Modelling of the relation between financial market and growth in EU: convergence and behavioural regimes

Lucian-Liviu Albu
Institute for Economic Forecasting, Romanian Academy

Abstract

Generally in specialised literature it is accepted that, in a modern economy, between financial market and the growth should be a strong relation. Consequently, the real convergence in EU, already demonstrated last two decades, should be followed by a convergence in matter of financial market development. Unfortunately, today still there are huge discrepancies among countries or groups of countries in EU in matter of financial market, this being apparently irregular correlated with the real economy dynamics. Empirical evidences demonstrate a chronic underdevelopment of financial market in central and eastern countries of EU. In the same time, it seems that between financial market and the macroeconomic dynamics there is an atypical mismatch even in case of western countries. In this study we try to estimate few significant parameters related to the relation between financial market and macroeconomic variables. Further, based on them, we estimate some possible behavioural regimes, at least until the present ignored or only implicit treated in the standard analysis of convergence. In this area is located our contribution, trying to highlight the transition from one regime to another in matter of correlation between market capitalisation and GDP per capita, along with the increasing of development level.

Keywords: economic growth, convergence, market capitalization, nonlinear model, behavioural regimes

1. Introduction

Last decades, in the context of studying economic convergence, many studies in economic literature investigated the relation between financial markets and the dynamics of macroeconomic variables in different groups of countries in EU. Among relevant contributions, we can mention Goldsmith (1969), Geske and Roll (1983), Chen et al. (1986), Fama (1990), Lee (1992), King and Levine (1993), Levine and Zervos (1998), Levine (2004), Kenourgios and Samitas (2007), Fink et al. (2009), Ayadi et al. (2013), Albu et al. (2014), Lupu and Călin (2014), Albu et al. (2015) or Raileanu-Szeles and Albu (2015), Albu, 2016; Albu and Caraiani, 2016), etc.

Coming from our previous studies and based on recent published data, we present in this study main trends in EU both in matter of real convergence (evaluated by using GDP per capita in PPS or PPP) and in matter of development of financial market (evaluated by using market capitalisation as per cent of GDP). Based on empirical data, it seems that there are two opposite patterns in the dynamics of the correlation coefficient between GDP per capita level and market capitalisation. Along with a general continuous growth of GDP per capita, there is a descending trend of the correlation coefficient in case of EU11 (the group of less developed countries in EU) and there is an increasing trend in case of EU15 (the group of most developed countries in EU). Further, by combining available data we try to separate for the whole EU three linear behavioural

regimes, function of the level of GDP per capita. Finally, using a non-linear modelling approach we obtained a general simulation model that can highlight the existence of a number of different behavioural regimes, covering the whole scale of GDP per capita in EU.

2. Empirical evidences

In EU, especially after the year 2000, when the last waves of adhering new members from Central and Eastern part of Europe were registered, there was a significant convergence process. In order to show the trend of convergence in EU, the countries were grouped in two categories: EU15 (old members of EU, excluding the two small island countries Cyprus and Malta) and EU11 (former Eastern communist countries which adhered to EU after 2000).

For instance, GDP per capita (in euro PPS), as a share of the average EU28 level, increased in EU11 from 44.4% to 65.7% in 2014 and the same variable decreased from 116.0% to 108.9% in EU15. Moreover, the convergence in relative terms was followed after 2006 by a convergence in absolute terms. Thus, the gap decreased from a maximum level of 14,594 (in 2006) to 11,807 euro per capita (in 2014). In the period 2000-2014, at the level of EU28, GDP per capita increased in absolute terms from 19,600 to 27,300 euro PPS (+39.3%).

In case of EU11, the convergence process is reflected by the dynamics of the variation coefficient, from 24.7% in 2000 to 12.5% in 2014. In the same period, inside of EU15, the variation coefficient increased from 7.0% in 2000 to 10.6% in 2014.

Further, the convergence between the two groups of countries it is expected to continue. According to the available data, GDP per capita expressed this time in international dollar PPP (Purchasing Power Parity), the gap between EU15 and EU11, as share of average EU28 level, already decreased from 68.4 percentage points in 2000 (115.3% against 46.9%) to 43.0 percentage points in 2014 (108.9% against 65.9%) and perhaps will continue to decrease to around 35.1 percentage points in 2020 (107.1% against 72.0%), according to IMF forecast. In Figure 1 this evolution is presented.

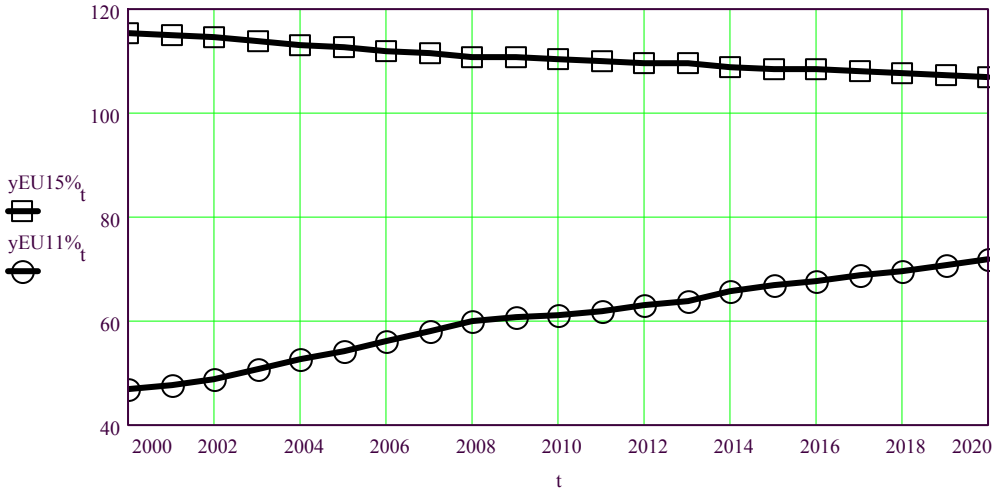

Figure 1

In case of financial market, despite of a trend of convergence, there is still a larger difference among the two groups of countries in EU than in case of GDP per capita.

In terms of market capitalization as percentage of GDP the gap between EU15 and EU11 decreased from 86.7 percentage points in 2000 (102.1% in EU15 and 15.4% in EU11), to 42.2 percentage points in 2012 (64.8% in EU15 and 22.6% in EU11). In Figure 2 we observe the smallest gap between EU15 and EU11 in 2008, this being the first year of the crisis.

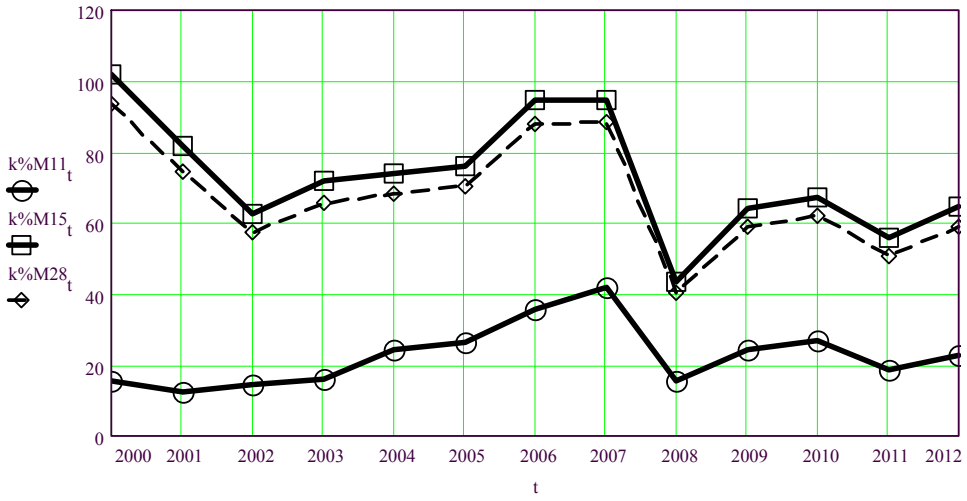

Figure 2

Given a higher volatility characteristic to financial market than to the macroeconomic time series and also given the market capitalization per capital (in euro PPS) as a share of the EU 28, we notice a convergence between the two groups of EU. This increased in from only 7.3% in 2000 to 24.5% in 2012 and was accompanied by a decrease from 126.7% in 2000 to 119.8% in EU15.

Moreover, after 2000, the convergence in relative terms between EU11 and EU15 was generally accompanied by a convergence in absolute terms. Thus, the gap decreased from a maximum level of 21,839 in 2000 to 14,935 euro per capita, in 2012 (with a minimum level of 10,163 in 2008).

During the period 2000-2012, in all EU11 countries, except Estonia (generally being in an early stage of financial market development and ranked as “frontier markets”), a positive dynamics was observed. On the contrary, in EU15 a negative dynamics predominated (excepting Austria, Denmark, Luxembourg, Spain, and Sweden).

At the level of EU28, market capitalization per capita decreased in absolute terms, during the period 2000-2012, from 18,300 to 15,700 euro PPS. In the same period, in EU15 this indicator decreased from 23,200 to 18,800 euro PPS, but in EU11 it increased from only 1,300 to 3,800 euro PPS. A higher growth in the EU11 was registered only in Croatia (+4,900 euro PPS) and Poland (+4,600 euro PPS).

In addition to this, when it comes convergence in matter of market capitalization, as in case of GDP per capita, inside the two groups of EU there are different situations.

In EU11 in the period 2000-2012 a slow convergence was registered (in terms of the dynamics of the variation coefficient) from 60.6% in 2000 to 54.3% in 2012. In the same period, inside of EU15 there were no signs of convergence, changes in variation coefficient being insignificant (40.6% in 2000 and 40.2% in 2012).

In order to evaluate the development of a country's financial market (expressed as market capitalization per capita) related to its general level of economic development (expressed by GDP per capita), we present graphically their correlation for the period 2000-2012 in Figure 3. In this case, and expressing in PPS, gk%28 is the ratio between market capitalization per capita in a country and average market capitalization per capita in EU28 and g%28 is the ratio between its GDP per capita and average GDP per capita in EU28 (in Figure 3 Luxembourg was excluded).

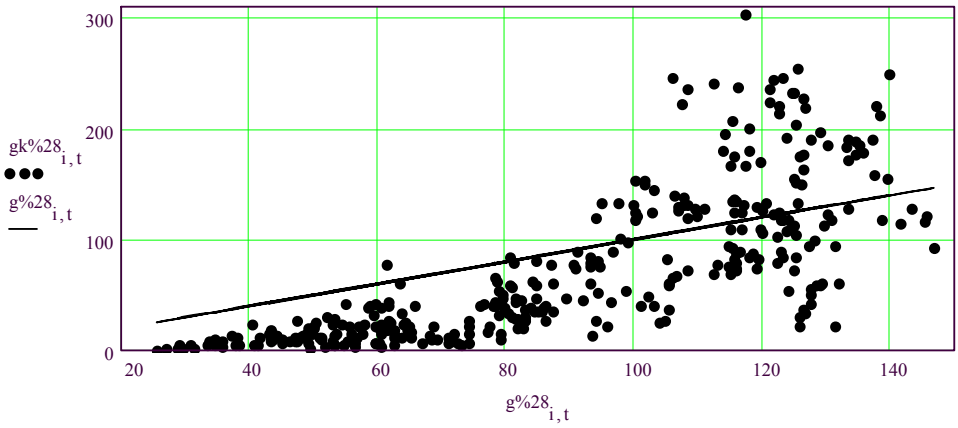

Figure 3

At the level of EU28 for the period 2000-2012, the correlation between GDP per capita, y, and market capitalization per capita, k, was strongly positively (the estimated correlation coefficient is +0.807). Comparatively with their position in EU as GDP per capita, higher development of market capitalization (gk%28 > g%28) was registered for the whole analyzed period only in five western countries (as positive difference in percentage points): Luxembourg (137.0-651.3), UK (62.0-140.2), Sweden (37.2-128.0), Netherlands (15.3-109.2), and France (12.1-33.3). A similar situation was registered in Spain (for the period 2001-2012), Belgium (for the period 2006-2008 and 2012), Denmark (for 2007 and period 2009-2012), Finland (for periods 2000-2008 and 2011-2012), Croatia and Cyprus (only in 2007). In such cases it can been argued that the financial market plays a significant role in national economy.

The comparison between the situations within the two groups of countries in EU demonstrates by using individual countries data, for the entire interval (2000-2012) a strong correlation between GDP per capita and market capitalization per capita in case of EU15 (the value of estimated correlation coefficient is +0.794) but a weaker correlation in case of EU11 (the value of estimated correlation coefficient is only +0.479). Thus, as a simple rule, we may expect that an increase in the GDP per capita level to be followed by an increase in correlation coefficient between market capitalization and GDP per capita.

During the analyzed period for the EU countries we observe a stronger positive correlation between GDP per capita, y, and market capitalization per capita, k. This is the case for Poland

(+0.784), Croatia (+0.693), Slovakia (+0.651), Romania (+0.639), Czech Rep. (+0.637), Spain (+0.589), Bulgaria (+0.572), Luxembourg (+0.534), Slovenia (+0.517), and Denmark (+0.516).

In the same period, a significant negative correlation has been registered in Finland (-0.466), Italy (-0.464), Netherlands (-0.242), and Estonia (-0.205).

3. Different behavioural regimes in EU

A deeper analysis could highlight some more significant differences between the two groups of countries, as they can operate in different regimes. Thus, by putting together, on the same graphical representation, the dynamics of the values of the correlation coefficient, CORRyk, and the dynamics of the average GDP per capita (as thousand euro PPS), yM, in the period 2000-2012, it seems that there are two different regimes in which countries belonging to the two groups of EU are operating.

As it is shown in Figure 4, in case of EU15, in the investigated period, there was a quasi-continuous ascending trend in the value of correlation coefficient, tending asymptotically to 1, as much as GDP per capita is increasing.

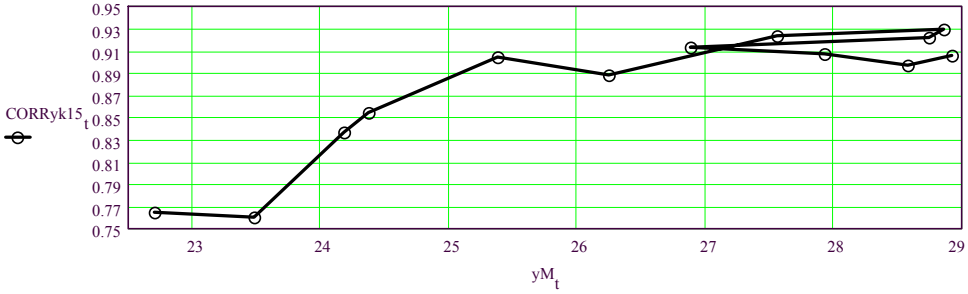

Figure 4

Contrary, in case of EU11 group, we noticed a quasi-continuous descending trend, tending perhaps to a minimum level which is corresponding to an average GDP per capita somewhere above 17,000 euro PPS, as it is shown in Figure 5.

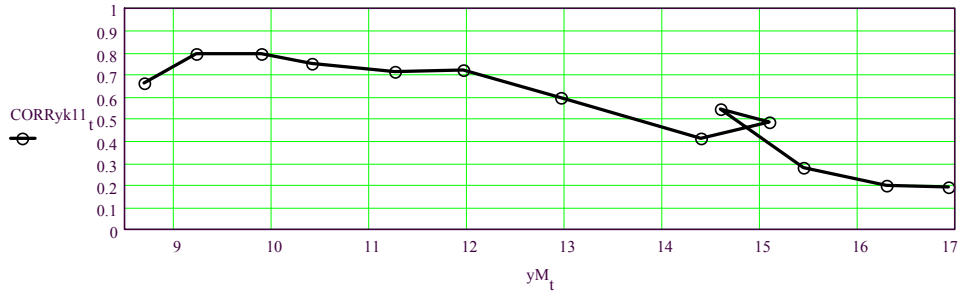

Figure 5

Figure 6 combines the two regimes on the same graphical representation. Figure 6 also incorporates as line segments the results of a nonparametric simple linear regression.

The two different regimes are shown on the dashed line by the following two line segments: the first regime – the segment between points (8.694; 0.830) and (16.930; 0.277), and second regime – the segment between points (22.705; 0.808) and (28.930; 0.906). On the dashed line there is also a third line segment which could be interpreted as a transitory regime – between points (16.930; 0.277) and (22.705; 0.808).

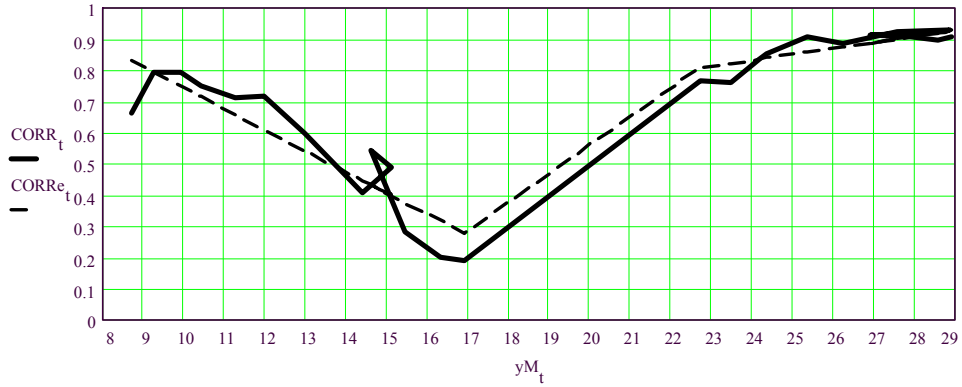

Figure 6

Moreover, in order to find an alternative to discrete regimes represented by line segments, we can search for a continuous correlation function which is varying with GDP per capita, marked this time as z(y). In order to find the best candidate to approximate real registered data, we propose the following nonlinear model for the continuous function of z(y):

$$z(y) = [a / (by^2 + cy + d)] + y / (y+1)$$

where a, b, c, and d are parameters to be estimated econometrically.

As output of applying a nonlinear optimization the following values for parameters were obtained:

a=667.9482925;

b=-81.18986148;

c=2777.189194;

d=-24630.40428.

In addition to this, the estimation procedure yields the following results: Coefficient of Multiple Determination (R^2) = 0.9589002877; Proportion of Variance Explained = 95.89002877%; Adjusted coefficient of multiple determination (Ra^2) = 0.9532957815; Durbin-Watson statistic = 1.579894370199.

Figure 7 shows a graphical representation of the nonlinear model (obtained by range expansion of y values on the left side to zero and on the right side to 40,000 euro per capita) is as dashed trajectory, comparatively to real registered data (solid line).

Based on the estimated nonlinear model, this time we can separate a large set of behavioral regimes. Thus, on the graph of function z(y) there are few important points eventually separating multiple regimes: two local extreme points, a maximum for y=7.35484 and a minimum for y=17.09198; two inflexion points for y=15.14797 and for y=19.0016; etc.

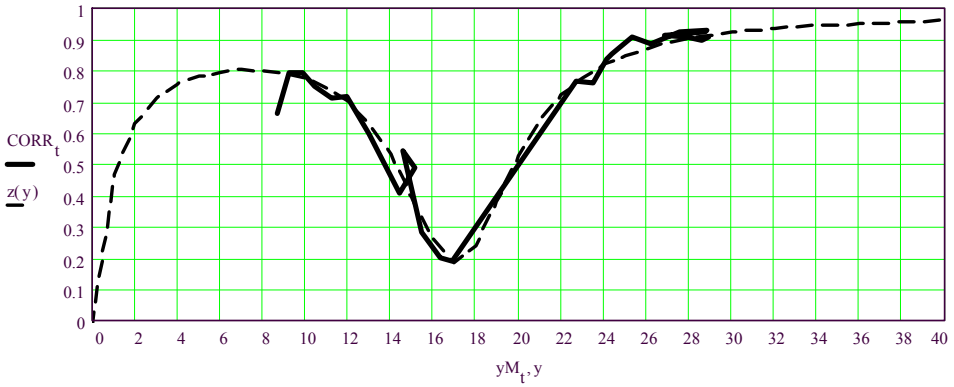

Figure 7

4. Conclusions

The economic and political convergence is considered as one of the main objectives for the achievement of prosperity within the European Union. Measured at the macroeconomic level, the concept of contagion became a directed economic phenomenon, usually as a gauge for economic integration. Weather, as a consequence of its economic importance, the phenomenon of contagion became an important element in the assessment of efficiency of political measures, its features for the dynamics of financial markets have been analyzed only independently, as part of financial integration achieved by the free movement of capital and direct access to listed securities. This chapter establishes the settlement for the development of a study of the implications of the macroeconomic convergence inside the European Union on the dynamics of financial markets in this region. Using a nonlinear model we succeeded to identify the existence of multiple regimes and two inflexion points.

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