers were removed as from the date of accession to the EU vis-à-vis all members of the European Economic Area (the mandatory authorization of foreign banks' branches and the possession of a minimum endowment capital; limitations concerning the direct involvement of banks in financial leasing activities etc).
- at the end of 2004, through the enactment of Law no. 443/2004, several elements of progress towards ensuring the free movement of services have been recorded, including the elimination, as from the date of accession, of the requirements concerning the knowledge of the Romanian language and other study requirements for the management of affiliates and branches of EU credit institutions and the closer transposition of the structure of Directive 2000/12/EC.
  - *Various regulations, transposing the relevant acquis, have been enacted by NBR, with direct impact on the stability of the banking system.*
    - norms concerning the individual and consolidated supervision of funds;
    - norms concerning the supervision of solvability and of large exposures of credit institutions;
    - norms concerning the investments permitted to institutions issuing electronic currency;
    - norms concerning the organization and internal control of credit institutions activity and the management of significant risks, as well as the organization of credit institutions internal audit;
    - norms concerning capital adequacy requirements of credit institutions.

Romania has also made efforts in the banking sector to transpose the new capital requirement rules for credit institutions and investment firms into its national legislation.

Reflecting a rather liberal trade regime of banking services shown by the restrictiveness index, the results for Romania reveal only a limited impact of the remaining restrictions on the prices of these services. The market is generally contestable, with a few discriminatory regulations against foreign entry, lines of business (non-discriminatory) and the permanent movement of people (discriminatory). Thus, the policy priorities for the banking sectors in Romania would appear to be related to the broad issues of macroeconomic stability and structural reform.

## **6. Concluding remarks**

From the above analysis it has become evident that the acceptance and implementation by Romania of EU regulatory disciplines, particularly explicit in the analyzed sector (i.e. banking services), have decisively influenced the pace and considerable depth of services liberalization, with GATS being less relevant as a lock-in mechanism.

Several factors explain why the EU accession process, based on the acceptance of the EU rules and disciplines has played such a key role. First, the adoption of the EU regulations has been a high political priority in Romania, as a candidate country. Second, the EU commitments cover a larger spectrum of

disciplines than GATS obligations and, in contrast to the multilateral system, they encompass stricter regulatory guidelines: while the GATS provides relatively limited guidelines for domestic regulations, the EEA embodies more precise regulatory guidance, and this process has been further strengthened within the framework of the pre-accession process, implying the adoption of EU regulations, embodied in the EU *acquis*, that imposes a detailed and compelling blueprint for the regulatory and institutional framework, which is to be achieved within agreed deadlines. Finally, the EU accession process relied on a regular and efficient monitoring mechanism that controlled the progress made in adopting the requested disciplines.

The fact that the quality of banking services is of pivotal importance to developing countries has been widely acknowledged. Thus, further improvement of the regulatory measures in Romania and the other transition countries, and continued harmonization with EU standards in the banking sector are essential in order to increase the gains from trade and foster the integration of these countries in the European economy.

Notwithstanding major progress and fairly accomplished market reforms, Romania still has to undertake some efforts towards dismantling impediments to local and foreign suppliers of services, enforcing the already transposed legislation, as well as towards good governance of service markets. As it recently became an EU member, this could be done in parallel with the EU efforts to encourage the Internal Market for services.

The driving force behind trade liberalization and regulatory convergence, though, should not only be the EU membership status, but also the ambition to compete in the international markets, which are institutionally linked through WTO membership.

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## AGRICULTURAL COOPERATIVES IN SLOVAKIA

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**Abstract:** In spite of a decreased number of agricultural cooperatives and a loss of cultivated land acreage, the agricultural cooperatives in Slovakia still represent the most important legal form of enterprise in agriculture. The paper tries to answer the question why the agricultural cooperatives in Slovakia still maintain their dominant position in agricultural business while in other countries of Central Europe agricultural cooperatives play only an insignificant role. Based on the results of the study, the authors state that also in the future the Slovak agricultural cooperatives will continue to be not only the main producer of agricultural commodities but also they will play a growing role in social and environmental spheres and other non-agricultural activities in rural areas.

**Key words:** cooperatives, legal form, rural development, economic situation

### 1. Introduction

The agricultural cooperative as a legal form of enterprise has a long tradition in Slovakia. The first cooperative of this form was set up in Slovakia as early as in 1845 (Martuljak, 1995). It was of great importance to small producers in the growing free market at the beginning of the twentieth century. According to Demo (2001), the cooperative was to protect them against a pressure of stronger competitors in the market. Cooperatives along with state farms even kept their dominant position during the period of centrally planned economy in 1948-1989, although the idea of cooperative movement deformed substantially. In 1990 the process of transformation of the whole national economy to the socially and ecology-oriented market economy was launched, which also had a significant impact on agriculture. Agricultural cooperatives have started the long-term transformation process. While state farms cooperatives as a business structure of agricultural enterprises are slowly disappearing, agricultural cooperatives have succeeded in justifying their dominant position in terms of farming agricultural land even among newly created agricultural entities such as business companies or

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private farmers<sup>1</sup>. In the neighbouring Czech Republic, by contrast, business companies are coming to the fore ( a 44.8% share in agricultural land), while the agricultural cooperatives manage only 25.3% of land (Green Report of the Czech Republic, Ministry of Agriculture 2004). The agricultural cooperatives in Hungary are reported to own even less agricultural land, only 8.3 % (CSOH, Budapest, 2003). In Slovakia, the agricultural cooperatives are currently managing over 44% of a total acreage of agricultural land (Green Report 2006).

## **2. Material and methods**

The aim of the work is to evaluate an impact of the transformation regulations on the position of agricultural cooperatives in Slovakia, thus pointing out their present status, further potential development, application and perspectives in the area of land business, as well as to assess the economic and social role of the agricultural cooperatives in rural areas in Slovakia.

Three partial targets have been set in order to achieve the objective

- To analyse the legal regulations of the process of transformation of agricultural cooperatives and their influence on the position and development of cooperatives in comparison with other land managing entities of which the following question subsequently results: Why do the Slovak agricultural cooperatives maintain the dominant position in agriculture whilst cooperatives in other countries of Central Europe (especially in the Visegrad Group countries ) play only a negligible role in this area ?
- To analyse the economic position of the agricultural cooperatives in Slovakia and their function in a market economy focusing on the question whether and how the subject of agricultural cooperatives has changed since 1990 up till now and how their function and activity will develop in the next period with regard to the needs of the development of rural areas.
- To analyse the social position of the Slovak agricultural cooperatives in the countryside, with an emphasis on selected indicators such as employment, agricultural land property and use rights.

The work is based on the legal regulations amending the transformation of agricultural cooperatives, the material obtained from the Slovak Statistical Office, the Slovak Ministry of Agriculture, Real Estate Cadastre and Company Register, the documentation obtained from the Institute for Agriculture and Food Economy Research, the ideas of home and foreign experts about the area in question, as well as on the results of research conducted by the Law Department of the Slovak Agricultural University in Nitra within the project VEGA no. 2570/05. In order to achieve the targets, we examined in details the legal regulations used as the primary resource for implementing the transformation process of agricultural cooperatives. Subsequently, statistical indicators of the structure development of

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<sup>1</sup> In 1990 there were 73 state farms with an average acreage of 5083 ha agricultural land, but nowadays (2005) there are only 5 state farms with an average acreage of 1972 ha managing farm land (Gubová, Ambróziová, 2003; The Green Report of the Slovak Ministry of Agriculture 2006)



agricultural cooperatives, rights in agricultural land property and use, and the employment in agricultural cooperatives were analysed and compared to other legal forms of running business in Slovak agriculture. Chosen indicators of the financial analysis were used to compare the economic situation of different forms of agricultural enterprises.

$$\text{Return on gross capital: } RCK = \frac{PROFIT + ir(1 - tax)}{GrossCapital},$$

*ir* – interest rate; *tax* – income tax rate;

$$\text{Return on equity capital: } RVK = \frac{PROFIT}{EquityCapital};$$

$$\text{Return on fixed assets: } RZI = \frac{PROFIT}{ZI}; \quad ZI - \text{fixed assets}$$

$$\text{Return on revenues: } RT = \frac{PROFIT}{REVENUES};$$

$$\text{Return on added value: } RPH = \frac{PROFIT}{PH}; \quad PH - \text{added value}$$

$$\text{Return on total costs: } RCN = \frac{PROFIT}{CN}; \quad CN - \text{total costs}$$

$$\text{Total profitability of gross capital: } UVCK = \frac{Total Revenues}{GrossCapital}$$

### **3. The impact of legislative changes after the year 1990 on the position and function of agricultural cooperatives**

The starting point for implementing the structural changes to agriculture were first of all legislation changes. After 1990 the legal regulations were adopted through which the restitution of property, transformation and privatization in the agricultural sector were carried out. Among general legal regulations related to a given problem are the Constitution of the Slovak Republic, 460/1992 Coll. as altered and amended, the Civil Code No. 40/1964 Coll. as altered and amended, particularly sections concerning real rights and thus property rights, and the Commercial Code No. 513/1991 Coll. as altered and amended, which comprises the new legal enactment of the cooperative as a legal form of enterprise. Special legal regulations according to which the whole process of transformation of the agricultural sector was carried out include (1) the Act No. 229/1991 Coll. on the amendment of the ownership of land and other agricultural property as amended (First Restitution Act), (2) the Act No. 503/2003, Coll. on the return of property to the owner (the so-called Second Restitution Act), (3) the order of the Constitutional Court 218/2005, Coll., (4) the Act No. 42/1992 Coll. on the amendment of property relations and settlement of property rights in cooperatives as amended (the Transformation Act), (5) the Act No. 264/1995 Coll., amending and supplementing the Act No. 42/1992 Coll. on the amendment of property relations and settlement of property rights in cooperatives as amended (the First

Amendment to the Transformation Act), (6) the Act No. 3/2005 Coll. supplementing the Act No. 42/1992 Coll. on the amendment of property rights and settlement of property rights in cooperatives as amended (the Second Amendment to the Transformation Act).

As a result of the transformation of agricultural cooperatives, a transformation project was approved, whose part was also the decision on further existence of the cooperative, which could be changed into a business company or to adopt to a new legal form of cooperatives according to the new Commercial Code. From the statistical data relating to the transformation period it follows that the majority of cooperative members decided to continue a cooperative form of enterprise.

Another result of the transformation process was the fact that the property of original agricultural cooperatives was divided among entitled persons in accordance with the transformation laws. Among them were not only the members of the cooperative but also previous land owners, who were returned their property within restitution and the majority of which did not belong to the cooperative's membership. It means that a big part of the property of cooperatives was given to persons without previous property relationship or another legal relationship with the cooperative. It is due to the legal regulations that we can state that after 1992 two groups of agricultural cooperatives came into existence in Slovakia: 1) cooperatives which have not undergone the transformation process (set up as new legal entities according to the new Commercial Code 513/1991 Coll. after 1992), their initial conditions being better as they did not begin farming as indebted entities and 2) cooperatives which have undergone the transformation process (set up before 1992). Thus, the situation when the persons that are not members of the cooperative have the right of its property is disadvantageous to both parties involved. On the one hand there are entitled persons who are not members of the cooperative, although they have the right of cooperative's property but they cannot interfere with managing the cooperative, and on the other one there are members of the cooperative without absolute rights of the cooperative's property (Bandlerová 2001). The current status of agricultural cooperatives by region is presented in Table 1:

Table 1: Status of agricultural cooperatives by company register as to 28 February 2006

| Locality                                 | Nitra | Žilina | Trnava | Trenčín | Prešov | Košice | Bratislava | Banská<br>Bystrica | Total |
|--|-------|--------|--------|---------|--------|--------|------------|--------------------|-------|
| <b>Total</b>                             | 124   | 61     | 98     | 53      | 106    | 115    | 34         | 102                | 693   |
| <b>Established<br/>before 1992</b>       | 110   | 43     | 67     | 45      | 72     | 72     | 30         | 78                 | 517   |
| <b>Established in<br/>1992 and later</b> | 14    | 18     | 31     | 8       | 34     | 43     | 4          | 24                 | 176   |

Source: Business Register ([www.orssr.sk](http://www.orssr.sk))

In the last years (2000-2006) the entrepreneurs who decided to run a business in the agricultural sector in Slovakia have mostly chosen some form of business companies as a form of enterprise, or they have started as private farmers. Only a few entrepreneurs have taken a decision to set up the cooperative

in order to carry agricultural business. Our statement is based on the results obtained from the Slovak Company Register. Only four agricultural entities in Slovakia have preferred the cooperative as a form of enterprise over 2002–2006, and in some regions (Nitra and Bratislava regions) no agricultural cooperatives were established in the said period of time. The results of our study showed that these few agricultural cooperatives largely came into existence because of division, or a merger of hitherto agricultural cooperatives.

There is still a question why the agricultural cooperatives in Slovakia have maintained their dominant position in the market, as compared to other countries of Central Europe. Not only their number (598) but also a total acreage of agricultural land they farm (817,138 ha, i.e. 44.8%) (Green Report of the Slovak Ministry of Industry, 2006) confirm that the agricultural cooperatives in Slovakia have remained one of the most important forms of land business up till now.

Is this situation a consequence of the absence of knowledge and of experience of managers of other forms of entrepreneurship? Is it caused by doubt, fear of responsibility, entrepreneurial risk or failure, a lack of resources to start business or is it the question of people's character? It is obvious that in the first years of a market economy in Slovakia it was due to ignorance of rules and problematic, finance- and time-demanding overcoming of barriers to start private business as well as to a lack of experience of entrepreneurship and last but not least unwillingness to give up advantages which present jobs offer. It is a fact that it is impossible to change the thinking of people influenced by a 40-year period of centrally planned economy during a night. In the 1990s, it was easier to continue with the established form of the cooperative as a form of entrepreneurship and wait how the situation will develop later. Indeed, many cooperatives were booming that time, especially those farming larger land areas (Námerová, 1997).

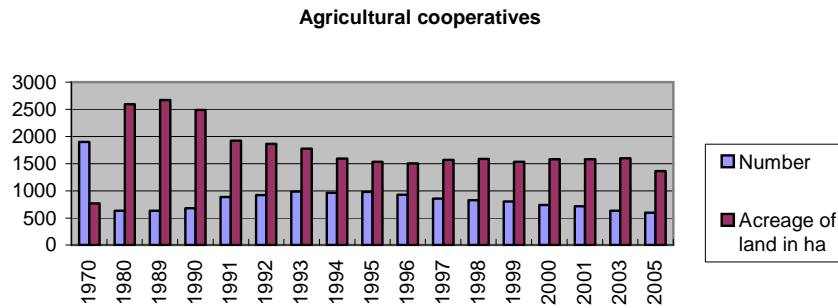
According to the results achieved within VEGA 2570/05 project, the dominant position of cooperatives in the agricultural sector is influenced by the disintegration of property rights of agricultural land in Slovakia as well as by the unsettled restitution process and insufficiently developed agricultural land market. The fact that in Slovakia there are about 12-15 owners per less than hectare of agricultural land (0.45 ha) and there is 20% of agricultural land belonging to unknown owners, i.e. unidentified land (Bandlerová et al., 2005) causes that a new business entity showing an interest in land business has to enter into a contract of lease and/or a contract of sale with more owners. This process is time-demanding and mainly finance-demanding, as this fact results in increasing transaction costs. According to Swinnen and Ciaian (2003), transaction costs are costs of searching agricultural land owners, costs invested in talks and making a contract, as well as costs of separation of purchased land, which has been farmed by the cooperative, or another agricultural enterprise till now. Also, it is necessary to point out that the contract is relatively invalid if it is not made with all land owners so it can be impugned, thereby causing considerable uncertainty about business.

#### **4. Economic standing of the agricultural cooperatives in Slovakia and their functions in a market economy**

Agricultural cooperatives have undergone a dynamic change not only from the viewpoint of the legislative process but also in terms of structural changes to the agricultural sector. Figure 1 illustrates the development trend in a number of

agricultural cooperatives and average land area farmed by cooperatives in a period covering 1970 –2005.

Figure 1: Agricultural cooperatives

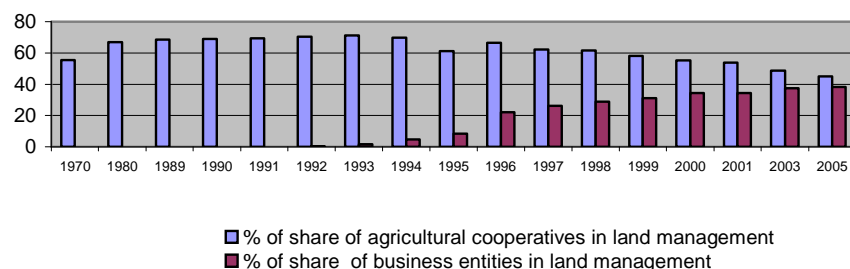


Source: Green Report of the Slovak Ministry of Agriculture, 1996 – 2006

Until 1989 agricultural cooperatives were one of two important forms of land farming. After 1989, due to gradual privatization, state farms managing land were liquidated, or changed in new, superseding legal forms of entrepreneurship; however, these were set up only after new legal regulations governing business companies entered into the Civil Code 513/1991 Coll. In the first years of its effectiveness companies made an unimportant percentage of land farming enterprises. Agricultural cooperatives dominated unequivocally in this period. A comparison of the situation in the Czech Republic revealed that as early as in 1998 the agricultural cooperatives managed only 34.5% of agricultural land while business entities did over 40%.

As shown in Figure 2, a share of both legal forms of enterprises managing agricultural land in Slovakia became balanced over time. Since 1996, a share of business companies in land management has started to increase and today they seriously attack the dominant position of agricultural cooperatives, although after a 10-year competitive struggle they have not succeeded in taking over the first place of the agricultural cooperatives. It will probably take just several years for business companies and/or private farmers to overtake the dominant position in land managing as it is the case in other countries.

Figure 2: Share of agricultural cooperatives in land management



Source: Green Report of the Slovak Ministry of Agriculture, 1993 – 2005

### A. Land of agricultural cooperatives

With regard to the process of transformation of agriculture and a question of the restitution of agricultural land, which is still topical and unsettled, the rights of ownership and use of land managed by agricultural cooperatives is of great importance.

Table 2: Total and leased agricultural land of cooperatives

| Year   | 1999  |        | 2000  |        | 2001  |        | 2002  |        | 2003  |        |
|--|-------|--------|-------|--------|-------|--------|-------|--------|-------|--------|
|  | Total | Leased | Total | Leased | Total | Leased | Total | Leased | Total | Leased |
| Average land area per cooperative, ha                      | 1587  | 968    | 1608  | 966    | 1650  | 1161   | 1662  | 1266   | 1643  | 1274   |
| Share of leased land of total land managed by cooperatives | 100%  | 61%    | 100%  | 60%    | 100%  | 70%    | 100%  | 76%    | 100%  | 78%    |

Source: Gubová, 2005, our calculations

The above-mentioned data indicate that the agricultural cooperatives lease the majority of land they farm. Among lessors are the Slovak Land Fund, administering state-owned land as well as the land of unknown owners, and the agricultural land owners, who do not take an interest in farming their own land because of different reasons (e.g. a shortage of financial resources, no interest in land farming, job in other sectors of national economy, business risk aversion).

### B. Labour of agricultural cooperatives

Over 1989-2005 the total employment in the agricultural sector decreased by 77.5%. While in 1989 agriculture offered work to 361,486 people, in 2005 it was only 81,500 persons (Green Report, 2006, 1999). Employees at the ages between 50 and 54 are the most numerous group, making 23% of all agricultural workers (Green Report, 2006). As far as the education structure is concerned, agriculture belongs to those sectors of national economy where employees with basic and vocational education prevail, high school- and university-educated workers making

about 27.7% and 7%, respectively (Green report of the Slovak Ministry of Agriculture, 2006).

Table 3: Employment structure by legal form of enterprise

| Year Indicator        | 1989 | 1993 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2003 | 2004 | 2005 |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Cooperatives, %       | 79,1 | 73,6 | 72,4 | 72,3 | 72,3 | 70,2 | 69,2 | 70,4 | 69,6 | 69,5 | 67,8 | 65,2 |
| Business companies, % | 0    | 0    | 9,3  | 12,4 | 21,0 | 26,2 | 28,4 | 27,3 | 28,3 | 28,7 | 30,4 | 33,4 |
| Others, %             | 20,9 | 26,4 | 18,3 | 15,3 | 6,7  | 3,5  | 2,4  | 2,3  | 2,1  | 1,8  | 1,8  | 1,5  |

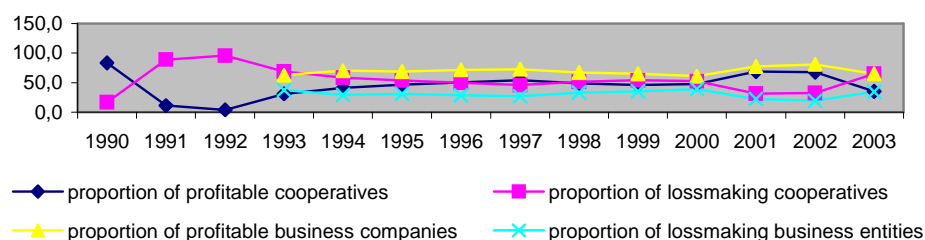
Source: Green report, 1994-2006

Table 3 shows that the agricultural cooperatives offer most job opportunities, as compared with other entities involved in the agricultural sector. Despite the fact that a share of individual legal forms of enterprise in the agriculture employment also copies a trend in the development of land managing companies, this trend is slower and agricultural cooperatives will be, on a long term-basis, the most important source of jobs in the agricultural sector. According to this trend, we can draw a conclusion that in addition to production functions, the agricultural cooperatives also fulfill very important social and demographic functions, especially in rural areas, thus helping to stop or at least reduce the outflow of inhabitants from these areas and supporting significantly the employment policy at the same time.

### C. Income of agricultural cooperatives

The development of profitable and loss-making enterprises under legal form of entrepreneurship in legal persons is illustrated in Figure 3. As expected, a proportion of loss-making cooperatives was the highest during the transformation process at the beginning of the 1990s. In the following period, a proportion of profitable and loss-making agricultural cooperatives settled down on a 50:50 ratio, approximately; a number of profitable cooperatives did not start increasing until a new decade began. Business companies started to be established as late as after 1992, a number of profitable companies being prevailing. There were no substantial changes in this ratio during the 1990s. They appeared after the year 2000 when a share of profitable companies increased.

Figure 3. Development of profitable and lossmaking enterprises by legal form of entrepreneurship



Source: Green Report of the Slovak Ministry of Agriculture, 1996 – 2006

**Profitability indicators of agricultural enterprises.** Enterprises try to gain as high profitability values as possible. We may state that the situation improved significantly in 2004, this statement being also supported by a positive economic result. Values of different kind of profitability showed an increase last year.

Table 4 Profitability indicators

| Indicator                                | 2003   | 2004  | Difference |
|--|--------|-------|------------|
| <b>All agricultural enterprises</b>      |        |       |            |
| Total capital profitability              | -0,025 | 0,024 | 0,049      |
| Own capital profitability                | -0,052 | 0,029 | 0,081      |
| Fixed assets profitability               | -0,108 | 0,068 | 0,176      |
| Revenue profitability                    | -0,050 | 0,030 | 0,080      |
| Added value profitability                | -0,245 | 0,124 | 0,369      |
| Final cost profitability                 | -0,042 | 0,025 | 0,067      |
| Aggregate profitability of total capital | 0,652  | 0,647 | -0,005     |
| <b>Agricultural cooperatives</b>         |        |       |            |
| Total capital profitability              | -0,048 | 0,011 | 0,059      |
| Own capital profitability                | -0,071 | 0,009 | 0,080      |
| Fixed assets profitability               | -0,162 | 0,023 | 0,185      |
| Revenue profitability                    | -0,046 | 0,006 | 0,052      |
| Added value profitability                | -0,391 | 0,042 | 0,433      |
| Final cost profitability                 | -0,081 | 0,011 | 0,092      |
| Aggregate profitability of total capital | 1,140  | 1,172 | 0,032      |
| <b>Business companies</b>                |        |       |            |
| Total capital profitability              | 0,009  | 0,045 | 0,036      |
| Own capital profitability                | -0,004 | 0,080 | 0,084      |
| Fixed assets profitability               | -0,006 | 0,172 | 0,178      |
| Revenue profitability                    | -0,002 | 0,045 | 0,047      |
| Added value profitability                | -0,012 | 0,268 | 0,280      |
| Final cost profitability                 | -0,002 | 0,039 | 0,041      |
| Aggregate profitability of total capital | 0,843  | 0,819 | -0,024     |

Source: Our calculations

#### D. Complementary profitable activities of agricultural cooperatives

Gubová (2005) presents a review of the most often used complementary activities of the agricultural cooperatives of legal persons in comparison with private farmers running agriculture business as natural persons (Table 5)

Table 5: Complementary profitable activities of agricultural cooperatives and private farmers

| <b>Legal persons</b>                        | <b>Natural persons</b>                      |
|---|---|
| <b>Year 2001</b>                            |   |
| Direct selling of agricultural products     | Direct selling of agricultural products     |
| Commercial activity                         | Commercial activity                         |
| Contract works                              | Contract works                              |
| Own slaughter                               | Sheep and goat milk processing              |
| Building operations                         | Wine production                             |
| Wine production                             | Agrotourism and country tourism             |
| Milk processing                             | Another processing of agricultural products |
| Another processing of agricultural product  | Fruit and vegetable processing              |
| Agrotourism and country tourism             | Building operation                          |
| Wood processing                             | Potato processing                           |
| <b>Year 2003<sup>(3)</sup></b>              |   |
| Direct selling of agricultural products     | Direct selling of agricultural products     |
| Commercial activity                         | Commercial activity                         |
| Contract works                              | Contract works                              |
| Building operations                         | Wine production                             |
| Sheep and goat milk processing              | Agrotourism and country tourism             |
| Another processing of agricultural products | Building operations                         |
| Own slaughter                               | Sheep and goat milk processing              |
| Wine production                             | Another processing of agricultural products |
| Agrotourism and country tourism             | Wine bottling                               |
| Wood processing                             | Wood processing                             |

Source: Gubová, 2005

Table 6 presents revenues of agricultural cooperatives and business companies from sales of their own products and services per hectare of agricultural land as well as a share of plant and animal production and other activities in the total incomes of agricultural enterprises.



Table 6: Development of revenues by subject of activities of agricultural enterprises

| Year <sup>(1)</sup>  | 1991  | 1992  | 1996  | 1997  | 1998  | 1999  | 2000  | 2001  | 2002  | 2003  |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Agricultural cooperatives  |       |       |       |       |       |       |       |       |       |       |
| Revenues from sales of own products and services(SKK/ha agricultural land) | 19202 | 17134 | 18188 | 18850 | 18493 | 17985 | 17915 | 20823 | 22710 | 21178 |
| - Revenues from plant production, %  | 28,43 | 33,99 | 38,16 | 35,71 | 32,57 | 33,34 | 29,60 | 31,93 | 33,46 | 34,62 |
| - Revenues from animal production, %                                       | 42,97 | 42,87 | 43,34 | 46,24 | 49,26 | 50,18 | 53,54 | 51,94 | 52,23 | 51,36 |
| -Revenues from other activities  | 28,6  | 23,14 | 18,5  | 18,05 | 18,17 | 16,48 | 16,86 | 16,13 | 14,31 | 14,02 |
| Business companies   |       |       |       |       |       |       |       |       |       |       |
| Revenues from sales of own products and services (SKK/ha)                  | -     | -     | 19829 | 21850 | 21159 | 18036 | 17715 | 19828 | 21374 | 21239 |
| - Revenues from plant production, %  | -     | -     | 41,68 | 34,66 | 33,49 | 35,84 | 32,72 | 39,92 | 40,97 | 38,68 |
| - Revenues from animal production, %                                       | -     | -     | 45,87 | 46,69 | 45,32 | 39,79 | 45,87 | 42,36 | 41,81 | 36,97 |
| -Revenues from other activities  | -     | -     | 12,45 | 18,65 | 21,19 | 24,37 | 21,41 | 17,72 | 17,22 | 24,35 |

Source: Ambrózyová, Gubová, 2003; our calculations

In the period 1991–2003, the total revenues per ha agricultural land in the agricultural cooperatives amounted to 19,248 SKK on average, which was nearly 1,000 SKK less than in business companies. A proportion of plant production in the total revenues was 33.18% on average in comparison with 37.25% in business companies. The revenues from animal production made as much as 48.39%, which is 5 % more than in business companies (43.09%). A share of other business activities in the total revenues was the same in both types of agricultural enterprises; it made 18.30%. From the above-mentioned data it follows that the animal production was of the utmost importance to agricultural enterprises, followed by plant production and other business activities. Agricultural production seems to be the highlight in agricultural cooperatives in the nearest future and other activities will fulfil only a complementary function in terms of revenue and profit formation.

## 5. Conclusion

Chosen indicators of financial analysis and indicators of revenues as calculated to hectare of agricultural land show that the transformed agricultural cooperatives in Slovakia are able to keep pace with newly created business companies. To carry agriculture business in the form of a cooperative is still one of the most important forms of land managing despite the fact that a number of entrepreneurs willing to run a cooperative in the agricultural sector is minimal. There are more reasons for this attitude. According to the results of research, the

dominant position of cooperatives is influenced by the situation in the desintegration of right of agricultural land ownership, which makes signing a contract of sale or of lease complicated, by the process of restitution .which has not been settled yet, as well by undeveloped land market. In the first years of a market economy it was also ignorance of rules, the problematic time- and finance-demanding way of overcoming barriers to starting private business, a lack of experience of entrepreneurship as well as unwillingness to give up advantages offered by current job. It is the fact that it is impossible to change the thinking of people affected by a 40-year centrally planned economy during „a night.. Despite the fact that the number of agricultural cooperatives and land acreage they manage are declining, it is obvious that the agricultural cooperatives in Slovakia will perform an important function of producers of agricultural and food commodities. Also, they play and will play a growing role in the area of social and ecological functions in rural areas and in the sphere of other non agricultural activities as well.

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## LA TARIFICATION FINANCIERE D'UN CONTRAT D'ASSURANCE VIE EN UNITES DE COMPTE

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**Abstract.** The financial pricing and provisioning methods which are using the pricing theory are fit for the unit-linked insurance products. The financial crash from 2000 determined the insurance companies to practice provisioning methods against the financial risks. For pricing and provisioning the risk of the minimum capital guarantee we have proposed the utilization of the options theory and the dynamic insurance of the portfolio. The application on the Romanian capital market, which is characterized by an important volatility, justifies the efficacy of the method proposed for pricing the unit linked contracts.

**JEL Classification:** G22, G11, O16

**Keywords:** unit linked, pricing, theory of options, dynamic insurance.

### 1. Introduction

Dans cet article nous présentons l'évolution récente des modalités de tarification des contrats d'assurance vie. L'utilisation des méthodes consacrées est adaptée pour les assurances traditionnelles mais pour les assurances en unités de compte on a proposé une méthode de tarification qui gère efficacement le risque de chute des marchés financières.

L'analyse actif passif des sociétés d'assurance fait que les risques viagers soit séparés de celles financiers qui sont souvent liés aux options cachées détenues par les assurés : capital minimal garanti, option de remboursement anticipé, option de rachat, option de transformation.

Pour les produits d'assurance avec capital minimal garanti le risque de chute des marchés financiers revient à la société d'assurance. Le moment qui a relevé aux assureurs la nécessité d'introduire l'option de capital minimal garanti et d'utiliser des méthodes de tarification et de provisionnement pour les assurances

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en unités de compte a été le déclin des marchés financiers à partir de l'année 2000.

Pour élaborer une telle méthode nous sommes parti de l'idée de Brennan et Schwartz (1976) d'appliquer la théorie des options pour la tarification des assurance vie en unités de compte. On a présenté la modalité d'établir la prime afférente au capital garanti en utilisant la théorie des options et la couverture du risque financier utilisant l'assurance dynamique. La forte volatilité du marché roumain du capital justifié l'utilisation de l'assurance dynamique du portefeuille comme modalité de couverture contre les risques.

Dans la dernière partie de l'article on a appliqué la méthode présentée antérieurement sur le marché roumain de capital, pour déterminer la primé des contrats d'assurance vie en unités de compte avec capital garanti indexé et pour réaliser une couverture des risques acceptés par la société d'assurance. On a choisi le capital garanti indexé parce qu'est une solution plus attractive pour les assurées si on prend en compte la longue durée de l'assurance vie et le fait que l'inflation peut sérieusement affecter leur épargnes

## 2. Présentation générale des assurances vie en unités de compte

Une police d'assurance vie en unités de compte peut-être décrite comme ayant deux composantes : une composante investitionnelle et une composante de protection. *La composante de protection* est représentée par une assurance temporaire décès. En cas de décès le bénéficiaire recevra le maximum entre le capital investi et la valeur de parts de fond commun d'épargne à ce moment. *La composante investitionnelle* consiste dans l'acquisition des unités dans les fonds financiers constitués pour ce type d'assurance. La valeur du compte à un certain moment peut-être obtenu en multipliant le numéro des unités détenues à la valeur de l'unité de fond pour la journée. Les bénéfices obtenus de l'investissement des capitaux sont directement liés au performance des fonds et à leur risque.

Les produits d'assurance vie en unités de compte présentent un grand nombre de caractéristiques intéressantes pour les assureurs et pour les assurés. Parmi les avantages pour la société d'assurance on peut mentionner<sup>1</sup> :

- le transfert du risque d'investissement vers l'assuré ;
- le fait qu'ils n'exigent pas non plus la constitution d'autant de fonds propres d'où résulte une relaxation des normes de solvabilité ;
- l'attirement de nouveaux clients tout en conservant ceux qui recherchaient des placements plus rémunérateurs et qui, sinon, auraient résilié leur polices.

Ces produits offre des avantages aussi pour les assurés :

- la transparence de la répartition des rendements ;
- la possibilité de transferts de placements entre les fonds ;
- des avantages fiscaux dans la majorité des pays européennes (la Roumanie fait exception).

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<sup>1</sup> *Unit-Linked Life Insurance in Europe: Regaining Momentum*, Swiss Re, Sigma, No.3, 2003.

## 2.1. Les risques générés par les assurances en unités de compte

Le transfert du risque d'investissement vers l'assuré implique le fait que l'assureur ne supporte pas ni le risque de hausse ni le risque de baisse des marchés financiers. Toutefois, en analysant la situation d'un peu plus près, l'assureur reste exposé au risque de renonciation, au risque d'illiquidité et au risque de garantie plancher.

*Le risque de renonciation* se réfère au droit de l'assuré à renoncer à son contrat dans un délai de 30 jours consécutifs à l'adhésion. Cette disposition permet donc au souscripteur de récupérer le montant de la prime versée même si les unités de compte ont vu leur valeur baisser depuis la souscription. Par conséquent, si la prime est investie en unités de compte immédiatement après la souscription, l'assureur supporte le risque de baisse des supports durant le premier mois. L'assureur peut neutraliser ce risque en insérant dans le contrat une clause selon laquelle la prime ne sera investie dans les unités de compte qu'après une période de 30 jours à compter de la souscription.

*Le risque d'illiquidité* apparaisse quand les unités de compte sont des actifs peu liquides. Ce risque peut envisager deux types de conséquences. Tout d'abord, la valeur des supports communiquée à l'assuré peut se révéler supérieure au prix obtenu dans le cas de leur cession. Par ailleurs, dans le cas d'un rachat d'un contrat composé d'unités de compte peu liquides, l'assureur peut rencontrer certaines difficultés à céder les titres concernés. Pour autant, il devra tout de même verser à l'assuré la valeur du contrat. Ce risque peut être en partie neutralisé par l'assureur : il lui suffit de ne retenir que des supports liquides dans le cadre des contrats en unités de compte qu'il commercialise.

*Le risque de garantie plancher* se réfère à une garantie annexe qui assure le bénéficiaire du contrat, en cas de décès de la tête assurée, du versement d'un montant minimum, quelle que soit la valeur de l'unité de compte à cette date. L'assureur supporte le risque que la tête assurée décède alors même que les marchés financiers ont baissé.

Jusqu'à maintenant on a vu qu'il y a les deux aspects du risque : le côté décès et le côté financier. Mais il existe encore un risque supplémentaire qui rend encore plus importante une gestion correcte de ce type des produits: le risque systémique. En effet, les fluctuations boursières vont se répercuter de manière systémique sur tous les contrats de ce type. Il n'y a pas de compensation entre les différents contrats mais plutôt un cumul de risque. De plus, lors de fortes fluctuations boursières, les ressources propres de l'assureur et du réassureur peuvent être mises à mal et ainsi réduire la capacité à faire face aux engagements conclus.

Le succès des contrats en unités de compte date du début de la deuxième moitié des années '90, c'est-à-dire à une époque où les marchés financiers étaient à la hausse. Le risque de garantie plancher a alors été souvent négligé. A cette époque, les sociétés d'assurance n'ont pas toujours mis en œuvre de méthode de tarification – et encore moins de méthode de provisionnement – pour ce type de garantie, dans la mesure où le risque de baisse des marchés financiers semblaient faible. La baisse des marchés financiers entamée depuis le début de l'année 2000 a complètement modifié la situation. Il est aujourd'hui primordial que les sociétés d'assurances mettent au point des méthodes de tarification et de provisionnement

qui ont évidemment des conséquences sur la gestion actif passif de ce type de risque.

De 1997 à 2000, les affaires en unités de compte de l'ensemble des marchés d'Europe occidentale ont affiché une expansion beaucoup plus rapide que les affaires traditionnelles. En Italie, en Belgique, en Espagne, en Autriche et en Finlande, les revenus de primes des produits en unités de compte ont même plus que doublé chaque année, alors que les affaires traditionnelles avec participation aux bénéfices n'enregistraient qu'une progression modeste, voire des taux de croissance négatifs sur certains marchés.

Les produits en unités de compte paraissaient très intéressants pour les clients durant les années de forte hausse des marchés d'actions. Une analyse de régression simple montre qu'une hausse du marché d'actions de 10% a entraîné une augmentation de 15% des ventes de produits en unités de compte à prime unique. Mais l'impact des dépréciations boursières est très puissante : sur le marché britannique après la crise boursière de 1987, il a en effet fallu six ans pour que les nouvelles primes des produits d'assurance vie en unités de compte renouent avec leurs niveaux de 1987.

L'année 2001 a représenté un fort recul pour l'industrie d'assurance en unités de compte due aux changements dans les conditions de marché (la chute des marchés boursières). Malgré le recul sensible du marché d'actions en 2001, la valeur des actifs en unités de compte n'a connu qu'une diminution modérée. Cela peut s'expliquer par les nouvelles primes souscrites, le fait qu'une certaine partie des placements en actions bénéficie d'une protection du capital investi (souvent couverte par l'assureur vie) et par la présence d'un certain volume d'obligations dans les placements en unités de compte. Ce comportement a fait que les produits en unités de compte à capital garanti retiennent beaucoup l'attention ces dernières années. Avec ce type de produit, le titulaire d'une police récupère généralement, à l'expiration du contrat, au moins les primes qu'il a versées (le capital investi). Avec ces produits hybrides, la société d'assurance vie prend en charge un certain risque d'investissement. Les sociétés peuvent soit assumer ce risque elles-mêmes, soit le transférer sur le marché financier.

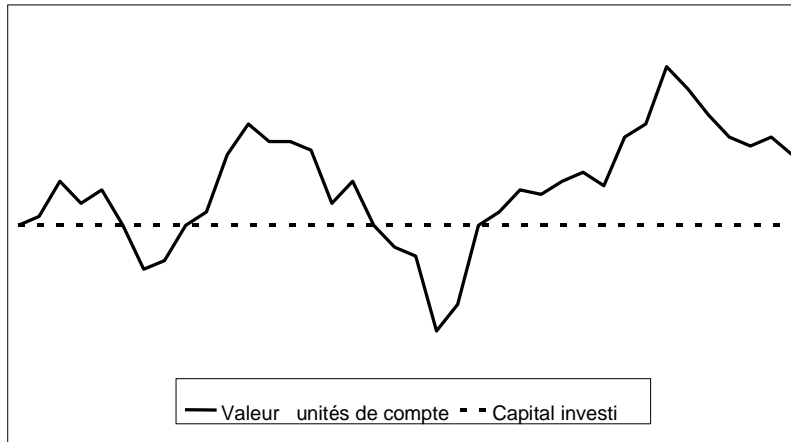
## **2.2. La typologie des contrats en unités de compte avec capital garanti**

La garantie plancher peut avoir plusieurs variantes. On va présenter trois d'entre elles à partir d'un exemple très simplifié portant sur un versement unique. La courbe représente l'évolution supposée de la valeur de l'unité de compte et est identique dans les trois cas.

### 1. La garantie plancher du capital minime investi

Le montant du capital versé en exécution du contrat ne peut jamais descendre en dessous du capital investi. La figure montre l'existence de deux périodes durant lesquelles la garantie plancher joue si l'assuré vient à décéder.

Figure 1. La garantie plancher du capital minime investi pour les contrats en unités de compte

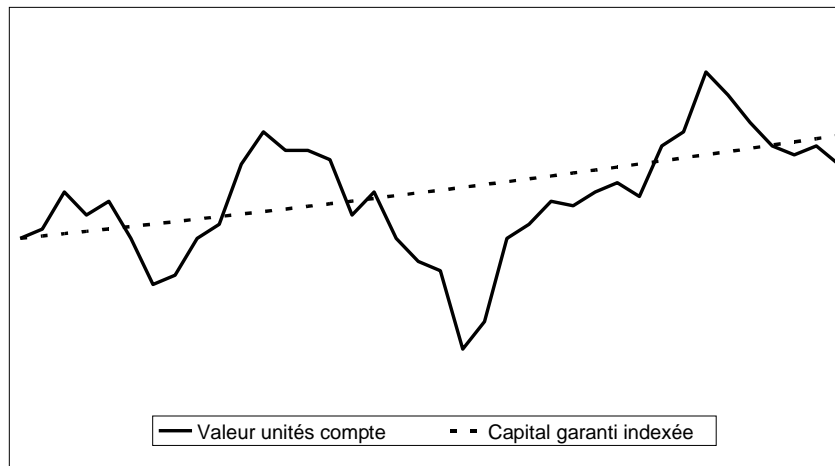


Source: Corfias, Th, (2003), Assurance-vie: techniques et produits, L'Argus de l'assurance, Paris.

## 2. La garantie plancher indexée

Le plancher est lui-même indexé selon une clause figurant au contrat. La figure 2 montre l'existence de trois périodes durant lesquelles la garantie plancher joue si l'assuré décède.

Figure 2. La garantie plancher indexée pour les contrats en unités de compte

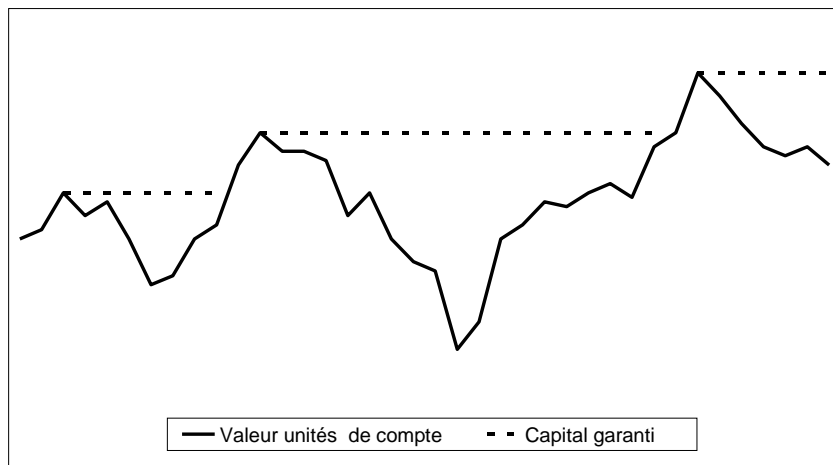


Source: Corfias, Th, (2003), Assurance-vie: techniques et produits, L'Argus de l'assurance, Paris.

### 3. La garantie du „plus haut historique“

Le plancher s'ajuste à la hausse à chaque fois que la valeur de l'unité de compte atteint un nouveau maximum. La figure 3 montre l'existence de trois périodes durant lesquelles la garantie plancher joue, pour un montant à chaque fois en hausse.

Figure 3. La garantie du „plus haut historique“ pour les contrats en unités de compte



Source: Corfias, Th, (2003), Assurance-vie: techniques et produits, *L'Argus de L'assurance*, Paris.

### 2.3. Opportunités de développement de l'industrie des assurances en unités de compte

Les réformes de retraites vont déterminer une importante hausse de demande pour les produits en unités de compte. Ces produits, qui sont déjà très populaires en France et en Italie, vont absorber une grande partie de l'industrie apparu après l'implémentation des réformes. Les nouvelles réformes de retraites d'Allemagne et d'Autriche peuvent aussi offrir un grand potentiel de croissance pour les produits en unités de compte.

Un autre facteur qui peut influencer le développement de ces produits est leur fiscalité. Dans le moment actuel les investissements dans des produits en unités de compte offrent des avantages fiscaux dans la plupart des pays européens. Une disparition de ces avantages peut entraîner dans le temps une baisse de l'industrie d'assurance vie en unités de compte. Sans avantages fiscaux, les assureurs vie n'ont souvent pas les moyens de faire concurrence aux banques sur le front de la gestion d'actifs, compte tenu de leurs coûts d'acquisition supérieurs. En Espagne, par exemple, jusqu'à 2001, les polices en unités de compte comportaient des avantages fiscaux par rapport aux fonds communs de placement. L'abolition de ces avantages fiscaux a été certainement une des raisons importantes de la brusque contraction des affaires en unités de compte en



Espagne, en 2001, les assureurs vie se retrouvent soudain privés d'un important avantage concurrentiel.

La poursuite du mouvement de concentration du secteur des services financiers à travers les différentes disciplines des produits et les frontières nationales devrait stimuler le développement des produits en unités de compte ainsi que la croissance des primes. Des opportunités existent dans des pays où le concept de bancassurance n'est pas encore établi (Allemagne et Suisse, par exemple), inclusivement dans la Roumanie, où la bancassurance est à ces débuts.

En Roumanie le marché d'assurance vie en unités de compte est en pleine expansion. Les 5 sociétés d'assurance présentes jusqu'en 2006 sur le segment „unités de compte“ offrent la possibilité d'investir le capital dans plusieurs fonds avec des rendements variables en fonction du degré de risque. Comme part de marché de l'assurance vie, le segment „unités de compte“ détiennent environ un tiers du marché. Dans l'année 2005 les assurances en unités de compte ont représenté 35% du volume des primes versées par les sociétés d'assurance vie. On peut estimer que jusqu'à la fin de l'année 2007 ce type de produit va représenter environ 40% du volume des nouvelles primes versées sur le segment d'assurance vie.

### **3. L'application de la théorie des options dans la tarification des contrats d'assurance vie en unités de compte**

L'utilisation de la notion d'option a devenu indispensable dans l'analyse des actifs financiers qui contiennent des clauses additionnelles implicites : obligations convertibles ou obligations remboursables au gré de l'émetteur. La maîtrise de la théorie des options a largement contribué à l'explosion de ces produits hybrides dans les dernières 20 années. Ces nouvelles produits sont des véritables combinassions entre les dérivés financiers et les produits d'assurance. Une analyse attentive des contrats proposés par les sociétés d'assurance vie met en lumière les risques « cachés » qui apparaissent dans leurs bilans. Les contrats d'assurance vie contiennent des options « cachées » : garantie du taux minimal, option de remboursement anticipé, option de rachat. Selon l'évolution des marchés, ces diverses options peuvent être choisies par leur détenteurs. Leur prise en compte modifie donc radicalement le profil de risque des assureurs, tout en dégradant sensiblement leur solvabilité.

La théorie des options a été utilisée pour la première fois dans le domaine de l'assurance par Brennan & Schwartz (1976) dans leur article sur la tarification d'une assurance vie en unités de compte avec actif garanti. Ce type de contrat d'assurance vie relie son revenu d'un actif financier qui est le plus souvent un fond mutuel.

Pour la tarification de ce type de produits sont utilisés les théories financières tel que des éléments de la théorie actuarielle. L'utilisation de ces théories est basée sur les suppositions d'indépendance entre les facteurs financiers et les facteurs de mortalité – l'assureur ne touche pas aucune compensation économique pour avoir accepté le risque de mortalité. Cette supposition est aussi implicite dans le principe traditionnel de l'assurance, justifié par l'argument de « mise en commun » qui dit que l'assureur peut, au moins en principe, éliminer le risque de mortalité par l'accroissement du numéro des contrats identiques et indépendants de son portefeuille – la loi de grand nombres.

Brennan et Schwartz ont considéré dans leur article que l'unité de compte suivre un mouvement brownien géométrique, avec un taux d'intérêt constant. Les deux auteurs ont montré que le revenu payé pour un contrat d'assurance vie en unités de compte avec actif garanti –  $b(t)$  est équivalent au montant garanti,  $K$ , plus la valeur d'une option Call (d'achat) sur le portefeuille de référence immédiatement exerçable au prix d'exercice égal au montant garanti –  $C(x(t), K)$ .

$$b(t) = K + C[S(t), K], \quad (1)$$

$$\text{ou } b(t) = K + \max[S(t) - K, 0] \quad (2)$$

Le même revenu peut être exprimé comme la somme d'un montant incertain – la valeur du portefeuille de référence,  $X(t)$  – et la valeur d'une option Put (de vente), exerçable au prix d'exercice égal au montant garanti –  $P[X(t), K]$ .

$$b(t) = S(t) + P[S(t), K], \quad (3)$$

$$\text{ou } b(t) = S(t) + \max[K - S(t), 0] \quad (4)$$

En termes de valeur présente du revenu au début du contrat,  $V_0(b(t))$  on a :

$$V_0(b(t)) = K \cdot e^{-rt} + C[S(t), K] \quad (5)$$

$$\text{ou } V_0(b(t)) = V_0(S(t)) + P[S(t), K] \quad (6)$$

Le problème est de calculer le montant excédentaire -  $P[X(t), K]$  - , au dessus du montant investi déjà –  $X(t)$  -, que la société doit faire payer pour offrir la garantie. On doit préciser qu'il s'agit des options européennes, donc l'assuré n'a pas le droit de racheter le contrat avant l'échéance établie.

L'introduction de la mortalité dans le calcul des primes fait décroître la prime exprimée en fonction de l'option de vente avec l'échéance du contrat et la fait accroître avec l'âge.

La conséquence de cet article a été que la tarification des contrats d'assurance vie en unités de compte avec une garantie minimale a reçu un grand intérêt dans la littérature financière et actuarielle.

Bacinello and Persson (2002) ont considéré la tarification de ces contrats d'assurance vie en unités de compte utilisant des taux d'intérêt stochastiques. Ils ont démontré que les formules pour les contrats en unités de compte basés sur les taux d'intérêt déterministes, peuvent être généralisés pour des taux d'intérêt stochastiques suivant le modèle Heath, Jarrow & Morton (1992) qui utilise la structure par termes des taux d'intérêts.

L'évaluation des primes et des revenus offerts par les contrats d'assurance vie en unités de compte avec une garantie minimale en cas de décès (garantie européenne) est décrite dans une vaste littérature- Hochreiter (2006). En revanche, le cas des contrats avec une garantie minimale et avec option de rachat

avant leur maturité (option américaine) est rarement considéré – Bacinello (2005). Pour l'assureur ce problème implique la considération des trois sources de risques :

- l'évolution du prix d'unité du fond de référence ;
- la survie de l'assuré ;
- la stratégie de rachat adopté par l'assuré.

Si le souscripteur veut racheter son contrat et l'assureur détienne les placements initiaux, leur liquidation dans une situation de baisse des taux d'intérêts apportera un bénéfice à l'assureur. Pour celui-ci le risque de rachat représente la vente de ces actifs en perte si les taux d'intérêt présente une forte augmentation. Une telle conjecture constitue une forte incitation au rachat, parce que les souscripteurs qui récupèrent leur fonds peuvent les réinvestir à un taux d'intérêt avantageux.

Pour diminuer ce risque il est possible de réajuster à chaque moment la composition de l'actif. Une solution peut être la détention d'une certaine proportion en bons de trésor avec une valeur liquidative insensible aux variations des taux d'intérêt – Consiglio (2006). La proportion de ces placements dépend du risque de rachat à chaque moment (la proportion sera diminué si le taux d'intérêt est grande). Une autre solution est la détention des options de vente associées aux obligations à taux d'intérêt fixe du portefeuille. Dans ce cas l'assureur bénéficiera de l'accroissement éventuel du cours, mais il a une garantie minimale sur le prix de vente en cas de chute des cours.

Albizzati (1996) a assimilée la possibilité offerte aux assurés de racheter leurs contrats d'assurance vie, leur permettant ainsi de faire jouer la concurrence, à une option de vente accordée à la souscription du contrat. Cette option est américaine, car la date d'exercice (date de rachat) n'est pas connue à l'émission du contrat, elle est au choix de l'assuré. A chaque instant  $t$ , l'assuré peut demander le rachat de son contrat à sa valeur de rachat. Cette valeur de rachat n'est pas égale à la valeur de marché de l'actif correspondant. Le flux écart est garanti par l'assureur. La valeur la plus élevée de l'option apparaît pour les échéances de 2 ans et 4 ans après l'émission du contrat (pour un contrat de maturité 8 ans). Donc, le risque de rachat le plus critique pour l'assureur est en début de contrat et non en fin de contrat.

Petauton (2004) présente l'opération de rachat comme ayant trois types des risques :

- 1) si elle touche un trop gros volume de contrats dans des circonstances financières défavorables, elle obligera l'assureur, si les valeurs de rachat sont garanties, à vendre des actifs dans des mauvaises conditions ;
- 2) une « vague » de rachats peut ne laisser subsister chez l'assureur qu'un effectif trop réduit de contrats en cours qui ne permet plus les compensations dans une mutualité ;
- 3) elle pourrait provoquer une antisélection, si des assurés en cas de vie avaient ainsi la possibilité de récupérer leurs mises au moment où ils redoutent de ne plus pouvoir bénéficier des garanties.

La troisième catégorie de risque peut être évité en interdisant le rachat sur des contrats dont la garantie est exclusivement en cas de vie.

#### 4. Modalité de tarification et provisionnement des assurance en unités de compte avec garantie plancher

La plus utilisée méthode d'évaluation du risque de garantie plancher (la garantie du capital investi) par les sociétés d'assurance est la *méthode du capital sous risque*. Il existe aussi la méthode des options de vente (puts) qui a été fondée théoriquement par Brennan et Schwartz (1976) et Boyle et Schwartz (1977), mais dont application pratique n'a pas obtenu la consécration méritée parce que est une méthode plus complexe.

Premièrement on va présenter le cadre général d'application des deux méthodes. Considérons un assuré d'âge  $x$  à la souscription versant un montant  $K'$  au titre d'un contrat en unités de compte. Des frais d'entre sont prélevés à hauteur du pourcentage  $\alpha$ . La provision mathématique du contrat à la date de versement (date 0) est égale à  $(1-\alpha) \cdot K' = K$ , et évoluera au moment  $t$  en fonction des cours des supports sélectionnés. La durée du contrat ne pourra excéder  $T$  ans.

La garantie du capital investi<sup>2</sup> prévoit qu'en cas de décès de l'assuré les bénéficiaires du contrat recevront la provision mathématique du contrat, sans que celle-ci puisse être inférieure au montant investi  $K$ . Si le décès survient à la date  $t$ , cette garantie représentera une charge de sinistre pour l'assureur égale à  $\max(K - PM_t^x, 0)$ .

Partant de ce cas, deux méthodes d'évaluation de la garantie plancher sont étudiées dans ce qui suit:

- **la méthode du capital sous risque**: consiste à déterminer un prix en se fondant sur le coût qui résulterait de l'exercice de la garantie du capital investi à la date du calcul;
- **la méthode des puts** : s'inspire des méthodes de tarification d'options financières et consiste à appréhender la garantie du capital investi comme une série d'options de vente.

Le capital sous risque correspond à la partie positive de la différence entre le capital garanti (le plancher) et la provision mathématique. Le capital sous risque représente la prestation, au titre de la garantie plancher, qui devrait être versée par l'assureur en cas de décès immédiat de l'assuré.

Le principe de ce mode de tarification est intuitif : la charge afférente à la garantie plancher est estimée en pondérant la prestation en cas de sinistre par le taux de sinistre. En termes plus « actuariels », il s'agit de la tarification d'une garantie temporaire décès pour laquelle le capital garanti est estimé par le capital sous risque en début de période et la durée est celle qui sépare deux prélèvements successifs.

La qualité de la tarification est directement fonction de la fréquence de calcul du capital sous risque et de prélèvement. Plus la durée entre deux dates de prélèvement est réduite, meilleure est la tarification. Un calcul fréquent – hebdomadaire, par exemple – du capital sous risque permet de suivre l'évolution du risque de manière satisfaisante. Dès lors que la période entre deux dates

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<sup>2</sup> Le Vallois F., Palsky P., Paris B., Tosetti A., (2003), Gestion actif passif en assurance vie, Economica, Paris, p.282.

successives de calcul du montant prélevé est courte et que le portefeuille de contrats est d'une taille importante, on peut considérer le risque financier bien appréhendé et le risque viager mutualisé.

#### La méthode des puts

Une option est un titre conférant à son détenteur le droit, et non l'obligation, d'acheter ou de vendre une certaine quantité d'un actif financier, à une date convenue et à un prix fixé d'avance.

Pour une option de vente européenne, d'échéance  $T$ , de prix d'exercice  $K$ , sur un sous-jacent de cours  $S_t$  à la date  $t$ , il existe deux possibilités à l'échéance:

- $K > S_T$  : le détenteur de l'option a alors intérêt à exercer l'option et réalise ainsi un profit égal à  $K - S_T$  ;
- $K < S_T$  : le détenteur de l'option n'a alors pas d'intérêt à exercer l'option.

La garantie du capital investi en cas de décès est une option de vente détenue par le bénéficiaire du contrat en unités de compte<sup>3</sup>. Cette garantie donne en effet la faculté au bénéficiaire du contrat de « vendre » à l'assureur le contrat, ou plutôt les supports qui le composent, à une valeur déterminée, le capital investi (le plancher). Il ne s'agit pas d'une option financière classique puisque la date d'exercice est la date de décès de la tête assurée.

On considère tout d'abord le cas où il n'y a pas d'aléa viager. En d'autres termes, l'assureur a une parfaite connaissance pour chaque contrat de la date de décès  $\tau$  de la tête assurée. Si le décès survient avant le terme  $T$  du contrat, la garantie plancher peut s'analyser comme une option de vente européenne de maturité égale à la date de décès  $\tau$  de l'assuré et de valeur égale à  $\max(K - PM_\tau^x, 0)$ .

Une hypothèse moins forte consiste à considérer que le risque décès du portefeuille de contrats est parfaitement mutualisé: la variable aléatoire « nombre de décès au sein du groupe d'assurés » se réalise à son espérance. Pour simplifier les choses, on considère en outre que les décès indiqués par la table de mortalité au cours d'une année surviennent tous à la fin de cette année. Sous cette hypothèse, les garanties plancher vendues à 100.000 assurés d'âge  $x$  ayant versé la même prime  $K$  (nette de prélèvements d'acquisition et de gestion) représentent pour l'assureur les mêmes engagements que :

- $100000 \cdot \frac{d_x}{l_x}$  puts de maturité égale à 1 an et de prix d'exercice  $K$ ;
- $100000 \cdot \frac{d_{x+1}}{l_x}$  puts de maturité égale à 2 ans et de prix d'exercice  $K$ ;
- $100000 \cdot \frac{d_{x+2}}{l_x}$  puts de maturité égale à 3 ans et de prix d'exercice  $K$ .....

<sup>3</sup> Merlus S., Péqueux O., (2000) – Les garanties plancher des contrats d'assurance vie en unités de compte : tarification et couverture, Thèse d'actuariat, IAF.

Par conséquent, chaque garantie plancher est équivalente, pour une prime nette égale à  $K$ , à  $\frac{d_x}{l_x}$  puts de maturité égale à 1 an et prix d'exercice  $K$ , à  $\frac{d_{x+1}}{l_x}$  puts de maturité égale à 2 ans et prix d'exercice  $K$ , à  $\frac{d_{x+2}}{l_x}$  puts de maturité égale à 3 ans et prix d'exercice  $K$ ..

Cette équivalence n'a de sens que pour l'ensemble du portefeuille de l'assureur, puisque seule la mortalité de l'ensemble des assurés est supposée connue, sans qu'elle soit tête par tête.

L'intérêt d'analyser les garanties plancher sous l'angle des options financières réside dans la possibilité d'utiliser des méthodes usuelles de tarification de celles-ci. La théorie d'évaluation des options reste raisonnablement simple dès lors que deux hypothèses concernant les marchés financiers sont faites :

- l'hypothèse de base est qu'il n'existe pas d'opportunité d'arbitrage, c'est-à-dire qu'il est impossible, disposant au départ d'un capital nul, de faire des profits de manière certaine sans prendre de risque ;
- la seconde hypothèse est que le marché est complet, c'est-à-dire qu'il existe suffisamment d'actifs financiers pour couvrir toutes les sources de risques.

#### La tarification du contrat

Dans l'hypothèse de parfaite mutualisation du risque décès et de l'absence d'opportunité d'arbitrage et de marché complet en ce qui concerne le risque financier, on considère un contrat en unités de compte à support unique avec versement d'une prime unique. A  $t = 0$  on suppose que  $K = S_0 (PM_0^x)$ .

L'équivalence décrite précédemment entre la garantie plancher et une série de puts conduit à la tarification suivante :

$$CCMG = \sum_{i=0}^{T-1} \frac{d_{x+i}}{l_x} \cdot Put(i+1, K, S_0), \quad (7)$$

où CCMG – le coût du capital minimal garanti

$Put(i+1, K, S_0)$  - le prix de l'option de vente de date d'exercice  $t$ ,  
prix d'exercice  $K$  sur le sous-jacent de prix  $S_0$  à la date 0.

$T$  - la durée maximale du contrat (en années).

Dans ces conditions, la tarification de la garantie plancher revient à l'évaluation d'options de vente. Pour ça on va utiliser le modèle proposé par Black et Scholes<sup>4</sup> au début des années '70 qui permet d'obtenir à la fois une formule explicite de prix d'options européennes de vente sur actions ne donnant pas de dividendes et une stratégie de couverture parfaite pour le vendeur de l'option.

Le modèle Black et Scholes suppose que la dynamique du prix de base est décrite par un mouvement brownienne géométrique. Cette mouvement à deux composantes : une tendance, qui dépend de la valeur antérieure de la variable et

<sup>4</sup> Black, Scholes, (1973) 'The pricing of options and corporate liabilities', *Journal of Political Economy*, 81, 637 - 654.

du facteur temps, et un mouvement aléatoire déterminé de temps et de variation des valeurs autour de la moyenne. Le modèle suppose que la dynamique de l'actif sous-jacent à l'option est la suivante :

$$\frac{dS}{S} = \mu dt + \sigma \varepsilon dt \quad , \quad (8)$$

où :  $\frac{dS}{S}$  - la variation en temps du prix de l'actif de base;

$\mu$  - le rendement moyen de l'actif sous-jacent;

$\sigma$  - la volatilité de l'actif support<sup>5</sup> ;

$\varepsilon$  - variable aléatoire de distribution normale;

$dt$  - l'intervalle de temps analysé.

On va utiliser les notations suivantes :

$K$  - le prix d'exercice;

$T$  - l'échéance de l'option, exprimée en années;

$r$  - le taux de l'intérêt sans risque (annuelle);

$N(.)$  - la fonction de répartition de la loi normale.

Dans ces conditions la valeur d'une option d'achat (Call) peut s'exprimer comme :

$$C = S \times N(d_1) - K \times e^{-rT} \times N(d_2) \quad (9)$$

$$\text{où} \quad d_1 = \frac{\ln(S/K) + (r + \frac{\sigma^2}{2}) \times T}{\sigma \sqrt{T}},$$

$$d_2 = \frac{\ln(S/K) + (r - \frac{\sigma^2}{2}) \times T}{\sigma \sqrt{T}} = d_1 - \sigma \sqrt{T}.$$

La valeur de  $N(d_1)$  peut être interprétée comme la probabilité que à l'échéance  $S > K$ , et la valeur de  $N(d_2)$  la probabilité que à l'échéance  $S < K$ . A partir de la formule de l'option d'achat on peut préciser la composition du portefeuille sans risque. La dérivée de l'option par rapport au prix du sous-jacent est  $N(d_1)$ <sup>6</sup>. La construction d'un portefeuille sans risque à partir de  $N_c$  (le numéro des options d'achat du portefeuille) est obtenue par la vente de  $N_c \times N(d_1)$  titres.

La relation de parité des options européennes qui ne distribue pas des dividendes permet d'exprimer la valeur théorique de l'option de vente (put). Cette relation de parité est :

<sup>5</sup> La volatilité est déterminée à partir des données historiques.

<sup>6</sup> La valeur de  $N(d_1)$  est toujours positive et s'appelle *delta call* ( $\Delta_c$ ).

$$P = C - S + K \times e^{-rT} \quad (10)$$

L'équilibre<sup>7</sup> sur le marché des options impose que cette relation soit respecté indifféremment du modèle d'évaluation proposé, condition qui permet le calcul de la valeur théorique de l'option de vente (put) :

$$P = S \times (N(d_1) - 1) + K \times e^{-rT} \times (1 - N(d_2)) \quad (11)$$

où  $d_1$  et  $d_2$  ont déjà été définis. En appliquant la dernière formule pour notre cas, on obtient:

$$\begin{aligned} Put(i+1, K, S_0) = & K[e^{-r(i+1)}(1 - N(\frac{r - (\sigma^2/2)(i+1)}{\sigma\sqrt{i+1}})) + \\ & N(\frac{r + (\sigma^2/2)(i+1)}{\sigma\sqrt{i+1}}) - 1] \end{aligned} \quad (12)$$

En conséquence,

$$CCMG = K \sum_{i=0}^{T-1} \frac{d_{x+i}}{l_x} \cdot [e^{-r(i+1)}(1 - N(d_2)) + (N(d_1) - 1)] \quad (13)$$

La formule précédente donne l'évaluation à la souscription de la charge liée au capital minimal garanti. Le prix de l'option européenne de vente sur le support  $S_t$ , avec le prix d'exercice  $K$ , d'échéance  $T$ , est le capital que le vendeur de l'option doit le détenir initialement pour promouvoir une certaine stratégie d'investissement obtenant le bénéfice  $(K - S_T)^+$  à l'échéance de l'option.

Dans le modèle de Black et Scholes, la stratégie, appelée *couverture en delta-neutre*, consiste à former à chaque instant  $t$  le portefeuille composé de :

-  $N_p \cdot [N(d_1) - 1]$  parts de l'actif sous-jacent, où  $N_p$  est le numéro des options de vente du portefeuille;

- le reste en actif sans risque (capitalisant au taux sans risque  $r$ ).

Dans le cas du capital minimal garanti, il faudrait mettre en place un portefeuille de couverture qui serait la somme pondérée avec  $d_{x+i}/l_x$  pour chaque option de vente dupliquée.

Par conséquent, les prix donnés par les formules précédentes n'ont de sens que dans la mesure où une couverture du risque financier est mise en place, qu'il s'agisse du portefeuille de couverture en delta-neutre indiqué précédemment ou du portefeuille composé des *puts* qui ont servi à tarifer la garantie plancher. Le plus approprié méthode de couverture pour le risque financier est l'assurance

<sup>7</sup> Suppose l'évitement des possibilités d'arbitrage rentable sans risque.



dynamique qui offre le même profil du gain comme les options : protection en cas de chute du marché et profit en cas de hausse.

### Application de l'assurance dynamique du portefeuille

L'assurance dynamique consiste à gérer un portefeuille composé d'actifs risqués (les actions) et d'actifs sans risque (comme les bons du Trésor). Les proportions investies dans chaque catégorie d'actif sont révisées sur la durée de la protection afin d'atteindre le profil de revenus souhaité<sup>8</sup>.

La création du put couvert synthétique constitue une technique d'application de l'assurance dynamique. Quand l'option de vente n'existe pas ou elle n'est pas adaptée pour couvrir un portefeuille spécifique pour une société d'assurance vie, on peut dupliquer (répliquer), en pratiquant une gestion dynamique, le comportement d'un portefeuille assuré.

Cette technique repose sur l'argument d'arbitrage de Black et Scholes qui consiste à créer un portefeuille sans risque en combinant de manière rationnelle des actions et des options : les variations de la position titres sont compensées par les variations de la position options. Pour être identique avec une option de vente, le portefeuille répliqué doit avoir le même rendement comme l'option et il doit se autofinancer (aucun somme ne doit pas être ajouté dans la période de duplication). L'importance de cette condition a été mise en évidence par Harrison et Kreps (1979). La relation d'arbitrage qui soutient les formules d'évaluation des options n'est plus valable si les agents peuvent prendre des nouveaux engagements pendant la stratégie de duplication.

Les proportions qu'il faut détenir en titres sont définies par le delta ( $\Delta$ ) de l'option représentant la sensibilité de l'option au prix du titre. La détention de  $\Delta_p$  (delta du put) action peut être parfaitement immunisée par l'achat d'un *put* (de prix  $P$ ). Le rendement de cette position au terme d'une échéance très courte doit être égal sur un marché équilibré au taux sans risque.

Soit  $A$  – le placement au taux sans risque correspondant à l'achat de bons du Trésor et  $S$  – la valeur du titre. Nous avons l'équation suivante:

$$A = P - \Delta_p \times S \quad (14)$$

$$P = A + \Delta_p \times S \quad (15)$$

Nous constatons que le put peut être dupliqué<sup>9</sup> par un placement en bons de Trésor et une position courte (vendeuse) sur l'action support de l'option. La position qui assure la protection d'une action est un achat de put. L'ensemble des positions est noté  $S+P$ . En remplaçant  $P$  dans la dernière formule, nous obtenons:

$$S + P = S + (A + \Delta_p \times S) = (1 + \Delta_p) \times S + A = (1 + \Delta_p) \times S + (P - \Delta_p \times S) \quad (16)$$

<sup>8</sup> Jeannicot K., Ben Larbi S., (2004), Management des Risques Financiers et Marchés Organisés, Economica, Paris, p.144.

<sup>9</sup> La duplication représente la construction d'un portefeuille qui a le flux de trésorerie identique avec ce généré par l'option.

Cette équation exprime le fait qu'une action couverte par un put peut être dupliquée par la détention de  $(1 + \Delta_p)$  actions et par un placement au taux sans risque d'une valeur de  $(P - \Delta_p \times S)$ .

Ce raisonnement fondé sur une action détenue peut être étendu à un portefeuille d'actions. Dans ce cas, le gérant d'un portefeuille dont la valeur est  $V$  peut construire un put couvert synthétique

$(V + P)$ , en vendant une proportion  $|\Delta_p|$  du portefeuille d'actions, tout en respectant les pondérations de chaque titre au sein du portefeuille (car il doit détenir  $(1 + \Delta_p)$  actions). Il place ensuite la trésorerie qui en résulte au taux sans risque (en achetant bons de Trésor) majorée de la valeur  $P$ .

La duplication du put couvert ne peut être parfaite que lorsque les variations du portefeuille sont très faibles et sur un intervalle très court. Dès que le delta du put se modifie, il est nécessaire de recomposer le portefeuille: calculer la nouvelle valeur du put afin de ne détenir qu'une proportion de  $(1 + \Delta_p)$  actions et  $(P - \Delta_p + S)$  en bons de Trésor. Ainsi les ajustements à opérer entre le portefeuille et les bons du Trésor s'effectuent de manière dynamique. La recomposition doit avoir lieu dès que le portefeuille se modifie.

A l'échéance de l'option ils peuvent exister deux situations:

- Si la valeur du portefeuille  $V$  est beaucoup plus élevée que la valeur assurée  $K$  (le prix d'exercice ou le capital minimal garanti), on parle d'une position globalement investie en actions afin de profiter de la hausse des cours;
- Si  $V$  devient très inférieur à  $K$ , l'investissement est fait en majorité en bons de Trésor de façon à obtenir à l'horizon de la protection la valeur assurée ( $K$  - capital garanti).

Les échanges nécessaires à l'assurance dynamique sont autofinancés, c'est-à-dire qu'une fois l'investissement initial réalisé, aucune liquidité n'est requise: le montant des titres vendus en cours de période d'assurance est toujours égal à la valeur des titres nécessaires à acheter.

La mise en oeuvre de la procédure de duplication impose au préalable l'estimation de plusieurs variables pour évaluer le put théorique:

- $K$ , la valeur du portefeuille que le gérant souhaite se garantir à l'horizon de l'assurance;
- $r$ , le taux sans risque;
- $T$ , l'horizon de l'assurance;
- $\sigma$ , la volatilité du portefeuille d'actions.

## **5. Tarification sur la base des options et de l'assurance dynamique – application pour le marché roumain d'assurance**

Dans cette section on va illustrer pratiquement la modalité de établir la prime d'assurance pour une assurance vie en unités de compte avec capital garanti indexé, en utilisant la théorie des options et puis le provisionnement du

risque financier par l'assurance dynamique du portefeuille. On a choisi le capital garanti indexé parce qu' est une solution plus attirante pour les assurées si on prend en compte la longue durée des assurances vie et l'inflation qui peut affecter sérieusement les épargnes des assurées.

On a pris l'exemple d'une assurance sur la période de 10 ans souscrite par un assuré de 40 ans. Concernant les fonds dans lesquelles les argents seront investis, on a considéré un portefeuille d'actions sur l'indice BET de la Bourse de Valeurs Bucarest, qui contient les titres suivants dans les proportions mentionnées :

Tableau 1. La composition de l'indice BET de la Bourse de Valeurs Bucarest

| No.crt. | Symbole | Emitent                        | Pondération (%) |
|---------|---------|--------------------------------|-----------------|
| 1       | TLV     | Banca Transilvania Cluj-Napoca | 20              |
| 2       | RRC     | Rompetrol Rafinare Constanta   | 20              |
| 3       | BRD     | BRD-Groupe Societe Generale    | 20              |
| 4       | SNP     | Petrom Bucuresti               | 20              |
| 5       | OLT     | Oltchim Râmnicu Vâlcea         | 11,13           |
| 6       | ATB     | Antibiotice Iași               | 3,41            |
| 7       | IMP     | Impact Bucuresti               | 2,70            |
| 8       | TBM     | Turbomecanica Bucuresti        | 1,36            |
| 9       | AZO     | Azomureș Târgu Mureș           | 1,23            |
| 10      | RBR     | Rulmentul Brașov               | 0,17            |

Source: <http://www.bvb.ro> – Ajustation Indice BET 01.11.2005

En Roumanie, les options sur les indices boursiers sont transactionnées uniquement à la Bourse Monétaire Financière et de Marchandises Sibiu (BMFMS), donc les argents seront investis dans cette bourse. La principale utilité de ces options est que les options permettent de modifier l'exposition des portefeuilles au risque de marché – Todea (2003). Si un investisseur anticipe une baisse du marché il peut acheter un option de vente (put) sur l'indice représentatif du marché. Si le marché baisse il peut réaliser profit en vendant l'option.

Sur la base des données de la fondation – 10.09.1997 jusqu'au 23.02.2006 sur l'indice BET (2095 valeurs), on a calculer la volatilité moyenne journalière du marché de capital :  $\sigma_{journaliere} = 1,78\%$  . Dans le modèle Black & Scholes d'évaluation des options, on a besoin de la volatilité moyenne annuelle du marché:  $\sigma_{annuelle} = \sigma_{journaliere} \cdot \sqrt{N_j} = 1,78\% \cdot \sqrt{250} \cong 28\%$  , où  $N_j$  - représente le numéro moyenne des jours de transaction par année.

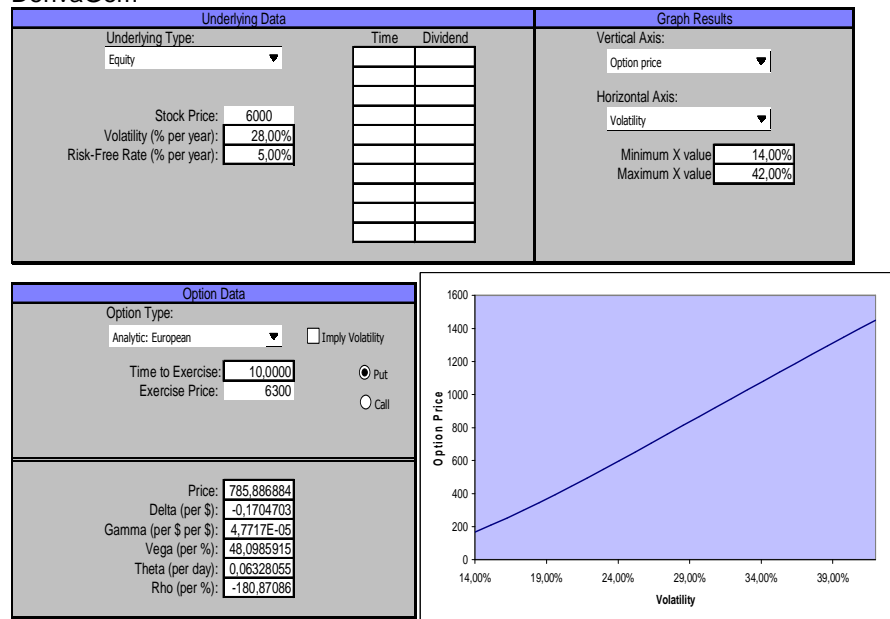
On va considérer le taux annuel d'intérêt sans risque  $r = 5\%$  . Le capital initial de l'assurée de 6000 RON sera investi dans les actions qui composent l'indice BET, dans les proportions présentées. Le capital initial sera indexé chaque année avec le taux d'intérêt sans risque, qui signifie que en cas de décès les bénéficiaires de l'assures vont touches le maximum entre (la valeur du portefeuille, le capital indexé).

On a expliqué dans la section 3 que la garantie du capital indexé pour chaque assurée est équivalente, pour une prime nette égale à  $K$ , à  $\frac{d_x}{l_x}$  puts de maturité 1 ans et prix d'exercice  $K$ , à  $\frac{d_{x+1}}{l_x}$  puts de maturité 2 ans et prix d'exercice  $K$ , à  $\frac{d_{x+2}}{l_x}$  puts de maturité 3 ans et prix d'exercice  $K$ . L'assureur achètera sur

BMFMS les options Put sur l'indice BET d'échéances et prix d'exercice établies, pour qu'il soit couvert en cas de décès de l'assurée quand le marché financière est en baisse. Un portefeuille peut être assuré par l'achat d'un put sur un indice, seulement si le portefeuille est bien diversifié, donc sa composition doit rester très proche de celle de l'indice tout au long de l'assurance – Todea (2003).

Pour calculer les prix des options de vente on a utilisé l'utilitaire Excel DerivaGem<sup>10</sup> – version 1.5., qui offre des applications complémentaires pour l'évaluation des actifs dérivés. On va illustrer l'utilisation d'utilitaire Excel pour une option de vente, avec l'échéance de 10 ans et capital garanti 6300 RON:

Tableau 10. Le calcul du prix d'une option de vente avec l'utilitaire Excel DerivaGem



Source: Page de travail importé de Excel –DerivaGem -1.5

<sup>10</sup> Hull J., Roger P., (2004), Options, futures et autres actifs dérivés, 5-ème édition, Pearson, Paris + CD DerivaGem.

On observe que le prix d'une option de vente est  $Put(10; 6300; 6000) = 785,886884$  RON. Pour tenir compte de la mortalité des potentiels assurés on a utilisée Le Tableaux de mortalité de la population roumaine – 2000-2002. Les calculs pour les primes d'assurances afférentes au capital garanti indexé ont été faites en Excel, en utilisant la formule présentée dans la section 3.2.

Tableau 3. Le calcul de la prime d'assurance (CCGI) pour un assuré de 40 ans

| T  | K        | PUT(t,K,S)  | d(39+t) | l(40) | d(39+t)/l(40) | PUT*d(39+t)/l(40)  |
|----|----------|-------------|---------|-------|---------------|--------------------|
| 1  | 6300     | 785,8868836 | 303     | 93076 | 0,003255404   | 2,55837945         |
| 2  | 6615     | 906,2302685 | 338     | 93076 | 0,003631441   | 3,290921728        |
| 3  | 6945,75  | 1046,918051 | 373     | 93076 | 0,004007478   | 4,195500807        |
| 4  | 7293,038 | 1212,207318 | 418     | 93076 | 0,004490954   | 5,443966855        |
| 5  | 7657,689 | 1407,706782 | 430     | 93076 | 0,004619881   | 6,503437149        |
| 6  | 8040,574 | 1641,133978 | 447     | 93076 | 0,004802527   | 7,881590186        |
| 7  | 8442,603 | 1923,794498 | 488     | 93076 | 0,005243027   | 10,08650689        |
| 8  | 8864,733 | 2273,841697 | 538     | 93076 | 0,005780223   | 13,1433112         |
| 9  | 9307,969 | 2724,625798 | 579     | 93076 | 0,006220723   | 16,94914196        |
| 10 | 9773,368 | 3349,2281   | 638     | 93076 | 0,006854613   | 22,95766393        |
|    |          |             |         |       | CCGI(40)=     | <b>93,01042015</b> |

Source: les calculs de l'auteur

On observe que la prime d'assurance croit à mesure que l'assuré vieillisse (de 20 à 60 ans) et au même temps à mesure que l'échéance d'option de vente s'approche (t- représente le numéro des années qui se sont écoulées de la souscription du contrat).

Le prix du risque du capital garanti n'a pas de sens que dans la mesure qu'une couverture du risque financier est réalisée. Pour résoudre ce problème on peut appliquer l'assurance dynamique du portefeuille, qui a été expliqué dans la section 3.3.

Pour l'assurance dynamique l'ajustement du portefeuille sera fait pour toute la durée de l'assurance (10 ans). Au début la valeur du portefeuille est de 6000 RON (le capital investi), mais la valeur évoluera en fonction de l'évolution des titres du portefeuille (le portefeuille non- couvert). Le tableau 4 présente les différents ajustements à opérer sur les actions et sur les bons de trésor sur la durée de l'assurance, ainsi que les valeurs des actifs avant et après les ajustements.

| T  | K<br>Capital<br>garanti<br>Indexé | Val.<br>port.<br>Non<br>Couvert<br>(V) | Put*<br>d(39+t)<br>/ l(40) | Delta<br>(call) | V+P   | Valeur<br>avant<br>ajust.<br>Act. | Valeur<br>à<br>détenir<br>Actions | Ajuste-<br>ment<br>Actions | Valeur<br>avant<br>ajust.<br>B.T. | Valeur<br>à<br>détenir<br>B.T. | Valeur<br>porf.<br>couvert<br>(réel) |
|----|-----------------------------------|--|----------------------------|-----------------|-------|-----------------------------------|-----------------------------------|----------------------------|-----------------------------------|--------------------------------|--------------------------------------|
| 0  | <b>6000</b>                       | <b>6000</b>                            | 2,11                       | 0,855           | 6002  | 6000                              | 5127                              | -872,1                     | 0                                 | 874,2                          | <b>6002</b>                          |
| 1  | <b>6300</b>                       | <b>6290</b>                            | 2,56                       | 0,83            | 6292  | 5375                              | 5217,74                           | -157,9                     | 917,9                             | 1076                           | <b>6293</b>                          |
| 2  | <b>6615</b>                       | <b>6920</b>                            | 3,29                       | 0,799           | 6923  | 5740                              | 5531,98                           | -208,3                     | 1129                              | 1338                           | <b>6870</b>                          |
| 3  | <b>6945,75</b>                    | <b>7480</b>                            | 4,2                        | 0,763           | 7484  | 5979                              | 5707,82                           | -271,8                     | 1404                              | 1677                           | <b>7384</b>                          |
| 4  | <b>7293,04</b>                    | <b>7990</b>                            | 5,44                       | 0,719           | 7995  | 6096                              | 5743,58                           | -353,4                     | 1760                              | 2114                           | <b>7857</b>                          |
| 5  | <b>7657,69</b>                    | <b>8570</b>                            | 6,5                        | 0,664           | 8576  | 6160                              | 5694,37                           | -466,1                     | 2219                              | 2686                           | <b>8380</b>                          |
| 6  | <b>8040,57</b>                    | <b>9400</b>                            | 7,88                       | 0,597           | 9407  | 6245                              | 5608,87                           | -637                       | 2820                              | 3457                           | <b>9066</b>                          |
| 7  | <b>8442,6</b>                     | <b>8250</b>                            | 10,09                      | 0,511           | 8260  | 4922                              | 4214,73                           | -707,9                     | 3630                              | 4338                           | <b>8552</b>                          |
| 8  | <b>8864,73</b>                    | <b>9900</b>                            | 13,14                      | 0,4             | 9913  | 5057                              | 3961,15                           | -1096                      | 4554                              | 5651                           | <b>9612</b>                          |
| 9  | <b>9307,97</b>                    | <b>10800</b>                           | 16,95                      | 0,255           | 10816 | 4321                              | 2755,53                           | -1565                      | 5934                              | 7499                           | <b>10255</b>                         |
| 10 | <b>9773,37</b>                    | <b>12500</b>                           | 22,96                      | 0,077           | 12522 | 3189                              | 965,41                            | -2223                      | 7874                              | 10098                          | <b>11064</b>                         |

Tableau 4. Ajustements et valeur du portefeuille à chaque période

On va expliquer la modalité de calcul pour les paramètres du tableau 4 :

- La valeur du put à l'initialisation de l'assurance est de 2,11 RON, correspondant à un delta du call de 0,855. A la date 0, la valeur du portefeuille en actions à détenir est de  $0,855 \cdot 6000 \approx 5130$  RON<sup>11</sup>.

- La différence entre la valeur initiale en actions (6000 RON) et la valeur à détenir (5130 RON) doit être vendue. Si on ajoute à cette valeur la valeur du put on obtiennent le montant nécessaire en bons de trésor ( $\approx 872$  RON)<sup>12</sup>.

- Dans la période suivante, la valeur des bons de trésor a progressé de 5%, donc la valeur avant ajustement des bons de trésor est de  $872 \cdot 1,05 \approx 917$  RON.

- La valeur avant ajustement des actions est fonction de la progression du portefeuille non couvert, soit:  $5127,89 \cdot \frac{6290}{6000} \approx 5375,73$  RON. Or la valeur des

actions à détenir est de  $\Delta_{CALL} \cdot V$ , soit  $0,83 \cdot 6290 = 5217$  RON. Il faut par conséquent vendre des actions pour un montant de 158 RON ( $5217,74 - 5375,74$ ) et acheter des bons de trésor. Le montant à détenir en bons de trésor devient égal à la *valeur avant ajustement* moins *l'ajustement en actions*, soit  $1075,93$  RON =  $917,93 - (-158)$ .

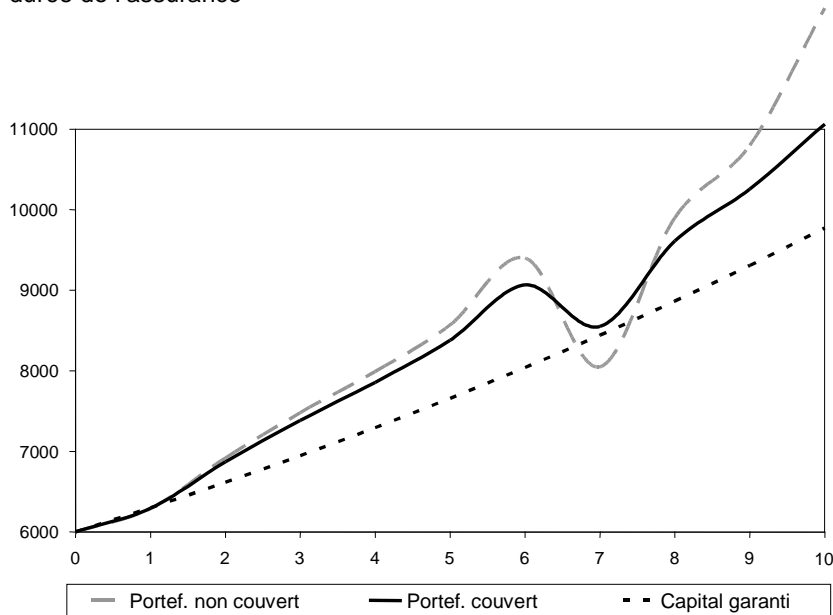
- La valeur du portefeuille couvert = Valeur à détenir en actions + Valeur à détenir en bons de trésor, soit 6293,67 RON.

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<sup>11</sup> La différence par rapport à la valeur du tableau (5127,89 RON) provient du fait qu'en Excel les calculs ont été fait en prenant toutes les décimales et dans le tableau 4 on a fait l'ajustement à 2 décimales par manque d'espace.

<sup>12</sup> Initialement est nécessaire le financement de l'option de vente parce que elle se rajoute à la partie d'actions vendues.

Figure 4. Evolution du portefeuille couvert et non couvert et du capital garanti sur la durée de l'assurance



Source: les calculs de l'auteur

On peut observer sur la figure 4 que le portefeuille ainsi assuré capture la hausse lorsque la valeur des actions augmente et reste au-dessus du plancher lorsque la valeur des actions chute. En général l'assurance du portefeuille avec les options est attractive sur un marché avec un fort caractère volatil, mais empêche l'obtention des gains substantielles quand le marché est sur une tendance ascendante – Todea (2003).

En ce qui concerne le marché roumain de capital, en 2005 et 2006 les investisseurs ont été confrontés à des brusques baisses et hausses, dans une courte période, indiquant une forte volatilité (ou une hausse du risque). Le risque a été double en 2005 par rapport à la moyenne des années 2001-2004. Cet état du marché roumain de capital justifie l'utilisation de l'assurance dynamique du portefeuille comme modalité de couverture contre les risques.

## 6. Conclusions

Les contrats d'assurance vie contiennent des clauses implicites (capital minimal garanti, option de remboursement anticipé, option de rachat) qui augmentent l'attractivité des produits d'assurance mais au même temps modifient le profil du risque des assurés.

Les sociétés d'assurance vie ont considéré pour une longue période qu'ils sont moins exposés au risque par rapport aux banques. Les modifications inattendues des taux d'intérêt et les risques financiers assumés par les assureurs par les clauses implicites ont constitué le motif pour lequel les assureurs ont



commence d'utiliser la théorie des options comme modalité de quantification et de gestion des risques.

Les modalités financières de tarification et provisionnement sont appropriées pour les produits en unités de compte, produits qui sont très attractives dans les périodes de hausse boursière. Jusqu'à la crise financière de l'année 2000, les assureurs n'ont pas pratiqué aucune couverture contre le risque de chute des marchés financiers qui semblait insignifiant, ce qui a déterminé des pertes importantes pour les possesseurs des assurances en unités de compte. Pour relancer ce type de contrats d'assurances ont apparu les produits en unités de compte à garanti plancher qui transfèrent une partie du risque investissement à l'assureur. Ce transfert du risque, et la conscientisation des pertes qui peuvent apparaître si les marchés financiers chutent a déterminé les assureurs de voir la nécessité d'appliquer des méthodes de tarification et de provisionnement.

Pour le provisionnement du risque de garantie plancher (capital minimal garanti) on a proposé l'utilisation de la théorie des options et de l'assurance dynamique du portefeuille. On a considéré la garantie du capital minimal en cas de décès comme une option de vente (put) détenue par le bénéficiaire du contrat en unités de compte. L'utilisation des options de vente pour évaluer à la souscription la prime correspondante au capital minimal garanti n'a pas de sens si une couverture du risque financier n'est pas réalisée. La méthode la plus appropriée de couverture du risque financier est l'assurance dynamique qui consiste dans la gestion d'un portefeuille composé des actifs risqués (actions) et des actifs sans risque par une réévaluation des proportions investies dans chaque catégorie d'actifs pour réaliser le montant de profit désiré. L'application sur le marché roumain de capital qui est caractérisé par une forte volatilité justifie l'efficacité de la méthode d'options et de l'assurance dynamique pour la tarification des contrats en unités de compte.

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## THE ROLE OF EDUCATION FOR THE DURATION OF UNEMPLOYMENT IN GORJ COUNTRY

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**ABSTRACT.** In this paper are presented the results of the ASO international project "The Role of Education for the Duration of Unemployment" for Gorj County. Using techniques to estimate models for duration data, like the Kaplan Meier method and Cox's proportional hazard model, this project answer to the following question: does the education level influence the duration of unemployment in Gorj County? The influences of age and gender on duration of unemployment spells are also estimated.

**JEL Classification:** J40, J46

**Keywords:** unemployment, education level, labor market, gender

### 1. Labor Market in Gorj County

Gorj County is situated in the South-Western part of Romania, composing the fourth development area, Oltenia, together with the counties Vilcea, Olt, Doj, Mehedinti. The surface of Gorj County is of 560177 ha; on the 1st of July 2004 there were 2 municipalities, 7 towns, 61 communes and 411 villages within this county.

On the 1st of July 2004 the permanent population of this county was of 386759 inhabitants, representing 1.78 % of the total population of Romania at the same date; 190747 are men and 195350 women. 180663 persons of Gorj County lived at that date in urban area, and 206 090 in rural area, their great majority (98.75%) being of Romanian nationality. The population density in Gorj County is

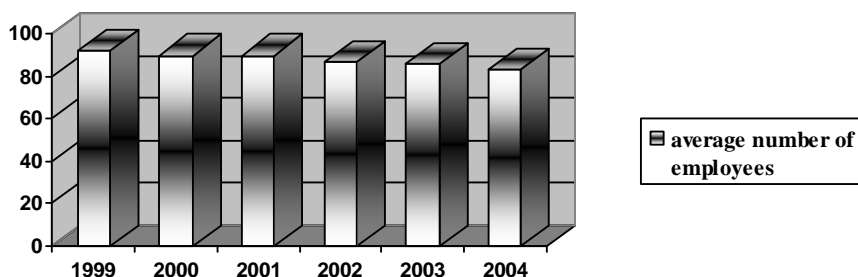
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of 68.9 inhabitants / km<sup>2</sup>. The average lifespan is of 71.79 years (68.42 men and 75.34 women). As to the distribution of population by age groups, at the same date, 67940 persons represented the population aged 0-14 years, 250735 the population aged 15-59 years, and 68084 persons were aged 60 years and over. The employed population of Gorj County represented 142.4 thousand persons, of which 42.3 thousands were working in agriculture, 44.7 thousands in industry, and 8.8 thousands in constructions, on the 31<sup>st</sup> of December 2004. The evolution of average numbers of employees in Gorj County decreased from 92 thousand persons in 1999 to 83 thousand persons in 2004 (Figure 1).

**Figure 1:** Evolution of the average number of employees in Gorj County  
1999-2004 -thousand persons-



\*Source of data: Romanian Year Book 2005, pp. 192

On the 31<sup>st</sup> of December 2005 the number of unemployed persons in Gorj County reached 14252 persons, of which 6139 women, 2531 of them coming from the private sector. The unemployment rate at the same date was of 9.2% and the female unemployment rate was of 8.6%. Gorj County holds the third place in the country in respect of the registered unemployment rate.

As to the unemployed registered in Gorj County, they totalized 7433 persons on the 31<sup>st</sup> of December 2005, of which 3029 women. 6808 persons registered as unemployed had a secondary school and vocational educational level (2675 were women), 485 persons registered as unemployed had a high school and post high school educational level (274 women) and 140 persons were university graduates (80 women)<sup>1</sup>. (Figure 2).

<sup>1</sup> Statistics offered by the Ministry of Labour, Social Solidarity and Family  
<http://www.mmssf.ro/website/ro/statistici/somaj53.pdf>

**Figure 2: Unemployment by level of education in Gorj County (%)**  
-31 Decembre 2005-



\*Source of data: Ministry of Labour, Social Solidarity and Family  
<http://www.mmssf.ro/website/ro/statistici/somaj53.pdf>

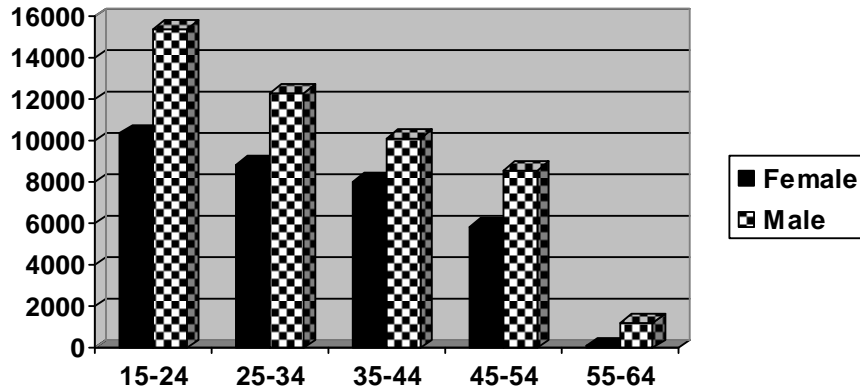
Statistical data analysis, as part of the project “The Role of Education for the Duration of Unemployment” is based on data offered by the National Agency for Employment of Romania (NAE). Although the Romanian research team filed an application to NAE in June 2006, in order to obtain data for the whole country, at the end of August 2006 we received only the database for Gorj County.

Using techniques to estimate models for duration data, like the Kaplan Meier method and Cox’s proportional hazard model, we tried to answer to the following question: does the education level influence the duration of unemployment in Gorj County? The influences of age and gender on duration of unemployment spells are also estimated.

## 2. Empirical analysis

For the empirical analysis we used data offered by the National Agency for Employment of Romania. The database has individual information about all the subjects registered at NAE during January 1, 2002- August 31, 2006. The sample contains 80961 registrations, with information concerning the start date and end date of the unemployment spells, sex, age, educational level and the reason of unemployment leaving for each registered person. Among the 80961 subjects, 33270 are women (41.1%) and 47691 men (58.9%). In figure 3 there is presented the distribution of the subjects in the database by sex variable and by age.

Figure 3: The unemployed registered in the database for the analyzed period by sex and age (years).



The minimum duration of unemployment spells, in months, is 0 and its maximum duration of 57 months, with an average of 8.8 months and median of 6 months. For the analyzed period, 53.6% of the total of registered persons (with the date of unemployment end) were in short and average duration of unemployment, 34.3% of the registered persons being in long duration of unemployment.

Figure 4: Histogram for the variable duration of unemployment spells (months)

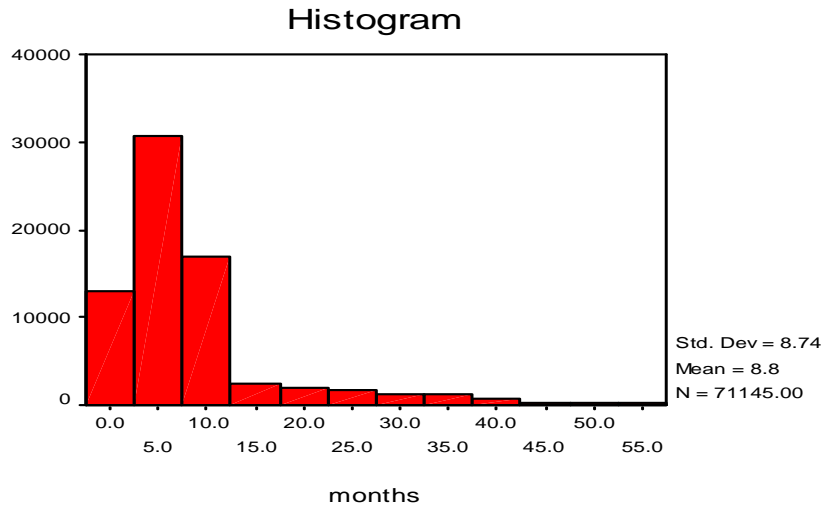
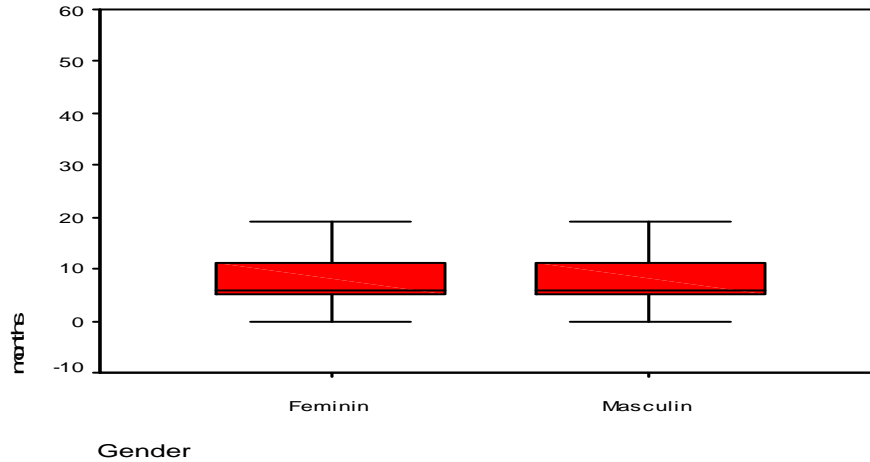


Figure 5: Box plot depicting the duration of unemployment spells (months) for both sexes



As we can notice the male unemployment in Gorj County for the analyzed period is higher than the female unemployment, and for the unemployed men it lasts longer than for women (the more the unemployment period lasts, the more differences between male and female unemployment increase). Taking into account the fact that the number of women in Gorj County that are able to work is higher than the number of men, we draw the conclusion that differences between the number of women registered as unemployed and the number of men are a direct consequence of the continuous reorganisation, after 1992, of the mining sector, thermo energetic and oil tanker in the Gorj County area, with negative effects on men belonging to all educational levels, employed in these jobs. As can be seen, both from figure 10 there is a slight difference between the duration of unemployment of male and female; male have to wait approximately 9 months to get employment and women 8 months.

The average age of the persons registered in the database is of 32.58 years, and the median is of 32 years. As one can notice in figure 6, most of the unemployed registered in the database are aged between 15-35 years; the youngest subject is 15 years and the oldest is 62. The high number of young unemployed registered in Gorj County shows that young people cannot find a job after finishing their studies, as the labour market in the county is not ready to receive them. The age distribution is positively skewed (Figure 6).

Figure 6: Histogram for the variable age of unemployed

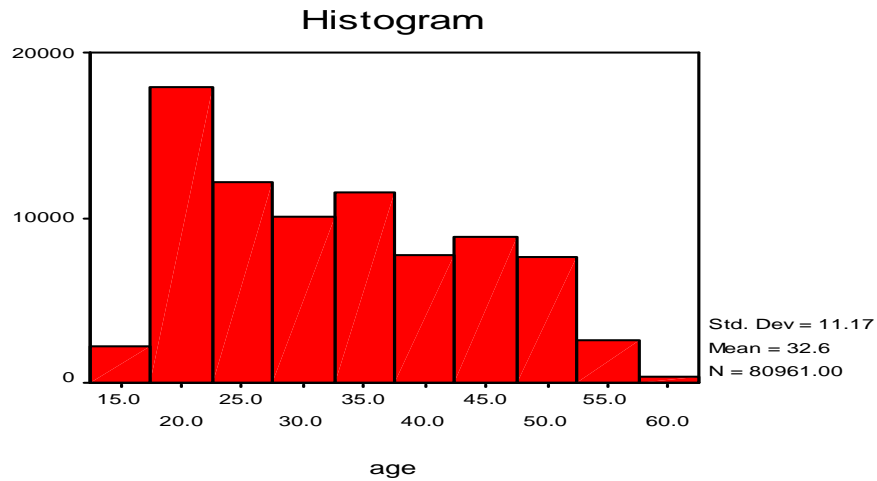
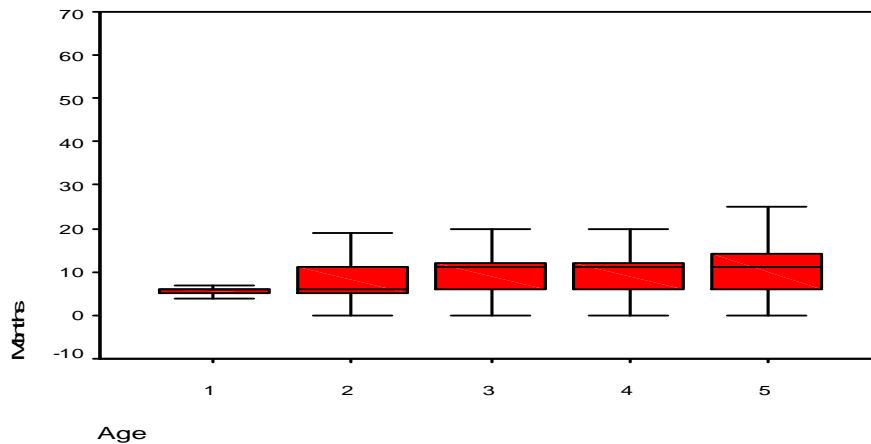


Figure 7 presents the duration of unemployment spells for five age groups. The median duration of unemployment spells increases with the age increasing. As it can be seen, the interval of duration of the unemployment spells becomes wider with age increasing: 6.03 month for 15-24 years, 9.30 for 25-34 years, 10.53 for 35-44 years, 11.17 for 45-54 years, 12.47 for 55-64 years.

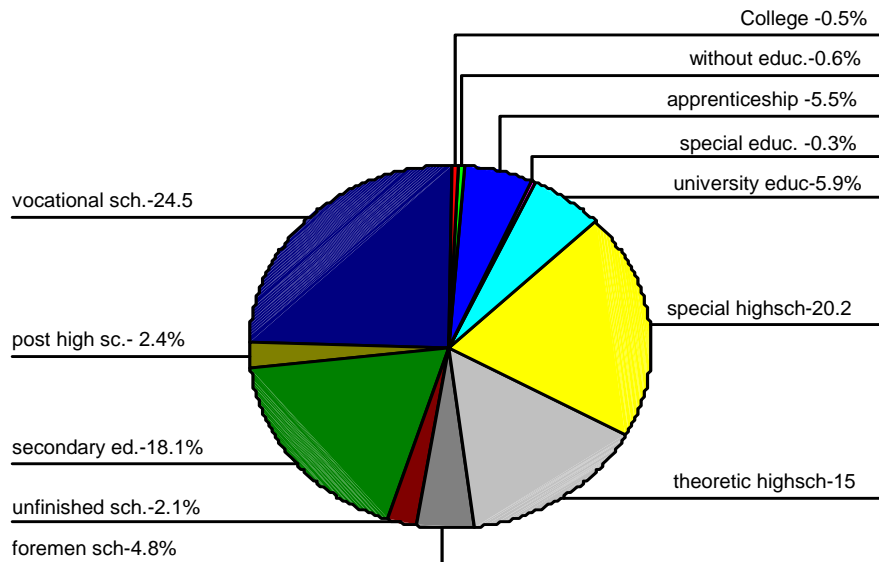
Figure 7: Box plot depicting the duration of unemployment spells (in months) for five age groups





Regarding the educational level, 4816 persons (5.9%) registered in the database are university graduates, 369 (0.5%) registered persons have college as educational level, 1982 (2.4%) graduated from post high school, 16390 (20.2%) graduated from speciality high school, 12165 (15.0%) graduated from theoretical high school, 221 (0.3%) are special education graduates, 19849 (24.5%) have vocational school, 3856 (4.8%) graduated from foremen school, 4437 (5.5%) are apprenticeship complementary education graduates, 14653 (18.1%) graduated only from secondary school, the educational level for 1703 (2.1%) is unfinished secondary school, and 520 persons (0.6%) are without education. (Figure 8)

Figure 8: Pie for the variable level of education.



In Romania, the number of study years corresponding to these educational levels is: graduated secondary school – 8 years, graduated vocational school – 10 years, graduated foremen school – 14 years, graduated post high school (sanitary, economic, industrial) – 14 years, graduated theoretical high school – 12 years, graduated special education for disabled persons - 10 years, graduated speciality high school (vocational, music, sports, plastic arts high schools, pedagogical high schools, industrial high schools, agricultural high schools) – 12 years in present, but for the persons registered in the database that are aged over 40 years the number of the years of study for this education form is of 13 years, because at that time 5 years were needed in order to graduate such a high school, graduated college – 15 years, graduated tertiary education – 16 years or 17 years, according

to the specialization; 5 years of study are necessary for the technical university education in Romania. We have also in our database persons registered with unfinished secondary school, with less than 8 years of study, situation in which, in the statistical analysis we have rated them with 6 years of study. There are also persons declared without education, these registrations being ascribed the value 0 for the years of study. Unfortunately the received data do not provide information about the registered unemployed post university education graduates, (master's or doctorate graduates). In data processing we have grouped persons by their educational level in 5 groups: group 0 - without graduated school, group 1- unfinished secondary school, secondary school, vocational school, apprenticeship complementary education, special education, with the maximum number of 10 years of study, group 2- theoretical high school, speciality high school, with 12 respectively 13 years of study, group 3 – foremen school and post high school with 14 years of study and group 4 corresponding to university education, (with short form – college), with 15, 16 and respectively 17 years of study. In table 1 there is presented the distribution of the persons registered in the database by age (years) and the educational level.

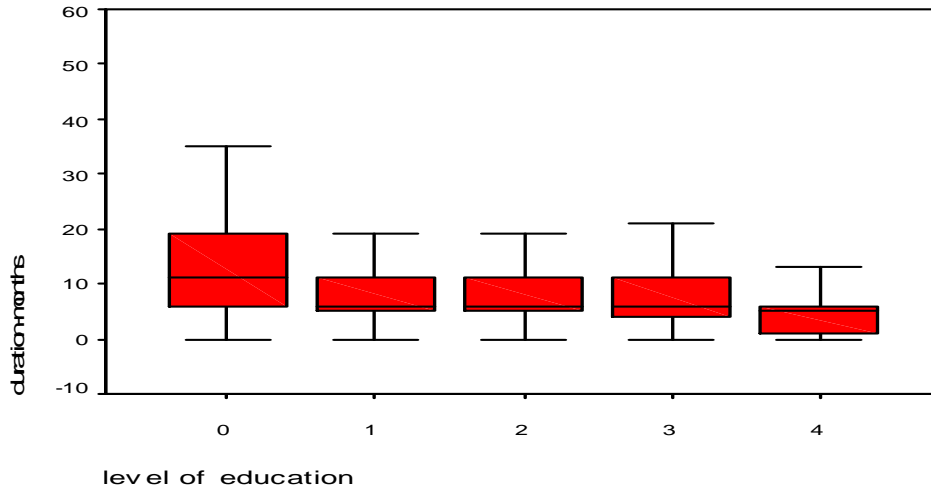
Table 1: Distribution of unemployed by age and educational level

| Age   | Groups by educational level |       |       |      |      | Total |
|-------|-----------------------------|-------|-------|------|------|-------|
|       | 0                           | 1     | 2     | 3    | 4    |       |
| 15-24 | 106                         | 13002 | 9482  | 893  | 2293 | 25776 |
| 25-34 | 142                         | 10121 | 8428  | 877  | 1570 | 21138 |
| 35-44 | 108                         | 9128  | 7612  | 699  | 678  | 18225 |
| 45-54 | 151                         | 8027  | 2764  | 2964 | 546  | 14452 |
| 55-64 | 13                          | 585   | 269   | 405  | 98   | 1370  |
| Total | 520                         | 40863 | 28555 | 5838 | 5185 | 80961 |

We can notice from the table that most of the unemployed (51.11%) are people with low educational level, (maximum 10 years of study), followed by high school graduates (theoretical or speciality high school)-35.27%. From the total of the persons registered as unemployed in Gorj County for the analyzed period, only 6.40% is represented by university graduates, education playing an important part in finding a job. Young people aged between 15-34 years and a low or average educational level register the highest values; high values are also registered by persons aged between 45-54 years and a low educational level, of maximum 10 years of study.

In order to use the box-plot as a visual aids, we have grouped educational levels as it follows: group 0 - without education; group 1: unfinished secondary school, secondary school, vocational school and apprenticeship complementary education and special education; group 2: theoretical high school, speciality high school, group 3: foremen school and post high school; group 4: college, university education. It is obvious that the duration of unemployment is higher for the lower levels of education and lower for the higher levels of education. The highest mean length of unemployment spells for the unemployed without education is approximately 13 months and the lowest mean registered is for the level four, university education, only 5 months.

Figure 9: Box plot depicting the duration of unemployment (in months) for different levels of education.



In table 2 we have descriptive statistics for the duration of unemployment spells in months and the variables sex, educational level and age.

Table 2: Descriptive statistics for the duration of unemployment spells (in months)

|   | N     | Mean  | Std.Dev. | 95% conf. interval for the mean |
|---|-------|-------|----------|---------------------------------|
| Total   | 71145 | 8.82  | 8.74     | (8.75, 8.88)                    |
| Factor Sex  |       |       |          |                                 |
| Male  | 47691 | 9.32  | 9.56     | (9.23-9.41)                     |
| Female  | 33270 | 8.03  | 7.17     | (7.94, 8.11)                    |
| Factor: Education   |       |       |          |                                 |
| Level 0 – without education   | 440   | 12.78 | 9.26     | (11.92-13.65)                   |
| Level 1<br>Unfinished secondary school,<br>secondary school,<br>vocational school and apprenticeship<br>complementary education | 35683 | 9.16  | 8.53     | (9.08-9.25)                     |

|   |       |       |       |               |
|---|-------|-------|-------|---------------|
| Special education   |       |       |       |               |
| Level 2<br>Theoretic high school,<br>speciality high school | 25456 | 8.77  | 9.01  | (8.66-8.88)   |
| Level 3<br>Foremen school and post high school              | 5012  | 9.69  | 10.16 | (9.41-9.97)   |
| Level 4<br>college, university education                    | 4554  | 5.05  | 5.44  | (4.89-5.21)   |
| Factor: Age   |       |       |       |               |
| 15-24 years   | 24015 | 6.03  | 6.27  | (5.95-6.11)   |
| 25-34 years   | 18960 | 9.30  | 9.38  | (9.17-9.44)   |
| 35-44 years   | 15338 | 10.53 | 9.31  | (10.38-10.68) |
| 45-54 years   | 11727 | 11.17 | 9.46  | (11-11.35)    |
| 55-64 years   | 1105  | 12.47 | 10.56 | (11.84-13.05) |

We used the non-parametric Kruskal-Wallis test in order to test the null hypotheses that the mean duration of unemployment spells is the same for each of the levels of the factors sex, age and level of education. The result shows that we can reject the null hypothesis.

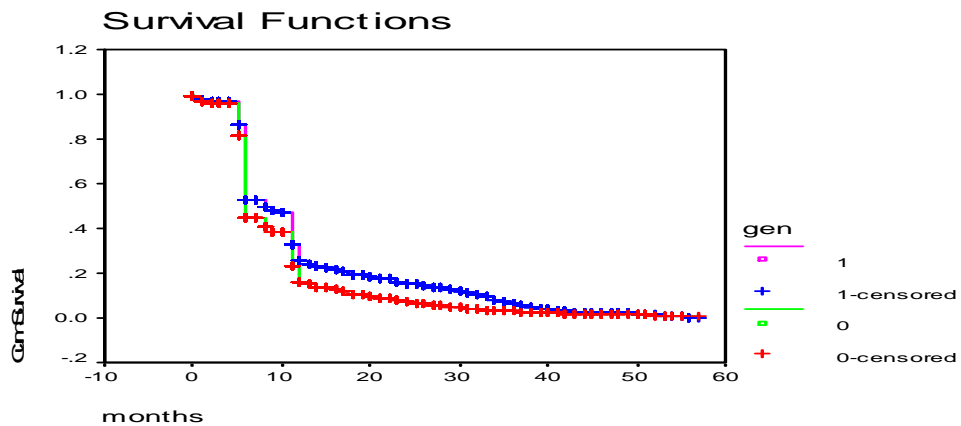
### 3. Kaplan Meier survival analysis

The Kaplan-Meier method is a nonparametric (actuarial) technique for estimating time-related events (the survivorship function). The Kaplan-Meier technique is usually only useful as a method of preliminary evaluation, since it is purely a descriptive method for the evaluation of one variable. The survival curve of this method is scalariform because the proportion of subjects who have the chance to continue observation without the occurrence of the pre-established event changes exactly at the moments when the pre-established event is achieved. The survival level is of 100% from the curve origin until the moment of the first occurrence of the event (employment in our case), where it drops to the new calculated value, that constitutes a new level during which survival is constant, until the next event achieved. Therefore, every step corresponds to the occurrence of one or several pre-established events.

For our survey the pre-established event is employment, this event being ascribed the value 1, the number of the subjects who achieved the event at the end of the analyzed period being of 19369, representing only 23.9% of the total of subjects; the rest of 61592 subjects representing 76.1% of the total either did not achieve the event, or their track has been lost (they don't have the date of unemployment leaving), they have been censored at the right side, being ascribed the value 0.

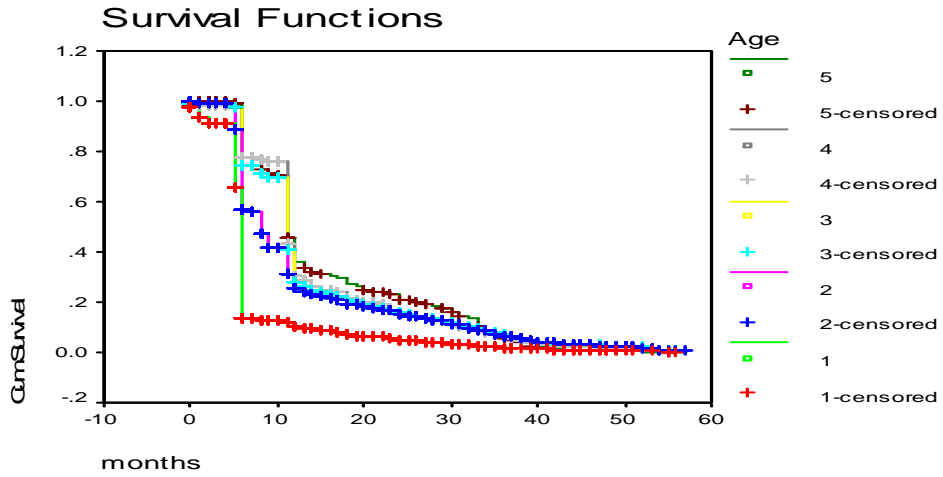
In figure 10 there is presented the survival curve for the women and men in the database. The qualitative sex variable has been codified, 1 representing men, 0 representing women. The results suggest a significant difference in probabilities of remaining unemployed between female and male (we have a higher probability of remaining unemployed for male rather than for female). The median unemployment duration for female is 10 months and for male is 13 months. After 40 months the curves coincide.

Figure 10: Survival function estimates for male and female unemployed



In figure 11 there is presented the survival curve for the age groups 15-24 years, 25-34 years, 35-44 years, 45-54 and 55-64 years. Applying Kaplan-Meier analysis we have:

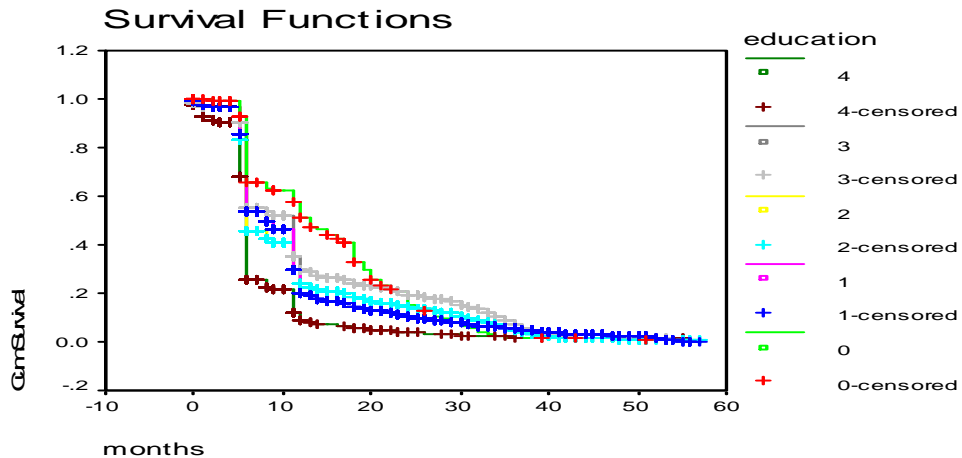
Figure 11: Survival function estimates for the age groups 15-24 years, 25-34 years, 35-44 years, 45-54 and 55-64 years



We can notice that the probability of remaining unemployed increased with age. The older persons are at a disadvantage on the labor market of Gorj County. The median unemployment duration for the age group 15-24 years is 6 months; for the age group 24-34 years is 8 months, for the age group 35-44 years is 11 months, for the age group 45-54 is 11 months and for the age group 55-64 is 11 months. The differences observed are statistically significant.

In figure 12 there is presented the survival curve for the level of education. Applying Kaplan-Meier analysis we have:

Figure 12: Survival function estimates for the five groups of education



We can notice that the probability of remaining unemployed is higher for the persons without education, followed by the persons with foremen school and post high-school and the lowest probability of remaining unemployed is for the persons with university education. For the group 4, university education level (faculty and college) the probability of unemployment at time  $t$  or later decreases much more rapidly, indicating that the unemployed with the higher education have better opportunities in the labour market of Gorj County. We can notice in the figure 3 that after 40 unemployment months curves start to coincide and the educational level no longer influences the probability of finding a job.

Testing the statistical signification for Kaplan Meier method presupposes the choice of one of the two hypotheses: the null hypothesis, which supposes that curves should be the same for two or several levels of a specified factor, or the alternative hypothesis, which supposes that they should be different. With this purpose we used the log rank test with Chi-Squared distribution under the null. For all three factors, the highly significant  $p$ -values (lower that  $10^{-6}$ .) confirm the results derived graphically from the Kaplan-Meier estimates of the survival functions.

#### 4. Cox analysis

In order to study the impact of the level of education on the length of unemployment spells in Gorj County, we used the Cox proportional hazard model. The hazard function is the probability that an event occurs at time  $t$ , conditional on it has not occurred till that time. The hazard function suggested by Cox is  $h_i(t) = e^{x_i\beta} h_0(t)$ , where  $x_i$  represents the covariate values,  $\beta$  represents the regression coefficients,  $h_i(t)$  is the hazard function and  $h_0(t)$  is the baseline function. In Table 3 are given the results of the omnibus tests of the model coefficients (using SPSS 10.0). The score chi-square statistic and the likelihood ratio show the fact that we can reject the null hypothesis.

Table 3: Omnibus tests of the model coefficients

| -2 Log Likelihood | Overall (score) |    |      | Change From Previous Step |    |      | Change From Previous Block |    |      |
|-------------------|-----------------|----|------|---------------------------|----|------|----------------------------|----|------|
|                   | Chi-square      | df | Sig. | Chi-square                | df | Sig. | Chi-square                 | df | Sig. |
| 224183,716        | 694,546         | 9  | ,000 | 625,135                   | 9  | ,000 | 625,135                    | 9  | ,000 |

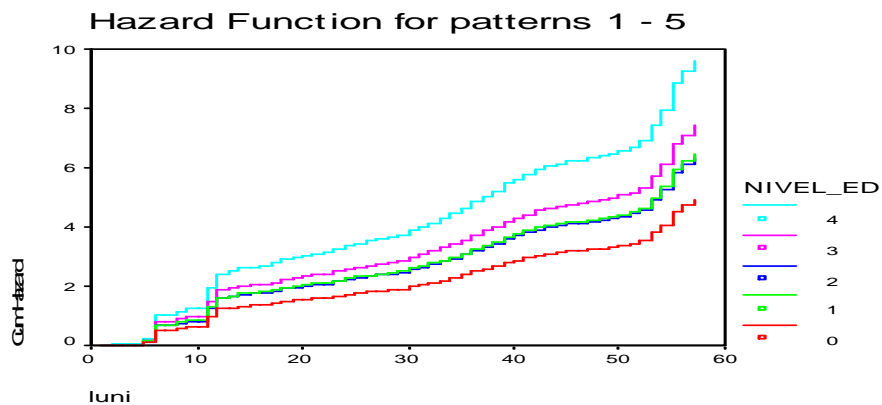
In Table 4 are presented the results of the Cox regression analysis B is the estimate vector of the regression coefficients.  $\text{Exp}(B_p)$  is the predicted change in the hazard for each unit increase in the covariate.

Table 4: Variables in the equation

|              | B          | SE   | Wald    | df | Sig. | Exp(B) | 95,0% CI for Exp(B) |       |
|--------------|------------|------|---------|----|------|--------|---------------------|-------|
|              |            |      |         |    |      |        | Lower               | Upper |
| Age          | -,002      | ,009 | 0,041   | 1  | ,000 | ,998   | ,981                | 1,016 |
| Sex          | -,151      | ,021 | 54,002  | 1  | ,000 | ,860   | ,826                | ,895  |
| Education    |            |      | 428,441 | 4  | ,000 |        |                     |       |
| Education(0) | -<br>1,284 | ,143 | 80,382  | 1  | ,000 | ,277   | ,209                | ,367  |
| Education(1) | -,745      | ,038 | 387,847 | 1  | ,000 | ,475   | ,441                | ,511  |
| Education(2) | -,748      | ,039 | 368,430 | 1  | ,000 | ,473   | ,438                | ,511  |
| Education(3) | -,701      | ,051 | 191,203 | 1  | ,000 | ,496   | ,449                | ,548  |

As we can notice from table 4 the hazard for the unemployment spell to end is 14% lower for the female unemployed than for the male unemployed. With increased age, the hazard is reduced by 0.2% each year. All other levels of education yield significant hazard ratios of less than 1 with a decreased risk for the unemployment spell to end. The hazard ratio is the lowest for the level 0 - without education - 0.209 and the highest for level 3 - foremen school and post high school (0.496). As we expected, the hazard ratio increased with higher levels of education. We can notice the fact that the hazard ratio for the level 1 - unfinished secondary school, secondary school, vocational school and apprenticeship complementary education, special education, speciality high school is slightly higher than for the level 2 - theoretic high school, speciality high school. The cumulative hazard functions for different levels of education are presented in Figure 13.

Figure 13. Cumulative hazard functions for different levels of education





#### 4. Conclusions

Survival analysis of the duration of unemployment spells give the following results:

In respect of the duration of unemployment, persons with university education level remain unemployed for 5 months on the average, unlike persons without education, who remain unemployed for 13 months on the average, and persons with maximum 10 years of study, who remain unemployed for 9 months on the average. As for age, for the group 15-24 years 20.75% leave unemployment by becoming employed, 30.76% of the young people aged between 25-34 years registered in the database leave unemployment by becoming employed, 32.07% of the persons aged between 35-44 years become employed during the analysed period, 28.82% is the percent corresponding to the age group 45-54 years respectively 23.07% for the age group over 55 years. The age group 15-24 years is disadvantaged on the labour market by the lack of experience, a considerable number of them become unemployed after graduation. But the duration of unemployment is on the average the smallest for the age group 15-24 years, 6 months, compared to 9 months for the group 25-34 or 13 months for the group over 55 years. Regarding the variable gender, of 33270 women registered in our database 19.21%, leave unemployment by becoming employed and of 47691 men registered 27.21% leave unemployment by becoming employed. But the duration of unemployment is smaller for women with about a month on the average.

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## STRATEGIC ASPECTS OF GLOBAL PHARMACEUTICAL INDUSTRY

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**ABSTRACT.** Globalisation process has increased competition among pharmaceutical companies and caused a fierce fight for global market share and customers' loyalty. Nowadays, pharmaceutical industry faces new strategic challenges as a number of newly launched innovative blockbuster products is steadily decreasing despite heavy multi billion dollar investments in research and development. Intensive process of concentration is taking place in all these industry segments - originators, generic companies and specialists. Further consolidation of the industry on the global scale can be realistically forecasted as the competition for tomorrow will be predominantly among coalition of companies and stand-alone companies. Global pharmaceutical companies will cooperate and compete at the same time. Globalisation process will further spur mergers and acquisitions in the pharmaceutical industry and we will see even bigger pharmaceutical conglomerates and more oligopolisation in the future.

**JEL Classification:** G 34, M 14

**Keywords:** global pharmaceutical industry, originators, generic pharmaceutical industry, oligopolisation, consolidation.

### 1. Introduction

Global pharmaceutical industry is structurally not unique as pharmaceutical companies differ according to their basic vision and development. We define three different groups of pharmaceutical companies (Kesič, 2006):

- companies which focus primarily on basic research, development, and marketing and sales of brand new, innovative pharmaceutical products (so called originators),

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- companies which work primarily on development and sales of generic products (so called generic or copycat producers),
- companies which focus primarily on basic research and development of biotechnology and pharmacogenomic products and technologies of new delivery systems (so called specialists).

Strategic development of pharmaceutical industry shows clearly its significant consolidation on the global scale and strong market orientation. Unprecedented development in the field of basic sciences and technological knowledge has overtaken incumbent management knowledge and had a big impact on strategic business performance of pharmaceutical companies in the race for global market share.

Global pharmaceutical market has been growing steadily in the last decade. In the year 2005, global pharmaceutical market posted total sales of 602 billion dollars and a growth rate of 10-percent (see Figure 1). It is estimated that global brand pharmaceutical market will grow by an average 7-percent CAGR (Compounded Annual Growth Rate) till the year 2010 (World Review 2005). However, global generic market is expected to grow even faster by an average 12-percent CAGR till the year 2010 (World Review 2005, Pharma Strategy Group, 2005) due to several factors like the expiration of patent protection of some of blockbuster pharmaceutical products, worldwide healthcare cost reduction and ageing of population.

Figure 1: Global pharmaceutical market in 2005

| Region                | Value in billion<br>US \$ | Market share in % | Growth in % |
|-----------------------|---------------------------|-------------------|-------------|
| North America         | 283                       | 47.0              | 5.2         |
| Europe                | 181                       | 30.0              | 7.1         |
| Japan                 | 64                        | 10.7              | 6.8         |
| Asia/Africa/Australia | 49                        | 8.1               | 11          |
| Latin America         | 25                        | 4.2               | 18.5        |
| Global market         | 602                       | 100.0             | 10.0        |

Source: World Review 2005, 10-15

Leading pharmaceutical markets in terms of sales as well as per capita consumption of medicines are the U.S., Japan and Germany (see Figure 2). The U.S. pharmaceutical market represents over 40-percent of global pharmaceutical market in the year 2005. This reflects the fact that the U.S. pharmaceutical market has some specific factors which distinguish it from the other markets like: generally free pricing policy of medicines which is not the case with other markets which

have regulated reference pricing systems, especially the EU, high consumption of medicines, intensive marketing and fierce competition.

Figure 2: Leading pharmaceutical markets in 2005

| Position | Markets        | Value in billion US\$ |
|----------|----------------|-----------------------|
| 1.       | USA            | 248                   |
| 2.       | Japan          | 67                    |
| 3.       | Germany        | 29                    |
| 4.       | France         | 26                    |
| 5.       | United Kingdom | 17                    |
| 6.       | Italy          | 16                    |
| 7.       | Canada         | 14                    |
| 8.       | Spain          | 12                    |
| 9.       | Brasilia       | 9                     |
| 10.      | Mexico         | 8                     |

Source: own estimation, according to IMS Health

## 2. Global players and global products

Leading ten pharmaceutical companies currently command over 42-percent of global pharmaceutical market (see Figure 3). Just ten years ago, it was only 30-percent. This clearly suggests how fast the consolidation, mainly through mergers and acquisitions, has taken place and changed the map of global players.

Figure 3: Leading innovative pharmaceutical companies in 2005\*

| Position | Company         | Country of origin | Sales in million US\$ | Global market share in % |
|----------|-----------------|-------------------|-----------------------|--------------------------|
| 1.       | Pfizer          | U.S.A.            | 44,284                | 7.4                      |
| 2.       | Sanofi-aventis  | France            | 33,592                | 5.6                      |
| 3.       | GlaxoSmithKline | U.K.              | 32,096                | 5.3                      |
| 4.       | Novartis        | Switzerland       | 24,956                | 4.1                      |
| 5.       | AstraZeneca     | U.K.              | 23,950                | 4.0                      |
| 6.       | Johnson&Johnson | U.S.A.            | 22,300                | 3.7                      |

|     |          |             |        |     |
|-----|----------|-------------|--------|-----|
| 7.  | Merck&Co | U.S.A.      | 22,030 | 3.7 |
| 8.  | Roche    | Switzerland | 21,470 | 3.6 |
| 9.  | Wyeth    | U.S.A.      | 15,321 | 2.5 |
| 10. | BMS      | U.S.A.      | 15,254 | 2.5 |

\* according to consolidated sales of pharmaceuticals and vaccines  
Source: own estimation according to official company data

Competition among global players has increased tremendously; nowadays, global customers have more options to choose from and it is more difficult to count on their loyalty. We forecast, taking into consideration aforementioned factors, further consolidation and concentration of global pharmaceutical industry. We expect the formation of even bigger pharmaceutical concerns in all three sectors of pharmaceutical industry. We notice intense concentration of generic pharmaceutical industry in the last couple of years and transformation of country-based or regional players to truly global generic pharmaceutical companies (see Figure 4).

Global pharmaceutical industry has reshaped during the last decade, most notably through the process of concentration in all three sectors; numerous mergers and acquisitions have significantly consolidated the industry. Some representative mergers and acquisitions in the industry that illustrate the current situation (Kesič, 2003):

- in the group of originators: acquisition of Warner Lambert and Pharmacia by Pfizer; merger of GlaxoWellcome and SmithKlineBeecham to form GlaxoSmithKline; merger of Astra and Zeneca to form AstraZeneca; merger of Ciba Geigy and Sandoz to form Novartis;
- in the group of generic companies: leading Israeli company Teva has consummated more than ten acquisitions in the last decade including U.S. generic company Ivax; Swiss Sandoz which is a generic group of Novartis has acquired as well several generic companies worldwide including Lek in Slovenia, Hexal in Germany and Eon Labs. in the U.S.; recently Barr Pharmaceuticals acquired Croatian pharmaceutical company Pliva,
- in the group of specialists: U.S. biotech company Amgen has been acquisitive in the last five years, predominantly in the U.S., having acquired four specialists in the same group segment.

Figure 4: Leading generic pharmaceutical companies in 2005

| Position | Company                 | Sales in billion US \$ |
|----------|-------------------------|------------------------|
| 1.       | Teva, Israel            | 5.3                    |
| 2.       | Sandoz, Germany         | 4.7                    |
| 3.       | Merck Generics, Germany | 2.3                    |
| 4.       | Ivax *, U.S.A.          | 1.8                    |
| 5.       | Ratiopharm, Germany     | 1.7                    |
| 6.       | Watson, U.S.A.          | 1.65                   |

\* Ivax sales is to be included into Teva's sales from July, 2006

Source: own estimation, according to pharma companies official reports

The blockbuster products, i.e. human medicines with sales potential of at least one billion dollars annually, are the main growth generator of global brand pharmaceutical industry (see Figure 5). Innovative pharmaceutical companies compete on products' characteristics and therefore invest heavily into marketing activities in their endeavour to gain prescribers (doctors) /patients loyalty. They compete directly with each other and big global players (multinationals) invest over 25-percent of their revenues for marketing and sales activities.

Figure 5: Leading pharmaceutical products in 2005

| Position | Product/indication/company   | Sales in billion \$ |
|----------|--|---------------------|
| 1.       | Lipitor (atorvastatin) / hyperlipidaemia/<br>Pfizer  | 12.9                |
| 2.       | Plavix (clopidogrel) / preventive of<br>cardiovascular disorders (strokes) /<br>sanofi-aventis and BMS | 5.9                 |
| 3.       | Nexium (esomeprazol) / antiulcerant/<br>AstraZeneca  | 5.7                 |
| 4.       | Seretide/Advair (fluticazon+salmeterol) /<br>asthma/ GSK   | 5.6                 |
| 5.       | Zocor (simvastatin) / hyperlipidaemia/<br>Merck&Co.  | 5.3                 |

Source: own estimation according to IMS Health

It is evident that the number of new innovative products (being market launched for the first time) have been declining in the last years despite heavy investments into research and development (R&D) by multinationals thus raising strategic challenges to leading brand pharmaceutical companies (see Figure 6).

Figure 6: New innovative pharmaceutical products' launches worldwide from 2003 to 2005

| Year | Number of brand new launches (NAS) |
|------|------------------------------------|
| 2003 | 36                                 |
| 2004 | 30                                 |
| 2005 | 26                                 |

Source: World Review, 2005, 98-111

In our opinion, this is one of the key strategic issues for pharmaceutical industry. Why is it so important? It is evident that without new blockbuster products pharmaceutical companies can not generate additional revenues in order to enable sustainable growth in the long run. Without new blockbusters they can not create enough added value in the long run to finance required heavy investments into the R&D (around 15-percent of revenues) and S&M (around 25-percent of revenues) activities. Development of new products is so important in the pharmaceutical industry that companies choose practically all available avenues to reach the targets, including acquisition of competitors.

Lack of new innovative products in the coming years is expected to further increase competition among big players and intensify fight for market share and global customers' loyalty. Marketing way of thinking and performing together with prudent market orientation will prevail.

### 3. Globalisation and pharmaceutical industry

We can say that globalisation is almost a synonym for a modern economy. Globalisation processes could not be possible without fast and profound technological achievements and changes. Nowadays, global competition is mostly based on the knowledge, technology and ability to serve the customers' needs. Technological innovation, human capital and market knowledge have become the basic and the most important competition factors among companies and countries, too. Globalisation has become a synonym for economic liberalisation and opening of world economy. The most active subjects of globalisation process are transnational or multinational companies. They have caused that less and less international exchange of goods is really free exchange as increasing proportion is managed by intercompany goods or services and controlled by parent multinationals.

The global market is becoming oligopolistic, i.e. controlled by a limited number of multinational companies. OECD (1993) defines globalisation as »spreading and deepening of companies performance with the target to produce and sell goods or services on multiple markets«. Later definition of globalisation



from OECD (1994) indicates that » we may define globalisation as a developing pattern of international business cooperation, which includes investments, trade and contractory ways of cooperation, and targets the development of products, production, procurement and marketing. Such kind of international performance enables the companies to conquer new markets, use their technological and organisational advantages and to lower the costs and risks.«

The main drivers of globalisation are transnational companies. The following characteristics are significant for their performance, taken into consideration multinational pharmaceutical companies:

- multinational companies have good market position on the most important and strategic world markets,
- they integrate globally and connect their business performance, so national identity is no longer important,
- they perform flexible purchasing strategy,
- have global structure of production,
- have global organisation of research and development activities,
- have global marketing organisation which supports the market orientation and strategic focus on customers.

We emphasize that globalisation is, in its core meaning, a complex market conditioned world process. It is driven by ever changing ways of doing business and ever increasing competition in strive to optimally identify changing needs of global customers. Svetličič (1996) defines globalisation as:

- multidimensional process, which includes economic, political, legal and cultural contents, which together create new quality,
- globalisation means global internationalisation or at least internationalisation of activities such as trade, foreign direct investments (FDI), contractual ways of international economic cooperation in the most important markets,
- globalisation supports common alliancing, which needs global coordination and integration of activities in the brand new manner,
- globalisation means production of , on the basis same products, for domestic consumption and foreign markets as well, and are able to satisfy local needs and habits,
- globalisation means high share of components from foreign suppliers in the products for domestic consumption and for the export as well.

Customers should be treated as the most precious value of every company. Bartlett and Ghosal (1989) underline that »successful companies of today and tomorrow are these who would be able at the same time to satisfy local market needs, to increase global successfulness, to strive for constant innovativeness and to constant global learning.«

Drucker (1993) mentioned five important elements of development which would influence greatly the strategies, structure and performance of future companies:

- economic relations would be performed in the direction among trade blocs instead of countries,

- business performance would be more and more matter of strategic partnerships which would be integrated into a world economy,
- restructuring of business would be intensifying and more globalising, it would be important to have information and knowledge,
- strategic management of companies would be decisive for a competitive success,
- intensive market orientation of companies would be a core advantage for achieving a competitive advantage over competitors.

Global pharmaceutical industry has been in the intensive process of concentration and consolidation for a period of more than 15 years. We argue that research and development and marketing activities are two the most important strategic priorities of modern pharmaceutical companies. Main characteristics of global pharmaceutical industry are the following:

- huge investments into R&D,
- lack of new innovative products to drive sales growth,
- fast concentration process of the industry,
- global marketing and sales activities which require large investments,
- increased competitiveness,
- changed structure and ways of competition among global players,
- country reforms of their health care systems,
- increased importance of regulatory issues (registrations, intellectual property, law-suits).

According to Datamonitor study (2005), there have been more than 10,000 various processes of forging alliances, mergers and acquisitions (AMA) in the last decade in the pharmaceutical industry. We indicate that the consolidation processes have been carried out in all three segments of global pharmaceutical industry (innovative pharmaceutical companies, generic producers and specialists). Global consolidation has created new players, some previously well known and respected pharmaceutical companies have disappeared from the global scene. For example, leading pharmaceutical company Pfizer is nowadays composed of five big former multinational pharmaceutical companies - Pfizer itself, Warner Lambert, Upjohn, Searle and Pharmacia. GlaxoSmithKline is amalgamation of four companies - Smith, Kline, Beecham, Glaxo and Wellcome. Leading generic player Teva has acquired over 10 generic companies including Lemmon, Gry, Prosintex, Biogal, Human, Biocraft, Pharmascience, Copley, Novofarm, Bayer Classics, Sicor and Ivax to form today's Teva. German generic player Sandoz, second largest generic player worldwide, has acquired a great portion of generic pharmaceutical industry, among others Biochemie, Labinca, Lagap, BASF Pharma (Knoll) Generics, Apothecon, Lek, Amifarma, Sabex, Hexal and Eon Labs.

We argue that global pharmaceutical industry is becoming increasingly oligopolistic. We concur with Knickerbrocker's theory of oligopolistic reaction. Knickerbrocker (1973) defines oligopolistic companies as minimizers of risk taking in order to avoid the destroying effects of competition and followers of each others' entries to new markets to protect their own interests. It is important to observe the fact that actions of one player create reaction of competitors; action

creates reaction and so the story of oligopolisation continues. Knickerbrocker's theory illustrates and explains the process of consolidation of global pharmaceutical industry. Global pharmaceutical companies have to follow the 3-F strategy (Kesič, 2000) - to be fast, focused and flexible - in their strategic orientation and corporate performance.

In light of the aforementioned, we argue further that globalisation process will continue at even faster pace in the future as global pharmaceutical companies try to follow their competitors' strategies of M&A (mergers and acquisitions) in endeavour to maintain the global market position and long-term competitiveness. Magnitude of consolidation process of pharmaceutical industry on global scale marked by a large number of consummated acquisitions in 2006 (see Figure 7) confirms the theory of fast oligopolisation of global pharmaceutical industry and its future trends.

Figure 7: Overview of M&A process in 2006

| Target                  | Acquirer                     | Creating of synergies                       |
|-------------------------|------------------------------|---|
| Schering AG, Germany    | Bayer, Germany               | R&D, markets, marketing&sales               |
| Hemofarm, Serbia        | Stada, Germany               | markets, products, sales                    |
| Serono, Switzerland     | Merck KGaA, Germany          | R&D, markets, marketing&sales               |
| Schwarz Pharma, Germany | UCB, Belgium                 | R&D, products, markets, marketing&sales     |
| Altana Pharma, Germany  | Nycomed, Denmark             | R&D, markets, products, marketing&sales     |
| Hospira, U.S.A.         | Mayne Pharma, Australia      | products, markets, sales                    |
| Pliva, Croatia          | Barr Pharmaceuticals, U.S.A. | markets, products, R&D (biogenerics), sales |
| Abbott, USA             | Kos Pharmaceuticals, U.S.A.  | R&D, products                               |

Source: own estimation, according to official data

Due to described complexity of pharmaceutical industry we argue that pharmaceutical companies tend to form strategic alliances and compete at the same time. They cooperate on some particular projects (e.g., common R&D projects) and fiercely compete for market share. This is the C and C phenomenon of the industry, so called coopetition (cooperation and competition at the same time).

Svetličič (1996) thus properly observes that » strategic combinations of companies have become attractive due to:

- rising costs of innovation and entrance to new markets,
- reinforcing of cost reduction competition,
- pressure to enlarged gaining of synergistic technologies and economies of scale and synergy with help of strategic alliances and acquisitions,
- endeavour to protect existing market shares and to conquer new ones,
- rising need to shrink time, needed from an innovation to enter the market with a product«.

Svetličič (1996) stipulates »modern ways of internationalisation with aid of network formation and strategic alliancing enable internationalisation without growth of companies.» Nowadays, international companies in order to improve corporate performance have to:

- increase effectiveness,
- be closer to customers and their needs,
- gain better access to technologies and knowledge (know-how),
- protect from competitors (strategic reasons).

#### **4. Conclusion**

Global pharmaceutical industry has undergone intensive process of concentration and consolidation in all three industry sectors in the last decade that changed significantly the industry map. Globalisation process has a strong impact on the development of pharmaceutical industry. Increased competition and ever changing structure of global competitors impact the strategic orientation of pharmaceutical companies.

New strategic combinations, mainly through mergers and acquisitions, nowadays prevail as an avenue for growth. Through strategic alliances they tend to create and realise synergies in their endeavour to become truly global and long-term successful in order to continue with required development circles. We conclude that further consolidation of the industry on the global scale can be realistically forecasted as the competition for tomorrow will be predominantly among allied companies, among coalition of companies and stand-alone companies.

Global pharmaceutical companies will cooperate and compete at the same time We argue that globalisation will further spur mergers and acquisitions in the pharmaceutical industry and we will see even bigger pharmaceutical concerns and conglomerates in the future. At the same time, the process of consolidation of pharmaceutical industry will cause even more oligopolisation of pharmaceutical industry on the global scale and increase its bargaining power.

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