IMPACT OF POPULATION AGING ON THE DYNAMICS OF STOCK MARKETS. 
THE CASE OF FIVE CEE COUNTRIES

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Abstract
Numerous studies have tried to model the connection between aging and the financial markets, showing the possibility of a future meltdown in the financial markets, via lower savings and investments given the reaching of the baby-boom cohorts at the age of retirement. In general the research has focused on the case of more industrialized countries, were the aging phenomenon is more felt in the present. The case of Central and Eastern European countries was somehow left aside, although the issue of aging should be an important one, considering also the current state of development of the CEE capital markets. Our empirical work, based on the case of five CEE countries, suggests also that the demographic dynamics have had a detectable impact on the domestic stock market.

Keywords: aging, stock markets, life-cycle theory, CEE countries
JEL classification: G12, G02, C10

1. INTRODUCTION
There is a growing body of literature which analyses the connection between aging and the possibility of a future meltdown in the financial markets, via lower capital accumulation and investment. The general conclusion is that the demographic change is likely to have a negative influence on the capital markets, both in their rates of return and their financial assets volume. The majority of the research focused though on the case of the industrialized countries. Our work aims on bringing more light on this issue, being based on the experience of five Central and Eastern European countries, members of the European Union (Czech Republic, Hungary, Poland, Romania, Slovakia).

The paper is structured as follows. Section 2 provides a brief review of the demographic dynamics, outlining a similar aging trend present in all the CEE countries and developing a line of economic reasoning that could link this dynamics with some negative effects for the financial markets. Section 3 presents the main conclusions of the previous empirical research in this respect. Section 4 proposes a first methodological attempt for an empirical
investigation of the connection between aging and the five CEE capital markets. Section 5 summarizes the results and concludes.

2. DEMOGRAPHIC EVOLUTION AND MOTIVATION

“The population of European Union is aging, without any exception (old and new member states). This is due to an increase of the population over 65 years old and a shrinking of the segment of population between 0-14 years old. The highest increase in the segment of 65 over years population is noticed especially in the EU-15 countries, while the most significant decrease in the 0-14 years population is noticed in the EU-12 countries” (Miloș, 2011). All these factors had a strong influence on the old-age dependency ratio, both in its level and rate of growth, showing an increased economic burden on people in work. As far as concerns the five CEE considered countries, although not all of them have a leading position in the ranking of the EU-12 countries with the highest level of old-age dependency ratios, they all have very high levels of growth of this indicator (the majority of them surpassing the average rate of growth of this indicator in the European Union, of 19 %) (Figure no.1).

Moreover, if we look in general at the age structure diagram in Europe, it shows as well that from a relatively stable pyramid in 1950, we are gradually passing to a constrictive pyramid till 2050.
Impact of Population Aging on the Dynamics of Stock Markets. The Case of Five CEE Countries

We are witnessing at a greying population, as the countries experience longer life expectancy, lower death rates and also lower birth rates (Figure no. 2). This type of pyramid is characteristic to developed countries, with high living standards, this direction of development being followed by all CEE countries, member of the European Union by the end of 2050.

The life-cycle hypothesis (introduced by Modigliani and Brumberg, 1954) outlines the negative connection between aging and saving, considering that a larger share of elderly people could lead to a smaller aggregate saving rate. Goyal (2004) points out that an increase in the level of saving is mainly determined by the middle-aged individuals for two reasons: the increasing wealth of this share of population and the desire to save for old age, when the incomes are low. Jacklin and Goldsticker (2007) define the 40-64 middle-aged individuals as primary asset accumulators in comparison with those over 65, which are disinvesting in order to maintain their previous standard of living.

The researchers have focused lately on the negative effects that the demographic shift might bring on the domestic financial markets in general and on the stock markets, in particular. Chawla et. al. (2007) analyses the influence of aging on portfolio structure, stating that the people’s risk aversion is a function of their age. The older they are, the less risk they are willing to take. Consequently, the process of aging determine people to shift from high-risk instruments to safer instruments, like fixed-income ones. The subject of lifecycle investment is of particular interest for investment professionals wishing to analyse the investment patterns and now, with the baby boom generation almost reaching the retirement age, the influence of changing age distributions becomes even more important.

Source: [United Nations, 2012]
Still, little empirical work has been done, to our knowledge, on the case of some Central and Eastern European countries. Therefore, due to the negative demographic trend registered in these countries we consider worth trying an empirical approach in order to see whether a decrease in the share of the middle-aged individuals (the so-called savers who are thought to have positive net savings, usually considered in the literature as the share of population between 40 and 64), respectively an increase of the old-age individuals (over 64), considered the dissavers, may generate an effect on the domestic stock market. In this way we are also verifying the scenario of a possible meltdown of the financial market in the case of CEE countries. Chawla et al. (2007) describe the asset meltdown as specific to those countries where the size of the cohorts that tend to have positive net savings is shrinking over time. We can notice this trend, starting with 2030 if we look at all the EU-12 countries (Figure no. 2 and Figure no. 3).

Practically, the potential meltdown process of the financial markets is expected to appear when the retirement age generation starts selling their assets, generating an imbalance between the demand (the smaller cohort eager to buy) and offer of financial assets, contributing to the lowering of asset prices. This process may be fostered by the retirement of the baby boom generation, the demand being in this case insufficient to absorb a massive sell-off of financial assets (Siegel, 2006). However, till now, no model predicted a significant movement that would qualify as asset meltdown and would be comparable to any of the historic crashes.

Nevertheless, not all the studies share the same opinion that aging will lead to a downturn of the financial markets, regardless of its magnitude. There are some authors which consider unrealistic some constraints like the fixed rate of saving rate for young cohorts, the fixed capital supply or the lack of mobility of the capital, often mentioned by the studies which predict a meltdown of the financial markets (Lim and Weil, 2003) and others who actually claim, based on their empirical approaches, that the asset prices on the stock markets may actually rise once with aging (Brooks, 2006).

3. THEORETICAL BACKGROUND

The influence of the demographic factors on stock markets, via asset prices, had usually been theoretically modelled using an OLG framework, differing mainly in the econometric specification. The majority of the empirical works have focused on the case of
US financial markets. From these studies, we can outline Poterba’s one (2004) which explores the importance of changing demographic structure for asset returns, asset prices, and the composition of household balance sheets in the United States. He basically finds that asset holdings rise sharply when households are in their 30s or 40s, but when he wants to forecast the asset demand in the future in accordance with the demographic shift, he does not find a sharp decline in the asset demand between 2020 and 2050. Then Yoo (1994) analyses the influence of different measures of the age distribution on the real returns on stocks, bonds and Treasury bills in the US, but only finds relevant link between demographics and treasury bills. Bergantino (1998) finds a statistically significant link between the effects of changes in the age distribution of the U.S. population and the housing, stock, and bond prices over the post World War II period.

Then there are a number of papers which focus on the case of the industrialized countries. Ang and Maddaloni (2003), using a relatively long sample over the whole 20th century find that demographic variables predict excess returns internationally, but this connection is stronger in the case of the countries with well developed social security systems. Davis and Li (2003), on the contrary, find that the proportion of savers (age groups 40-64) is positively and significantly correlated with changes in real stock prices, while it is negatively correlated with real bond yields. Brooks (2006) empirically proves that the relationship between middle-aged cohorts and relatively high real stock and bond prices does not hold for countries with strong equity market participation among households.

Fewer studies have aimed at proving empirically the impact of population aging on the Central and Eastern European stock markets. Chawla et al. (2007) outline in their study that aging is proceeding rapidly in all EU15 countries, whereas the countries in Eastern Europe and the former Soviet Union are a more heterogeneous group. For a number of these countries, dependency rates are not projected to decline over the next two decades, so demographically driven concerns about declining saving rates are not relevant. Holzmann (2009) presents some key aspects of the impact of aging on the rates of return paid by pension schemes. They conclude that although changes in demographic structure are likely to affect the supply and demand for financial assets and consequently their returns, the increase in dissavers in relation to savers across are unlikely to lead to a meltdown in financial asset prices in the case of Central and Eastern European Union states. They see the worst case scenario as a downturn between 50 and 100 basis points for the retirement assets only.

4. METHODOLOGY AND DATA

Our methodological approach is based on the findings of other researchers that have previously proved that the demographic dynamics is connected with the saving and the investment pattern. They are considering people like having similar rational economic behavior, preparing for retirement by accumulating financial and real assets, especially at the middle age, when they have the capacity of investing in such assets, being at their peak earning years. Therefore, it is expected that a decrease in the so called „savers” group (the 40-64 years group), respectively an increase in the dissavers group, generated by the process of aging, should lead to negative effects on the domestic financial market, through the channel of lower marginal demand for financial assets.

For testing this hypothesis, we used as a proxy for the dynamics of the stock market the official main indexes for the five considered CEE stock markets, as follows:
PX–Glob – broad-base price index for the Czech stock market (Prague Stock Exchange);
BUX – the official index of blue-chips shares listed on the Hungarian stock market (Budapest Stock Exchange);
WIG – the oldest index for the Polish stock market (Warsaw Stock Exchange), which comprises all the stocks listed on the stock market;
BET-C – a composite index for the Romanian stock market (Bucharest Stock Exchange), which reflects the movement of all companies listed on the BSE regulated market;
SAX – for the Slovak stock market (Bratislava Stock Exchange).

As for the independent variables, we have taken into consideration the two-age distributions (40-64 years, the savers group; and over 64 years, the dissavers group). We have proceeded on regressing the index values on the evolution of the population of the two-age categories, the regression being:

$$Index_{i,t} = \alpha + \beta_1\text{Savers}_{i,t} + \beta_2\text{Dissavers}_{i,t} + \epsilon_{i,t}$$ (1)

The data for the domestic indexes was obtained from the website of each national stock market and WFE (World Federation of Exchanges), while the demographic data was computed by the authors, using data provided by Eurostat. We have taken into consideration 2000-2010 time series.

5. RESULTS AND CONCLUSIONS

Given the common features of the sample’s countries, it was intuitive to start estimation with a model with individual effects. Considering the fact that there were no major period events that could trigger importance for our model, we have considered cross-section effects. The statistic tests (F-test, Jarque-Bera, Hausman) pointed out the necessity of fixed cross-section effects. After correcting some heteroskedasticity problems, we have finally reached a feasible model, which main features are to be seen below (Table 1).

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>EGLS</th>
<th>Cross-section SUR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>White diagonal standard errors &amp; covariance</td>
</tr>
<tr>
<td>Savers</td>
<td>0.003171*</td>
<td>(0.000391)</td>
</tr>
<tr>
<td>Dissavers</td>
<td>0.033252*</td>
<td>(0.005731)</td>
</tr>
<tr>
<td>Constant</td>
<td>-85508.38*</td>
<td>(14725.74)</td>
</tr>
<tr>
<td>Observations</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Number of countries</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.88</td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.87</td>
<td></td>
</tr>
<tr>
<td>F-test</td>
<td>61.92</td>
<td></td>
</tr>
<tr>
<td>Prob&gt;F</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Durbin-Watson stat</td>
<td>1.75</td>
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*p<0.01
Our results seem to be quite surprising, since while they confirm the fact that an increase in the savers group (the number of individuals between 40-64) are bringing a moderate positive influence on the dynamics of local capital markets, they also show that the dissavers group has a positive and stronger impact on the latter (Table no. 1).

The results, which appear to be statistically significant, are of course subject to some limits. First, the reduced period of analysis. Then, the narrow range of dependent and independent variables. Future attempts will try to quantify more control variables that might be influencing on the development of the domestic stock market (i.e. inflation, capital openness of the economy, bank size, GDP per capita, investment freedom, law and order index etc.). Lastly, we could take into consideration in our future research the case of other Central and Eastern European countries in order to have a broader perspective.

In general, trying to establish the influence of aging on the Central and Eastern European capital markets represents quite a challenging task in the context of controlling for all the variables that might affect the development of the domestic capital markets. The saving pattern of households and individuals may differ from the Western European countries, given the transition period. There might be that savings increase in these countries due to the wish of people of „replenishing depleted assets from the early years of transition” (Chawla et al., 2007). Secondly, the savings rate could be also enhanced when moving from the stage of bank-based financial system, once with the implementation of reforms meant to deepen the financial markets and foster the financial innovations. A determinant for the development of the domestic capital market could be represented therefore by the type of existing financial system in the country of analysis. In general, the Central and Eastern European countries have relatively developed capital markets, their financial system being rather a bank-based than a market oriented one. This is the reason why, while assessing aging impact, it would be essential to consider how financial structures evolve as countries develop, and factors that influence such development.

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