**Acta Oeconomica** 73 (2023) 2, 251–273
DOI: 10.1556/032.2023.00015

AKADÉMIAI KIADÓ

# The role of pension funds in capital market development in the new EU member states: An empirical panel cointegration approach

JORDAN KJOSEVSKI[1]*, MIHAIL PETKOVSKI[2] and ALEKSANDAR STOJKOV[3]

[1] S.N Broker, Pitu Guli 5, Ohrid, Republic of Macedonia

[2] Department of Financial Management, Faculty of Economics, Ss. Cyril and Methodius University, Skopje, Republic of Macedonia

[3] Iustinianus Primus Law Faculty, Ss. Cyril and Methodius University, Skopje, Republic of Macedonia

Received: March 30, 2021 • Revised manuscript received: November 12, 2021 • Accepted: January 12, 2022



**ABSTRACT**

The main goal of this paper is to analyse the impact of pension funds on capital market development in 11 new EU member states from Central and Eastern Europe using annual data for the period between 2000 and 2019. Given the geographical, institutional, political and economic differences across these countries, we split them into three homogenous groups: Balkan, Baltic and Visegrad countries. We use three different variables as a proxy for capital markets growth: stock market capitalization, the value of stock traded, and private bond market capitalization. We apply dynamic and fully-modified ordinary least squares to examine the relationship between the variables. The empirical results indicate that pension funds have a positive effect on the bond markets growth in all sub-groups but they do not impact the stock market growth in the Balkan and Baltic countries.

**KEYWORDS**

capital market development, retirement savings, pension funding, panel cointegration

**JEL CLASSIFICATION INDICES**

G15, G23, G30, H55

* Corresponding author. E-mail: koseskijordan@gmail.com

## 1. INTRODUCTION

A large body of the academic literature (e.g., Meng – Pfau 2010; Raisa 2012) identifies at least four channels through which pension assets increase economic growth: increased savings, improved corporate governance, reduced labour market distortion, and enhanced capital market development.

In the literature several important functions of pension funds have been highlighted. These are accumulating institutional capital, transferring financial resources, controlling for the risk, reducing the price volatility, integrating the capital market at international level, diversifying the financial instruments existing on the market, and intensifying the competition (Enache et al. 2015). According to Blommestein (2001), these functions will lead to a more developed stock market and strengthened financial stability. Furthermore, Dayoub – Lasagabaster (2008) refer to the positive impact of pension funds on the domestic capital markets, both for those economies with developed as well as less developed financial systems, the influence being somewhat diminished for the latter. Other authors emphasise the effect of deepening of bond and equity markets produced by the development of the activity pension funds (Corbo – Schmidt-Hebbel 2003; Thomas – Spataro 2016).

Numerous countries have faced the unsustainability of their existing pension systems (defined benefit system) due to the increasing number of retirees, longer life expectancy, declined birth rates and changes in the labour market that have increased fiscal imbalances. In Europe, the old age dependency ratio (the ratio of the older population to the working population) is projected to double by 2050. Unfavourable problems were even more pronounced in the countries of Central and Eastern Europe (CEE) at the beginning of the transition period because of high unemployment, the informal economy, and the evasion of tax revenues. Furthermore, their pension systems were extremely vulnerable to political pressure and abuse. Originally, the CEE countries had followed the Bismarckian model. However, despite the excessive contribution rates in the mid-1990s, almost all of them recorded significant deficits in the state-funded pension systems which had to be covered from transfers from the central budget. The restructuring of the pension systems initially involved different parametric measures, for example, increasing the retirement age, tightening conditions for retirement, and increasing contribution rates. Nevertheless, these changes were proved to be insufficient, and most countries undertook comprehensive reforms of generational solidarity and transition to a defined contribution or mixed system in order to solve fundamental problems. Most of the CEE governments implemented the pension reform initiated and encouraged by the World Bank report *Averting the Old Age Crisis* (1994). Reformed pension systems upgraded existing pay-as-you-go (PAYG) system with two pillars consisting of mandatory and voluntary pension funds.

The special contribution of these systems is evident in stimulating the development dynamics of financial markets, especially in its long-term segment. The pension funds market is the fastest growing segment of the financial systems in the CEE countries. Differences in the growth of assets under management are caused by the beginning and nature of reforms as well as the establishment of the mandatory (second) pillar of the pension system, the range of investment opportunities, and specific investment regulation. The 2008 Global Financial Crisis triggered the second wave of pension system changes. Many countries decided to diverge from the existing pension system, especially in the second pillar by reducing the amount of contributions transferred to the mandatory pension funds, changing

fund participation rules or even nationalization of the mandatory pension funds' assets (Ádám – Simonovits 2019).

The CEE countries have implemented or have been planning pension reforms since 2009. The following descriptions summarise the key features of these reform measures in the 11 countries covered by this study, but they by no means constitute an exhaustive list of the reform measures of each country.[1] To sum up, the following common characteristics emerge from the pension reform measures implemented by these CEE countries:

- These reforms were mainly initiated in response to the fiscal pressures exerted by the financial authorities and the international institutions to contain current government deficits, caused partly by the pension systems.
- None of the countries effectively increased their total contribution rate in consideration of avoiding further decreases in the aggregate demand. However, several countries with second-pillar systems decreased – or delayed the planned increase in – their contribution rates, thereby allocating more contributions to the state pension systems.
- All countries focused on the measures reducing the pension benefits. Two typical measures include the modification of the indexation rules towards price indexation (or the temporary suspension of indexation in some cases), which has both short- and long-term impacts, and the gradual increase in the pensionable age (and the equalization of the pensionable ages for men and women), the effects of which emerge in the long-term due to its phased implementation.

From the perspective of individual pension fund members, the existence of funded pillars in the CEE countries in the current design and the persistence of relatively short time horizon is questionable for the time being. A much better "job" could have been done via organising the pension system as a purely PAYG one with the GDP-linked rate of return. Or, alternatively, it could have been more efficient if the design of the particular pension system in question followed the ones applied in Poland, Hungary or Romania. Nevertheless, the fully-fledged comparison of competing pension models that would have required a much wider perspective such as the length of accumulation period (30–40 years). Obviously, the discussion of what the potential factors are that contributed to this result so far is beyond the scope of the chapter.

The studies on the impact of pension assets on capital market development have mostly been focused on the OECD countries (e.g., Aras – Müslümov 2005) or South American countries (e.g., Raddatz – Schmuckler 2008). The countries from CEE have been somewhat omitted. To the best of our knowledge, there are only two studies that investigate the role of pension funds on the capital market development of the CEE region – Hryckiewicz (2009) with a sample of 8 CEE countries and Enache et al. (2015) with a sample of 10 CEE countries.

Given their geographical, institutional, political and economic differences, we split the CEE countries into three homogenous groups – Balkan countries (BAL-4), Baltic countries (B-3), and Visegrad countries (VIS-4). To the best of our knowledge, this is the first time that new member states (NMS) are classified into sub-samples, and then separately analysed.

We used an unbalanced panel with a longer time series data, from 2000 to 2019. The selected period is determined by the data availability and the need to encompass the entire boom-and-

[1]Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

bust period around the Global Financial Crisis. One of the main advantages of panel data estimations is that they allow for testing and adjustment of the implicit assumptions in cross-sectional analysis. The short time series and poor availability and quality of the data have been – so far – the common reasons for refraining from analysis of the selected countries. We have addressed these concerns by selecting a more recent period, including the ups and downs of the economic and credit cycles, while making use of better data availability.

The remainder of the paper is organized as follows. *Section 2* provides an overview of the literature; *Section 3* presents the data and methodology employed; and *Section 4* presents the empirical results. *Section 5* outlines the conclusions of the research.

## 2. LITERATURE REVIEW

The literature blossomed from 2000 onwards aiming to test the theoretical link between the growth of the pension fund industry and the development of domestic capital market, majorly focused on the developed countries or the emerging Latin American countries, with the latter being the first to implement the pension reforms. The CEE countries have only recently shifted to a third-pillar functional pension system (mandatory state pay-as-you-go pillar as well as fully-funded pension insurance, and voluntary pension insurance).

Hryckiewicz (2009) analysed the link between recent institutional assets' growth, institutional behaviour, and stock market performance in 8 CEE countries over the period of 1995–2006 using a GMM technique. The empirical results indicate that institutional development exerts a robust and significant impact on the securities markets' growth. Moreover, she found that the institutional investors contributed to a greater extent of the emerging capital markets as a result of higher demand for the local securities induced by these institutions. Her findings suggest that the pension reform has contributed significantly to the institutional development and stock market growth in these countries.

Enache et al. (2015) estimate the connection between pension reform and capital market development using a sample of ten CEE countries (Bulgaria, Czech Republic, Hungary, Estonia, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia) for the 2001–2010 period using a single equation Error Correction Model as a proxy indicator for the capital market development. They used the market capitalization of listed companies as a percentage of GDP (MC). The results confirm the existence of a strong positive short-term effect, as well as a lower magnitude positive long-term effect of the pension funds' assets on the market capitalisation. Furthermore, their results confirm that the implementation of the second pillar of pension system reform in the considered CEE countries was strengthened with mandatory investments in the local financial market requirements for recipient pension funds, could immediately boost the local financial development. Another important finding of this paper is that the positive effect of a shock in the pension funds' assets on market capitalisation does not fade in the long run.

A study conducted by Zubair (2016) examined the impact of pension fund investments on the performance of capital market in Nigeria. The study was a time series analysis covering the period from 2009 to 2016 using the Autoregressive Integrated Moving Average (ARIMA) regression technique. The results confirmed the existence of a positive relationship between pension funds' investments and the performance of the capital market in Nigeria. Specifically,

the study concluded that total pension investments in Nigeria improved the performance of the capital market significantly in terms of depth and liquidity (market capitalization and value traded). The capital market performance variables were measured by market capitalization and turnover; while pension funds' investments were measured using the total pension funds' assets at the end of every quarter.

Bayar (2016) also examined the effect of individual pension funds in Turkey using a sample 10 years period with a cointegration test. The study found that, in the long-run, pension funds have a positive impact on the capital market. The capital market performance variables were measured by market capitalization and total value traded, while pension funds' investment was measured using the total pension funds' assets.

Vassilios – Stavroyiannis (2020) investigated the dynamic interaction between stock market development and pension funds' investment in equities. Results were derived from a panel VAR of 29 countries. Their main finding was that the pension fund investments in equities enhance the stock market development. Moreover, there is a significant bidirectional Granger causality between stock market development and pension funds' investment in equities. The forecast error variance decompositions validated the importance of pension funds for stock market development.

Daradkah – Al Namdoun (2020) investigated the dynamic relationship between pension funds and development of capital market in Jordan between 1980 and 2017. Autoregressive distributed lag (ARDL) approaches for co-integration (bounds test) were employed to achieve the objectives of the study. Using annual data, the results indicated no statistically significant relationship between pension funds and development of capital market in the short run. However, the co-integration tests show a statistically significant long-run equilibrium relationship between pension funds and development of capital market regardless of whether capital market development was measured by market depth or market liquidity. They showed a statistically significant long-run equilibrium relationship between economic growth, interest rate and development of capital market regardless of whether capital market development was measured by market depth or market liquidity.

In sum, the selected studies support the positive impact of private pension funds on financial market capitalisation. More studies so far focused on the developed or developing countries from South America or used mixed samples of developed and emerging economies, rather than the countries from CEE. The majority of these papers, quite different from the point of view of the methodological framework, reach the same conclusion – that the pension funds positively influence the development of the capital market. Be that as it may, there are differences in the results that could be related to the level of financial development and the stock market of the country, the indicator taken into consideration when considering the stock market (if it applies to both equity and bond markets or considers just one of them), the legislative restrictions concerning the investment strategies of the private pension funds, and the herding behaviour of pension funds that often align their investment strategies and lead to the development of only certain parts of the capital market (Enache et al. 2015).

## 3. DATA AND METHODOLOGY

The data set for our study consists of a sample of 11 new EU member states over the period between 2000 and 2019.

The selection of the countries is based on their deepening political, economic and institutional integration with the EU. Despite the macroeconomic similarities and the growing interconnectedness of their economies and geographical and cultural proximity, these countries do not constitute a homogenous group. On the contrary, the aggregate pattern would mask significant heterogeneities in terms of the key variables, such as real GDP growth, inflation rate, level of financial development, etc. Given that the levels of economic and financial development vary considerably across these countries, we classify emerging Europe into three more homogenous groups: the Visegrad group of countries (VIS-4): Hungary, Slovakia, Czech Republic and Poland; the Baltic group of countries (B–3): Lithuania, Latvia and Estonia; and the Balkan group of countries (BAL-4): Bulgaria, Croatia, Romania and Slovenia.

The core determinants in our eclectic model have been commonly used in the academic literature (e.g., Impavido et al. 2003; Meng – Pfau 2010). The internationally comparable and reliable data come from Eurostat, IMF's International Financial Statistics, and the World Bank's World Development Indicators. Given the central objective of this paper as an indicator of growth of capital markets, we use three different variables. In the spirit of works of Rajan – Zingales (2003) and Impavido et al. (2003), we use stock market capitalization (SMC) as a proxy for the development of stock markets, and the value of stock traded (STV) as a proxy for the liquidity of the stock markets. For bond markets, we use private bond markets, which are equal to the total amount of outstanding domestic debt securities issued by private or public domestic entities divided by GDP (ODPS). In line with Meng – Pfau (2010), we exclude public bond markets because the private bond market capitalization serves as a better proxy for the development of financial markets as the former largely depends on the government's fiscal position and financing needs. Hence, SMC, STV and ODPS are three dependent variables in different empirical specifications.

Based on the theoretical and empirical guidance from the literature review, the following explanatory variables are used:

- macroeconomic determinants: GDP per capita growth (GDPPCG); the inflation rate (INF); the real interest rate (RIR), and
- financial determinants: pension funds, measured in terms of pension fund financial assets as a proportion of GDP (PENG); domestic credit provided by the financial sector to GDP (DCPS); and the Economic Freedom Index (INDEX).

At the core of all previously-mentioned studies, the variables related to the GDP are among the main macroeconomic determinants of capital market development. In this context, several variations of this determinant, such as the annual growth rate of real GDP, growth of income per capita, etc., are well-known in the literature. However, in this study, we follow Hryckiewicz (2009) and Impavido et al. (2003) and use the GDP per capita growth, which they refer to as the demand for finance.

The rate of inflation is defined as the annual growth rate of the Consumer Price Index and reflects the annual average percentage change. It is also a measure of macroeconomic stability and an indicator of the monetary policy stance. The justification for its inclusion in the model is to capture the effect of the loss in purchasing power among investors on their decisions to shift their investments in capital markets. Having this in mind, we expect higher inflation to have a negative effect on capital market development.

Inspired by Impavido et al. (2003), we include the real interest rate in our model, which is computed as the lending interest rate adjusted for the GDP deflator. The effect of interest rates on particularly the bond market must be controlled for as the change of yields has an impact on the demand for stocks or bonds. We expect a positive relationship, so that a rise in yields is likely to decrease the demand for stocks and increase the demand for bonds.

As already mentioned above, to capture the pension effect on capital market development, we use the pension funds' assets as a percentage of GDP (PENG). This choice was made given the design of the second pillar of the CEE pension systems reform. Especially important is the restriction imposed by legislation on recipient pension funds to invest in certain financial instruments on the domestic capital market.

In order to measure the development of financial sector, we follow Raisa (2012) and use all domestic credit provided by the financial sector to GDP, which is a common indicator measuring the level of financial development. The higher level of financial sector development associated with the enhanced capability of financial intermediaries to mobilise savings to capital for investments. We expect higher levels of financial development as measured by the private sector domestic credit to increase the capital markets.

The importance of pension systems for capital market development has a stronger impact if a country has a more developed legal system, higher trade freedom, or better regulatory efficiency. To measure this characteristic, we use the overall Economic Freedom Index from the Heritage Foundation. This index is computed for four main categories: rule of law, limited government, regulatory efficiency, and open markets – the latter being comprised of trade freedom, investment freedom and financial freedom. Each of these freedoms within these four broad categories is individually scored on a scale of 0–100. The overall score is a simple average of its scores on the ten individual freedoms that form the four categories. Some authors only consider trade freedom when controlling the development of the domestic stock markets, while others consider the investment freedom, capital openness, or use the Law-and-Order index (e.g., Hryckiewicz 2009) (Table 1).

The size of the pension funds displays large differences: it ranges from a minimum of 0.09% of GDP in country X to a maximum of 27.35% in country Y. Such substantial differences among

**Table 1.** Descriptive statistics

| | SMC | STV | GDPPCG | INF | RIR | PENG | INDEX | DCPS |
|---|---|---|---|---|---|---|---|---|
| Mean | 17.08 | 4.998 | 3.811 | 3.726 | 4.59 | 7.956 | 65.55 | 48.02 |
| Median | 14.28 | 2.415 | 4.144 | 2.770 | 4.1 | 6.765 | 65.95 | 48.23 |
| Maximum | 83.4 | 33.78 | 12.91 | 45.66 | 19.7 | 27.35 | 79.1 | 100.81 |
| Minimum | 0.18 | 0.020 | −14.26 | −1.544 | −7.2 | 0.09 | 47.3 | 0.186 |
| Std. dev. | 13.49 | 5.800 | 3.995 | 4.809 | 4.43 | 5.892 | 6.535 | 17.879 |
| Observations | 155 | 207 | 220 | 220 | 185 | 185 | 220 | 186 |

*Source*: Authors' calculations.

the 11 NMS justify the classification of the sample countries into three subgroups to obtain a more precise investigation.

Our empirical strategy is based on a panel data analysis. Before proceeding with the econometric method, we need to verify the stationarity of the selected variables. In this paper, we perform a panel analysis and apply panel unit root tests – the Im, Pesaran and Shin (IPS) test (2003) and two alternatives of a Fisher-type test (Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) test). These allow for the deterministic and dynamic effects differing across the panel members. In this paper, a 10% level of importance is applied as a critical value for determining whether the time series is stationary.

According to Baltagi (2001), the Fisher-type tests have more advantages because: (1) the cross-sectional dimension can either be finite or infinite; (2) each group can have non-stochastic as well as stochastic components; and (3) the time-series dimension can vary for each cross-section. An additional advantage is that, unlike the IPS test, it does not require a balanced panel and allows for the use of different lag lengths in the individual ADF regressions. Although we prefer the Fisher-type tests, we also report the results of the IPS tests to provide an additional check for robustness.

To estimate the existence of a long-run relationship between the dependent variable and the explanatory variables, we test the cointegration equations in the panel. We use two cointegration tests – Pedroni (1999) and Kao (1999) – to verify the null hypothesis of no cointegration between the selected determinants. Pedroni (1999) derives seven panel cointegration test statistics, of which four are based on the within-dimension and three are based on the between-dimension. Namely, the first of the simple panel cointegration statistics is a type of non-parametric variance ratio statistics. The second is a panel version of a non-parametric statistics that is analogous to the familiar Phillips Perron rho-statistics. The third statistics is also non-parametric and is analogous to the Phillips and Perron *t*-statistics. The fourth statistics is a simple panel cointegration which is corresponding to the augmented Dickey-Fuller t-statistics. The rest of the statistics are based on a group mean approach. The first of these is analogous to the Phillips and Perron rho-statistics, and "the last two are analogous to the Phillips and Perron *t*-statistics and the augmented Dickey-Fuller *t*-statistics, respectively" (Pedroni 1999: 658). Furthermore, in our empirical analysis, we use additional cointegration tests, such as the Kao (1999) test, which is based on the Engle-Granger two-step procedure and imposes homogeneity on the members in the panel. The null hypothesis of no cointegration is tested using an ADF-type test.

Having established the cointegration tests, the next step is to estimate the long-term relationship between the variables. The literature proposes different estimation methods for the panel cointegration models. We use the Fully Modified Ordinary Least Square (FMOLS) and the Dynamic Ordinary Least Squares (DOLS) estimators. We choose these methods for several reasons. Firstly, the OLS estimator is a biased and inconsistent estimator when applied to a cointegrated panel. On the other hand, DOLS and FMOLS take care of both small-sample bias and endogeneity bias by taking the leads and lags of the first-differenced regressors. Secondly, for panels that have a larger time dimension ($T$), the dynamic estimator of the Generalized Method of Moments (GMM) is not very effective as it is more applicable when the number of the cross-sectional units is higher than the time periods (Roodman 2009). In this research, the time dimension ($T = 19$) is much greater than the cross-sectional dimension ($N = 11$). Thirdly,

these estimators allow for a greater flexibility in the presence of heterogeneity in the examined cointegrated vectors (Pedroni 1999, 2001).

However, the DOLS parametric approach is preferred to the FMOLS non-parametric one, because the latter imposes additional requirements of all variables being integrated of the same order *I(1)* and the regressors themselves not being cointegrated (Masih – Masih 1996). Additionally, according to Kao – Chiang (2001), the FMOLS estimator is complicated by the dependence of the correction terms upon the preliminary estimator, which can be biased in finite samples with panel data. The DOLS estimator also has an additional advantage of controlling the endogeneity in the model, as augmentation of the lead and lagged differences of the regressor suppresses the endogenous feedback (Lean – Smyth 2010; Afonso – Jalles 2013). This indicates that the DOLS estimator may be more promising than the OLS or FMOLS in estimating the cointegrated panel regressions.

In order to account for the possibility of the endogeneity issue to influence the debt variable and to get robustness of the results estimated by FMOLS and DOLS, we employ the instrumental variable (IV) estimation technique. In particular, the estimator used in our research is the System General Method of Moments (SGMM). By applying this method, we assume that all the control variables are predetermined or endogenous. We deal with the potential problem of having too many instruments compared to the number of groups analysed by Roodman (2009) by keeping the number of instruments lower than the number of countries. In the standard uncollapsed form, each instrumental variable creates one instrument for each time period and the lag attributable to that period. In the collapsed form, a single column vector of instruments is created instead of a whole matrix. Although collapsing can reduce the statistical efficiency in large samples, it can be a helpful tool in avoiding the bias in finite samples, which are usually characterised by instrument proliferation. In other words, we control the number of instruments by limiting our analysis to two lags. The latter helps avoid any bias due to the large number of instruments in a relatively small sample. The validity of the instruments selected can be tested using the Sargan test. In addition, we test the serial correlation in the residuals differentiated once AR(1) and twice AR(2). The first-order autocorrelation in the differentiated residuals does not imply that the estimates are inconsistent but the second-order autocorrelation would imply that this is the case.

## 4. EMPIRICAL RESULTS

The first step of our empirical analysis is to perform panel unit root tests (Tables 2–5). As already mentioned in the previous section, we apply the panel-IPS unit root tests and Fisher-type tests using ADF and PP-test, as outlined by Maddala –Wu (1999).

These tests are conducted on both levels and first differences for all variables in the models. Bearing in mind the traditional null hypothesis of stationarity, the results indicate acceptance of stationarity at first difference and rejection of stationarity at levels indicating that all series are *I(1)*.

Following the panel unit root tests results for all series of interest, the null hypothesis of a unit root cannot be rejected. Since the null hypothesis of a unit root holds for all series of interest, we continued with the panel cointegration tests as the next step.

**Table 2.** Panel unit root tests, Balkan countries (BAL-4)

| Variables | Im, Pesaran and Shin W-stat | | ADF-Fisher Chi square | | PP-Fisher Chi square | | Conclusion |
|---|---|---|---|---|---|---|---|
| | At a level of | First differentiation | At a level of | First differentiation | At a level of | First differentiation | |
| SMC | −1.461 | −2.252*** | 13.23 | 19.73*** | 6.629 | 15.44*** | I(1) |
| STV | −1.208 | −3.647*** | 13.74* | 28.65*** | 13.27 | 55.51*** | I(1) |
| GDPPCG | −1.139 | −5.387*** | 12.75 | 41.22*** | 17.97*** | | I(1) |
| INF | −0.641 | −4.176*** | 11.45 | 31.90*** | 14.41 | 58.26*** | I(1) |
| RIR | −0.571 | −2.761*** | 9.139 | 24.30*** | 14.55** | 57.02*** | I(1) |
| PENG | 1.157 | −2.171*** | 7.382 | 19.17*** | 16.96*** | | I(1) |
| DCPS | −0.310 | −2.344*** | 6.885 | 18.42*** | 5.681 | 18.974*** | I(1) |
| INDEX | −0.691 | −3.998*** | 10.72 | 30.61*** | 17.70** | 45.68*** | I(1) |

*Note*: *, ** and *** indicate that the test statistic is significant at the 10, 5 and 1% level, respectively.
*Source*: Authors' calculations.

**Table 3.** Panel unit root tests, Baltic countries (B-3)

| Variables | Im, Pesaran and Shin W-stat | | ADF-Fisher Chi square | | PP-Fisher Chi square | | Conclusion |
|---|---|---|---|---|---|---|---|
| | At a level of | First differentiation | At a level of | First differentiation | At a level of | First differentiation | |
| SMC | −0.897 | −0.494 | 10.28 | 7.587 | 1.658 | 4.932 | I(1) |
| STV | 1.501 | −1.292*** | 2.167 | 9.828*** | 1.813 | 24.19*** | I(1) |
| GDPPCG | −1.246 | −5.894*** | 11.44 | 39.16*** | 12.28 | 66.96*** | I(1) |
| INF | −1.728 | −5.248*** | 12.07* | 34.83*** | 12.76 | 90.95*** | I(1) |
| RIR | −1.421 | −2.326*** | 12.20** | 20.43*** | 7.954 | 22.83*** | I(1) |
| PENG | 2.677 | −1.942*** | 0.590 | 13.97*** | 0.726 | 24.52*** | I(1) |
| DCPS | −0.061 | −2.254*** | 7.516 | 19.17*** | 2.902 | 17.90*** | I(1) |
| INDEX | −1.019 | −2.335*** | 9.099 | 16.05*** | 20.77*** | | I(1) |

*Note*: *, ** and *** indicate that the test statistic is significant at the 10, 5 and 1% level, respectively.
*Source*: Authors' calculations.

As presented in Tables 6 and 7, the majority of Pedroni's (1999, 2001) tests indicate that there is a cointegration relationship in all models. Kao's (1999) test in Table 6 also indicates a cointegration relationship in all models (*Panels A* and *B*).

**Table 4.** Panel unit root tests, Visegrad countries (VIS-4)

| Variables | Im, Pesaran and Shin W-stat | | ADF-Fisher Chi square | | PP-Fisher Chi square | | Conclusion |
|---|---|---|---|---|---|---|---|
| | At a level of | First differentiation | At a level of | First differentiation | At a level of | First differentiation | |
| SMC | 0.960 | −0.699 | 7.502 | 10.35 | 4.574 | 12.83 | I(1) |
| STV | 0.560 | −2.599 | 5.433 | 21.18 | 6.809 | 46.62 | I(1) |
| GDPPCG | −2.118 | | 17.54 | | 23.33 | | I(1) |
| INF | −2.903 | | 22.51 | | 31.12 | | I(1) |
| RIR | −1.143 | −2.515*** | 14.85** | 23.83*** | 11.43 | 45.77*** | I(1) |
| PENG | −0.630 | −2.545*** | 11.03 | 22.81*** | 27.91*** | | I(1) |
| DCPS | −0.061 | −2.254 | 7.516 | 19.17 | 2.902 | 17.90 | I(1) |
| INDEX | 0.825 | −3.294*** | 4.775 | 25.47*** | 10.44 | 44.35*** | I(1) |

*Note*: *, ** and *** indicate that the test statistic is significant at the 10, 5 and 1% level, respectively.
*Source*: Authors' calculation

**Table 5.** Panel unit root tests, 11 new EU member countries (NMS 11)

| Variables | Im, Pesaran and Shin W-stat | | ADF-Fisher Chi square | | PP-Fisher Chi square | | Conclusion |
|---|---|---|---|---|---|---|---|
| | At a level of | First differentiation | At a level of | First differentiation | At a level of | First differentiation | |
| SMC | −0.802 | −1.940*** | 31.02* | 37.67*** | 12.86 | 33.21*** | I(1) |
| STV | 0.151 | −4.436*** | 21.34 | 59.66*** | 21.89 | 126.3*** | I(1) |
| GDPPCG | −1.528 | −3.840*** | 21.34 | 51.74*** | 15.76 | 53.59*** | I(1) |
| INF | −1.425 | −4.246*** | 22.35 | 56.04*** | 19.35 | 88.30** | I(1) |
| RIR | −0.770 | −4.396*** | 26.2 | 68.57*** | 33.94*** | | I(1) |
| PENG | 1.729 | −3.859*** | 19.00 | 55.96*** | 45.60*** | | I(1) |
| DCPS | −1.473** | | 21.6 | 38.56*** | 18.66 | 39.65*** | I(1) |
| INDEX | −0.451 | −5.612*** | 24.60 | 72.140*** | 48.93*** | 125.8*** | I(1) |

*Note*: *, ** and *** indicate that the test statistic is significant at the 10, 5 and 1% level, respectively.
*Source*: Authors' calculations.

**Table 6.** Results of Pedroni's and Kao's panel cointegration tests

| Statistics | Balkan Group (BAL-4) | | | Baltic Group (B-3) | | | Visegrad Group (VIS-3) | | |
|---|---|---|---|---|---|---|---|---|---|
| | STV | SMC | OI | STV | SMC | OI | STV | SMC | OI |
| Panel v-Statistic | 0.030 | −1.270 | −0.712 | −1.488 | −1.341 | −1.175 | −1.031 | −1.019 | 0.058 |
| Panel rho-Statistic | 1.3668 | 2.041 | 1.146 | 2.053 | 2.127 | 0.948 | 1.794 | 1.623 | 2.597 |
| Panel PP-Statistic | −1.509** | −1.920*** | −3.043*** | −2.136*** | −0.731 | −4.823*** | −13.98*** | −2.896 | −2.870*** |
| Panel ADF-Statistic | −1.301*** | −1.703*** | 2.305*** | −1.426*** | −5.131*** | −2.234*** | −5.162*** | −1.420 | −1.710*** |
| Group rho-Statistic | 2.260 | 3.088 | 1.763 | 2.756 | 2.520 | 1.841 | 2.964 | 2.905 | 3.174 |
| Group PP-Statistic | −2.169*** | −1.668** | −3.688*** | −4.753*** | −4.403*** | −4.501*** | −12.87*** | −7.623 | −6.361*** |
| Group ADF-Statistic | −1.223* | 0.332 | −2.688*** | 1.772*** | −4.570*** | −1.780*** | −4.449*** | −2.077 | −2.894*** |
| Kao Residual Cointegration Test (*P*-value) | 0.000 | 0.005 | 0.000 | 0.034 | 0.000 | 0.003 | 0.0344 | 0.016 | 0.026 |

*Note*: *, ** and *** indicate that the test statistic is significant at the 10, 5 and 1% level, respectively.
*Source*: Authors' calculations.

**Table 7.** Results of Pedroni's and Kao's panel cointegration tests

| Statistics | New EU member countries (NMS 11) | | |
|---|---|---|---|
| | STV | SMC | OI |
| Panel v-Statistic | −1.045 | −2.696 | −1.696 |
| Panel rho-Statistic | 3.266 | 4.623 | 4.071 |
| Panel PP-Statistic | −0.059 | −0.830 | −4.049*** |
| Panel ADF-Statistic | −1.497** | −1.698*** | −3.001*** |
| Group rho-Statistic | 4.5375 | 5.971 | 5.169 |
| Group PP-Statistic | −6.769*** | −1.595*** | −14.22*** |
| Group ADF-Statistic | −2.206*** | −1.540*** | −5.453*** |
| Kao Residual Cointegration Test (*P*-value) | 0.000 | 0.000 | 0.011 |

*Note*: *, ** and *** indicate that the test statistic is significant at the 10, 5 and 1% level, respectively.
*Source*: Authors' calculations.

Keeping in mind that all determinants in all models are co-integrated, in the next step we test the long-run linkage among the pension fund and other selected determinants and capital markets growth using the FMOLS and DOLS tests.

Based on the results of FMOLS and DOLS for the three subgroups and the entire sample (Tables 8–11), we may conclude that the growth of pension fund financial assets is positively associated with the private bond market capitalization, while the impact on stock market capitalization and stock value depends on the employed method or analysed subgroup.

From the results we can see that a one percentage point increase in the pension fund's financial assets relative to GDP, on average, leads to 0.47 and 0.50 percentage point increases in the stock value traded. On the other hand, a private bond market capitalization relative to GDP increases between 0.10 and 0.15 percentage points, *ceteris paribus*.

Among the control variables, although in some cases with different statistical significance the estimation procedures lead to the coefficients with the same signs. Thus, the estimation results with the FMOLS and DOLS for GDPPCG suggest that this variable has a positive and statistically significant impact on capital market development, which implies that the higher income countries tend to have deeper and better-functioning capital markets. This result is consistent with the results of Rajan – Zingales (2003).

The coefficient on inflation rate is negative and statistically significant at the 10% significance level only for the bond market capitalization. The result is consistent with Huybens –Smith (1999), which empirically demonstrate that the higher levels of inflation are associated with smaller, less active and less efficient stock markets.

**Table 8.** Estimation results, Balkan countries (BAL-4)

| Independent variables | Dependent variables | | | | | |
|---|---|---|---|---|---|---|
| | STV | | SMC | | OPDS | |
| | FMOLS | DOLS | FMOLS | DOLS | FMOLS | DOLS |
| GDPPCG | 0.09 (0.06) | 0.10 (0.11) | 0.63 (0.72) | 1.98*** (0.90) | 0.15*** (0.05) | 0.17*** (0.06) |
| INF | −0.10* (0.06) | −0.03 (0.08) | 0.64 (0.76) | 0.30 (0.54) | −0.13** (0.05) | −0.09*** (0.04) |
| RIR | −0.27*** (0.06) | −0.29*** (0.11) | −1.91*** (0.77) | 0.06 (0.90) | 0.16*** (0.07) | 0.11 (0.07) |
| PENG | 0.10 (0.07) | 0.09 (0.12) | 0.36 (0.85) | 0.27 (0.46) | 0.28*** (0.06) | 0.20*** (0.06) |
| DCPS | 0.05*** (0.02) | 0.06 (0.04) | 0.68*** (0.26) | 0.97*** (0.22) | 0.01 (0.02) | 0.02 (0.01) |
| INDEX | 0.02 (0.09) | 0.01 (0.15) | −1.32 (1.10) | −0.55** (0.28) | −0.10 (0.08) | −0.08 (0.07) |
| Adjusted *R*-squared | 0.51 | 0.57 | 0.62 | 0.55 | 0.64 | 0.65 |
| Observations | 48 | 52 | 39 | 43 | 42 | 46 |

*Notes*: *, ** and *** indicate that the test statistic is significant at the 10, 5 and 1% level, respectively. Standard errors are in parentheses.
*Source*: Authors' calculations.

**Table 9.** Estimation results, Baltic countries (B-3)

| Independent variables | Dependent variables | | | | | |
|---|---|---|---|---|---|---|
| | STV | | SMC | | OPDS | |
| | FMOLS | DOLS | FMOLS | DOLS | FMOLS | DOLS |
| GDPPCG | 0.14* (0.08) | 0.05 (0.14) | 0.06* (0.07) | 0.24 (0.48) | 0.04 (0.06) | 0.06 (0.08) |
| INF | −0.18 (0.15) | −0.02 (0.22) | −0.06 (0.13) | −1.52 (0.91) | −0.02*** (0.10) | −0.06* (0.13) |
| RIR | 0.03 (0.07) | 0.06 (0.11) | −0.11 (0.06) | −0.99** (0.51) | 0.18*** (0.05) | 0.11*** (0.07) |
| PENG | 0.09 (0.12) | 0.01 (0.20) | 0.34 (0.09) | 1.59 (1.78) | 0.42*** (0.07) | 0.34*** (0.09) |
| DCPS | 0.01 (0.03) | 0.04 (0.05) | 0.01 (0.03) | 0.06 (0.22) | 0.03 (0.02) | 0.01 (0.02) |
| INDEX | 0.94*** (0.20) | 0.68*** (0.33) | 0.12 (0.21) | 0.36*** (0.14) | −0.05 (0.14) | −0.11 (0.21) |
| Adjusted *R*-squared | 0.62 | 06 | 0.71 | 0.68 | 0.77 | 0.70 |
| Observations | 27 | 37 | 18 | 28 | 22 | 25 |

*Notes*: *, ** and *** indicate that the test statistic is significant at the 10, 5 and 1% level, respectively. Standard errors are in parentheses.
*Source*: Authors' calculations.

**Table 10.** Estimation results, Visegrad countries (VIS-4)

| Independent variables | Dependent variables | | | | | |
|---|---|---|---|---|---|---|
| | STV | | SMC | | OPDS | |
| | FMOLS | DOLS | FMOLS | DOLS | FMOLS | DOLS |
| GDPPCG | 0.57*** (0.19) | 0.50 (0.36) | 0.45*** (0.20) | 0.34 (0.40) | 0.29*** (0.05) | 0.43 (0.41) |
| INF | −0.48** (0.28) | −0.37** (0.40) | −1.06 (0.28) | −0.79 (0.45) | −0.03 (0.07) | −0.63* (0.37) |
| RIR | −0.22 (0.20) | −0.04 (0.33) | 0.10 (0.20) | 0.26 (0.39) | 0.01 (0.05) | 0.59** (0.28) |
| PENG | 0.18*** (0.17) | 0.38 (0.33) | 0.41 (0.22) | 0.55 (0.45) | 0.38** (0.14) | 0.41** (0.19) |
| DCPS | 0.41 (0.08) | 0.37 (0.15) | 0.01*** (0.10) | 0.02*** (0.18) | 0.04** (0.02) | 0.16 (0.11) |
| INDEX | −1.61 (0.26) | −1.55 (0.47) | −0.37*** (0.33) | −0.48*** (0.60) | −0.46*** (0.06) | 0.05 (0.09) |
| Adjusted *R*-squared | 0.52 | 0.55 | 0.81 | 0.82 | 0.72 | 0.55 |
| Observations | 50 | 58 | 39 | 45 | 49 | 49 |

*Notes*: *, ** and *** indicate that the test statistic is significant at the 10, 5 and 1% level, respectively. Standard errors are in parentheses.
*Source*: Authors' calculations.

**Table 11.** Estimation results, 11 new EU member countries (NMS 11)

| Independent variables | Dependent variables | | | | | |
|---|---|---|---|---|---|---|
| | STV | | SMC | | OPDS | |
| | FMOLS | DOLS | FMOLS | DOLS | FMOLS | DOLS |
| GDPPCG | 0.38*** (0.16) | 0.23 (0.15) | 0.79*** (0.37) | 0.72*** (0.33) | 0.15*** (0.07) | 0.11* (0.07) |
| INF | 0.21 (0.19) | 0.20 (0.14) | 0.37 (0.49) | 0.21 (0.34) | −0.14* (0.08) | −0.08* (0.06) |
| RIR | −0.23* (0.14) | 0.07 (0.12) | −0.24 (0.38) | −0.33 (0.32) | 0.06 (0.06) | 0.01 (0.05) |
| PENG | 0.47*** (0.16) | 0.50*** (0.15) | 0.08 (0.48) | 0.18 (0.44) | 0.15**** (0.05) | 0.10** (0.06) |
| DCPS | 0.06 (0.05) | 0.02 (0.05) | 0.09 (0.14) | 0.07 (0.11) | 0.03 (0.02) | 0.01 (0.02) |
| INDEX | 0.36* (0.21) | 0.28 (0.18) | 0.81 (0.56) | 0.60 (0.48) | 0.21** (0.09) | 0.17*** (0.08) |
| Adjusted *R*-squared | 0.56 | 0.62 | 0.60 | 0.52 | 0.65 | 0.67 |
| Observations | 125 | 147 | 96 | 116 | 113 | 127 |

*Notes*: *, ** and *** indicate that the test statistic is significant at the 10, 5 and 1% level, respectively. Standard errors are in parentheses.
*Source*: Authors' calculations.

The results of the Economic Freedom Index are consistent with the other financial variables. They reveal that this determinant has a positive impact on capital market development, although it is only significant in the case of stock value traded when we use FMOLS method and bond market depth. We found that 1 percent increase in the Economic Freedom Index is likely to lead to a growth of stock value traded by 0.36% or between 0.17% – 0.20% of bond market capitalization. These results are in line with the results of Claessens et al. (2006), which is not surprising, because the countries having a developed legal system and more trade-freedom, and regulatory efficiency will have better developed capital markets. In other words, the growth of capital markets is much more likely in a fully-fledged market economy that expands with the level of financial development and financial literacy.

Overall, we have demonstrated that the growth of the pension fund financial assets leads to the development of stock markets and private bond markets for the entire sample. The latter result might also reflect the dampening effect of a dominant banking sector on corporate bond markets, especially in light of the scale economy constraint and fixed costs of financing from bond issues as opposed to the banking sector.

We wanted to determine if the impacts of pension funds are different between the selected subgroups of countries. Tables 3–5 report the results for stock market capitalization, stock value traded, and private bond market capitalization.

The impact of pension fund financial assets on capital market growth, as shown in Table 4, is strongly significant in all groups of countries only in the case of bond market depth with almost similar results in the case of the Baltic and Visegrad group of countries, while this impact is found smaller in the Balkan countries.

The findings also suggest that pension funds have impact on stock value traded in only the Visegrad group, which is used as a proxy for the liquidity of the stock markets. In other subgroups, this impact of pension funds is not statistically significant, which might be due to the regulatory restrictions. Moreover, the results suggest that pension funds have a larger impact on private bond markets than on the stock markets growth. For instance, in the Visegrad group, this variable has a statistically significant coefficient for stock value trade and private bond markets. It is found that 1 percentage point increase in the pension fund financial assets over GDP in countries is likely to lead to an increase in stock value traded and private bond market capitalization, as a proportion of GDP of 0.18 and 0.41 percentage points, respectively.

Additionally, the coefficient on real growth of GDP per capita (GDPPCG) is positive and statistically significant for all subgroups of countries. However, it is smaller and statistically significant only in the case of stock valued traded when we use FMOLS model for the Baltic countries. This determinant has the strongest impact in the Balkan countries with value of 1.98 in the case of stock market capitalization. The estimation results imply that the countries with lower levels of financial development and real growth of GDP per capita experienced a much stronger impact on capital market growth than in the case of the more developed countries from the Balkan and Visegrad subgroups.

The results for the inflation rate are in line with our expectations, displaying a negative sign. This determinant is significant in all groups of countries when we applied the DOLS method in the case of bond markets. The inflation rate is also significant in the case of Balkan

and Visegrad subgroups, when we use stock valued traded as a dependent variable. It implies that an increase of the inflation would reduce the size of the stock, to a certain extent, due to the high cost of financing. According to Bencivenga – Smith (1993), governments are reluctant to impose additional tax burden on the financial sector to narrow the budget deficit in the inflationary periods. It has been tested that inflation undermines the performance of markets by discouraging the level of investment in the economy. The statistically significant impact in the Balkan and the Visegrad subgroups is not surprising. Namely, in some of the countries in these regions (for example, Romania), the inflation rate was 45.5% in 2000, which implies that the countries, or at least some of them, during the period of analysis have faced large inflation rates.

The change in the real interest rates offered by long-maturity debt instruments is statistically significant and positively impacts the bond market development for all three subgroups. The estimation results imply that a yield rise is likely to decrease the demand for stocks and increase the demand for bonds. This is confirmed with the results of stock traded value and stock market capitalization where this determinant has a negative sign and is statistically significant in the Balkan and Baltic countries.

Furthermore, the variable capturing the size of the financial sector is positively correlated with stock market development and appears in the regression as statistically significant. Consistent with other studies, our evidence indicates that well-developed financial sectors are necessary for the development of the capital markets. The effect is also economically significant in the Balkan and Visegrad subgroups.

The results present a slightly different picture when a stock market activity (STV) enters the regression as a dependent variable. None of the macroeconomic variables is statistically significant. Specifically, the insignificant effect of inflation on the stock market activity might be a result of the non-linear relation (Huybens – Smith 1999). This might be a result of high participation of foreign investors in the local stock markets, and thus, an insignificant influence of the local taxation on foreign investment.

The results for the Economic Freedom Index appear to be ambiguous. Namely, this determinant in the Balkan countries has a negative sign and is statistically significant only when we use DOLS method and stock market capitalization as a dependent variable. The Economic Freedom Index in the case of the Baltic states is statistically significant and has a positive sign when we use stock market capitalization and stock traded value as the dependent variables. For the Visegrad group, this determinant is found statistically significant in the case of stock market and bond market capitalization. While there is a positive sign in the case of Baltic states, the negative sign in the case of Balkan and Visegrad countries is unexpected. But since we have considered an aggregate index of economic freedom (rule of law, limited government, regulatory efficiency, and open markets – trade freedom, investment freedom and financial freedom), it is hard to say which one of them generates this negative sign. This finding is entirely consistent with Claessens et al. (2006), who found that financial liberalization and openness of the capital markets might also lead to migration of capital trading activity to international stock exchanges, and consequently, to a reduction in the activity of the domestic capital markets.

We check robustness of the results by estimating our model with System GMM. As we can see from Table 12, the results confirm the estimates of the FMOLS and DOLS.

**Table 12.** Estimation results with System GMM

| Independent variables | Dependent variables | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Balkan (B-4) | | | Baltic (B-3) | | | Visegrad (VIS-4) | | | Total (NMS 11) | | |
| | STV | SMC | OPDS | STV | SMC | OPDS | STV | SMC | OPDS | STV | SMC | OPDS |
| Lag of the dependent variables | 0.46 *** (0.24) | 0.81** (0.20) | 0.64*** (0.20) | 0.72*** (0.30) | 0.11* (0.64) | 0.55*** (0.51) | 0.67** (0.20) | 0.65*** (0.25) | 0.59* (0.19) | 0.88*** (0.26) | 1.13** (0.16) | 0.77*** (0.24) |
| GDPPCG | 0.01*** (013) | 1.40*** (0.31) | 0.18*** (0.58) | 0.01 (0.11) | 0.48 (0.47) | 0.05*** (0.09) | 0.18*** (0.22) | 0.13*** (0.19) | 0.25*** (0.57) | 0.05 (0.11) | 0.77*** (0.22) | 0.13*** (0.33) |
| INF | −0.13*** (0.08) | −0.52** (0.30) | 0.01 (0.58) | −0.07 (0.25) | −1.24 (1.04) | −0.46** (0.17) | −0.13 (0.19) | −0.14 (0.37) | −0.35** (0.80) | −0.26 (0.11) | 0.38 (0.22) | −0.01*** (0.33) |
| RIR | −0.17* (0.15) | 0.29 (0.64) | 0.02** (0.07) | 0.43 (0.09) | 0.61** (0.67) | 0.08 (0.16) | 0.14* (0.37) | 0.22 (0.24) | 0.66 (0.82) | −0.12*** (0.94 | −0.11 (0.31) | −0.02 (0.39) |
| PENG | 0.03 (0.06) | 0.24*** (0.25) | 0.01 (0.03) | 0.14** (0.18) | 0.07 (0.27) | 0.19** (0.22) | 0.11*** (0.33) | 0.16** (0.39) | 0.03 (0.06) | 0.15*** (0.07) | 0.25*** (0.18) | 0.01 (0.02) |
| DCPS | 0.01 (0.03) | 0.14 (0.15) | 0.02** (0.13) | 0.07 (0.37) | 1.33 (0.81) | 0.08 (0.24) | 0.11*** (0.12) | 0.78 (0.52) | 0.22 (0.23) | 0.03 (0.21) | 0.07 (0.08) | 0.03 (0.01) |
| INDEX | −0.10*** (0.93) | −0.56 (0.25) | 0.01 (0.03) | 0.03*** (0.19) | 4.01*** (3.35) | 0.01 (0.23) | −0.23** (0.25) | 0.03 (0.06) | 0.78 (0.52) | 0.11** (0.94) | 0.25** (0.18) | 0.03 (0.32 |
| Arellano-Bond test AR (1) | 0.03 | 0.02 | 0.09 | 0.05 | 0.03 | 0.07 | 0.09 | 0.04 | 0.08 | 0.05 | 0.00 | 0.03 |
| Arellano-Bond test AR(2) | 0.61 | 0.32 | 0.58 | 0.45 | 0.51 | 0.94 | 0.72 | 0.35 | 0.25 | 0.95 | 0.41 | 0.27 |
| Sargan test | 0.70 | 0.26 | 0.92 | 0.88 | 0.50 | 0.81 | 0.28 | 0.65 | 0.94 | 0.98 | 0.14 | 0.13 |

*Notes*: *, ** and *** indicate that the test statistic is significant at the 10, 5 and 1% level, respectively. Standard errors are in parentheses.
*Source*: Authors' calculations.

## 5. CONCLUSIONS

Following the radical pension system reforms, pension funds' assets are growing rapidly, thereby increasingly providing a source of investment funds for the domestic financial markets. Pension funds' investments are expected to increase the availability of long-term funds, enhance competition, induce financial innovation, and improve the corporate governance. The recent growth experienced by the private pension funds from the CEE countries, due to the pension reform, has led us to question the positive effect that this might have on the development of local capital markets.

Using the FMOLS and DOLS estimation techniques, we find that pension funds positively impacted bond markets growth in all country groups, while they did not impact stock market growth in the Balkan and Baltic countries. Given the institutional design of the pension system reform in 11 NMS, the obtained results prove the beneficial impact of the pension systems' reforms on the development of domestic capital markets.

Keeping in mind the institutional design of the pension systems' reform in the CEE countries, the obtained results prove the beneficial impact of these reforms on the development of domestic capital markets. In addition, we consider that this effect is likely to be more significant in the future, with larger accumulation of assets by the private pension funds.

These research findings have important implications for policy makers, regulators and all market players in the selected countries. First of all, the economic development has a significant impact for capital market development. It is therefore important to pursue investment liberalization policies as well to initiate and implement measures to encourage savings and investment. Measures further aimed at the development of financial systems need to be thoughtful, far-reaching, consistent and proactive, with the approach focusing on continuing privatization reforms and strengthening pensions system with an emphasis on strengthening property rights and shareholders and improving the corporate governance and a series of measures aimed at strengthening capital markets.

We highlight a few important limitations to our empirical analysis. In many European transition economies, pension fund portfolios were (and still are) leaning heavily towards fixed income (especially, public debt) instruments. The need to shift to higher risk/return profiles and greater equity allocations does not explicitly follow from our analyses. This is also related to the lack of discussion concerning the regulatory and financial sectors' specificities of the countries covered – factors that also enter into asset allocation considerations. Lastly, given the complexity of the topic, we have not investigated the possible effect of the pension savings on generating asset price bubbles, especially in markets where the demand for equities is dominated by pension funds. Our implicit assumption has been that the capital account liberalization among the new EU member states has enabled a satisfactory degree of diversification. However, the home biases in investment portfolios and the localized asset price bubbles cannot be excluded on *a priori* grounds.

We identify several possible investigations for the future. 1) The research may broaden the scope of examination by expanding the number of potential explanatory variables. For instance, future investigations could shed light on the investment behaviour, and the role of regulations and incentives as the conditioning factors. Another possibility is to increase the explanatory power by including either other macroeconomic determinants (monetary aggregates, stock prices and exchange rates) or bank-specific factors (size, loans-to-assets ratio, etc.). Admittedly, a severe problem is the lack of available data on selected determinants for a longer period. The

existence of a long-term series of data would enable more accurate and reliable results. 2) Future research may broaden the geographical context and consider the situation in South Eastern Europe, by including some of the EU candidate and/or potential candidate countries. 3) A natural extension of our analysis would be to consider the policy reversals of the 2008–2012 period, many of which were later perpetuated, directly impacting pension funds' revenues. 4) Future inquiries could also consider the exogenous factors, such as demographic changes (size of population and age composition). 5) Market size and structure in the sectors servicing the pension fund industry are also important factors that merit more attention.

## REFERENCES

Ádám, Z. – Simonovits, A. (2019): From Democratic to Authoritarian Populism: Comparing Pre- and Post-2010 Hungarian Pension Policies. *Acta Oeconomica*, 69(3): 333–355.

Afonso, A. – Jalles, J. T. (2013): Do Fiscal Rules Matter for Growth? *Applied Economics Letters*, 20(1): 34–40.

Aras, G.– Muslumov, A. (2005): Institutional Investors and Stock Market Development: A Causality Study. *Istanbul Stock Exchange Review*, 8(29): 1–14.

Baltagi, B. (2001): *Econometric Analysis of Panel Data*. (2nd ed.) Chichester: John Wiley & Sons.

Bayar, Y. (2016): Individual Pension Funds and Capital Market Development in Turkey. *Review of Economic and Business Studies*, 9(2): 95–109.

Bencivenga, V. R. – Smith, B. D. (1993): Some Consequences of Credit Rationing in an Endogenous Growth Model. *Journal of Economic Dynamics & Control*, 17: 97–122.

Blommestein, H. (2001): *Ageing, Pension Reform, and Financial Market Implications in the OECD Area.* Working Paper, No. 9/01, Center for Research on Pensions and Welfare Policies, Paris.

Claessens, S. – Klingebiel, D. – Schmukler, S. (2006): Stock Market Development and Internationalization: Do Economic Fundamentals Spur Both Similarly? *Journal of Empirical Finance*, 13(3): 316–350.

Corbo, V. – Schmidt-Hebbel, K. (2003): Macroeconomic Effects of the Pension Reform in Chile. In: *International Federation of Pension Fund Administrators: Pension Reforms: Results and Challenges*. Santiago, Chile, pp. 241–329.

Daradkah, D. – Al Namdoun, N. (2020): Pension Funds, Capital Market Development, and Macroeconomic Variables: Evidence from Jordan. *Public Affairs*, 21(2): 1–6.

Dayoub, M. – Lasagabaster, E. (2008): *General Trends in Competition Policy and Investment Regulation in Mandatory Defined Contribution Markets in Latin America*. Policy Research Working Paper, No. 4720. Washington D.C.: Worldbank.

Enache, C.– Miloş, L. R. – Miloş, M. C. (2015): Pension Reform and Capital Market Development in Central and Eastern European Countries. *Economic Research – Ekonomska Istraživanja*, 28(1): 75–84.

Hryckiewicz, A. (2009): *Pension Reform, Institutional Investors Growth and Stock Market Development in the Developing Countries: Does It Function?* Working Paper, No.67, National Bank of Poland.

Huybens, E. – Smith, B. (1999): Inflation, Financial Markets, and Long-Run Real Activity. *Journal of Monetary Economics*, 43(2): 283–315.

Im, K. S. – Pesaran, H. M. – Shin, Y. (2003): Testing for Unit Roots in Heterogeneous Panels. *Journal of Econometrics*, 115(1): 53–74.

Impavido, G. – Musalem, A. – Tressel, T. (2003): *The Impact of Contractual Savings Institutions on Securities Markets*. Policy Research Working Paper, No. 2948. Washington D.C.: World Bank.

Kao, C. (1999): Spurious Regression and Residual-Based Tests for Cointegration in Panel Data. *Journal of Econometrics*, 90(1): 1–44.

Kao, C. – Chiang, M. H. (2001): On the Estimation and Inference of a Cointegrated Regression in Panel Data. In: Baltagi, B. H. (ed.): *Nonstationary Panels, Panel Cointegration, and Dynamic Panels. Advances in Econometrics*, Vol. 15. NY: Elsevier Science Inc., pp. 179–222.

Lean, H. – Smyth, R. (2010): On the Dynamics of Aggregate Output, Electricity Consumption and Exports in Malaysia: Evidence from Multivariate Granger Causality Tests. *Applied Energy*, 87(6): 1963–1971.

Maddala, G. S. – Wu, S. (1999): A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test. *Oxford Bulletin of Economics and Statistics*, 61(S1): 631–652.

Masih, A. – Masih, R. (1996): Energy Consumption, Real Income and Temporal Causality: Results from a Multi-Country Study Based on Cointegration and Error-Correction Modelling Techniques. *Energy Economics*, 18(3): 165–183.

Meng, C. – Pfau, W. D. (2010): *The Role of Pension Funds in Capital Market Development*. National Graduate Institute for Policy Studies (GRIPS) Discussion Paper, No. 10–17.

Pedroni, P. (2001): Purchasing Power Parity Tests in Cointegrated Panels. *Review of Economics and Statistics*, 83(4): 727–731.

Pedroni, P. (1999): Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors. *Oxford Bulletin of Economics and Statistics*, 61(S1): 653–670.

Raddatz, C.– Schmukler, S. L. (2008): *Pension Funds and Capital Market Development: How Much Bang for the Buck?* Policy Research Working Paper, No. 4787, Washington D.C.: World Bank.

Raisa, M. L. (2012): *Spillover Effects of Pension Funds on Capital Markets: The EU–15 Countries Case.* Annals – Economy Series, Constantin Brancusi University, Faculty of Economics, 4: 164–170.

Rajan, R. – Zingales, L. (2003): The Great Reversals: The Politics of Financial Development in the Twentieth Century. *Journal of Financial Economics*, 69(1): 5–50.

Roodman, D. (2009): How to do Xtabond2: An Introduction to Difference and System GMM in Stata. *Stata Journal*, 9(1): 86–136.

Thomas, A. – Spataro, L. (2016): The Effects of Pension Funds on Markets Performance: A Review. *Journal of Economic Surveys*, 30(1): 1–33.

Vassilios, B. – Stavroyiannis, S. (2020): Pension Funds and Stock Market Development in OECD Countries: Novel Evidence from a Panel VAR. *Finance Research Letters*, Vol. 34.

Zubair, A. K. I. (2016): Effects of Pension Funds' Investments on Capital Market Performance in Nigeria. *International Journal of Economics and Business Management*, 2(9): 1–17.